PRESIDENTIAL CLIMATE COMMISSION
TOWARDS A JUST TRANSITION

PRESIDENTIAL CLIMATE COMMISSION

TECHNICAL REPORT SUPPORTING THE RECOMMENDATIONS FOR SOUTH AFRICA'S 2030 – 2035 NDC UPDATE

August 2025

ABOUT THE PRESIDENTIAL CLIMATE COMMISSION

The Presidential Climate Commission (PCC) is a multi-stakeholder body established by the President of the Republic of South Africa to advise on the country's climate change response and pathways to a low-carbon climate-resilient economy and society. In building this society, South Africa needs to ensure decent work for all, social inclusion, and the eradication of poverty. Those most vulnerable to climate change, including women, children, persons with disabilities, the poor and the unemployed need to be protected, and workers' jobs and livelihoods also need protection. The PCC facilitates dialogue between social partners on these issues and, in particular, defining the type of society we want to achieve and detailed pathways for how to get there.

ABOUT THIS REPORT

This report presents the technical analyses that underpins the PCC's recommendations for South Africa's 2030-2035 Nationally Determined Contributions (NDC) update. The analysis, and subsequent recommendations, are based on significant research, evidence, and stakeholder engagement with all social partners, set against the current national policy framework, notably the Climate Change Act, the National Development Plan, the Just Transition Framework, and South Africa's current climate commitments (2021 NDC update).

This technical report forms part of a series of three reports, that will all become available on the PCC website, that should be read together:

1. The 2030-2035 NDC Update Recommendations Report, which describes the recommendations of the PCC to the President of the Republic and Cabinet based on our research and engagement with stakeholders.
2. The Stakeholder Perspectives Report, which presents the unfiltered perspectives of the stakeholders consulted in preparing the PCC recommendations on the 2030-2035 NDC update.
3. The Technical Report (this report), which holds the summary of the PCC's technical research work that informed the consultations and recommendations report.

Collectively, these reports aim to inform South Africa's strategic positioning on adaptation, mitigation, and means of implementation for the 2030–2035 period, providing an evidence-based and consultative foundation for advancing an equitable and climate-resilient transition in alighnment with the objectives of a just transition.

Where the reader may disagree with the conclusions reached in this document, or where readers feel key pieces of information have been missed, the Commission welcomes additional research and insight. Such information should be sent to mitigation@climatecommission.org.za. The Commission will investigate all recommendations and questions that are substantiated with well researched, data-driven evidence.

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Abbreviations

A-NDC	Adaptation Nationally Determined Contribution
AAR	Anticipate–Adapt–Recover
AR5	IPCC Fifth Assessment Report
BTR	Biennial Transparency Report
CaDD	Climate Capacity Diagnosis & Development
CBDR-RC	Common But Differentiated Responsibilities and Respective Capabilities
COP	Conference of the Parties
CRD	Climate-Resilient Development
CSAG	Climate Systems Analysis Group
CSIR	Council for Scientific and Industrial Research
DAFF	Department of Agriculture, Forestry and Fisheries
DBSA	Development Bank of Southern Africa
DFFE	Department of Forestry, Fisheries and the Environment
DFI	Development Finance Institution
DOE	Department of Energy
DTIC	Department of Trade, Industry and Competition
EbA	Ecosystem-based Adaptation
ESRG	Economics of Sustainability and Resilience Group
GCF	Green Climate Fund

GGA	Global Goal on Adaptation
GHG	Greenhouse Gas
GW	Gigawatt
GWP	Global Warming Potential
IDC	Industrial Development Corporation
IDP	Integrated Development Plans
IGCC	Intergovernmental Committee on Climate Change
INDC	Intended Nationally Determined Contribution
IPCC	Intergovernmental Panel on Climate Change
IPPU	Industrial Processes and Product Use
JET-IP	Just Energy Transition Investment Plan
JETP	Just Energy Transition Partnership
JTF	Just Transition Fund
JTFM	Just Transition Financing Mechanism
LEDS	Low Emission Development Strategy
LTAS	Long-Term Adaptation Scenarios
LULUCF	Land Use, Land Use Change and Forestry
MEL	Monitoring, Evaluation, and Learning
MoI	Means of Implementation
$MtCO_2e$	Million tonnes of carbon dioxide equivalent
NAMA	Nationally Appropriate Mitigation Action
NAS	National Adaptation Strategy
NBI	National Business Initiative
NCCAS	National Climate Change Adaptation Strategy
NCCRP	National Climate Change Response Policy

NCCC	National Committee on Climate Change
NDC	Nationally Determined Contribution
NDMC	National Disaster Management Centre
NDP	National Development Plan
NEMA	National Environmental Management Act
NEVs	New Energy Vehicles
NGP	National Growth Path
PCC	Presidential Climate Commission
PPP	Public-Private Partnership
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
SAWS	South African Weather Service
SDFs	Spatial development frameworks
SETs	Sectoral Emission Targets
ToC	Theory of Change
UAE	United Arab Emirates
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States Dollar
WWF-SA	World Wide Fund for Nature South Africa

Executive Summary

This technical report underpins the Presidential Climate Commission's advice for South Africa's 2030–2035 Nationally Determined Contribution (NDC) update and aligns it with the Climate Change Act (2024), the National Development Plan, the Just Transition Framework and heightened international expectations arising from the Paris Agreement and UAE Consensus. It sets out rigorous analyses of climate risks, mitigation pathways and implementation requirements, demonstrating how an ambitious yet practical NDC can accelerate low-carbon development, reinforce socio-economic resilience and strengthen South Africa's credibility in international climate diplomacy.

Adaptation – Intensifying heat, drought, flood and sea-level rise threaten infrastructure, livelihoods, food, water and health security, with the greatest impacts falling on vulnerable communities already burdened by unemployment, poverty and inequality. The report proposes an Anticipate–Adapt–Recover governance cycle, stronger early-warning and data systems and clear sector-specific 2035 targets such as improved water security, climate-resilient infrastructure and wider adoption of agro-ecological practices. Priority actions include rehabilitating degraded catchments and wetlands, expanding potable-quality water reuse, upgrading critical public-service infrastructure and embedding inclusive knowledge co-production and just-transition measures across all spheres of government.

Mitigation – Updated models place South Africa's fair-share 2035 emissions corridor at 248–329 Mt CO_2-e, consistent with an achievable net-zero and 1.5°C pathway to mid-century. Near-complete power-sector decarbonisation through accelerated wind and solar deployment emerges as the central, least-cost lever, enabling deep cuts in transport, industry and buildings while creating reliable, affordable electricity and new green-economy jobs.

Means of Implementation – Tracked public adaptation finance reached only about USD 7.6 million in 2021–2022, while concessional mitigation funding, institutional capacity and public tracking tools remain inadequate. The report therefore highlights the need for a climate-budget-tagging framework, stronger municipal and sector capacity-building, wider access to blended finance via the Just Transition Financing Mechanism, and a transparent digital platform that links finance, actions and outcomes for real-time monitoring, reporting and verification.

Cross-cutting Insights – The report frames climate ambition as socio-economic risk management: collectively stronger global mitigation lowers future adaptation costs, while South Africa's fair-share contribution protects trade competitiveness and unlocks green-industrial opportunities; inclusive adaptation safeguards development gains and equity; and both mitigation and adaptation depend on robust governance, high-quality data, social-partner dialogue and meaningful stakeholder engagement, particularly for workers and communities in carbon-intensive value chains.

Taken together, these findings give policymakers and social partners a clear, evidence-based foundation for an NDC that safeguards development gains, advances a genuinely just and inclusive transition and fulfils South Africa's fair share of the global 1.5 °C effort.

1 Introduction

As a signatory of the Paris Agreement under the United Nations Framework Convention on Climate Change (UNFCCC), South Africa is required to submit Nationally Determined Contribution (NDC) targets every five years. The country submitted its first NDCs in 2016 and the updated NDC in 2021. The updated NDC committed the country to a fixed target range for greenhouse gas (GHG) emissions levels of 398-510 $MtCO_2$-e by 2025, and 350-420 $MtCO_2$-e by 2030. The Presidential Climate Commission (PCC) played an influential role in the update of the NDC ranges for 2025 and 2030 that were approved by cabinet, by making recommendations into the Department of Forestry, Fisheries and the Environment (DFFE) NDC update process. This was done by commissioning additional research, collating the research of others and convening a series of dialogues to seek alignment and forge consensus amongst stakeholders. The 2021 South African NDC has been crucial in driving domestic climate action. It is critical that the updated NDC, due for discussion at COP30 in Belem, provides a target range that would continue to drive domestic climate efforts that consider climate adaptation and mitigation efforts and their means of implementation. Moreover, the NDCs play a pivotal role in shaping the trajectory of South Africa's economy, serving as both a blueprint for sustainable development and a powerful economic signal.

The country's compilation of the 2030 - 2035 NDC is led by the DFFE, and the Minister of Forestry, Fisheries and Environment will table the NDC on behalf of South Africa with the United Nations. The PCC is once again preparing recommendations to the Minister of Fisheries, Forestry and Environment for consideration. The aim is to support a credible NDC that South Africa can submit ahead of the UNFCCC's COP30.

1.1 Context

South Africa stands at a pivotal juncture in its climate response, where the case for increased ambition is no longer driven solely by the science of physical climate risk, but by the mounting socio-economic imperative to protect the country's development trajectory. The urgency of climate action must be framed not only in terms of emissions, but in terms of people, especially those most vulnerable to climate shocks and least equipped to recover. Structural inequality, high unemployment, expanding informal settlements, and deep poverty already characterise South Africa's socio-economic landscape. These conditions are now being compounded by intensifying climate risks, which threaten to undermine service delivery, reverse development gains, and entrench long-standing injustices.

The case for increased ambition in the 2030–2035 NDC is therefore not only environmental or for international reputation and resource purposes, but also inherently socio-economic. Climate change amplifies every existing vulnerability in South African society. Rural livelihoods are destabilised by drought and heat stress. Urban infrastructure is overwhelmed by flooding. Health systems face mounting pressures from disease vectors and extreme temperatures. The livelihoods of low-income households, particularly women, youth, and informal workers, are increasingly exposed to uninsurable risks. Left

unaddressed, these impacts will not only deepen inequality but may trigger cascading effects on economic stability, investment confidence, and public trust in the country's institutions.

While South Africa contributes a relatively small share of global emissions, it is highly exposed to climate risks and remains committed to ambitious action in line with the principle of Common but Differentiated Responsibilities and Respective Capabilities (CBDR-RC). This framing recognises the country's unique position as both a vulnerable developing country and a top global emitter, necessitating an ambitious, yet fair, and nationally appropriate response.

Climate change challenges however present a strategic opportunity to structurally transform South Africa's economy and advance the goals of the Just Transition. By scaling up investments in renewable energy, electric mobility, climate-resilient infrastructure, and green manufacturing, South Africa can diversify its economy away from carbon-intensive sectors and unlock new pathways for inclusive growth. This transition must be deliberate, well-managed, and deeply rooted in social engagement to ensure that workers and communities in vulnerable sectors are not left behind. Ambitious climate action, when aligned with socio-economic development and economic diversification, becomes a vehicle for long-term resilience, job creation, and spatial justice.

This technical report provides the analytical foundation for the Presidential Climate Commission's (PCC) recommendations to inform South Africa's updated NDC. It is grounded in the latest science, policy, and extensive stakeholder engagement, but most importantly, it is guided by the recognition that climate ambition is essential to securing the country's social and economic future. A credible and ambitious NDC must reflect this developmental rationale, positioning climate action as a means to advance human well-being, equity, and economic transformation, while fulfilling South Africa's international obligations. The decisions taken now by all stakeholders including Cabinet, will shape not only our decarbonisation pathway but also the country's broader resilience, prosperity, and cohesion for the future.

1.2 Purpose and Role of this Technical Report

The core objective of this report is to provide detailed analytical inputs and technical insights that will directly inform the subsequent Recommendations Report. This Technical Report will advise the Minister on:

1. Specific measures to ensure full alignment between the gazetted national emissions trajectory and the 2030–2035 NDC.
2. Recommendations for establishing clear and coordinated adaptation mechanisms that satisfy both domestic legal requirements and international reporting expectations.
3. Recommendations for strengthening the Means of Implementation to ensure the NDC is implementable, including institutional capacity, climate finance mobilisation, technology access, skills development, and alignment with national budgetary and planning systems.

In other words, this technical report will not serve as an official policy document, but rather as an evidence-based reference, guiding the formulation of clear recommendations for the Minister, ensuring strategic consistency between domestic and international obligations.

Specifically, this Technical Report will inform recommendations by:

1. Aligning the forthcoming gazetted emissions trajectory with the call for increased ambition from the United Arab Emirates (UAE) Consensus and a science-based 1.5°C-compatible pathway while taking into consideration CBDR-RC.[1]

[1] PCC. 2024. *Climate Risk Report of South Africa*. Presidential Climate Commission

2. Identifying practical opportunities and concrete policy actions necessary to achieve ambitious emissions reductions and adaptation targets.
3. Highlighting key vulnerabilities to climate change, informing adaptation targets, promoting synergies with mitigation objectives, highlighting capacity needs, ensuring inclusivity in developing adaptation plans, and recommending adequate and efficient monitoring and alignment with national development plans.
4. Strengthening institutional, governance, and legal frameworks required to sustain rigorous climate action implementation and accountability.[2]

In summary, this report places the upcoming 2030–2035 NDC within a transformed domestic policy and regulatory landscape shaped significantly by the Climate Change Act, 2024 (Act 22 of 2024) and evolving international obligations under the UAE Consensus and Global Stocktake outcomes. It clarifies the NDC's changing role from primary domestic regulatory document to international communication instrument - and provides analytical inputs that will support a strategic, legally consistent, and ambitious set of recommendations for the Minister, laying the foundation for a locally credible and internationally aligned 2030–2035 NDC submission.

1.3 Nationally Determined Contributions under the Paris Agreement

Under the Paris Agreement, adopted at COP21 in 2015[3], countries commit to developing and submitting NDCs, which represent national climate action plans outlining commitments for reducing GHG emissions and adapting to climate impacts. Central to the Paris Agreement is the objective of limiting global temperature rise to "*well below 2°C*," while actively pursuing efforts to keep warming to 1.5°C above pre-industrial levels.[4]

The recent adoption of the UAE Consensus at COP28 reinforced this ambition, explicitly emphasising the global goal of limiting warming to 1.5°C.[5] The UAE Consensus significantly elevated international expectations for the upcoming round of NDCs (to be submitted ahead of 2025), requiring countries to demonstrate increased ambition, robust economy-wide targets covering all GHGs and sectors, and explicit commitments to accelerate the just transition away from fossil fuels, along with enhanced transparency, clear implementation pathways, inclusive stakeholder engagement, and strengthened institutional arrangements.

South Africa submitted its Updated NDC in 2021, setting national targets aligned with the global climate goals articulated in the Paris Agreement. The PCC played a key role in the 2021 NDC update by providing recommendations to the DFFE. The PCC's recommendations were based on consultations and scientific research, as well as public consultations with various stakeholders to ensure the updated NDC was just, inclusive, and grounded in scientific rigour. This Updated NDC provided quantified emission reduction targets for the period leading to 2030, strengthened adaptation commitments, and outlined general principles for a just transition. It represents the current, official national climate commitment under the Paris Agreement.

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[2] PCC. 2022. *Putting climate-resilient development pathways into practice*. Presidential Climate Commission

[3] UNFCCC.2015. *Paris Agreement*. United Nations Framework Convention on Climate Change

[4] UCT ESRG. 2024. *Net zero CO2 emission pathways for South Africa*. University of Cape Town Energy Systems Research Group

[5] UNFCCC. 2023. *UAE Consensus*. United Nations Framework Convention on Climate Change. COP28.

In light of the UAE Consensus and the outcomes of the first Global Stocktake[6], there is a clear expectation that the next cycle of NDC submissions - covering the period 2030–2035 - must significantly enhance ambition, specificity, and comprehensiveness in responding to emerging scientific evidence and heightened international requirements.

This technical report is specifically intended to provide detailed inputs that will inform the PCCs recommendations to the DFFE for South Africa's next NDC submission (2030–2035). It is designed to identify clear areas of increased ambition, outline strategic priorities, and propose specific policy and governance measures consistent with the expectations established under the UAE Consensus.

To support this objective, the technical report explicitly addresses the following elements in its analysis and recommendations, as rooted in the frameworks and mechanisms established under the United Nations Framework Convention on Climate Change (UNFCCC), the Paris Agreement, and the UAE Consensus from COP28. These elements align with international expectations for the preparation and implementation of NDCs:

1. **Integrating All Pillars of the Paris Agreement:** The recommendations cover robust actions across mitigation, adaptation, and the means of implementation—including scaled-up climate finance, technology transfer, and capacity-building. This holistic approach ensures alignment of financial flows with low-carbon and climate-resilient pathways.
2. **A Just Energy Transition:** This report provides recommendations on concrete measures to support South Africa's transition away from fossil fuels in a just, orderly, and equitable manner.
3. **Inclusive, Whole-of-Society Engagement:** It provides guidelines and strategic recommendations to ensure broad stakeholder participation in developing and implementing the next NDC, including roles for subnational governments, the private sector, civil society, youth, and marginalized communities, thus aligning with the inclusive processes advocated under the UAE Consensus.
4. **Increased Ambition and Comprehensive Scope:** It provides inputs on how South Africa can strengthen its emission reduction targets, expand coverage to all greenhouse gases, and explicitly incorporate economy-wide sectors. The report analyses pathways consistent with achieving a 1.5°C-compatible trajectory, ensuring a clear progression from the ambition set out in the Updated NDC (2021).
5. **Enhanced Transparency and Implementation:** The report proposes clear and quantifiable methodologies, sector-specific targets, baseline years, and implementation plans, in line with the transparency and accountability requirements articulated in the UAE Consensus.
6. **Strengthening Legal and Institutional Frameworks:** The Technical Report offers recommendations on legal and institutional reforms required to support sustained, credible, and transparent NDC implementation. It identifies governance measures needed to institutionalize and ensure long-term accountability for ambitious climate actions.
7. **Reflecting Outcomes of the Global Stocktake and most recent NDC:** The recommendations consider the findings of the Global Stocktake, the latest climate science, as well as achievements and likely achievements since South Africa's last NDC submission, ensuring South Africa's next NDC reflects updated international and local understanding and urgency around climate action.

[6] UNFCCC. 2023. *CMA.5 Outcome of the first global stocktake*. United Nations Framework Convention on Climate Change COP28

1.4 South African Context

This section provides the domestic and international policy context within which South Africa's NDC is developed and operationalised. It clarifies the relationship between existing policy frameworks - including the Updated NDC (2021)[7], the Low Emissions Development Strategy (LEDS, 2020)[8], and the Climate Change Act[9] - and outlines how this technical report contributes to the process of aligning South Africa's upcoming 2030–2035 NDC with these evolving frameworks.

1.4.1 Domestic Policy Origins and Frameworks for the NDC

South Africa's Intended NDC (INDC), submitted on 25 September 2015, represented the country's initial intended commitment under the Paris Agreement, and was subsequently strengthened with the Updated NDC (2021).[10] This updated submission increased ambition for emissions reduction and adaptation action for the 2025–2030 period, reflecting growing national recognition of climate urgency. It integrated the principles of a Just Transition, ensuring that ambitious climate action supports socio-economic priorities such as poverty alleviation, employment, and energy security.

1.4.2 The Climate Change Act

1. **National Emissions Trajectory:** The Act requires the Minister to formally gazette South Africa's national emissions trajectory, updated every five years.[11] Crucially, until the Minister gazettes this trajectory for the first time, the current NDC (2021), or the updated 2030–2035 NDC if gazetted before the international submission deadline (September 2025), will officially serve this regulatory purpose as the interim regulatory emissions trajectory. Once gazetted, however, this legally binding emissions trajectory will supersede the indicative trajectory provided by the NDC, thereby shifting the primary regulatory instrument from the NDC to the gazetted emissions trajectory. This shift reflects the transition from international political commitment to a domestically enforceable legal obligation.
2. **Adaptation Framework:** Within one year of the Climate Change Act's enactment, the Minister must gazette key adaptation planning documents, namely:
    a. National Adaptation Objectives,
    b. Adaptation Scenarios,
    c. National Adaptation Strategy and Plan,
    d. Sector Adaptation Strategies and Plans, and
    e. Adaptation Information and Synthesis Adaptation Report.

With the enactment of the Climate Change Act, South Africa's adaptation governance has been expanded through the introduction of legally mandated planning instruments, including National Adaptation

[7] DFFE. 2021. *South Africa's First Nationally Determined Contribution under the Paris Agreement Update.* Department of Forestry, Fisheries and Environment.

[8] DFFE. 2020. *South Africa's Low-Emission Development Strategy 2050.* Department of Forestry, Fisheries and Environment.

[9] Republic of South Africa. 2024. Climate Change Act, 2024 (Act 22 of 2024).

[10] Department of Environmental Affairs. 2015. *South Africa's Intended Nationally Determined Contribution*.

[11] Republic of South Africa. 2024. Climate Change Act, 2024 (Act 22 of 2024).

Objectives, Adaptation Scenarios, and sector-specific strategies and plans. While this new framework now provides the primary basis for domestic adaptation implementation, it reinforces the function of the NDC to become the central mechanism for communicating South Africa's adaptation ambition, coherence, and progress to the international community. It serves as a synthesising and alignment tool that reflects the implementation of these statutory instruments and articulates their contribution to South Africa's just transition and climate-resilient development. In this way, the NDC is elevated as an integrated economic and climate policy signal that shows how domestic priorities are aligned with global expectations.

The successful formulation of South Africa's updated 2030–2035 NDC requires strong alignment with existing national legislation, long-term strategic plans, and sectoral frameworks. The evolving domestic policy landscape, anchored in the Climate Change Act, Sectoral Emission Targets (SETs), the Carbon Budget and Carbon Tax systems, the LEDS 2050, the National Development Plan (NDP) 2030, the NEMA, and the National GHG Inventory, provides the legal, strategic, and empirical foundations for the NDC. Policy alignment ensures that the updated NDC is not only ambitious in its climate goals but also implementable, enforceable, and integrated with South Africa's socio-economic development objectives and a just transition.

The Climate Change Act fundamentally reconfigures South Africa's climate governance architecture. It mandates the Minister of Forestry, Fisheries and the Environment to gazette a national GHG emissions trajectory and establishes legally binding instruments to operationalise this trajectory through the SETs and Carbon Budgets.

The Act transitions the NDC from being South Africa's principal domestic climate policy instrument to serving primarily as a mechanism for international reporting under the Paris Agreement. Domestically, the primary regulatory force will now lie in the legally gazetted emissions trajectory and accompanying sectoral instruments.

Accordingly, the updated 2030–2035 NDC must:

1. Align explicitly with the legally gazetted emissions trajectory once established by the Minister.
2. Reflect national adaptation strategies and sector-specific measures under the Climate Change Act, 2024 (Act 22 of 2024). The Climate Change Act's adaptation provisions are not yet in force, as they depend on forthcoming regulations (expected late 2025), after which the National Adaptation Strategy and Plan must be developed within two years, placing its expected completion from late 2027 onward.
3. Provide clear and transparent communication of South Africa's climate actions to the international community, reinforcing alignment with both domestic legislation and international expectations.

1.4.3 Low Emissions Development Strategy 2050

The LEDS (2020)[12] provided the longer-term strategic vision guiding emissions reductions through mid-century. While the LEDS set out broad economy-wide objectives and strategic sectoral pathways, the

[12] DFFE. 2020. *South Africa's Low-Emission Development Strategy 2050.* Department of Forestry, Fisheries and Environment.

Updated 2021 NDC operationalised these objectives into near-term quantifiable targets, creating a clear trajectory toward a lower-carbon economy by 2030.

South Africa's LEDS, published in 2020, defines the long-term vision for achieving a net-zero carbon economy by 2050. The LEDS outlines sectoral pathways and cross-sectoral strategies, emphasising that emissions should peak by 2025, plateau between 2026–2035, and decline thereafter. Alignment with the LEDS requires that the updated NDC:

- Reaffirm South Africa's commitment to reaching net-zero emissions by 2050.
- Establish near-term targets (2030–2035) that are consistent with the LEDS's decarbonisation trajectory.
- Explicitly link sectoral contributions (through SETs) to the broader LEDS-defined milestones, ensuring coherence across planning horizons.

By ensuring alignment with the LEDS, the NDC will demonstrate a credible, science-based pathway that integrates short-term action with long-term transformation goals.

1.4.4 National Development Plan 2030

The NDP 2030 remains South Africa's primary strategic development blueprint. It integrates climate change as a cross-cutting risk that threatens poverty reduction, infrastructure development, and economic transformation goals.

The updated NDC must support the NDP by:

- Promoting economic diversification in vulnerable, carbon-intensive regions through the creation of new green economic clusters (e.g., renewable energy manufacturing, electric vehicles, green hydrogen, regenerative agriculture).
- Aligning adaptation and mitigation actions with infrastructure modernization objectives, spatial transformation, and human settlement reforms.
- Strengthening the resilience of critical systems (water, food security, transport) to protect developmental gains from worsening climate impacts.

By embedding climate ambition within the NDP's developmental vision, the updated NDC ensures that climate action acts as a catalyst for inclusive, sustainable growth.

In addition to the core policy and legislative frameworks outlined above, several cross-cutting planning and investment instruments play a critical role in supporting the alignment and implementation of South Africa's NDC. These include the Medium-Term Strategic Framework (MTSF), which sets out the government's five-year priorities and performance indicators aligned with the NDP; the Just Transition Framework, which guides a socially inclusive transition to a low-carbon economy; the Just Energy Transition Investment Plan (JET-IP), which identifies key investment priorities across the electricity, green hydrogen, and transport sectors; the Just Transition Financing Mechanism (JTFM), which provides a structure for coordinating and mobilising climate-aligned finance; and the Climate Change Response Framework (CCRF), which laid the early foundations for South Africa's mitigation and adaptation strategies. These instruments collectively strengthen the integration of climate goals into broader economic, fiscal, and social planning processes, and will be essential enablers of a credible and implementable 2030–2035 NDC.

1.5 International Commitments and Alignment

Internationally, South Africa's NDC commitments reflect obligations under the Paris Agreement and, notably, the heightened expectations articulated by the UAE Consensus at COP28, including the clear mandate to pursue ambitious 1.5°C-aligned action. South Africa's NDC will continue to demonstrate national commitments aligned with these global imperatives.

The outcomes of the first Global Stocktake have clearly articulated the need for deep, rapid, economy-wide emissions reductions and accelerated adaptation action.[13] These international outcomes must directly inform South Africa's domestic climate policy and the formulation of its 2030–2035 NDC, requiring clear progression beyond previous commitments.

Although South Africa is responsible for only about 0.5%–0.6% of global GDP and roughly 1% of global GHG emissions (but ranking among the top 20 global emitters), it is highly vulnerable to climate impacts. As such, South Africa occupies a dual position: a developing country with acute adaptation needs, and a significant emitter with an obligation to contribute to global mitigation. This duality is recognised through the principle of CBDR-RC, which underpins South Africa's climate strategy. CBDR-RC acknowledges both historical responsibility and current capacity, allowing South Africa to advance an ambitious but equitable climate response, commensurate with its development priorities and resource constraints.

1.6 Gaps to be Addressed in the 2030-2035 NDC

A gap analysis of South Africa's 2021 Updated NDC relative to the National Development Plan[16] (NDP) 2030, UAE Consensus, Low Emission Development Strategy (LEDS) 2020[14], and First Biennial Transparency Report (BTR1)[15] identifies critical areas needing attention to ensure alignment, ambition, and credibility for the upcoming 2030–2035 NDC period.

The comparison with the NDP 2030 highlights both synergies and conflicts (refer to Appendix 1: 2021 Updated NDC vs. NDP2030). The NDC effectively aligns with the NDP's socio-economic goals through renewable energy expansion, infrastructure modernisation, and just transition frameworks. However, contradictions persist, particularly regarding coal dependency, financial integration, and fragmented institutional coordination. Key recommendations include integrating renewable energy and infrastructure modernisation explicitly into NDP plans, accelerating coal phase-down, and embedding climate finance into national budgeting processes.

Alignment gaps between the 2021 NDC and the UAE Consensus (refer to Appendix 2: 2021 Updated NDC vs. UAE Consensus) underscore a need for explicit, economy-wide, and sector-specific emissions targets aligned with a 1.5°C-compatible pathway. The 2021 NDC currently lacks explicit targets for renewable energy and energy efficiency improvements, and clear plans for fossil fuel phase-down. To address these

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[13] UNFCCC. 2023. *CMA.5* Outcome of the first global stocktake. United Nations Framework Convention on Climate Change COP28

[14] DFFE. 2020. *South Africa's Low-Emission Development Strategy 2050.* Department of Forestry, Fisheries and Environment.

[15] DFFE. 2024. *South Africa's 1st Biennial Transparency Report to the UNFCCC*. Department of Forestry, Fisheries and Environment.

[16] National Planning Commission. 2012. *National Development Plan 2030*.

gaps, South Africa's next NDC encourage clear targets for renewable energy capacity, energy efficiency benchmarks, and establish defined timelines for coal retirement and sectoral decarbonization.

The analysis against the LEDS 2020 (refer to Appendix 3: LEDS 2020 vs. 2021 Updated NDC) reveals inconsistencies in sectoral specificity and interim target milestones. Although the 2021 NDC acknowledges the LEDS as a strategic reference, clearer interim milestones between 2030 and 2050, detailed sector-specific pathways, mandatory carbon budgets, and integrated adaptation–mitigation strategies are required. Furthermore, enhancing methodological transparency and explicitly detailing financial mobilisation strategies are essential for aligning short-term NDC targets with the LEDS' long-term vision.

The First Biennial Transparency Report (BTR1) further highlights implementation and methodological inconsistencies (refer to Appendix 4: 2021 Updated NDC vs. the First Biennial Update Report). Although South Africa is making progress towards its 2025 targets, it risks being off-track for 2030 without accelerated policy implementation.

Adaptation remains underfunded, with a substantial finance gap, and loss and damage frameworks are inadequately developed. Strengthening institutional frameworks, establishing standardised monitoring methodologies, and improving transparency and accountability mechanisms are critical to addressing these gaps[17].

In summary, the 2030–2035 NDC should explicitly address these identified gaps by:

- Setting clear interim milestones and sector-specific emissions reduction pathways.
- Integrating renewable energy and energy efficiency targets.
- Advancing the coal phase-down and strengthening just transition plans with actionable implementation strategies.
- Embedding adaptation and mitigation strategies into a unified governance framework.
- Strengthening financial mobilisation strategies and ensuring transparency in methodologies and assumptions.
- Enhancing institutional coherence, legal enforceability, and stakeholder engagement to facilitate comprehensive climate action.

Addressing these gaps will ensure South Africa's climate commitments remain credible, ambitious, and aligned with both national development priorities and international expectations, providing a strong and credible foundation for achieving a resilient, low-carbon economy and just transition.

[17] PCC. 2022. Putting climate-resilient development pathways into practice: Capacity assessment framework. Presidential Climate Commission

2 Adaptation

2.1 Adaptation Urgency, Vulnerability, and Climate Risk

The urgency to address climate change adaptation is evident when considering the escalating physical risks that South Africa faces, especially in the context that some of these risks are either not quantified at all or their impacts are underestimated.[18,19] Extreme weather events—including intense heatwaves, severe storms, prolonged droughts, and catastrophic flooding—are no longer distant threats but current realities that affect public health, infrastructure, and economic stability.[18,20]

Recovery periods are also shrinking as extreme events occur more frequently. For example, the socio-economic damage from successive flooding events in KwaZulu-Natal (KZN) has been amplified by the short time between disasters, leaving communities with inadequate time to recover or rebuild—thereby deepening their vulnerability. These risks underscore the immediate need for decisive action to mitigate the potentially devastating impacts on communities and critical sectors.[21,22]

A broad shift toward proactive risk reduction is, therefore, critical to strengthening South Africa's resilience to climate-related hazards, and depends on building both institutional and community capacity to manage escalating climate threats.[20,23] The integration of risk assessments into national planning ensures that policy decisions are grounded in the practical realities of a changing climate, thus safeguarding livelihoods and promoting long-term stability.[23]

Persistent and interlinked challenges across anticipation, adaptation, and recovery highlight the need for a unified and strategic governance framework to guide South Africa's climate adaptation efforts.[24] These challenges are not isolated implementation failures, but symptoms of deeper systemic and institutional weaknesses that require structural transformation. Fragmented climate data, limited foresight capabilities, coordination gaps between spheres of government, constrained local capacity, and short-term finance allocation all inhibit effective adaptation and recovery. Moreover, post-disaster recovery often fails to address root vulnerabilities or advance equitable resilience.

To address these systemic barriers, the next iteration of South Africa's Adaptation NDC must move beyond fragmented or sectoral responses and embrace a governance-centred framework that enables anticipatory, adaptive, and transformative climate action.

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18 DFFE. 2023. Fifth Biennial Update Report of South Africa to the United Nations Framework Convention on Climate Change (BUR-5).

19 Scholes, R.J. and Engelbrecht, F.A. 2021. Climate impacts in Southern Africa during the 21st century. In: *DFFE Climate Risk Report 3.0*, pp.18–36. Pretoria: Department of Forestry, Fisheries and the Environment.

20 NRF, SAEON & SAWS. 2024. Climate Risk Report of South Africa: Report to the Presidential Climate Commission and the African Climate Foundation. Presidential Climate Commission.

21 Presidential Climate Commission. 2022. The April 2022 Floods in KwaZulu-Natal: Climate Impacts and Just Transition Implications. [online] Available at: https://pccommissionflo.imgix.net/uploads/images/PCC-Brief-KZN-Floods.pdf [Accessed 29 May 2025].

22 University of the Witwatersrand. 2023. The 2022 Durban floods were the most catastrophic yet recorded in KwaZulu-Natal. [online] Wits University News. Available at: https://www.wits.ac.za/news/latest-news/general-news/2023/2023-04/the-2022-durban-floods-were-the-most-catastrophic-yet-recorded-in-kwazulu-natal.html [Accessed 29 May 2025].

23 DFFE. 2019. South Africa's National Climate Change Adaptation Strategy 2019.

24 DFFE. 2023. Fifth Biennial Update Report of South Africa to the United Nations Framework Convention on Climate Change (BUR-5).

By prioritising adaptation measures within a governance-centred framework, South Africa can ensure that investments in climate action are both strategic and impactful, ultimately reinforcing the country's commitment to protecting its people, economy, and environment against the challenges of a warming world.[23] Effective adaptation must also address underlying socio-economic vulnerabilities, prioritise protection for the most at-risk communities, and be supported by strengthened institutional capacity and sustainable, accessible finance. [25]

2.1.1 Overview of South Africa's Climate Profile

South Africa's climate vulnerability is shaped by its ecological and geographical diversity as well as socio-economic factors and existing patterns of inequality. The country encompasses arid and semi-arid zones in the west and interior, subtropical conditions along the eastern seaboard, and temperate highland plateaus in the centre.[24] These diverse climatic regions are increasingly exposed to changing weather patterns and intensifying extremes.

2.1.1.1 Observed Climate Trends and Physical Risks

Recent findings from a 2024 scientific workshop further confirm that Southern Africa has already surpassed a 2°C average temperature increase, above pre-industrial baselines (1850–1900), with countries like Botswana and Zambia nearing a 3°C increase.[26]Particularly concerning is the rapid warming of interior regions of southern Africa - where near-surface air temperatures have increased at about twice the global mean rate over the past six decades. Climate models indicate that, even under global efforts to limit warming to 2°C, the interior regions of the subcontinent are still likely to warm by 3–4°C.[19]

Moreover, rainfall trends have become less predictable. Some regions, like parts of the Western Cape, have experienced slight increases in total annual rainfall, while others, such as Gauteng and the Free State, have seen declines. [24] Critically, there has been a rise in the intensity of rainfall during extreme events, with more rainfall occurring during the wettest 5% of days, resulting in devastating floods such as the 2022 KwaZulu-Natal floods.[19] So even though there may be small differences in total annual rainfall the volume and frequency of extreme events is increasing.

Regional climate risks vary significantly across South Africa, requiring regionally tailored adaptation responses.[27]

- **Coastal Zones (KwaZulu-Natal, Eastern Cape, Western Cape):** Sea-level rise, intensified storm surges, and flooding are increasingly threatening coastal infrastructure and settlements such as Cape Town, Gqeberha, and Durban. However, risks also include severe heatwaves, droughts,

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25 Scholes, R.J., et.al. 2023. A Delphi assessment of climate change risks in southern Africa in the 21st century. Climate Risk Management, 42, 100566.

26 SASSCAL. 2024. Southern Africa Surpasses Critical 1.5°C Global Temperature Threshold. Southern African Science Service Centre for Climate Change and Adaptive Land Management. Available at: https://sasscal.org/southern-africa-surpasses-critical-1-5c-global-temperature-threshold [Accessed 6 May 2025].

27 Johnston, P., et al. 2024. Climate Change Impacts in South Africa: What Climate Change Means for a Country and its People. University of Cape Town, South Africa.

coastal erosion and saltwater intrusion, all of which jeopardise freshwater systems and coastal ecosystems.

- **Western Interior (Northern Cape, Western Cape interior):** These regions are experiencing rising temperatures, persistent droughts, and acute water scarcity, placing severe pressure on agriculture, water systems, and rural livelihoods.
- **Eastern Regions (KwaZulu-Natal, Mpumalanga, Limpopo):** These areas are increasingly vulnerable to extreme rainfall, flash flooding, and soil erosion, threatening transportation networks, crop production, and rural infrastructure.
- **Urban Centres (e.g., Johannesburg, Durban, Cape Town):** Urban heat island effects, stormwater management failures, and infrastructure strain are exacerbated by rapid urbanisation, increasing exposure to floods, heatwaves, and power outages.
- **Rural Areas:** In many agricultural districts, smallholder farmers and marginalised communities—including seasonal and migrant workers—are at the frontline of climate risks, facing the compounded effects of prolonged drought, extreme heat, inadequate infrastructure, and socio-economic exclusion.

Compound hazards are becoming increasingly common. The Western Cape drought of 2015–2017 exemplifies the combined effects of reduced precipitation and higher temperatures, which increased evaporation rates and reduced water availability.[19] The likelihood and severity of flash flooding has increased, particularly for communities in informal settlements living along flood lines or areas with inadequate stormwater management. It is estimated that the probability of extreme rainfall events has doubled compared to pre-industrial conditions.[28]

These physical risks are already driving observable sectoral impacts:

1. **Agriculture:** Crop yields are increasingly impacted by prolonged droughts, particularly for rain-fed crops.[19]
2. **Water:** Rising evaporation and declining surface water reliability are reducing water availability.[19]
3. **Biodiversity:** Climate stress is placing sensitive ecosystems such as the Succulent Karoo and Fynbos under severe pressure, leading to declines in species diversity.[23]
4. **Health**: Heat stress is becoming a growing public health concern, placing additional pressure on primary healthcare facilities. Vulnerable groups—including the elderly, children, and individuals with pre-existing conditions such as cardiovascular and respiratory illnesses—are especially at risk.[19]
5. **Energy Systems:** Demand spikes during heatwaves are straining already strained electricity grids.[29]
6. **Coastal Infrastructure**: Rising sea levels and coastal storm surges are causing land loss and damaging infrastructure in coastal cities and towns.[19]

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[28] IPCC. 2021. *Climate Change 2021: The Physical Science Basis*. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press. Available at: https://www.ipcc.ch/report/ar6/wg1/ [Accessed 6 May 2025].

[29] PCC. 2024. *Climate Risk Report of South Africa*. Presidential Climate Commission

7. **Transport infrastructure**: Roads, bridges, and rail systems are increasingly exposed to flood damage and heat-related wear, threatening logistics and economic stability.[27]

8. **Economy:** Climate-related disasters are driving up economic losses, straining municipal budgets and disaster response systems. Additionally, property insurance markets in high-risk areas are already being adversely affected.[30]

These trends suggest that without accelerated and systemic adaptation action, South Africa's risk profile will continue to deteriorate. Adaptive measures must therefore be transformative, cross-sectoral, and inclusive, with emphasis on long-term planning and implementation frameworks that align with the country's development goals.

2.1.1.2 Projections to 2050 and 2100: Regional and National Vulnerabilities

Future projections indicate a trajectory of significant warming across South Africa. By 2050, national average temperatures are projected to rise by approximately 3.1°C above pre-industrial levels (or 2.5°C relative to 1986–2005 baselines) under high-emission pathways (SSP5-8.5). Even under moderate scenarios (SSP2-4.5), a warming of around 2.2°C (or 1.6°C above 1986-2005) is expected.[31,32] Interior regions, particularly in the west, central plateau, and northern areas, will experience the most pronounced warming, with heat stress posing serious threats to human health, agriculture, infrastructure, and biodiversity.[19,27,33]

Alongside temperature increases, shifts in rainfall patterns are expected. Eastern provinces like KwaZulu-Natal and parts of the Eastern Cape may see more frequent and severe flooding, while the western and southern interior (e.g., Western Cape, Northern Cape) face prolonged droughts and declining water availability.[19,27] Inland metropolitan areas like Gauteng face increasing risks from extreme rainfall, flash flooding, and stormwater system overloads.[27]

Urban coastal regions, such as eThekwini, Gqeberha and Cape Town, are particularly vulnerable to rising sea levels and increased storm surge, which pose severe risks to coastal infrastructure and ecosystems.[23,19,27] Ports, roads, and other critical infrastructure in these areas are increasingly exposed to inundation, erosion, and storm surge damage[19] as sea-levels could rise by up to 0.9 meters by 2100 given that under a high-emissions pathway.[33] These combined climate stressors threaten key sectors, including agriculture, water, biodiversity, energy, and human settlements, making cross-sectoral adaptation an immediate and long-term necessity.[23,25]

By the end of the century, South Africa faces significant climate risks under all emissions scenarios. Should global emissions remain high, national average temperatures may exceeded 5°C nationally, and

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30 Minnaar, K. 2024. South African insurers pulling out of these areas. Daily Investor. Available here: https://dailyinvestor.com/south-africa/62199/south-african-insurers-pulling-out-of-these-areas/ Accessed on: 28/5/2025

31 Johnston, P., Egbebiyi, T.S., Zvobgo, L., et al. 2024. Climate Change Impacts in South Africa: What Climate Change Means for a Country and its People. University of Cape Town.

32 PCC. 2024. Climate Risk Report of South Africa: Report to the Presidential Climate Commission and the African Climate Foundation. Presidential Climate Commission. Available at:

33 Trisos, C.H., Archer van Garderen, E. & Engelbrecht, F. 2024. Projections of Future Climate Change in Southern Africa and the Potential for Regional Tipping Points. In Biggs, R., Reyers, B. & De Wit, M. (eds.) *Sustainability of Southern African Ecosystems under Global Change*. Springer, Cham.

potentially over 6°C in interior regions. Such warming would trigger extreme heatwaves, ecosystem collapse (notably in the Fynbos biome), water scarcity crises, and widespread economic disruptions.[19,27]

Key agricultural zones in the west and interior risk major productivity declines, threatening national food security. Climate change is expected to significantly impact South Africa's agricultural productivity, with studies projecting substantial declines in yields for key crops and stress on livestock systems. Maize yields in South Africa could decline by 20–50% under high-warming scenarios, with wheat yields projected to drop by 8.5% at +1°C, 18.4% at +2°C, and 28.5% at +3°C of global warming. These impacts are likely to intensify toward mid-century and may reach tipping points where staple crop cultivation becomes unviable. Additionally, beef productivity in arid rangelands is expected to decline due to heat stress, with the study warning that a 3°C global increase (translating to 4–6°C regionally) may lead to the collapse of the cattle industry.[33]

In parallel, financial institutions are increasingly recognising the macroeconomic consequences of unmitigated climate impacts. The South African Reserve Bank's climate risk stress testing framework indicates that physical risks, such as floods, droughts, and extreme heat, can lead to long-lasting economic shocks that degrade asset values, reduce GDP growth, and destabilise financial institutions through non-linear impacts across labour markets, housing, insurance, and infrastructure investment portfolios.[34]

2.1.2 Socio-Economic Vulnerabilities

South Africa's socio-economic circumstances significantly amplify its vulnerability to climate change. Persistent structural inequality, high unemployment, poverty, expanding informal settlements, and dependence on natural resources create a fragile context where climate risks can have disproportionate and cascading impacts across society and the economy.

South Africa remains one of the world's most unequal societies, with a Gini coefficient consistently above 0.63.[35] Climate change is a threat-multiplier and compounds existing inequality, as vulnerable groups—particularly low-income households, women, youth, elderly, rural communities, and informal settlement residents—have the least capacity to absorb, adapt to, or recover from climate shocks.[36] Informal settlements, now home to approximately 14% of the national population[37], are highly exposed to hazards such as flooding, extreme heat, and infrastructure failure. These areas often lack access to basic services, durable housing, and climate-resilient infrastructure, increasing the risks of disaster-related losses.[36]

The legacy of apartheid continues to shape patterns of poverty, spatial inequality, and access to resources, leaving historically disadvantaged communities disproportionately vulnerable to climate impacts.[38] Structural barriers such as restrictive land use management and limited formalisation opportunities perpetuate economic exclusion and constrain local adaptive capacity. These spatial

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34 Loewald, C. 2022 *A climate change modelling framework for financial stress testing in Southern Africa*. South African Reserve Bank Working Paper Series: WP/22/09. Pretoria: South African Reserve Bank.

35 World Bank. 2014. Gini index - South Africa. Available here: https://data.worldbank.org/indicator/SI.POV.GINI?locations=ZA

36 INR. 2023. *Integrating Knowledge Systems in Flood-Risk Modelling for Sustainable Solid Waste Management and Flood Resilience in Urban Informal Settlements in South Africa: Situational Analysis Report*. Institute of Natural Resources.

37 Stats SA. 2016. Community Survey 2016: Statistical Release P0301.5. Statistics South Africa.

38 Charman, A., et.al. 2017. Post-Apartheid Spatial Inequality: Obstacles of Land Use Management on Township Micro-Enterprise Formalisation. Sustainable Livelihoods Foundation.

inequalities are deeply entrenched and have proven resistant to post-apartheid policy interventions, further marginalising poor communities and exacerbating their exposure to climate risks. Studies show that female-headed households are disproportionately affected by climate variability due to their economic precarity and limited access to adaptive resources.[39] Often, their scarce financial assets are redirected towards recovery from extreme events such as droughts or floods, instead of being used for education, health, or income-generating activities. By contrast, wealthier households have more resources to absorb shocks and continue building intergenerational wealth. In this way, climate change entrenches socio-economic divides and limits upward mobility.

South Africa's reliance on coal and energy-intensive industries, particularly in regions like Mpumalanga, further heightens vulnerability for the communities who live in the area. Decarbonisation efforts, while necessary for mitigation, expose workers and communities to socio-economic risks if not managed through a just transition. Similarly, climate-sensitive sectors like agriculture and tourism are critical for rural livelihoods but are increasingly threatened by droughts, shifting rainfall patterns, and heat stress, especially in provinces like Limpopo and the Northern Cape.

These vulnerabilities intersect directly with South Africa's broader development priorities. Climate-related shocks threaten to undermine key goals of the NDP 2030, including inclusive growth, poverty reduction, and social equity. Rural communities, cities, economic infrastructure, and service delivery systems are all increasingly exposed to extreme weather events, compounding historical inequalities and risking developmental backsliding.

Climate-resilient development is therefore no longer optional. To safeguard development gains this must be mainstreamed across all spheres of national, provincial, and municipal government. Key priorities for climate-resilient development include: mainstreaming just transition in planning, enabling inclusive green jobs, upgrading informal settlements, fostering community engagement, coordinating multi-level governance, securing climate finance, and strengthening monitoring systems.[40,41,42] Without targeted action to address socio-economic vulnerabilities, climate change risks reinforcing existing inequalities and undermining South Africa's long-term sustainable development objectives.

2.1.3 Intersection of Development and Climate: How Climate Risks Threaten NDP Goals and Service Delivery

Climate change presents an intensifying threat to South Africa's development trajectory, directly jeopardising the NDP 2030 objectives—particularly those related to poverty reduction, employment creation, infrastructure development, and essential service delivery.[43, 44]

Climate change is likely to have the following impacts on development goals:

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39 Turok, I. 2020. Worlds Apart: Spatial Inequalities in South Africa. Journal of International Affairs, 73(1), 181–200.

40 SACN. 2023. Urban Resilience in South African Cities. South African Cities Network. https://www.sacities.net/publication/urban-resilience-in-south-african-cities/

41 C40 Cities. 2024. Pathways to a Just Transition: Pillars and City Actions. C40 Cities. https://www.c40.org/wp-content/uploads/2024/11/JTpillars-pathways_V06_Full.pdf

42 C40 Cities. 2024. South African Cities Dialogue on Just Transitions – Summary Report. C40 Cities. https://www.c40.org/wp-content/uploads/2024/09/RC4037-SA-Cities-Dialogue-Summary-Report-low-res.pdf

43 National Planning Commission. 2012. National Development Plan 2030: Our Future – Make it Work. Pretoria: The Presidency.

44 DFFE. 2020. National Climate Change Adaptation Strategy (NCCAS).

- **Economic Growth and Job Creation**:

  South Africa's already low GDP growth (averaging just over 1% per year since 2010) faces threats from climate disruptions. Sectors central to job creation, such as agriculture, tourism, and manufacturing, are highly climate sensitive. Droughts, flooding, and heatwaves can cause major economic losses, erode productivity, and undermine investment confidence.[44, 45]

- **Infrastructure and Service Delivery**:

  Critical infrastructure, especially in energy, transport, and water systems, is increasingly exposed to climate hazards. For instance, floods and rising temperatures have already damaged road networks, while water insecurity constrains urban and agricultural development. Informal settlements and rural communities are particularly vulnerable, where service delivery backlogs intersect with high climate exposure, deepening developmental disparities. [44, 46]

- **Health and Well-being**:

  Rising temperatures and extreme weather events are contributing to increased incidences of heat-related illnesses, vector-borne diseases (e.g., malaria spread), and food insecurity. This directly challenges the NDP's objectives for universal access to quality healthcare and improved public health outcomes. It is also increasing pressure on an already overburdened primary health care system.[44 ,47]

- **Food and Water Security:**

  Climate-driven reductions in rainfall and growing variability threaten water availability and agricultural productivity. This undermines food security, disproportionately affecting rural and poor communities, and jeopardizes progress toward nutrition and poverty eradication goals. Long term droughts have already had major economic impacts on cities like Cape Town and Gqeberha.[43,44]

Integrating effective climate risk management and anticipatory governance into South Africa's development strategy is no longer optional, it is foundational. Without urgent adaptation measures that mainstream climate risk management across all sectors and spheres of government, the cumulative impacts of climate change could reverse decades of developmental gains and intensify social inequalities. [44, 48]

2.2 Climate Ambition and Risk Governance

Climate change poses a direct threat to South Africa's development trajectory, undermining critical objectives of the National Development Plan (NDP) 2030 across sectors such as health, infrastructure, food systems, and economic growth. While adaptation is essential to buffer these impacts, the scale and pace of projected climate hazards increasingly outstrip the capacities of conventional adaptation responses alone. This underscores the need for a dual approach: strengthening adaptation while aggressively curbing emissions to avoid breaching ecological and socio-economic thresholds.

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45 World Bank. 2022. South Africa: Country Climate and Development Report.

46 DOGTA. 2022. State of Local Governance and Climate Resilience: Report to the Presidential Coordinating Council.

47 Department of Health. 2021. Climate Change and Health Sector Resilience Plan.

48 UNFCCC. 2024. NDC Synthesis Report – February 2024.

2.2.1 The Case for an Ambitious NDC Target: Avoiding Irreversible Climate Risks

The adoption of an ambitious and science-aligned NDC is not merely a matter of fulfilling international climate commitments under the Paris Agreement, it is a strategic imperative for safeguarding South Africa's future.

These changes threaten to overwhelm the ability of key systems—such as water, agriculture, health, human settlements, and infrastructure—to adjust to escalating climate pressures, manage potential damage, and seize opportunities for resilience. When these systems are pushed beyond their capacity to respond effectively (i.e., their adaptive capacity), the result can be non-linear and compounding socio-economic losses. Without accelerated emissions reductions, South Africa risks crossing critical thresholds beyond which adaptation efforts alone will be insufficient to prevent severe developmental setbacks.[33,49]

Ambitious adaptation goals in South Africa's updated NDC are crucial so that risks do not undermine national development, deepen inequality, and increase costs of future response measures. Clear and measurable adaptation targets are essential.

By explicitly linking its NDC to quantifiable risk reduction measures aimed at decreasing the adverse impacts of climate-related hazards, socio-economic resilience, and global investment opportunities, South Africa can ensure that its climate commitments are not only internationally credible but domestically transformative.

2.2.2 Climate Ambition as Risk Reduction: Limiting Warming to Manageable Levels

Avoiding each additional degree of global warming significantly reduces the magnitude and likelihood of adverse climate impacts on global society. Ambitious NDC targets present critical advantages for managing physical climate hazards globally.

- **Reduced exposure to extreme events**

  Climate models consistently show that a 1.5°C world experiences significantly fewer heatwaves, lower rainfall variability, and less severe drought and flood cycles compared to scenarios involving 2°C or 3°C warming. For instance, the frequency of extreme heat events could be halved under a 1.5°C scenario relative to 2°C, reducing direct threats to health, infrastructure, and productivity.[49, 50]

- **Sectoral risk reduction**

  Warming beyond 2°C has been shown to dramatically increase the likelihood of critical system disruptions. In South Africa, these include steep reductions in rainfed crop yields (e.g. maize, sorghum), biodiversity collapse in sensitive biomes, and heightened risk to water security due to declining runoff and rising evapotranspiration.[19,51] By limiting warming to below 2°C, ecological and economic thresholds can be avoided.

- **Cost-effective adaptation**

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49 IPCC. 2021. Sixth Assessment Report: The Physical Science Basis. Intergovernmental Panel on Climate Change.

50 Schleussner, C.F., et al. 2016. Differential climate impacts for policy-relevant limits to global warming: the case of 1.5 °C and 2 °C. Earth System Dynamics, 7, pp.327–351.

51 DFFE. 2018. South Africa's Third National Communication under the UNFCCC.

Ambitious mitigation pathways reduce the burden on adaptation systems by lowering the frequency and intensity of climate disasters. This makes adaptation investments, such as early warning systems and resilient infrastructure, more financially viable over time, while also preserving fiscal resources that would otherwise be spent on emergency response and reconstruction.[52,53]

In sum, mitigation and adaptation are complementary. Mitigation ambition reduces future risks, expands the space for effective adaptation, and ensures that resilience-building efforts are not overwhelmed by escalating climate extremes.

2.2.3 The Limits of Adaptation at Higher Warming Scenarios

While adaptation is essential, it has limitations, particularly under high-emissions scenarios where the magnitude of climate impacts may exceed ecological, economic, and institutional coping capacities.

- **Ecological limits**

  Ecosystems such as the Fynbos and Succulent Karoo biomes are highly climate-sensitive and face the risk of irreversible degradation and species extinction.[31] Ecosystem resilience is likely to collapse when exposed to prolonged drought, higher temperatures, and invasive species dynamics triggered by climate change.[54,55] Similarly, coral reefs and wetland ecosystems are projected to experience significant mortality.[56]

- **Urban adaptation constraints**

  Urban areas, and informal settlements in particular, are disproportionately exposed to compound hazards such as flooding from inadequate stormwater systems and extreme heat. Poorly managed infrastructure within urban areas (including roads, water and wastewater infrastructure, electricity networks) reduces the ability of cities and towns to cope with climate impacts. However, the effects of major climate events are rarely confined to the urban periphery. The Cape Town "Day Zero" crisis, for example, disrupted water security across the socio-economic spectrum, highlighting that while vulnerability is unequally distributed, exposure can be systemic. Retrofitting urban areas to climate-resilient standards requires sustained investment and institutional coordination—both of which are difficult to scale rapidly amid escalating climate pressures.[57, 58]

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52 UNEP-CCC. 2022. Adaptation Gap Report 2022: Too Little, Too Slow.

53 IPCC. 2022. *Sixth Assessment Report: Impacts, Adaptation, and Vulnerability*. Intergovernmental Panel on Climate Change.

54 Midgley, G.F., Archer, E., and Colvin, C. 2021. *Climate Risk and Vulnerability: A Handbook for Southern Africa*. 3rd Edition. CSIR, Pretoria.

55 IPCC. 2022. *Sixth Assessment Report: Impacts, Adaptation, and Vulnerability*. Intergovernmental Panel on Climate Change.

56 IPCC. 2018. *Global Warming of 1.5°C: An IPCC Special Report*. Intergovernmental Panel on Climate Change.

57 Council for Scientific and Industrial Research. 2021. *The Green Book: Adapting South African settlements to climate change*. Pretoria: CSIR.

58 World Bank. 2021. *South Africa Country Climate and Development Report*. Washington, DC: World Bank.

- **Rural livelihood viability thresholds**

  Several livelihood systems—particularly rain-fed agriculture and extensive livestock grazing in arid and semi-arid regions—may become non-viable under 4–6°C of regional warming. Studies indicate that maize yields could decline by 20–50% under high-emissions scenarios, and cattle productivity may collapse under chronic heat stress and rangeland degradation, which will exacerbate existing food insecurity.[59, 60]

Adaptation is necessary, it is not sufficient in isolation. Without urgent mitigation to limit warming, South Africa faces a future where adaptation becomes increasingly reactive, prohibitively expensive, and in some cases, no longer viable. Ambitious mitigation on a global scale, therefore, buys time, expands options, and preserves the effectiveness of adaptation interventions.

2.3 Policy and Regulatory Framework for Adaptation

2.3.1 Evolution of South Africa's Adaptation Policy Landscape

South Africa's climate policy framework has evolved significantly over the past two decades, progressively strengthening the country's strategic, institutional, and legal basis for climate action. Adaptation has shifted from being a voluntary policy goal to a formalised national commitment supported by statutory obligations.[61, 62]

The National Climate Change Response Strategy, adopted in 2004, represented South Africa's first strategic recognition of climate change as a development risk. It identified the need for coordinated action but was primarily voluntary and advisory in nature.[63] Building on this foundation, the National Climate Change Response Policy (NCCRP) was approved in 2011. The NCCRP offered the country's first comprehensive framework for addressing both mitigation and adaptation, emphasising a developmental, people-centred approach and mainstreaming climate resilience into national planning.[61]

Subsequent strategic instruments continued to build momentum. The Long-Term Adaptation Scenarios (LTAS), initiated between 2012 and 2014, provided critical scientific underpinning for policy development by exploring projected climate impacts across sectors.[64] The NDP 2030, while not exclusively a climate strategy, embedded long-term climate resilience and sustainable development objectives into South Africa's broader development vision.[43]

In 2020, South Africa adopted its first dedicated adaptation strategy – the National Climate Change Adaptation Strategy (NCCAS). The NCCAS provided a coherent framework for assessing vulnerabilities, identifying priority adaptation sectors, and strengthening institutional capacity across all levels of government. The NCCAS serves as the county's National Adaptation Plan and formally aligned national adaptation goals with the country's international obligations under the Paris Agreement.[23]

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59 Steyn, M., et.al. 2022. Climate change and livestock productivity in South Africa: A risk assessment. *South African Journal of Animal Science*, 52(1), pp.45–58.

60 DFFE. 2018. South Africa's Third National Communication under the UNFCCC.

61 DFFE. 2011. National Climate Change Response White Paper.

62 Republic of South Africa. 2024. Climate Change Act No. 24 of 2024.

63 DFFE. 2004. A National Climate Change Response Strategy for South Africa.

64 DFFE. 2013. Long-Term Adaptation Scenarios Flagship Research Programme (LTAS) for South Africa: Summary for Policy Makers.

This progression culminated in the promulgation of the Climate Change Act in 2024. The Act marks a turning point, shifting adaptation and mitigation measures from voluntary policy commitments to enforceable legal obligations. It mandates the development of national emissions trajectories, sectoral carbon budgets, sector-specific adaptation strategies, and comprehensive monitoring, evaluation, and learning systems, creating a legally binding framework for climate governance.[62]

Parallel to the domestic policy evolution, South Africa's international commitments under the UNFCCC have also matured. The 2015 Intended NDC included adaptation goals but without comprehensive quantification or tracking mechanisms. The 2021 Updated NDC introduced quantified adaptation targets, sectoral mainstreaming, and stronger integration of adaptation within national development priorities. [48,65]

Through this progressive legislative development, South Africa has steadily built the foundation for a national policy system capable of responding to escalating climate risks, safeguarding development gains, and fulfilling its global climate commitments. [62]

2.3.2 Alignment with International Frameworks

South Africa's adaptation policy framework is closely aligned with key international climate commitments, reflecting both its obligations under the Paris Agreement and its proactive engagement in global adaptation initiatives.[66]

The 2015 Paris Agreement firmly positioned adaptation as a central pillar of global climate action. Article 7 introduced the Global Goal on Adaptation (GGA), establishing a collective objective to enhance adaptive capacity, strengthen resilience, and reduce vulnerability to climate change, thereby contributing to sustainable development and supporting the achievement of the Agreement's temperature goals. [67, 68] Building on this foundation, the UAE Consensus adopted at COP28 in 2023 marked a major milestone in advancing global adaptation efforts. [69] The UAE Consensus operationalised the GGA by introducing a structured framework of thematic targets across critical sectors, including water, food, health, ecosystems, infrastructure, poverty eradication, and cultural heritage. For the first time, adaptation efforts were oriented around forward-looking ambition, emphasizing aspirational progress and transformative outcomes rather than retrospective assessments. [70]

The recently adopted UAE Framework for Global Climate Resilience [71] clarifies enhanced expectations for adaptation efforts. Countries are now expected to:[48]

- Set sectoral and thematic targets for key systems such as water security, food systems, public health, resilient infrastructure, and ecosystems, with these targets to be reflected in future NDCs.
- Shift towards forward-looking progress metrics, tracking outcomes and resilience-building over time rather than solely listing adaptation activities.

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65 Republic of South Africa. 2015. South Africa's Intended Nationally Determined Contribution (INDC).
66 Republic of South Africa. 2021. South Africa's Updated Nationally Determined Contribution (NDC).
67 UNFCCC. 2015. Global Goal on Adaptation (GGA). United Nations Framework Convention on Climate Change.
68 UNFCCC. 2015. The Paris Agreement. United Nations Framework Convention on Climate Change.
69 UNFCCC. 2023. UAE Consensus Delivers Historic Outcomes to Keep 1.5°C Goal Alive and Boost Resilience.
70 UNFCCC. 2023. 5 Key Takeaways from COP28. United Nations Framework Convention on Climate Change. Available here: https://unfccc.int/cop28/5-key-takeaways
71 UNFCCC. 2023. Decision -/CMA.5: Outcome of the first Global Stocktake.

- Systematically integrate equity, inclusivity, and justice principles into adaptation planning and implementation, building on existing commitments but requiring strengthened and explicit incorporation aligned with evolving global best practices.

South Africa's 2021 Updated NDC reflects a strong commitment to adaptation by introducing quantified targets and systematically integrating adaptation considerations across key sectors such as water, agriculture, and human settlements. This positioned South Africa among the relatively few developing countries with a dual-focus NDC that gave equal strategic weight to both mitigation and adaptation.[66] While the 2021 Updated NDC represents substantial progress compared to the initial 2015 submission, further strengthening will be necessary to align with the heightened ambition, sectoral specificity, and transparency requirements set out under the UAE Consensus and the evolving framework for the GGA.[48,69]

The international community is increasingly emphasizing the importance of transparent and accountable adaptation actions. As global frameworks evolve, South Africa is expected to further refine its adaptation policies to meet emerging standards and expectations. This includes strengthening monitoring, evaluation, and learning systems, enhancing sectoral integration, and ensuring that adaptation efforts are inclusive and equitable. [48]

2.3.3 Adaptation in South Africa's NDCs

South Africa's initial NDC, submitted in 2015, included adaptation as a core component but lacked detailed specificity and quantified targets.[65]

Key features of the initial NDC included:

- **General commitments**: Emphasised building resilience through existing policy frameworks, such as the National Climate Change Response White Paper[61] and the Disaster Management Act.[72]
- **Sectoral references:** Identified vulnerable sectors—particularly water, agriculture, health, and biodiversity—but did not present detailed adaptation pathways, measurable targets, or sector-specific financial needs.[65]
- **Absence of quantified finance requirements**: Adaptation was framed as integral to broader sustainable development goals, but without explicit costing or clearly defined funding strategies.[65]

The 2021 Updated NDC represented a significant evolution, aligning more closely with Article 7 of the Paris Agreement and introducing South Africa's first embedded Adaptation Communication.[66]

Key advancements included:

- **Quantified adaptation finance:** Estimated that USD 3–4 billion would be required between 2021 and 2030 to implement the NCCAS, focusing on priority sectors including water, agriculture, health, human settlements, and biodiversity.
- **Strategic adaptation goals:** Defined five national adaptation goals to guide action, focusing on reducing vulnerability, integrating adaptation into planning, strengthening institutional capacity, improving information systems and early warning capabilities, and mobilizing resources for adaptation.

[72] Republic of South Africa. 2002. Disaster Management Act (Act No. 57 of 2002). Pretoria: Government Gazette.

- **Sectoral pathways**: Outlined sector-specific goals, such as promoting climate-smart agriculture, strengthening early warning systems for health risks, and establishing climate-resilient infrastructure standards.
- **Institutional integration**: Linked adaptation planning to emerging legal frameworks, notably the proposed Climate Change Bill (which was subsequently enacted as the Climate Change Act in 2024), and underscored the role of the PCC in adaptation oversight.
- **Acknowledgement of loss and damage**: Recognised historical climate-related economic losses—estimated at over R113 billion since 1980, although no formal national loss and damage framework was yet established.

2.4 Adaptation Progress Since the 2021 NDC

South Africa's first Biennial Transparency Report (BTR1), published in 2024,[73] provides the first comprehensive assessment of adaptation progress since the submission of the 2021 Updated NDC. While important groundwork has been laid, BTR1 highlights that progress on adaptation goals remains uneven, with significant shortfalls in financing, implementation capacity, and institutional integration. Simultaneously, updated climate risk assessments reaffirm that South Africa's vulnerability to climate change is increasing across all sectors and regions, heightening the urgency of scaling up adaptation efforts.[73]

The 2021 Updated NDC set out five national adaptation goals: reducing vulnerability, integrating adaptation into planning, strengthening institutional capacity, improving information and early warning systems, and mobilizing resources. According to BTR1[73]:

- **Policy and Planning:** Progress has been made in developing sectoral adaptation plans, updating vulnerability assessments, and initiating the integration of climate risks into development frameworks.
- **Early Warning Systems:** Improvements have been noted in expanding disaster early warning systems, though coverage remains uneven, especially in rural areas.
- **Institutional Strengthening:** The Climate Change Act[62] provides a legal framework for adaptation governance, mandating the development of National Adaptation Plans and sectoral strategies.

However, BTR1[73] also reveals persistent implementation challenges:

- **Adaptation Finance Shortfalls**: South Africa received approximately USD 816.9 million in international climate finance during 2021–2022, with most of this support provided as concessional loans rather than grants. Of this total, only about USD 7.64 million was clearly identified as adaptation finance in the BTR, including both explicitly adaptation-labelled and cross-cutting projects. Thus, highlighting the fact that adaptation finance represents a small subset of total climate finance flows, reflecting ongoing challenges in mobilising sufficient funds to meet South Africa's climate adaptation needs and ambitions outlined in its NDC. This falls far short of the NDC's expectation of mobilizing approximately USD 8 billion annually for mitigation and adaptation combined.
- **Implementation Barriers**: Capacity constraints at provincial and municipal levels continue to delay adaptation action. Many local governments lack the technical expertise, financial resources,

[73] Republic of South Africa. 2024. South Africa's First Biennial Transparency Report (BTR1).

and institutional support necessary to implement NCCAS priorities or mainstream adaptation into Integrated Development Plans (IDPs).

- **Limited Social Inclusion**: Although national strategies acknowledge the importance of Indigenous knowledge and gender-responsive approaches, these principles are not yet systematically embedded in adaptation planning and implementation at scale.
- **Loss and Damage**: Despite escalating climate impacts—including the devastating 2022 floods in KwaZulu-Natal—no formal national framework has been established to quantify or systematically address loss and damage.

Sector-specific vulnerability assessments highlight that agriculture, water management, human settlements, energy infrastructure, and health systems remain critically exposed to escalating climate risks.[73]

South Africa's 2024 BTR1 confirms that important institutional and policy foundations for adaptation have been established since the 2021 Updated NDC. However, adaptation progress is falling behind the pace and scale needed to match the country's growing climate risks. Persistent gaps in finance, local implementation capacity, data systems, and inclusive planning threaten to undermine the achievement of national adaptation goals.

Addressing these shortfalls will require:

- Accelerated adaptation finance mobilisation (especially grant-based),
- Enhanced support for local government capacity building,
- Stronger integration of social inclusion and Indigenous knowledge systems, and
- The establishment of a formal Loss and Damage framework.

A step-change in ambition, implementation, and accountability is urgently needed to align South Africa's adaptation efforts with its NDC goals, the Paris Agreement's Article 7 requirements, and the emerging expectations under the GGA framework.[73]

2.5 Building Resilience through New Frameworks

Persistent and interlinked challenges across anticipation, adaptation, and recovery highlight the need for a unified and strategic governance framework to guide South Africa's climate adaptation efforts. These challenges are not isolated implementation failures but symptoms of deeper systemic and institutional weaknesses that require structural transformation.

Anticipation is constrained by fragmented climate data, limited foresight capabilities, and inadequate integration of risk scenarios in development planning. These are compounded by institutional fragmentation, where misalignments between national, provincial, and local authorities impede coherent climate risk assessment and early warning integration.[73]

Adaptation is hampered by weak institutional coordination, limited local capacity, and narrow monitoring, evaluation and learning (MELs) systems that fail to inform adaptive change. Technical, financial, and human resource limitations at subnational levels restrict the ability to mainstream A-NDC priorities into Integrated Development Plans (IDPs). These limitations are exacerbated by finance misalignment, with

climate funding often skewed toward short-term infrastructure projects instead of long-term resilience-building.[73,74]

Recovery remains an underleveraged entry point for systemic transformation, with post-shock interventions often failing to address systemic vulnerabilities or promote long-term resilience. In many cases, recovery efforts lack foresight and do not integrate transformation opportunities, particularly for informal settlements, degraded ecosystems, and under-serviced rural areas. Without deliberate attention to distributive and procedural justice, there is a risk that recovery efforts entrench rather than reverse existing inequalities.[48]

To address these challenges, the A-NDC must recognise the systemic barriers across climate data, institutional coordination, capacity, finance, and justice. These are not merely implementation deficits, but indicators of structural governance failure. Therefore, the next iteration of South Africa's Adaptation NDC must move beyond fragmented or sectoral responses and embrace a unified, governance-driven framework that can enable anticipatory, adaptive, and transformative climate action.

At its core, this governance-centred framework aims to deliver not only incremental resilience gains but transformative adaptation outcomes that confront the root drivers of vulnerability and injustice. Here the Anticipate–Adapt–Recover (AAR) cycle are proposed as the central organising framework for the adaptation component of the 2030–2035 NDC, guiding how the country manages systemic risks, institutional readiness, and climate-resilient development pathways. Supporting frameworks, namely Climate-Resilient Development (CRD) and Theory of Change (ToC), are integrated into the AAR cycle to provide strategic orientation and delivery architecture respectively (Figure 1).[48] Operationalising AAR through these frameworks ensures that adaptation is not only technically sound and responsive but also deeply rooted in the principles of a just transition.

Importantly, CRD is not presented as a subordinate process that feeds directly into the AAR cycle. Instead, it provides the strategic and normative orientation that shapes the principles, direction, and values of the AAR framework. In other words, it defines the 'why' and 'what for' of adaptation governance by articulating a vision grounded in ethical and societal imperatives. In contrast, the AAR framework outlines the procedural 'how' – the governance structure through which this vision is operationalised. The integration of CRD and AAR ensures that climate governance is not only methodologically sound and responsive, but also principled and transformative. The Theory of Change (ToC) complements both by enabling implementation through sequenced actions, measurable outcomes, and mechanisms for adaptive learning.

[74] Chambers, J.M. et al. 2022. Six modes of co-production for sustainability. Nature Sustainability.

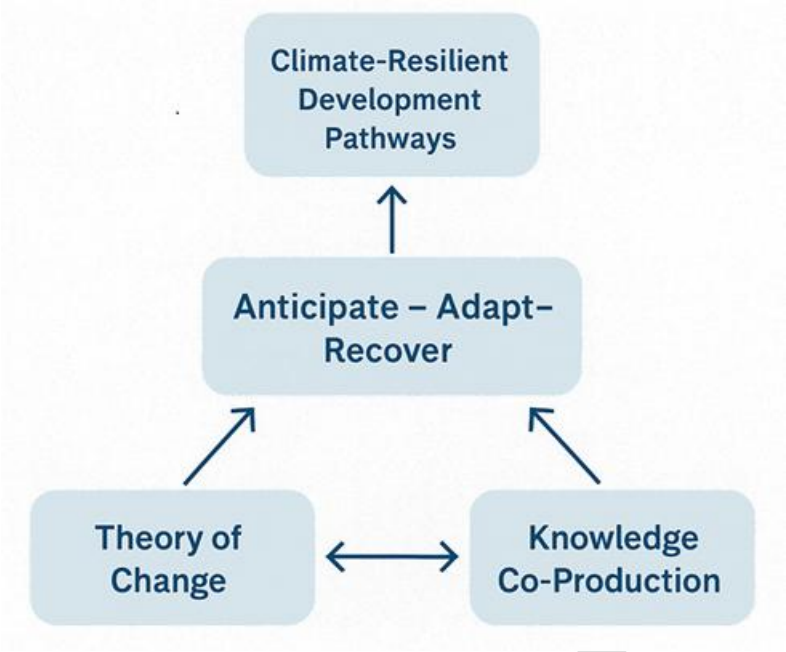

Figure 1 Integrated Framework for Resilient Adaptation Governance

2.5.1 Anchoring the Adaptation Component of the NDC in the Anticipate–Adapt–Recover Cycle

The AAR cycle offers a practical and strategic governance lens through which adaptation can be institutionalised across all levels of South Africa's climate response. This cycle is increasingly embedded in national legislation: the Climate Change Act mandates institutional mechanisms that support risk anticipation, iterative adaptation planning, and coordinated response and recovery actions across all levels of government.[62] The AAR cycle comprises three dynamic governance functions (Table 1) that enables a move from static policy reporting to dynamic, learning-oriented implementation, aligning with the principles of the Paris Agreement and best practice under the GGA.[67]

Table 1: Applying the AAR Framework to the Adaptation Component of the NDC

Pillar	Core Functions	Implementation
Anticipate	Proactively identify risks, vulnerabilities, and opportunities.	To fully operationalise the Anticipate pillar, South Africa's adaptation component of the NDC should invest in dynamic climate risk profiling (including real-time, spatially explicit models), embed multi-risk scenario planning across sectors (linking drought, energy, food, and health systems), and institutionalise early warning systems that directly trigger municipal and provincial adaptation planning. By systematically analysing both slow-onset and sudden hazards, and aligning adaptation strategies with national development pathways (e.g., the NDP and Just Transition Framework), the adaptation component of the NDC can shift from a static reporting instrument to a dynamic tool for strategic foresight and proactive governance.

Pillar	Core Functions	Implementation
Adapt	Adjust strategies, systems, and behaviours in response to evolving risks.	To operationalise the Adapt pillar, South Africa's adaptation component of the NDC should embed iterative, learning-driven processes across all levels of governance. This includes building flexible institutions capable of adjusting strategies based on emerging climate risks and monitoring results in real-time. Key enablers include mainstreaming climate adaptation into sectoral planning and municipal budgets, establishing robust monitoring, evaluation, and learning systems, and creating feedback loops that enable continuous course correction. Adaptive management must be decentralised, empowering provinces and municipalities to experiment, innovate, and refine local adaptation pathways based on evolving evidence and community feedback.
Recover	Rebuild systems post-shocks in a transformative and resilient manner.	To operationalise the Recover pillar, the adaptation component of the NDC must frame recovery not merely as restoring systems to pre-shock conditions, but as an opportunity for systemic renewal and resilience-building. Post-disaster recovery processes should integrate principles of sustainability, social equity, and climate foresight. Recovery interventions should also be leveraged to drive systemic reforms, such as reversing land degradation, strengthening urban resilience through spatial planning reforms, improving water security systems, and enhancing energy resilience. These measures ensure that rebuilding processes do not merely restore vulnerabilities but strategically shift development pathways toward long-term resilience and equity. This involves embedding "build back better" standards into disaster management protocols, prioritising the protection of vulnerable communities, and using recovery investments to address root causes of vulnerability (e.g., informal settlement risks, degraded ecosystems). Institutionalising after-action learning across sectors will ensure that each recovery phase strengthens long-term adaptive capacity and transformative resilience.

2.5.2 Strategic Direction: CRD within AAR

South Africa's next adaptation component of the NDC could be significantly strengthened by formally incorporating CRD Pathways as a core strategic orientation. CRD pathways integrate adaptation, mitigation, and sustainable development into a coherent, justice-centred model of change. This approach

responds to the country's escalating climate risks and systemic inequalities, offering a flexible, systemic framework for steering development trajectories toward resilience.

A four-part technical series *Guidance for Putting Climate-Resilient Development Pathways into Practice*, published by the PCC in 2022[75], provides a comprehensive operational framework for CRD in South Africa. The series of reports draw from international best practice, local case studies, and broad stakeholder engagement to inform both the theory and practice of climate-resilient development. They position the adaptation component of the NDC as a strategic vision document grounded in systems thinking and aligned with Article 7 of the Paris Agreement, a planning and investment tool linking measurable, risk-based adaptation targets to institutional and financial mechanisms, and a catalyst for transformative adaptation that advances reforms in land use, urban governance, and economic resilience.

2.5.2.1 Core Pillars of a CRD-Aligned NDC

In addition to conceptual foundations, the PCC identifies four foundational elements essential for structuring a CRD-aligned Adaptation NDC (Table 2).

Table 2: Four foundational elements essential for structuring a CRD-aligned NDC

Elements	Relevance to A-NDC
CRD Pathways Concept	Strategic framing aligned with Paris Agreement goals for adaptation.
Climate Information Systems	Provides baselines, hazard scenarios, and risk projections essential for planning.
Capacity and Institutional Readiness	Supports delivery mechanisms under Means of Implementation (MoI).
Operational Projects and Pilots	Offers concrete priority actions and learning platforms for scaling resilience.

CRD thinking must be applied across urban, rural, coastal, and industrial contexts, avoiding maladaptation and the lock-in of unsustainable pathways. It promotes narrative-driven, scenario-based planning that blends scientific modelling with Indigenous knowledge, lived experience, and local development priorities. CRD enhances the AAR framework by providing a vision of long-term resilience rooted in justice and equity. It supports transformative adaptation by enabling systems-level change, prioritising justice, and guiding institutional and spatial reforms. It informs the anticipation of risks through scenario-building and decision-node mapping, supports adaptation through governance and planning reforms, and guides transformative recovery through sustainability-centred interventions that avoid maladaptation and the lock-in of unsustainable development trajectories. This framework aligns with the Paris Agreement's Article 7, and its four foundational pillars—CRD pathways concept, climate information systems, institutional readiness, and operational pilots—are fully elaborated by the Presidential Climate Commission.[75]

[75] PCC. 2022. Guidance for Putting Climate-Resilient Development Pathways into Practice (Technical Series). Presidential Climate Commission. Available here: https://www.climatecommission.org.za/publications

2.5.2.2 Theoretical Foundations: The CRD Paradigm

The first report in the CRD technical series[75] frames CRD as the integration of adaptation, mitigation, and development into equitable, inclusive, and transformative pathways. It challenges siloed approaches and instead emphasises key concepts necessary for navigating complex socio-ecological systems. These include:

- **Development Pathways**: The dynamic evolution of socio-ecological systems that may entrench vulnerability or present opportunities.
- **Decision Nodes**: Strategic intervention points (e.g., infrastructure investment choices) that shape future development trajectories.
- **Thresholds, Signals, and Triggers**: Tools for early warning, governance adaptation, and timely policy intervention.
- **Nested Systems Thinking**: Recognition that actions reverberate across water, energy, food, urban, rural, and ecological systems.

2.5.2.3 Climate Information Systems: Enabling Risk-Informed Adaptation

The second instalment of the CRD technical series[75] highlights that credible climate information is fundamental to a risk-informed and equitable adaptation component of the NDC.

Key contributions include:

- **Threshold and Risk Mapping**: Integrating historical events (e.g., Day Zero drought) and future hazard projections to identify critical risks.
- **Addressing Institutional Fragmentation**: Strengthening coordination across SAWS, CSAG, CSIR, and NDMC to ensure aligned and accessible data systems.
- **Blending Top-Down and Bottom-Up Knowledge**: Combining hazard models with community experiences to build socially responsive adaptation pathways.
- **Managing Modelling Uncertainty**: Promoting flexible governance models based on plausible ranges of future climate risks rather than relying on a single projection.
- **Geographically and socially disaggregated data**. The ability to measure elements of vulnerability (gender, age, social variables) will allow is important to be able to determine.

The adaptation component of the NDC should prioritise climate information systems that are accessible, participatory, and continually updated to enable timely early warning, inform integrated planning processes, and underpin robust monitoring, evaluation, and learning frameworks that drive adaptive and inclusive decision-making.

2.5.2.4 Building Institutional Capacity for CRD Delivery

The third instalment of the CRD technical series[75] presents a Capacity Assessment Framework to strengthen institutional readiness across all levels of governance. It identifies critical clusters, including:

- Awareness and leadership
- Multi-level and cross-sectoral collaboration
- Learning cultures and adaptive management
- Justice and equity promotion

- Uncertainty management

Tools such as narrative diagnostics, participatory self-assessments, and CaDD (Climate Capacity Diagnosis and Development) provide practical methods to assess and strengthen these capacities. Embedding this framework within the A-NDC ensures that adaptation priorities are grounded in realistic capability assessments and enable transformative action.

2.5.2.5 Operational Proposals: Bridging Vision and Implementation

The fourth instalment of the CRD technical series[75] bridges CRD theory and application by proposing four operational pilots:

- **eThekwini**: Equity-driven CRD integrating ecosystem-based adaptation and informal settlement upgrading.
- **Greater Saldanha**: Industrial decarbonisation, energy transition, and water resilience planning.
- **National Capacity Building**: Simulation training, senior official courses, and climate capacity assessments.
- **WWF-SA Pilots**: Multi-sectoral CRD pilots across agriculture, catchments, and urban areas.

These pilots offer immediate proof-of-concept actions for embedding CRD into South Africa's NDC. To move from experimentation to systemic impact, these pilots must be complemented by broader governance reforms.

2.5.3 Operationalising AAR through ToC

A ToC is a structured planning and evaluation approach that outlines how and why desired change is expected to happen in a particular context. It links inputs, activities, outputs, outcomes, and long-term impacts in a clear sequence, while making assumptions and causal pathways explicit. This framework supports not only better design and delivery but also continuous reflection, monitoring, and adaptation.

Internationally, institutions such as the World Bank apply ToC frameworks extensively in their Country Partnership Frameworks, sectoral strategies, and project designs. For example, in its Climate Change Action Plan (2021–2025), the World Bank uses ToC models to link climate finance, institutional support, and policy interventions to measurable improvements in resilience and emissions reductions. Each Global Practice, such as Urban Development, Water, or Education, uses a ToC to structure priorities, align investments, and ensure accountability to results.[76]

A standard ToC is typically structured around a results-based logic model composed of the following elements:

- **Inputs:** Resources such as funding, technical expertise, data, and institutional support.
- **Activities:** Interventions like policy reforms, infrastructure upgrades, capacity building, or stakeholder engagement.
- **Outputs:** Immediate tangible products or services resulting from activities (e.g., climate risk maps, early warning systems, upgraded infrastructure).

[76] World Bank. 2021. Climate Change Action Plan 2021–2025. World Bank Group. Available here: https://openknowledge.worldbank.org/handle/10986/35799

- **Outcomes:** Short- to medium-term changes in systems, behaviours, or capacities (e.g., improved service delivery, strengthened adaptive capacity).
- **Impacts:** Long-term, sustained changes (e.g., reduced vulnerability, increased resilience, enhanced sustainable development outcomes).

Underlying this logic are assumptions and enabling conditions, supported by integrated MEL systems that track delivery across the results chain and facilitate adaptive management.

South Africa's 2021 Updated NDC already reflects some foundational elements of a ToC approach, notably:

- The identification of five priority sectors (water, agriculture, biodiversity, human settlements, and health).
- A high-level goal of reducing vulnerability and strengthening adaptive capacity.
- Commitments to develop an M&E framework and to integrate adaptation across national development planning frameworks.

These features demonstrate initial alignment with ToC principles, including clear articulation of development challenges, sectoral prioritisation, and reference to enabling frameworks such as the National Climate Change Response Policy (NCCRP) and the Climate Change Act.

However, the current adaptation component of the NDC remains largely qualitative and narrative-driven, lacking a formalised, structured ToC. Key gaps include:

- **Absence of explicit results chains**: There is no clear mapping of activities to outcomes and impacts across sectors.
- **Limited measurable outcome indicators**: While high-level impacts are outlined, there are few intermediate results or outcome metrics to guide implementation or learning.
- **Weak articulation of assumptions and risks**: Critical enabling factors—such as finance flows, institutional capacity, and behaviour change—are not explicitly mapped or tested.
- **Insufficient integration of justice and equity pathways**: Although vulnerable groups and the Just Transition are acknowledged, there is no explicit logic linking interventions to equity outcomes.
- **Unlinked financial planning:** Adaptation finance needs are estimated but not systematically connected to sector-specific action plans or investment pathways.

These gaps weaken the ability to operationalise, monitor, and adapt the NDC, limiting its potential as a strategic and implementation-focused instrument. By adopting a formal ToC framework, South Africa's next NDC can move beyond aspirational adaptation statements toward a practical, learning-oriented, and justice-centred roadmap for delivering resilience.

2.5.4 Enabling Systems: Climate Information, Capacity & Knowledge Co-Production

To operationalise the AAR cycle effectively within the NDC, three governance priorities must be strengthened. First, embedded learning loops and robust monitoring, evaluation, and learning systems are essential to drive continuous improvement, integrate diverse forms of knowledge, and support real-time course correction. Second, decentralised governance structures must be strengthened to support distributed leadership and enable flexible, place-based responses across sectors and regions. Third, embedding resilience principles at the governance level ensures that South Africa's adaptation system remains dynamic, iterative, and learning-oriented. By institutionalising these priorities, organisational

resilience can be embedded within the adaptation component of the NDC framework to enhance climate foresight, enable adaptive decision-making, and support transformative recovery from climate shocks.

Three enabling systems, namely: credible climate information, institutional capacity, and knowledge co-production are foundational to delivering the AAR framework successfully and equitably.

Credible and accessible climate information systems underpin risk-informed adaptation. These systems must integrate historical events (such as the Day Zero drought) with projected hazards, support blended top-down and bottom-up data sources, and enable institutions to respond flexibly under uncertainty. Coordination across SAWS, CSAG, CSIR, and NDMC is key to building consistent and responsive information flows.[75]

Institutional capacity building, as outlined in the third PCC report, must target nine critical readiness clusters. These include awareness and leadership, cross-sectoral collaboration, adaptive management, equity promotion, and uncertainty handling. Tools such as narrative diagnostics and participatory self-assessments should be widely deployed. The Climate Capacity Diagnosis and Development (CaDD) tool is also recommended by the PCC as a practical framework for evaluating institutional readiness and supporting targeted capacity strengthening across key governance clusters. [75]

Knowledge co-production must be a defining feature of South Africa's climate governance. The six modes of co-production are Researching Solutions, Empowering Voices, Brokering Power, Navigating Differences, Reframing Agency, and Reframing Power. These offer a roadmap for embedding inclusivity, local knowledge, and equity in all aspects of adaptation planning and delivery.[74]

These modes provide structured pathways to democratise knowledge generation, foster inclusive dialogue, and embed social justice principles throughout all stages of adaptation planning, implementation, and learning. They also support the operationalisation of the AAR governance cycle by ensuring that each phase of the cycle is informed by local realities, reflexive processes, and justice-oriented knowledge systems. The updated adaptation component of the NDC should expand participatory vulnerability assessments alongside expert-driven risk models, embedding local knowledge, Indigenous perspectives, and lived experiences of climate risk into official assessments. It should also promote co-designed early warning systems and adaptive social protection frameworks that are grounded in the realities of vulnerable communities and responsive to their evolving needs.

2.5.5 Strategic Alignment with International and Domestic Frameworks

This structured AAR framework strengthens South Africa's adaptation component of the NDC to:

- **Meets emerging global expectations** under the GGA and UAE Consensus (sectoral targets, forward-looking metrics).[69]
- **Fulfils national legislative obligations** under the Climate Change Act62 and NCCAS (sectoral plans, monitoring and reporting).
- **Advances climate-resilient development**, consistent with the PCC's CRD framework. [75]
- **Promotes social justice**, aligned with the Just Transition Framework and broader national development goals.[79]

By embedding clear actions and measurable targets at sectoral, regional, and local scales, South Africa's adaptation component of the NDC will move beyond conceptual commitments toward operational delivery of transformative, inclusive, and climate-resilient development.

2.6 Adaptation Priorities for the 2030–2035 NDC

The next iteration of South Africa's NDC must substantially increase both ambition and implementation readiness to respond to escalating climate risks and meet the evolving expectations under the Paris Agreement's GGA.[7] Drawing on lessons from the 2021 Updated NDC and the findings of the 2024 BTR1, this section outlines key strategic priorities, action areas, and frameworks necessary to guide a more resilient, inclusive, and transformative adaptation agenda for 2030–2035.[77] The updated Adaptation NDC should build upon the NCCAS, South Africa's de facto National Adaptation Plan, while significantly strengthening ambition, sectoral integration, and monitoring and evaluation systems to align with the emerging requirements of the GGA.[23]

In line with the UAE Consensus69, the adaptation component of the NDC should establish time-bound quantifiable sectoral targets for 2035 and intermediate milestones for 2035 to enable transparent tracking and adaptive management. The targets should be integrated into sectoral adaptation implementation plans and regularly reviewed through South Africa's National Adaptation MEL system, as mandated by the Climate Change Act[62] and aligned with the Enhanced Transparency Framework under the Paris Agreement.[78]

The forthcoming NDC should not only address immediate vulnerabilities in critical sectors such as water, agriculture, infrastructure, and human settlements, but also embed systemic approaches that build long-term resilience, enhance governance capacity, integrate social equity, and strengthen knowledge systems. Bridging the gap between aspiration and delivery will require clearer strategic frameworks, better integration of adaptation across government planning processes, and investments in data, research, and capacity-building. [77] The priorities outlined below aim to establish a robust foundation for delivering a more ambitious, coherent, and country-driven adaptation commitment that protects South Africa's people, ecosystems, and economy in the face of accelerating climate change.

To meet escalating climate risks and safeguard hard-won development gains, South Africa's 2030–2035 NDC must prioritise transformative, targeted, and inclusive adaptation action across key sectors. Building on updated climate risk assessments, the findings of the BTR1, and the CRD framework developed by the PCC, this section identifies the critical strategic priorities required to enhance systemic resilience.[79] The proposed actions aim to simultaneously address escalating physical hazards and underlying socio-economic vulnerabilities, strengthen adaptive capacity across all levels of governance, and embed climate resilience into South Africa's long-term development trajectory.[44]

The following priorities lay the foundation for a forward-looking, integrated adaptation framework that responds to South Africa's unique risk profile while advancing broader goals of sustainable, inclusive, and equitable development:

1. **Water Security and Drought Resilience.**
    a. Rehabilitating degraded catchments and wetlands to restore water regulation functions.[80]
    b. Scaling up water reuse, groundwater recharge, and diversification of water. [80]

[77] DFFE. 2024. South Africa's First Biennial Transparency Report (BTR1).
[78] UNFCCC. 2018. Enhanced Transparency Framework under the Paris Agreement.
[79] PCC. 2022. A Framework for a Just Transition in South Africa.
[80] SANBI. 2018. Guidelines for Ecosystem-Based Adaptation in South Africa.

c. Improving water use efficiency across all major sectors to reduce demand and relieve pressure on stressed systems.[81]

d. Investing in the maintenance, upgrading, and climate-resilience of water infrastructure, with a focus on reducing system losses, improving wastewater treatment capacity, and ensuring equitable access to reliable water services.[81]

e. Integrating water resource management with spatial development and climate risk mapping to guide evidence-based planning and resilient infrastructure investment

f. Strengthening interdepartmental coordination and local implementation capacity to ensure water resilience is mainstreamed across all development sectors.

2. **Climate-Resilient Infrastructure and Human Settlements.**

a. Upgrading informal and urban settlements with climate-resilient housing, retrofitted infrastructure (including roads, drainage, and public buildings), and reliable access to basic services, supported by the development of protective and multifunctional green infrastructure (e.g., green roofs, urban vegetation, permeable surfaces). These upgrades should be implemented through participatory, community-driven planning approaches that empower residents as active agents in shaping inclusive, climate-resilient development pathways, while ensuring that social safety nets are enhanced to protect the most vulnerable populations from climate-related shocks.

b. Systematically adopting Ecosystem-based Adaptation (EbA) in both urban and rural spatial and development planning frameworks, including zoning and land-use policies that prevent settlement in high-risk areas (e.g., floodplains, coastal setbacks), in order to enhance resilience, reduce exposure, and maintain critical ecosystem services.[82]

3. **Climate-Smart Agriculture and Food Systems.**

a. Scaling up drought-resistant crops, climate-resilient livestock breeds, agroecological practices, and water-smart farming techniques.

b. Strengthening smallholder and pastoralist support through targeted extension services, climate advisory systems, and access to climate risk insurance.

c. Integrating adaptation across agricultural value chains and rural development plans to build diversified, sustainable, and resilient food systems.

d. Strengthening community-driven food systems that enhance food sovereignty, reduce dependency on external inputs, and support local adaptive capacity across crop and livestock sectors.

e. Strengthen and integrate early warning systems for drought, disease outbreaks, and extreme weather, to equip farmers with timely, localised climate risk information.

4. **Climate-Responsive Public Health Systems**.

a. Strengthening surveillance and response for climate sensitive diseases, including outbreaks and malnutrition.

b. Establish heatwave early warning systems.

c. Expand public education campaigns on climate-health risks, especially in vulnerable communities.

[81] DWS. 2019. National Water and Sanitation Master Plan: Volume 1.

[82] DFFE 2016. South Africa's 2nd Annual Climate Change Report.

5. **Energy Resilience and Access**.
    a. Integrate distributed renewable energy systems into national and municipal energy planning.
    b. Enhance climate resilience of electricity grids.
    c. Promote off-grid solutions for vulnerable communities.
6. **Mainstreaming Adaptation in Governance and Planning.**
    a. Mainstreaming climate risk management into IDPs, sectoral strategies, and municipal service delivery frameworks. The Climate Change Act[62] establishes a binding legal mandate for the integration of climate adaptation across national, provincial, and municipal governance systems, requiring that climate risks and resilience measures be systematically incorporated into all development planning processes.
    b. Strengthening technical and institutional capacity at the local government level to enable effective climate adaptation planning and implementation.
    c. Establishing functional cross-sectoral coordination mechanisms at national and provincial levels to avoid fragmentation.
7. **Protecting Vulnerable Groups through Adaptive Social Protection.**
    a. Expanding climate-responsive social protection programmes that dynamically adjust to climate shocks (e.g., drought-responsive grants, public works schemes), including linking early warning systems to automatic or anticipatory social protection triggers to enable rapid, pre-emptive support before extreme events occur.
    b. Prioritising livelihood diversification and resilience-building initiatives, especially in rural and more marginalised communities contexts.
    c. Systematically embedding gender, youth, and disability considerations across all adaptation planning and implementation phases to drive inclusive resilience.
8. **Spatial Planning to Enhance Climate Resilience.**
    a. Conduct systematic assessments of exposure, vulnerability, and adaptive capacity at national, provincial, and municipal scales.[83]
    b. Integrate hazard mapping (e.g., flood zones, drought-prone areas) into SDFs and infrastructure plans.[83]
    c. Support ecosystem-based adaptation by preserving and restoring ecological buffers in high-risk areas.[80]
    d. Guard against maladaptation in spatial planning and development by prioritising no-regret investments, safeguarding ecological buffers, and ensuring flexibility in land-use decisions to avoid locking in future climate risks.[82]
9. **Strengthening Climate Risk and Vulnerability Assessments.**.
    a. Build on the Expert Stakeholder Reference Group (ESRG) and PCC recommendations to develop risk-informed, forward-looking adaptation strategies that combine technical modelling with participatory vulnerability assessments.[79] Community-driven risk mapping and the inclusion of local knowledge—particularly from vulnerable groups, smallholder farmers, informal settlement residents, and Indigenous communities—are critical to ensure that adaptation strategies are contextually grounded, socially just, and operationally effective.

[83] Republic of South Africa. 2022. National Spatial Development Framework.

b. Enable the regular updating of vulnerability assessments aligned with evolving climate risk profiles.

10. **Cross-Cutting Priority Areas**
    a. Mainstream nature-based solutions approach systematically across water management, urban development, agriculture, and particularly coastal adaptation efforts.
    b. Prioritise the protection and restoration of coastal ecosystems—such as dunes, wetlands, mangroves, and estuaries—which play a critical role in buffering communities from sea-level rise, storm surges, and flooding.
    c. Expand and integrate urban green spaces (e.g., parks, urban forests, green corridors, and permeable surfaces) as key components of urban resilience strategies. These features reduce heat stress, improve air and water quality, and manage stormwater, while enhancing biodiversity and quality of life in dense urban environments.
    d. Protecting and restoring natural systems must be prioritised as part of a holistic adaptation strategy that enhances resilience while delivering biodiversity and livelihood co-benefits.
    e. Strengthen the integration of disaster risk reduction principles and early warning systems into national, provincial, and local planning to minimise the cascading impacts of extreme events.

Effective implementation of these strategic priorities will require substantial scaling up of adaptation finance, targeted investments in institutional capacity, and enhanced knowledge systems to support evidence-based, inclusive, and transformative climate action.

2.7 Implementation, Governance, and Monitoring

Effective implementation, governance, and monitoring systems are essential to translate South Africa's NDC from a strategic adaptation framework into concrete, measurable outcomes.[84] Given the complexity of climate risks and the cross-cutting nature of adaptation, success depends on clearly defined institutional arrangements, strengthened coordination across all levels of government, robust stakeholder engagement processes, and the integration of adaptation into national and sectoral development planning frameworks such as Municipal IDPs and the NDP.[23]

This section outlines the institutional mechanisms and processes needed to systematically plan, implement, monitor, and continuously improve adaptation actions. It focuses on four core components:

- Strengthening regional and local adaptation planning and delivery.
- Deepening stakeholder engagement and capacity development.
- Clarifying national and subnational roles and coordination mechanisms.
- Institutionalising a comprehensive Monitoring, Evaluation, and Learning (MEL) framework aligned with the Climate Change Act, NCCAS, and the Global Goal on Adaptation.

[84] Department of Forestry, Fisheries and the Environment. 2024. *Climate Change Act (Act No. 22 of 2024).* Available here: https://www.gov.za/sites/default/files/gcis_document/202407/50966climatechangeact222024.pdf

2.7.1 Regional and Local Implementation

Effective adaptation must respond to South Africa's diverse climatic zones, socio-economic conditions, and local vulnerabilities. The Climate Change Act[62], the NCCAS[23], and international expectations under the UAE Consensus and GGA[67] all call for a decentralised, inclusive approach to implementation. This section outlines how adaptation can be grounded at provincial and municipal levels, with clear mandates, priority areas, and mechanisms for support.

Recognising South Africa's diverse climatic zones and socio-economic contexts, the adaptation component of the NDC should prioritise regional and municipal adaptation actions tailored to local vulnerabilities:

- **Provincial Adaptation Strategies**: Provinces should be required to update and align their Provincial Climate Change Response Strategies with the adaptation component of the NDC targets by 2026.
- **Municipal-Level Implementation**: Municipalities must integrate climate risk management into Integrated Development Plans (IDPs) and Municipal Spatial Development Frameworks (SDFs) as part of the 2027–2032 local government planning cycle. Differentiated assistance should be extended to vulnerable municipalities through the Just Transition Financing Mechanism.[79]
- **Priority Areas**: Special attention should be given to high-risk regions, including coastal municipalities (e.g., Durban, Cape Town), drought-prone rural areas (e.g., Northern Cape, Eastern Cape interior), and informal settlements in peri-urban areas.[63]

Localised adaptation planning will be supported by participatory vulnerability assessments, integration of Indigenous knowledge systems, and strengthened subnational access to climate finance, consistent with the Climate Change Act's emphasis on multilevel governance and the UAE Consensus' call for inclusive, context-sensitive adaptation.

2.7.2 Stakeholder Engagement and Capacity Building

Effective, inclusive stakeholder engagement and sustained capacity building are critical to achieving a resilient, just, and nationally owned adaptation response. The next adaptation component of the NDC must move beyond consultation toward meaningful co-creation processes that empower communities, local governments, and vulnerable groups as active partners in adaptation planning and implementation.[77]

Key priorities include:

- **Participatory Planning and Co-Production of Knowledge:** Climate adaptation must be co-developed with communities, civil society, private sector actors, and marginalised groups, rather than being imposed top-down.[85]
- **Integration of Indigenous and Local Knowledge Systems:** Indigenous knowledge holders, rural communities, and traditional leaders possess critical insights into managing climate risks that should be integrated into official adaptation planning, consistent with global best practice under the Paris Agreement and PCC recommendations on equitable climate governance.[85]

[85] Climate Transparency Platform. 2024. Climate Change Adaptation Policy Landscape, Institutional Arrangements and Implementation in South Africa.

- **Capacity Building for Municipalities and Local Institutions:** A systematic programme of technical assistance, skills training, and institutional support should be rolled out to address major adaptation delivery bottlenecks such as weak municipal capacity.[44,86]
- **Cross-Sectoral and Multilevel Capacity Enhancement:** Provincial and national departments must also strengthen their adaptive governance skills, including through:[85]
    - Scenario-based planning and dynamic risk management training.
    - Embedding monitoring, evaluation, and learning systems.
    - Strengthening cross-sector coordination capabilities.

Strengthening stakeholder engagement and capacity building is essential to move adaptation beyond technical compliance toward transformative, socially anchored resilience-building. It will ensure that South Africa's adaptation pathways are not only technically robust, but also democratically legitimate and socially just.

2.7.2.1 National Government

At the national level, the DFFE holds primary responsibility for leading climate change adaptation policy and coordination. The DFFE's Branch: Climate Change and Air Quality (CCAQ) oversees climate change mainstreaming, with the Chief Directorate: Climate Change Adaptation specifically tasked with guiding national adaptation policy, promoting sectoral implementation, and managing monitoring and evaluation processes.[62]

Under the Climate Change Act, DFFE is mandated to:

- Develop and update the National Adaptation Strategy.
- Coordinate the development of sector adaptation strategies across key sectors (e.g., water, agriculture, health, infrastructure).
- Oversee national monitoring, evaluation, and learning frameworks for adaptation.
- Manage South Africa's adaptation reporting obligations under the UNFCCC

Key supporting national institutions include:

- **South African National Biodiversity Institute (SANBI):** technical support for ecosystem-based adaptation.
- **South African Weather Service (SAWS):** provision of meteorological data and early warning services.
- **South African Environmental Observation Network (SAEON):** long-term environmental observation and research program established under the National Research Foundation (NRF)
- **Department of Water and Sanitation (DWS):** provides sector-specific leadership on climate adaptation in the water sector, including water resource planning, drought resilience, and flood management.
- **Department of Agriculture, Land Reform and Rural Development (DALRRD):** leads adaptation efforts in agriculture and rural development, focusing on climate-smart agriculture, land-use planning, and support for smallholder and subsistence farmers.

[86] National Treasury. 2022. System of Capacity Building for Local Government: Diagnostic Review.

- **Department of Cooperative Governance and Traditional Affairs (COGTA):** critical for supporting adaptation planning and implementation at the municipal level—both urban and rural—through governance support and local capacity building
- **National Treasury**: integration of climate considerations into public finance and budgeting frameworks
- **PCC:** independent oversight, advice, and facilitation of a just and inclusive climate transition.

2.7.2.2 Provincial and Local Government

Provinces and municipalities are frontline actors in implementing adaptation on the ground. The Climate Change Act and the First BTR1 formally assign local and provincial governments a critical role in operationalising South Africa's adaptation agenda. Their responsibilities include:

- Developing Provincial Climate Change Response Strategies and Municipal Climate Response Implementation Plans.
- Mainstreaming adaptation across planning instruments, such as IDPs, SDFs, and sectoral plans.
- Conducting regular Climate Needs and Response Assessments, updated every five years.

To improve cross-sectoral coordination, provincial forums and district-level structures have been strengthened to foster both horizontal (inter-departmental) and vertical (province-municipality) collaboration.[77] However, despite these institutional advances, challenges remain in translating national strategies into localised, implementable adaptation actions—particularly within municipalities facing resource and capacity constraints. Common challenges include limited access to climate data, insufficient expertise in conducting vulnerability assessments, and a lack of capacity for preparing and financing adaptation projects.[87,88]

The institutional positioning of climate change functions within provincial administrations significantly influences the effectiveness of adaptation integration. In many cases, responsibilities remain siloed within environmental departments, which may have limited influence over development planning and fiscal decisions. However, some provinces are beginning to position climate governance within economic development departments or even provincial treasuries, promoting greater alignment with infrastructure planning, economic strategy, and budget processes.[89] These emerging arrangements reflect a broader governance shift toward embedding climate risk into core development decisions, which is supported by initial efforts to pilot climate budget tagging, although these are still in early stages. Overall, these developments signal a gradually evolving institutional landscape where climate resilience is being treated less as an environmental add-on and more as a central component of developmental governance.

2.7.2.3 Strengthening intergovernmental relations and co-operative government

South Africa's institutional architecture for adaptation is increasingly sophisticated but remains challenged by functional fragmentation and coordination gaps across sectors and spheres of government. Recognising that adaptation responsibilities are distributed across national, provincial, and

[87] SALGA. 2023. Climate Change Capacity and Needs Assessment in Municipalities.
[88] COGTA. 2022. State of Local Government Report.
[89] National Treasury. 2025. Estimates of National Expenditure (ENE) Guidelines 2025: Including Climate Budget Tagging Pilot Plans.

municipal levels, with some functions held concurrently and others assigned exclusively to specific spheres, strengthening co-operative governance is essential to ensure coherence and impact.

To strengthen cross-sectoral and intergovernmental integration:

- The Climate Change Act mandates that national adaptation actions must be coherent with provincial and municipal planning frameworks.
- National, provincial, and municipal adaptation committees should be formally linked through structured dialogue mechanisms, including MINMEC (Ministerial-level coordination) and MINTECH (technical advisory bodies).
- Platforms like the PCC must continue facilitating cross-sectoral and multi-stakeholder dialogues.[85]
- Operation Vulindlela, a Presidency-National Treasury partnership, can play a supporting role in structural reform aligned with adaptation priorities.[90]

Additionally, the National Climate Change Information System (NCCIS) must be strengthened to serve as the central repository for adaptation monitoring, evaluation, and reporting, feeding into both national and international transparency frameworks.[91]

2.7.3 Monitoring, Evaluation, and Learning

Robust Monitoring, Evaluation, and Learning systems are essential for driving continuous improvement, enhancing transparency, and ensuring accountability in South Africa's adaptation response. The updated Adaptation NDC must institutionalise an integrated MEL framework that is aligned with the NCCAS, the Climate Change Act, and emerging GGA expectations.[92]

This is achievable through:

1. **Integrated monitoring, evaluation, and learning System Aligned with Legal and Strategic Instruments**

   As required under Section 21 of the Climate Change Act and building on the NCCAS framework, the adaptation component of the NDC's monitoring, evaluation, and learningsystem should integrate seamlessly across national, provincial, and local levels. It must track progress toward national adaptation goals, sectoral strategies, and municipal implementation mandates. Monitoring, evaluation, and learning should be embedded within the DFFE's coordination structures but implemented in a decentralized manner, with provinces and municipalities responsible for reporting on localized indicators.[92]

2. **Integration of Existing Sectoral Systems**

   Identify and leverage existing monitoring, evaluation, and learning systems across key sectors to strengthen the climate adaptation framework by:[93,94]

[90] Operation Vulindlela. 2023. Structural Reform Updates and Implementation Priorities.

[91] UNFCCC. 2022. South Africa's Experience on Adaptation Information Collection. GGA Workshop: 5 November 2022.

[92] DFFE. 2015. The National Climate Change Response Monitoring and Evaluation System Framework.

[93] DFFE. 2013. Long-Term Adaptation Scenarios for South Africa: LTAS Phase II, Technical Report (no. 7 of 7).

[94] SANBI. 2020. Case Study: Ecosystem-Based Adaptation in South Africa. Available at: https://www.sanbi.org/wp-content/uploads/2020/05/Case-Study-EbA-in-South-Africa-003.pdf

a. Aligning climate adaptation monitoring, evaluation, and learning indicators with existing relevant sectoral indicators (e.g., health) that capture climate-sensitive outcomes and impacts.
b. Utilising established digital and data management systems within sectors that routinely collect robust monitoring data to inform adaptation progress and vulnerability assessments.
c. Promoting interoperability and data sharing between climate and sectoral monitoring, evaluation, and learning systems to enhance comprehensive analysis, early warning, and adaptive management across sectors.
d. Strengthening capacity at national and subnational levels to analyse and use integrated monitoring, evaluation, and learning data for evidence-based policy, planning, and resource allocation, thereby supporting cross-sectoral learning and coordinated adaptation responses.

3. **Clear Indicators for Outcomes, Outputs, and Impacts**

   To operationalize an effective monitoring, evaluation, and learning framework, the adaptation component of the NDC should establish a structured indicator hierarchy:[95]

   a. ***Outputs:*** Track tangible deliverables such as updated vulnerability assessments, early warning systems installed, or climate-resilient infrastructure projects initiated.
   b. ***Outcomes:*** Measure intermediate results such as reduced vulnerability in targeted communities, improved water security, or strengthened municipal adaptation capacity.
   c. ***Impacts:*** Assess long-term, systemic improvements such as decreased disaster losses, enhanced food security, improved health outcomes, and strengthened ecosystem services.

   Indicators should be sector-specific, gender-responsive, and aligned with both national development priorities and international reporting obligations (e.g., Enhanced Transparency Framework under the Paris Agreement).[96]

4. **Annual Adaptation Dashboards and Public Reporting**

   South Africa should institutionalize an Annual Adaptation Dashboard to:

   a. Track adaptation actions, vulnerabilities addressed, and financial flows (domestic and international) across sectors.[97]
   b. Provide transparent, accessible information for government, civil society, and the private sector.[97]
   c. Enable real-time course correction through adaptive management, rather than relying solely on periodic National Communications or BTRs.[96]

5. **Strengthen Learning and Adaptive Management**

   Monitoring, evaluation, and learning must not be treated as a compliance exercise, but as a dynamic learning tool. To this end:

[95] Mthembu, N.N., et al. 2023. Indicators for monitoring and evaluating climate change adaptation efforts in South Africa. PubMed. Available at: https://pubmed.ncbi.nlm.nih.gov/37435435/

[96] IISD. 2024. National Monitoring, Evaluation, and Learning Systems for Climate Change Adaptation: A comparative analysis of nine countries. IISD. Available at: https://www.iisd.org/publications/report/monitoring-evaluation-learning-systems-adaptation

[97] DFFE. 2015. The National Climate Change Response Monitoring and Evaluation System Framework. Republic of South Africa. https://www.dffe.gov.za/sites/default/files/reports/nationalclimatechangeresponse_MESF.pdf

a. Results should feed directly back into policy, planning, and budgetary processes.[97]
b. Participatory monitoring, evaluation, and learning approaches should be developed, allowing communities and vulnerable groups to contribute to assessing progress and suggesting course corrections.[98]
c. Lessons learned from success and failure should be systematically analysed and disseminated.[97,96]

A well-structured monitoring, evaluation, and learning system will transform the adaptation component of the NDC from a static reporting document into a dynamic governance instrument — driving adaptive management, promoting institutional learning, and ensuring that South Africa's adaptation efforts remain fit for purpose in an era of escalating climate risk.

2.8 Adaptation Finance

Delivering South Africa's ambitious adaptation priorities for the 2030–2035 period will require a substantial scaling up of targeted adaptation finance. As reported in the 2024 BTR1[77], South Africa's adaptation financing needs are estimated at approximately USD 3–4 billion between 2021 and 2030. This equates to a rough financing requirement of USD 8 billion annually when combining adaptation and mitigation needs. However, current adaptation finance flows fall significantly short of these targets. BTR1 reports that only USD 7.6 million was spent on adaptation activities in 2021–2022.

This shortfall underscores a critical financing gap that threatens the achievement of South Africa's national adaptation goals. The mismatch between estimated funding needs and actual disbursements—exacerbated by an overreliance on loans rather than grants—puts at risk the timely implementation of adaptation actions outlined in Section 2.4.

To close this gap and operationalise South Africa's adaptation ambition, the following strategic actions are recommended:

1. **Embed adaptation finance into national budgeting processes:** Systematically integrate climate adaptation priorities into the Medium-Term Expenditure Framework (MTEF) and apply climate budget tagging mechanisms under development by National Treasury.
2. **Prioritise grants, concessional finance, and innovative financial mechanisms:** Given the developmental nature of most adaptation investments, grant-based and concessional finance must be prioritised, particularly for vulnerable communities and municipal-level adaptation. Instruments such as climate resilience bonds, green bonds, and disaster risk financing mechanisms should be developed or scaled up to diversify funding sources and crowd in private sector participation where appropriate.
3. **Align finance strategies with the JET-IP and Loss and Damage Fund opportunities:** Future adaptation financing must be integrated with South Africa's emerging climate finance platforms, including the JET-IP and any new mechanisms linked to the Loss and Damage Fund established at COP27. Ensuring that adaptation is explicitly funded through these channels will be critical to maintaining balance between mitigation, resilience-building, and equity imperatives.
4. **Strengthen pipeline development for adaptation projects:** As referenced in the Means of Implementation Section below, investments in adaptation project preparation facilities, technical

[98] Molale, T & Fourie, L. 202. A six-step framework for participatory communication and institutionalised participation in South Africa's municipal IDP processes. Development in Practice 33(25):1-12

assistance, and bankable pipeline development are urgently needed to enable municipalities, provincial governments, and community organisations to access available finance.

The strategic priorities outlined for adaptation require dedicated and predictable adaptation finance to be implemented at scale. Full details of South Africa's evolving climate finance architecture, including public finance instruments, blended finance innovations, and international finance mobilisation strategies—are provided in Section 4: Means of Implementation. Adaptation finance must be mainstreamed across these systems to ensure the delivery of a resilient, inclusive, and climate-ready development trajectory.

3 Mitigation

An ideal mitigation pathway for South Africa must integrate climate ambition with social justice, economic resilience, and inclusive governance before any discussion of what constitutes a credible NDC. Policymakers should align mitigation measures with the Just Transition Framework's pillars of procedural, distributive, and restorative justice, ensuring that workers, communities, women, and youth participate meaningfully in decisions, that benefits such as green-job creation and cleaner air accrue equitably, and that interventions correct historical inequities. Transition centres should re-skill and redeploy employees from high-emitting industries, while social protection, income support, early-retirement options, and public works, shields vulnerable groups from short-term shocks. Revenue from instruments like carbon taxes should flow back into clean energy access, affordable transport, and township-level renewable solutions so that low-income households are not burdened by higher costs. By embedding these principles up front, South Africa can chart a mitigation pathway that delivers deep emission cuts, sustains competitiveness, and secures broad societal support, thereby strengthening the credibility and durability of its NDC.

South Africa's extreme inequality means mitigation policies and measures must be carefully designed so as not to impose undue costs on vulnerable groups. The Just Transition framework's mandate to put people first should guide these choices. This approach not only obtains societal approval but also builds broader support for climate policies, as communities see tangible improvements (job opportunities, cleaner air, better services) resulting from mitigation actions. Inclusion also extends to recognising and addressing gender dimensions and the needs of youth in the transition, ensuring that climate programs uplift women, who often bear disproportionate burdens in affected communities, and create prospects for young people entering the workforce.

3.1 Aspects of a Credible NDC

A credible NDC must satisfy three interlinked criteria of credibility (see Figure 2): local, scientific, and international. Local credibility, hinges on demonstrating South Africa's best efforts within its unique national context, integrating the principle of common but differentiated responsibilities (CBDR) and respective capabilities to ensure that commitments are both achievable and. International credibility requires that the NDC exceeds the ambition of the previous one and aligns with evolving multilateral agreements and consensus for example, the UAE outcome of the global stocktake. Scientific credibility in turn, demands that targets reflect the latest climate evidence, models, and carbon budget calculations established by the IPCC and global carbon modelling.

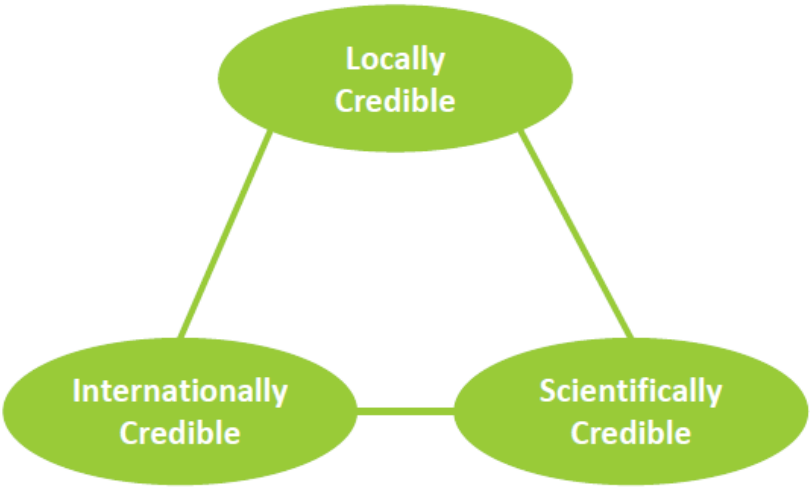

Figure 2 NDC credibility

South Africa's current pace of climate action lags behind the trajectory prescribed by both global science and equitable burden-sharing. Our latest NDC update remains more conservative than pathways consistent with a 1.5°C limit. Closing this ambition gap is critical not only to uphold our international standing but also to safeguard long-term national interests in a decarbonising world economy.

At the same time, South Africa must align its mitigation measures to the pace and scale that our economy and society can sustain. Overly aggressive targets without commensurate financial, institutional, and social readiness risk undermining both delivery and public trust. A practical balance, therefore, is essential, one that combines ambition with affordability, ensuring that climate action supports rather than destabilises economic growth and social welfare.

Current Computable General Equilibrium (CGE) modelling used to inform the NDC captures many macroeconomic interactions but omits several critical factors. Notably, these models typically exclude co-benefits including improved air quality, the full impact of carbon taxation, trade risks such as carbon border adjustment mechanisms (CBAM), and broader economic cycles. In practice, mitigation measures can yield substantial public health and regulatory gains through cleaner air quality, while aggressive carbon pricing and trade disruptions may constrain capital flows. A comprehensive NDC must therefore acknowledge these positive and negative externalities, integrating complementary policies to maximise co-benefits and mitigate unintended economic pressures.

Delivering a more ambitious NDC will necessitate significant structural change with uneven geographic impacts. Provinces like Mpumalanga, home to concentration of coal-fired power generation and heavy industry, will face the greatest transitional challenges. These communities will require social interventions, including skills development, social protection schemes, and dedicated investment to support job creation in emerging sectors. Crucially, economic diversification must underpin the just transition, broadening the provincial economic base and ensuring that mitigation efforts deliver inclusive growth rather than exacerbating regional inequalities.

3.2 Policy and Regulatory Framework for Mitigation

The domestic policy instruments that give legal force to South Africa's mitigation commitments under the updated NDC include the SETs, Carbon Budgets, and the Carbon Tax, each of which plays a specific role in operationalising the national GHG emissions trajectory required under the Climate Change Act. Together, they will eventually represent a coordinated system of targets, enforcement mechanisms, and price signals that enable South Africa to meet its climate goals while aligning with its socio-economic development priorities.

3.2.1 Sectoral Emission Targets

SETs form a cornerstone of the Climate Change Act's mitigation system. Under the Climate Change Act:

- SETs are allocated at a national level, specifying the total allowable emissions for key sectors over defined five-year periods aligned with NDC timelines.
- Each relevant Minister is assigned responsibility for meeting sector-specific targets, thus ensuring political accountability across government.
- The SETs will enable more granular, sector-specific tracking of progress and inform the allocation of responsibilities across the economy.

The SETs create the foundation for emission limits at the sector level. These are then cascaded down to individual emitters through the Carbon Budget system, which defines allowable emissions at the company level. The updated NDC should align with the SETs to ensure it is implementable, enforceable, and integrated with South Africa's socio-economic development objectives and a just transition.

3.2.2 Company-Level Carbon Budgets and the Carbon Tax

The Climate Change Act mandates the implementation of Carbon Budgets at the company level. These budgets are allocated to individual companies that are required to report their annual greenhouse gas emissions, covering a five-year compliance period aligned with the NDC cycles. Each company must also submit a mitigation plan outlining its intended approach to remaining within the allocated budget, thereby demonstrating how it will contribute to national emissions reduction objectives.

To reinforce the Carbon Budget system and incentivise compliance, South Africa's Carbon Tax provides a financial penalty for emissions that exceed allocated budgets. From 2026, the integration of these systems becomes more impactful, with escalating carbon tax rates and reducing tax-free allowances.

The Carbon Budget system operates in parallel with, and is reinforced by, South Africa's Carbon Tax regime.

Phase 1 of the Carbon Tax (2019–2025): Introduced a modest initial tax rate (R120/tCO_2e), combined with generous tax-free allowances (60%-95%) to ease economic impacts while the carbon budgeting system was being established.

Phase 2 of the Carbon Tax (2026–2030): From 2026, the tax rate will escalate to R308/tCO_2e, rising to R462/tCO_2e by 2030[99]. At the same time, the tax-free allowances will be progressively reduced to 10% by

[99] National Treasury. 2024. *Carbon Tax Discussion Paper: Phase Two of the Carbon Tax.*

2026, declining further by 2.5% annually. This phase also expands the offset allowance for combustion emissions from 10% to 25% while reducing the voluntary carbon budget allowance. Several allowances will remain unchanged including the fugitive and process emissions allowances and trade exposure allowance,

In Phase 2, the Carbon Budget system will be tightly integrated with the Carbon Tax: companies that exceed their allocated budgets will face a higher punitive carbon tax rate (currently expected to be triple the basic rate).

Thus, the updated NDC must clearly describe how the Carbon Budgets and Carbon Tax instruments work together to enforce sectoral emissions targets and mitigation plans, creating strong economic incentives for compliance and enhancing South Africa's credibility under the UNFCCC's Enhanced Transparency Framework.. These principles should be embedded into the Medium-Term Strategic Framework and guide fiscal and investment planning.

The alignment of SETs, Carbon Budgets, and the Carbon Tax within the framework of the legally gazetted emissions trajectory reflects a systemic shift in South Africa's climate governance. These instruments collectively operationalise the domestic emissions pathway established under the Climate Change Act. While the NDC continues to serve as an instrument of international communication, its alignment with these binding domestic tools ensures credibility and coherence between South Africa's global commitments and national implementation.

3.3 Scientific Context

The scientific basis for calculating the national emissions budget relies on a combination of established climate models, integrated assessment frameworks, and comprehensive data collection. Advanced models, such as those used in the Intergovernmental Panel on Climate Change (IPCC) assessments, form the basis of these calculations, incorporating historical emissions data, projected socioeconomic trends, and energy system analyses. Key assumptions include the rate of technological advancement, projected energy demand, and the pace of policy implementation[100]. In addition to these assumptions, the IPCC applies Shared Socioeconomic Pathways (SSPs) which provide scenarios relating to varying social and economic parameters[100]. These scenarios provide social and economic context for the technical modelling. Data sources range from national statistical databases to international repositories, ensuring that the budget reflects both local realities and global climate scenarios.

Methodologically, the process involves scenario analysis where multiple trajectories are modelled to determine the feasible range of emissions reductions. This includes establishing mitigation targets that align with global temperature goals, such as the Well Below 2°C and 1.5°C pathways. The calculation methods integrate factors like carbon intensity of various fuels, sector-specific emission factors, and projected shifts in energy production and consumption. This rigorous approach provides a robust framework for determining an emissions budget that is both scientifically sound and policy relevant.

The principle of CBDR and respective capabilities underpins South Africa's climate strategy by embedding notions of historical accountability and equitable burden-sharing into policy design. Originating in the UNFCCC and reaffirmed in the Paris Agreement, CBDR recognises that industrialised nations have contributed the largest share of cumulative greenhouse gas emissions and thus have a greater moral and material obligation to lead emissions reductions. At the same time, it acknowledges that developing

[100] IPCC. 2023. *Sixth Assessment Report*. Intergovernmental Panel on Climate Change

countries, including South Africa, face pressing socio-economic development challenges and possess more limited financial and technical resources. By considering CBDR, South Africa positions its NDC commitments within a framework that calls for ambitious action from all parties, while allowing for differentiated pathways that reflect the country's specific emissions profile, development priorities, and governance capacities.

This dual emphasis on global equity and national capability affects every aspect of the mitigation agenda. South Africa currently sets unconditional targets that align with its domestic decarbonisation potential, drawing on measures such as SETs under the Climate Change Act and the LEDS, while articulating conditional, more ambitious targets that hinge on access to international finance, technology transfer, and capacity-building assistance. This tiered structure ensures that the country contributes its fair share to limiting global warming to well below 2°C with an ambition of 1.5°C, without compromising essential investments in poverty alleviation, infrastructure development, and industrial transformation. Moreover, CBDR informs the sequencing of sectoral decarbonisation: high-emitting industries as well as industries at risk of trade pressures, such as the automotive sector, receive targeted policy support and transition financing under the Just Transition Framework, whereas new green sectors should benefit from incentives designed to catalyse private investment and skills development. Through this approach, South Africa can balance its responsibilities as a significant GHG emitter with its imperative to pursue inclusive and economically feasible climate action.

3.3.1 UAE Consensus and Global Stocktake

The UAE Consensus emerging from the global stocktake results underscores the collective commitment of nations to accelerate climate action. This consensus reflects an urgent call for policies and strategies that align with the 1.5°C target, emphasizing the necessity of coordinated efforts, deep emissions reductions, and enhanced international cooperation[101]. It serves as a benchmark for evaluating national trajectories and ensuring that global efforts are sufficiently ambitious to avert the most severe impacts of climate change.

The Global Stocktake results suggest that current mitigation efforts have already played a crucial role in avoiding a potential 4°C increase in global temperatures. This avoided escalation highlights the benefits of existing climate actions, showing that timely interventions can significantly alter the trajectory of warming. However, this achievement also serves as a reminder of the critical importance of scaling up these efforts to secure long-term climate stability.

If current climate action plans are implemented in full, projections indicate that global temperature increases could be contained within a range of 2.1°C to 2.8°C[101]. While this outcome represents a marked improvement over more severe warming scenarios, it remains well above the aspirational 1.5°C limit in the UAE Consensus. This disparity underlines the need for enhanced ambition and a realignment of policies to further accelerate emissions reductions.

There remains a possibility to limit global warming to below 2°C, contingent upon a substantial strengthening of climate commitments and the rapid deployment of advanced mitigation measures. Achieving this target will necessitate an accelerated transition to renewable energy, transformative policy

[101] UNFCCC. 2023. *CMA.5 Outcome of the first global stocktake*. United Nations Framework Convention on Climate Change

reforms, and robust financial support across all sectors. Such a concerted effort would mark a critical step forward in safeguarding both environmental integrity and economic resilience.

Nonetheless, a significant mitigation gap persists between the current emissions trajectory and the levels required to limit warming to 1.5°C, as stipulated in the UAE Consensus. This gap highlights the pressing need for a more ambitious, comprehensive climate strategy that goes beyond incremental adjustments. Bridging this divide is essential to secure a sustainable future, demanding immediate and sustained action across all dimensions of climate policy, finance, and technological innovation.

3.3.2 National Carbon Budgets

A carbon budget represents the total volume of greenhouse gas emissions that the planet, a country or region can release over a defined timeframe while still ensuring that the planet remains within a particular temperature limit (see also the discussion on company-level carbon budgets presented in Section 3.2.2). Carbon budgets may either be expressed as tonnes of carbon dioxide, CO_2, or in terms of all greenhouse gases, expressed in carbon dioxide equivalents, CO_2e. In addition to specifying which gases are included, it is critical to indicate the timeframe over which the budget is calculated, especially regarding the starting year, given that the early years are generally the most emissions intensive. Current literature typically defines global carbon budgets for the period to 2100.

The global budget for CO_2, after correcting for other greenhouse gases, was estimated in the IPCC AR6 report as 500 $GtCO_2$ from 2020 to 2100, to have a 50% chance of limiting warming to 1.5°C. A study by the Global Carbon Project[102] suggests this will have been reduced to 235 $GtCO_2$ by the start of 2025, indicating the speed at which the planet is consuming the remaining budget.[103]

Debate is ongoing as to how the remaining global carbon budget should be divided up between different countries. Two approaches have been widely considered. The “fair share” approach takes into account principles including historical responsibility for emissions, equity, population and per capita emissions, while the “best effort” approach reflects the maximum feasible emissions reductions achievable by a country or region given current technological capabilities, economic conditions, and policy instruments. Determining both a fair share and best effort carbon budget requires several assumptions to be made, all of which imply a degree of subjectivity.

Although South Africa accounts for just 0.5% to 0.6% of global GDP[104] and roughly 0.7% to 0.8% of the world’s population[105], it ranks as the 10th highest emitter of fossil CO_2[106], indicating a disproportionate contribution to global emissions relative to its economic and demographic size[107]. Determining a fair share of the remaining carbon budget for South Africa thus involves careful consideration of its historical

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[102] Global Carbon Budget. 2025. *Global Carbon Budget 2024*.

[103] Note that assessments of the remaining carbon budgets for South Africa presented in Section 3.4 to Section 3.6 of this report present these as CO_2e rather than CO_2.

[104] Compiled from World Bank, IMF and UN data

[105] Compiled from World Bank, UN and CIA fact book data

[106] Global Carbon Project. 2024. *Global Carbon Project 2023.*

[107] Carbon Brief. 2021. *Analysis: Which countries are historically responsible for climate change*.

responsibility, developmental needs, and capacity to reduce emissions without jeopardizing socio-economic progress.

Only a small selection of studies has been undertaken to provide an indication of what South Africa's remaining carbon budget might be. The University of Cape Town's Energy Systems Research Group (ESRG) Net Zero Pathways work refers to a carbon budget of 6 to 9 $GtCO_2e$ as representing South Africa's fair share from 2021 to 2050[108] Work done by NBI, based on analysis by the global Climate Action Tracker, has suggested that the country's fair share carbon budget may sit between 7 and 9 $GtCO_2e$.[109] The time period covered by the latter carbon budget is not stated explicitly in the study but is assumed to be 2021-2050 in line with other studies. Other modelling work done by ESRG in support of development of the Just Energy Transition Investment Plan (JET-IP) considers a budget range of 7.8 to 8.5 Gt CO_2e.

The ESRG and NBI studies were, however, conducted in the context of the Paris Agreement, where the aim was to limit the global average temperature increase to well below 2°C, and to pursue efforts to limit the increase to 1.5°C. As such, although it is not stated explicitly, it might be assumed that the budget range of 6 to 9 $GtCO_2e$ is aligned with that temperature goal. With the more recent UAE Consensus, which agrees on limiting warming to 1.5°C, it may be argued that the upper end of this budget may be considered too high[110], and that the country should rather target the lower end of the budget range. There are, however, no updated analyses to conclusively state what a 1.5°C aligned budget range might be, and thus these figures could be even lower.

3.4 Modelled decarbonisation pathways

A carbon budget does not directly translate into a level of emissions in any one year, as the budget is cumulative over time and a decline in emissions will not follow a linear trajectory. A country could choose to meet the budget by investing in decarbonisation effort early on; to spread the effort over the entire period covered by the budget; or to continue high levels of emissions for now and then implement extensive emissions reductions later in the period covered by the budget. Quantitative system modelling is used to provide an understanding of how emissions for the planet or a country or region might change over time, under a range of assumptions. Models also indicate the broader implications of following a particular trajectory. For example, model runs collated by the IPCC suggests that early action is likely to be associated with several economic and societal co-benefits, while delaying action is risky and potentially expensive for the economy [111].

A small number of modelling studies has been conducted that include quantitative long-term projections of emissions from the entire economy. When assessing these models' suitability for making recommendations on 2030 and 2035 targets, several requirements needed to be met. Firstly, the broad approach needed to be aligned with that taken in compiling the Updated First NDC. Secondly, they needed to give due consideration to South Africa's domestic climate policy commitments. Thirdly, the studies

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[108] PCC. 2025. *Net Zero CO2 Emission Pathways for South Africa – Technical Report.* Presidential Climate Commission

[109] NBI. 2022. *South Africa's Net-Zero Transition*. National Business Initiative.

[110] This assertion is corroborated by the World Bank study's 9GT budget being associated with keeping global temperatures below 2°C.

[111] IPCC. 2023. *Sixth Assessment Report*. Intergovernmental Panel on Climate Change

need to have considered scenarios with net zero dates, appropriate carbon budgets, and Paris Agreement / UAE Consensus temperature goals. Fourth, the underlying data needed to be accessible to the PCC, and finally, they needed to consider a sufficient number of scenarios to draw meaningful conclusions.

Only one study met all of these requirements, being that commissioned by the PCC from the Energy Systems Research Group (ESRG) at UCT in 2024[39] The study is further considered well suited to informing these recommendations as it includes recent data, and has been developed by a local well-respected research institution.

Recognising, however, the need to contextualise the findings from the ESRG work, the model results are cross correlated with the latest data from two independent international analytical projects used previously in determining South Africa's NDC targets[40], the Climate Action Tracker (CAT) and the Climate Equity Reference Calculator (CERC), as well as data from studies by the National Business Initiative, the World Bank's Country Climate and Development Report, and South Africa's Just Energy Transition Investment Plan.

The ESRG modelling scenarios cover a mix of current sectoral policies and plans and decarbonisation policies (where relevant adjusted to reflect implementation realities), as well as possible additional decarbonisation policies going forward to give effect to South Africa's climate policy commitments, such as a higher carbon tax rate.

3.4.1 ESRG net zero pathways

In 2024, the Presidential Climate Commission engaged the University of Cape Town's Energy Systems Research Group (ESRG) to explore pathways for South Africa in the journey to net-zero. The ESRG used its proprietary SATIMGE model, an integrated energy-economics-emissions model, to simulate 40 distinct decarbonisation pathways. The ESRG defined a set of scenario parameters through research and extensive expert consultation, creating two illustrative "global futures" based on IEA fuel-price projections and assumed EU border-tax adjustments: World A, in which international cooperation drives a rapid fossil-fuel phase-down and carbon costs inform trade policy, and World B, where fragmented action prolongs global demand for fossil fuels. Within each future, national emission pathways were constructed to reflect different net-zero target years (none, 2050 and 2055) and cumulative GHG budgets (none, and within an 8-11Gt CO_2e range). These pathways were then further defined using various combinations of key policies and measures, specifically updated carbon taxation, localisation requirements for renewable-energy component manufacture, and enhanced energy-efficiency standards, before being simulated in the integrated SATIMGE model. By varying critical inputs such as technology adoption rates, policy instruments, and economic growth assumptions, the study provided a portfolio of pathways, enabling policymakers to evaluate trade-offs and identify the most cost-effective strategies for achieving South Africa's long-term mitigation goals as set out in the LEDs[112] . The models do not capture the economic benefits of improved air quality and reduced impact on water resources, or the differences in trade (beyond a small selection of parameters) and physical climate impacts associated with the two global futures. These could be significant. A selection of the pathways is illustrated in Figure 3.

[112] DFFE. 2020. *South Africa's Low-Emission Development Strategy 2050.* Department of Forestry, Fisheries and Environment.

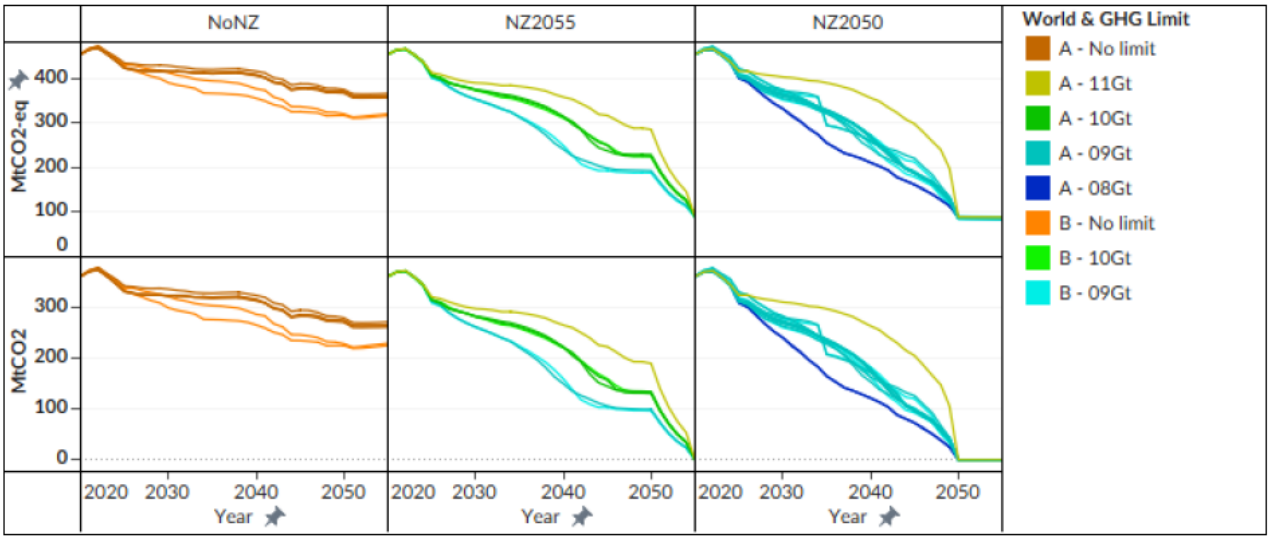

Figure 3 Net zero pathways - ESRG modelling, Figure 1[113]

To evaluate the trade-offs between economic growth and emissions reduction, the study applied the concept of Pareto optimality to modelled pathways that maximise GDP per capita under varying cumulative CO_2e budgets from 2021 to 2055. This approach involved plotting GDP per capita gains against total emissions, thereby identifying a Pareto frontier – the set of pathways where any further emissions reduction would entail a corresponding loss in economic output.The resulting analysis yields some important insights:[114]

- There is negligible benefit to the economy, in terms of per-capita GDP, of a national carbon budget of more than 10 $GtCO_2e$ in pathways which reach net zero. Furthermore, pathways representing budgets that exceed 10 $GtCO_2e$ or lack a net-zero target, introduce risks not included in the analysis. This suggests that a 10 $GtCO_2e$ budget a "no-regrets" option due to its economic and climate benefits.
- It is possible to increase the GDP/capita by 120% from 2021 to 2055, reach net zero in 2050 and impose a long-term GHG budget of 8 Gt on the economy, providing the right combination of accompanying measures is adopted. A similar observation is made for pathways which reach net zero in 2050 or 2055 with a 9 Gt constraint.
- With a strongly growing economy, the difference in GDP outcomes between the 8 and the 10 $GtCO_2e$ budget constrained pathways only represents a few years' growth. This difference will likely be eradicated or reversed if considering benefits from improved air quality and reduced water resource impacts, the benefits achieved through investment in energy efficiency measures, access to concessional finance, as well as reduced climate impacts in those pathways where all countries pursue similar levels of ambition.

[113] UCT ESRG. 2024. *Net zero CO2 emission pathways for South Africa*. University of Cape Town Energy Systems Research Group

[114] *Work done by Cambridge Econometrics for the PCC concurs that ambitious decarbonisation action has a positive impact for the economy, regardless of what the rest of the world does.* *https://pccommissionflo.imgix.net/uploads/images/CE_sapcc_eucd_E3ME_june2024.pdf*

One final note is offered here about the model's findings related to carbon tax. A strengthened carbon tax alone reduces cumulative emissions by approximately 4 $GtCO_2e$ by 2055. However, in the absence of concessional finance or revenue recycling, low-carbon investments in the power sector are funded through a crowding-out of other productive investments, resulting in an average annual GDP growth reduction of about 3%. The carbon tax also produces a slight decrease in income inequality, evidenced by a marginal decline in the Palma Ratio, indicating that while overall growth is reduced, the burden is shared more evenly across income groups.

In interpreting these findings, it is critical to note that the ESRG framework, similar to most energy and economic models, deals with the socio-economic implications of various scenarios by conflating these to the **narrow indicator of per-capita GDP**. Particularly in times of rapid change and uncertainty, GDP provides a limited account. A consideration of un-quantified upside socio-economic benefits and downside risks which are not modelled is crucial to obtain a more realistic comparison of the socio-economic implications of the different scenarios.

The higher ambition scenarios in the ESRG framework are accompanied with greater co-benefits and lower risks than those less ambitious. Benefits to higher ambition include air and water quality impacts and associated health issues linked to fossil fuels; increased access to markets based on perceived climate target ambition; new business opportunities in the transition; and access to concessional climate finance. Correspondingly, the less ambitious South Africa's climate ambition, the more the country will be subject to unilateral trade measures (border tax adjustments) on key exports; will face the risk of meeting a more stringent target later as a result of increasing international pressure in a rapidly warming world which would require a far more rapid and costly transition; and of being uncompetitive in the rapidly growing global green economy. Work done by Cambridge Econometrics also concurs that ambitious decarbonisation action has a positive impact for the economy, regardless of what the rest of the world does.

Further sectoral observations from the ESRG study are presented in Section 3.7.

3.4.2 NBI's Net Zero Transition study

The National Business Initiative commissioned a study in the early 2020s to explore implications of a net-zero transition. The study explored decarbonisation pathways for eight emitting sectors plus cross-cutting themes (finance, gas, grid expansion). Each sector pathway combined detailed techno-economic cost curves with modelling of energy demand, technology diffusion and behavioural change. The individual pathways were then integrated to produce a national emissions trajectory, to check consistency with a 7 to 9 $GtCO_2e$ fair-share carbon budget to 2050, and test policy levers such as carbon pricing, accelerated renewables roll-out and just-transition measures. The work was underpinned by ten published sector reports and iterative scenario analysis to capture uncertainty around technology costs, grid constraints and social acceptance.

The resulting pathway (see Figure 4) shows that South Africa can technically achieve a fair-share budget of $9GtCO_2e$ and reach net-zero greenhouse gas emissions by 2050, but only if: renewables are deployed ten-fold faster, approximately 6 to 7GW per annum; coal power is fully retired by the mid-2040s; road and rail mobility are electrified; and a domestic 9.5 Mtpa green-hydrogen industry is created. The modelling assumes only limited penetration of carbon capture and storage (CCS), rather prioritising scaling of green hydrogen for hard-to-abate sectors.

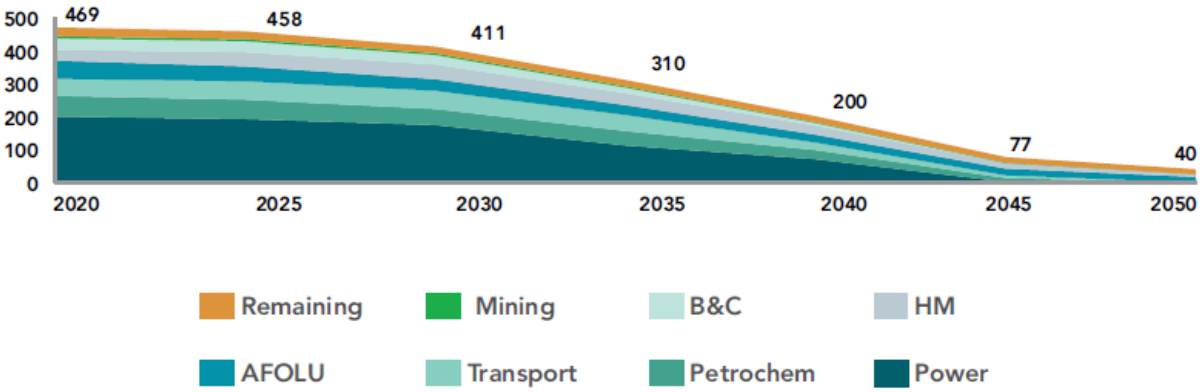

Figure 4 NBI Net Zero Transition Trajectory[115]

The economic upside of achieving a 9GtCO$_2$e aligned pathway is material: large-scale localisation of renewables and hydrogen could deliver roughly 5 million net job-years, offsetting losses in coal and conventional automotive value chains, while safeguarding export competitiveness that would otherwise see 50% of trade value and one million direct jobs placed at risk by emerging carbon-border measures. Realising this trajectory requires at least ZAR6 trillion of mitigation investment to 2050, half of which is needed in the power sector, plus concessional finance of ZAR100 to 350 billion this decade to crowd in private capital and absorb social costs. The study thus highlights that South Africa cannot manage the investment shock without concessional international finance and that a credible just-transition framework must accompany sectoral rollouts to avoid deepening inequality. Although investment costs are high, the NBI study also highlights the costs of inaction: without rapid decarbonisation roughly 50 percent of the country's total export value, one million direct jobs and 15 percent of GDP could be lost as foreign markets decarbonise.

3.4.3 World Bank CCDR

The World Bank's Country Climate and Development Report analysed the net emissions by sector until 2050 to achieve net-zero, constrained by a 9 GtCO$_2$e emissions cap. This study, which draws on outputs from the model run by ESRG, aligns with the findings of the other two studies presented above in terms of emissions reduction trends and technology options for the different sectors. It also highlights the criticality of early action, and of achieving around 58% of emission reductions in South Africa between 2030 and 2040. The sectoral emissions pathways developed through the ESRG model framework for this study are replicated in Figure 5.

[115] Figure 28 in NBI. 2022. *South Africa's Net-Zero Transition*. National Business Initiative.

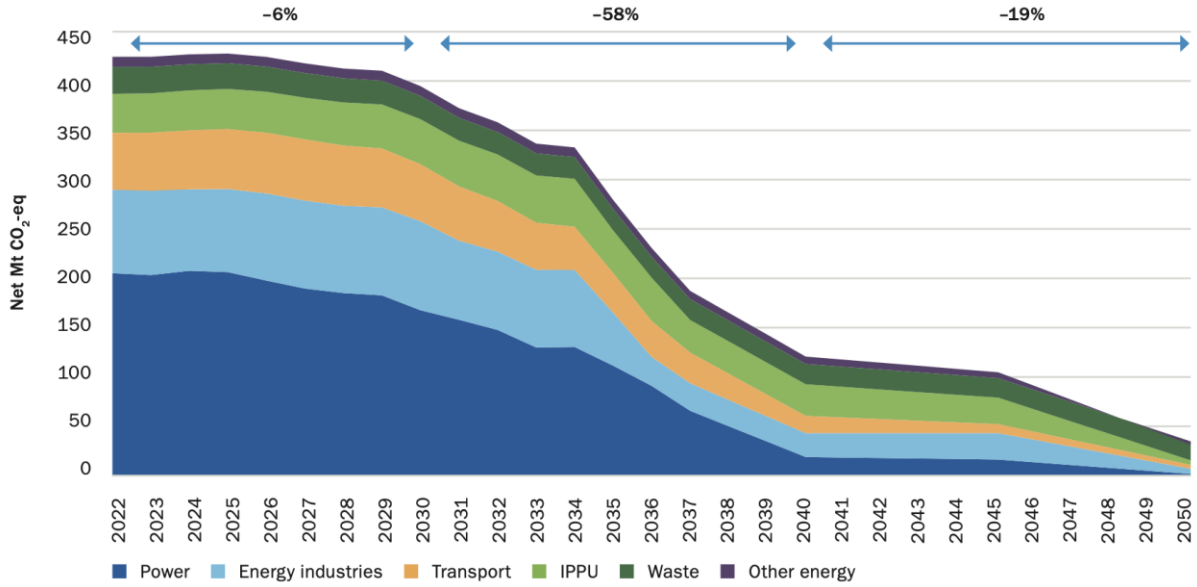

Figure 5 Net emissions by sector to achieve net zero by 2050[116]

The study also highlights that South Africa's export-oriented economic structure exposes several carbon-intensive value chains to escalating transition risks as major trade partners tighten climate policies and introduce border carbon measures. The European Union alone, South Africa's largest customer, plans to phase in a Carbon Border Adjustment Mechanism (CBAM) that will initially target iron and steel, aluminium, cement, fertilisers, hydrogen and downstream chemicals. The CCDR highlights almost three-quarters of South Africa's current exports to the EU come from sectors classified as moderate-to-high trade-risk: mining, metals, agriculture, chemicals, plastics and rubber.

3.5 Revisiting GHG Emissions Target Range for NDC 2025-2030

South Africa's updated 2021 NDC sets revised emissions reduction targets of 398–510 $MtCO_2e$ for 2025 and 350–420 $MtCO_2e$ for 2030[117]. It states that South Africa's updated target range for 2030 lies within the 2 °C fair share range based on the post-September 2020 version of CAT analysis, while the lower end of the 2030 target range lies within CERC's 1.5 degree assessment. Subsequent analysis by CAT (Figure 6) suggests that these targets are almost sufficient and align with a 2°C world if mitigation is undertaken where it can be achieved at global least cost (left hand side of Figure 6, 'modelled domestic pathways'). However, looking at a fair share approach (the right-hand side of the figure), South Africa's targets are deemed insufficient and more aligned with a 3°C world. Nevertheless, the 2021 update represents a marked increase in ambition relative to South Africa's initial NDC submission, with the 2030 upper limit reduced by 32% and the lower limit by 12%.

[116] World Bank. 2022. *South Africa: Country Climate and Development Report*.

[117] Republic of South Africa. 2021. *Updated First Nationally Determined Contribution Under the Paris Agreement.*

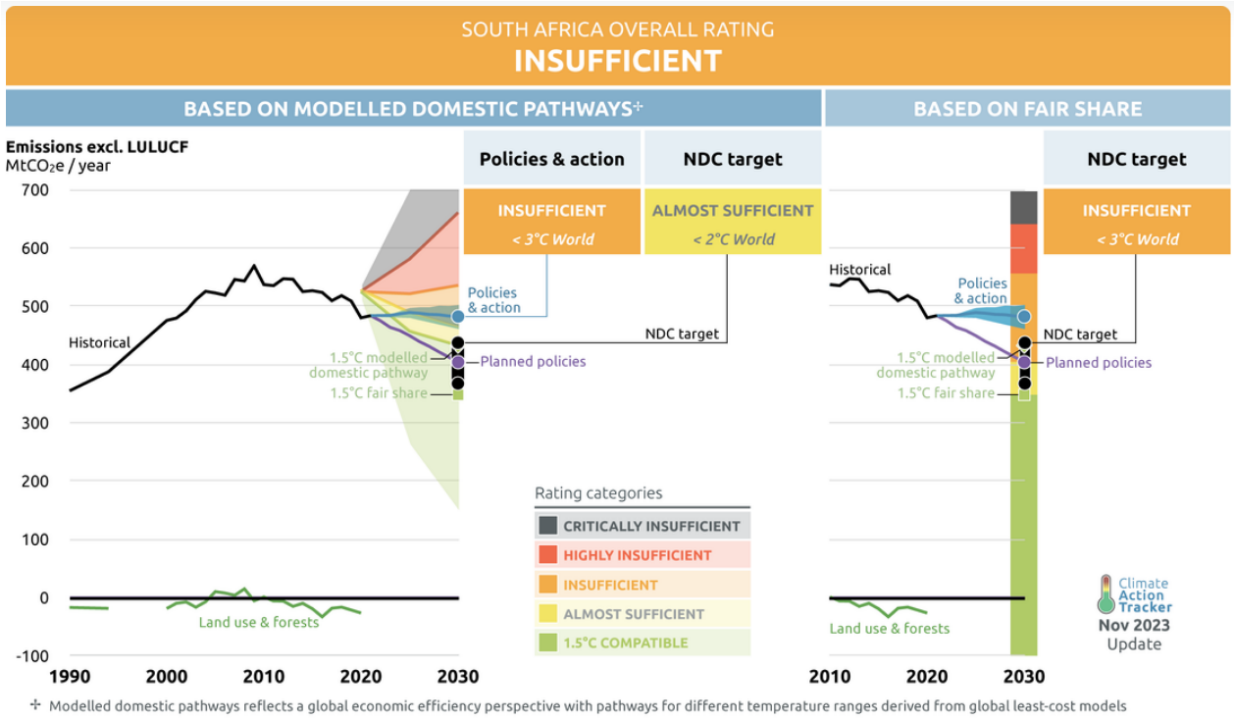

Figure 6 South Africa's current NDC rating[118]

South Africa's 2030-2035 NDC update provides the opportunity to revise its 2030 targets. There are a variety of trade-offs to be faced in so doing. On one hand, there is the scientific evidence from modelling to be considered. As indicated above, ESRG suggests that a fair share of the global carbon budget[119] for South Africa might lie between 6 and 9 $GtCO_2e$ between 2021 and 2050 and the NBI indicates a 7 to 9 $GtCO_2e$ fair share range.[120] For the ESRG pathways that fall within the 8 to 9 $GtCO_2e$ fair share national emissions budget range[121], which is not necessarily 1.5°C aligned, the models indicate that 2030 emissions could lie between 325 and 373 $MtCO_2e$. The latest CAT data[122] suggests a 1.5°C fair share 2030 emissions level for South Africa of 320 $MtCO_2e$, while the latest fair share values offered by CERC are between 309 and 329 $MtCO_2e$[123]. Combined, the analyses thus suggest that the 2021 Updated NDC 2030 target range is higher than the country's fair share contribution towards the current 1.5°C-aligned international policy position. Certainly, there is no analytical fair share justification in published literature for raising the upper bound of the 2030 target range.

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[118] Climate Action Tracker, South Africa. Nov 2023

[119] A carbon budget represents the total emissions that can be emitted across the planet or by a country while remaining aligned with a particular temperature goal.

[120] NBI. 2022. *South Africa's Net-Zero Transition*. National Business Initiative. https://www.nbi.org.za/focus-areas/environmental-sustainability/climate-pathways-and-a-just-transition-for-south-africa/

[121] This subset consisted of a total of 19 pathways, each with different assumptions of economic growth rates, carbon taxes, energy efficiency and extent of localisation.

[122] https://climateactiontracker.org/countries/south-africa/ (values exclude LULUCF; land emissions typically considered a net sink of 10 - 14 MtCO2.)

[123] The figures quote from CERC are for the Low Energy Demand and Standard 1.5°C aligned pathways respectively. Note that CERC allows for a number of input parameters to be changed which will provide different emissions outcomes (values exclude LULUCF; land emissions typically considered a net sink of 10 - 14 MtCO2.)

At the same time, it is recognised that sustainable economic growth is a critical component of the economic transition, and a decision on bringing down both the upper and lower bounds of the 2030 target range should not exacerbate existing challenging economic conditions. Furthermore, there have been some delays in implementing critical policy measures that are required to drive decarbonisation – notably the IRP.

The country could thus argue that it needs the additional emissions space as allowed for in the 2021 Update for economic recovery and growth in the short to medium term – particularly in the light of the impacts of Covid-19 and loadshedding, and in the period while relevant policy is rolled out. At the same time, it could be argued that there is an argument for reducing the target range – precisely for the purposes of driving exponential growth in the renewable power sector and realising the value of early investment in green power infrastructure. Early, targeted investments in renewable energy and green industrialisation both enable the country to attract greater levels of concessional international climate finance and put a greater level of ambition in the post-2035 period within reach.

These various tensions thus need to be carefully considered in deciding on the position to be taken with respect to revision of the 2030 targets during the NDC update process.

3.6 Considerations for setting the 2035 emissions range

South Africa has historically taken the approach of setting targets as a range of emissions values, to reflect the extent of the uncertainties and support needs associated with achieving a particular emissions level. This approach is well established and does not necessarily need revision. However, in line with the UAE Consensus, it is suggested that a 2°C aligned target range is no longer meaningful, and that future targets should ideally be aligned with a 1.5°C temperature goal and corresponding country-level carbon budget. As indicated previously, a small selection of studies (Section 3.3.2) suggest a fair share carbon budget range of 6 to 9 $GtCO_2e$ to be aligned with a well below 2°C temperature target. No further studies exist exploring specifically what budget would be aligned with a 1.5°C temperature goal.

In addressing concerns about socio-economic impacts of imposing different emissions constraints on the economy, consideration is given to the findings of the ESRG study discussed previously that sought to understand the implications of decarbonisation for GDP. As mentioned, the study suggests that cumulative emissions budgets above 10 $GtCO_2e$ provide no net economic benefit for South Africa, and further suggest that the costs of other impacts associated with GHG emissions from fossil fuels (air pollution and water use) that have not been fully factored into the models are likely to result in a worsening GDP/capita outcome for all scenarios, but particularly those with cumulative GHG emissions above 10 Gt. The study further notes additional, un-analysed risks in high-GHG emissions pathways (>10 Gt) for South Africa: that of having to meet a more stringent target later as a result of increasing international pressure in a rapidly warming world, which would require a far more rapid and costly transition, and the imposition of unilateral trade measures (border tax adjustments) on key exports. There is thus a strong argument that a carbon budget of 10 Gt should represent an upper limit for South Africa's long-term emissions budget, and there is no value in pursuing a less ambitious trajectory.

The ESRG models indicate that there could be some negative impact on 2050 GDP of imposing an 8 or 9 $GtCO_2e$ carbon budget. However, in analysing these results the study notes that "A combination of long-term measures, especially energy efficiency measures, can offset some or most of this loss, as can concessional finance." Furthermore, the models do not include the air pollution and water benefits of reducing fossil fuels, and avoidance of climate impacts in pathways that include coordinated global

climate action. As such, the study recognises that (although not explicitly modelled) there is likely to be negligible difference in pursuing an 8, 9 or 10 $GtCO_2e$ pathway in terms of impacts on GDP.

Based on both the arguments regarding what a fair share budget for South Africa might be, the observations that higher budgets do not offer economic benefits and that there is likely limited difference between an 8, 9 or 10 $GtCO_2e$, the recommends pursuing an emissions trajectory for 2035 aligned with the 8 or 9 $GtCO_2e$ budget as modelled by the ESRG. This budget range suggests that 2035 emissions levels of between 248 and 329 $MtCO_2e$ (Figure 7), represents a preferred position for South Africa. This will support the country in terms of both protecting the economy and contributing a fair share to the global mitigation challenge. Note that this budget range is used in the current absence of modelled pathways aligned with an even lower carbon budget, which may be more relevant to a 1.5°C fair share temperature goal.

While it is recognised that this range is obtained from a single study, which is recognised like any modelling study to have various limitations, it is aligned with findings from other work that explores emissions levels that represent South Africa's 2035 fair share contribution to the global mitigation effort. The NBI's net zero study suggests a level of 310 $MtCO_2e$ for 2035. Interpolation between the latest 2030 and 2050 data from Climate Action Tracker (CAT)[124] suggests a 1.5°C fair share aligned target of 291 $MtCO_2e$ for 2035, while the Climate Equity Reference Calculator (CERC)[119] suggests emissions of 306 $MtCO_2e$ and 320 $MtCO_2e$ for two different scenarios. This provides further evidence for suggesting that this emissions range could be appropriate for South Africa's NDC.

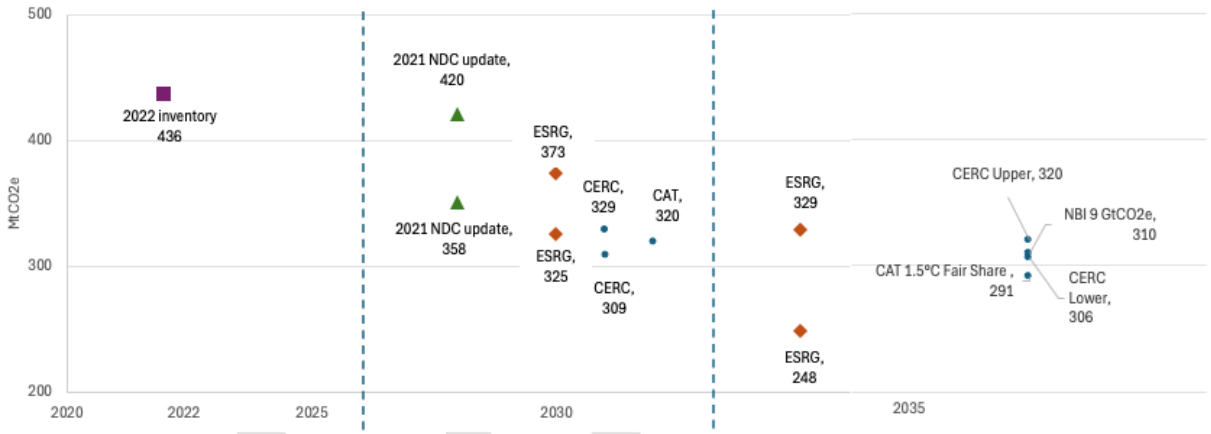

Figure 7 Data points used in developing the PCC emissions range proposals

3.7 Sectoral Implications

The discussion now turns to sectoral considerations in shaping the NDC update.

3.7.1 Electricity supply

The electricity supply sector is the largest contributor to emissions and provides the lowest cost and most mature technologies to support decarbonisation[125]. The global power sector is already undergoing rapid and disruptive transition, as traditional, centralised baseload dominated systems are evolving to move

[124] https://climateactiontracker.org/countries/south-africa/

[125] NBI. 2021. *Decarbonising South Africa's Power System.* National Business Initiative

towards decentralised, variable-generation dominated, and digitalised systems. Decarbonisation models run for South Africa, including those presented in this report, also suggest a prioritisation of decarbonisation of the power sector decarbonisation largely through deployment of wind and solar PV[126]. The sectoral emissions pathways of three of the ESRG scenarios are shown in Figure 8. The findings suggest that central to all net-zero pathways is the near-complete decarbonisation of the power sector, with coal phased out (including Medupi and Kusile), and investment in renewables, storage, and (in a few scenarios towards the end of the period) nuclear[127]. This result is aligned to the findings by Meridian Economics and the CSIR in their 2021 study on net-zero for the power sector[128]. Mid-term power sector decarbonisation will not only be aligned with low-cost power provision[129] but will contribute to reducing local air and water pollution associated not only with the power stations themselves but also with the mining of coal for their supply. Zero emissions electricity also has knock-on implications for other sectors, providing the most affordable decarbonisation option in transport, industry, residential use and others[130].

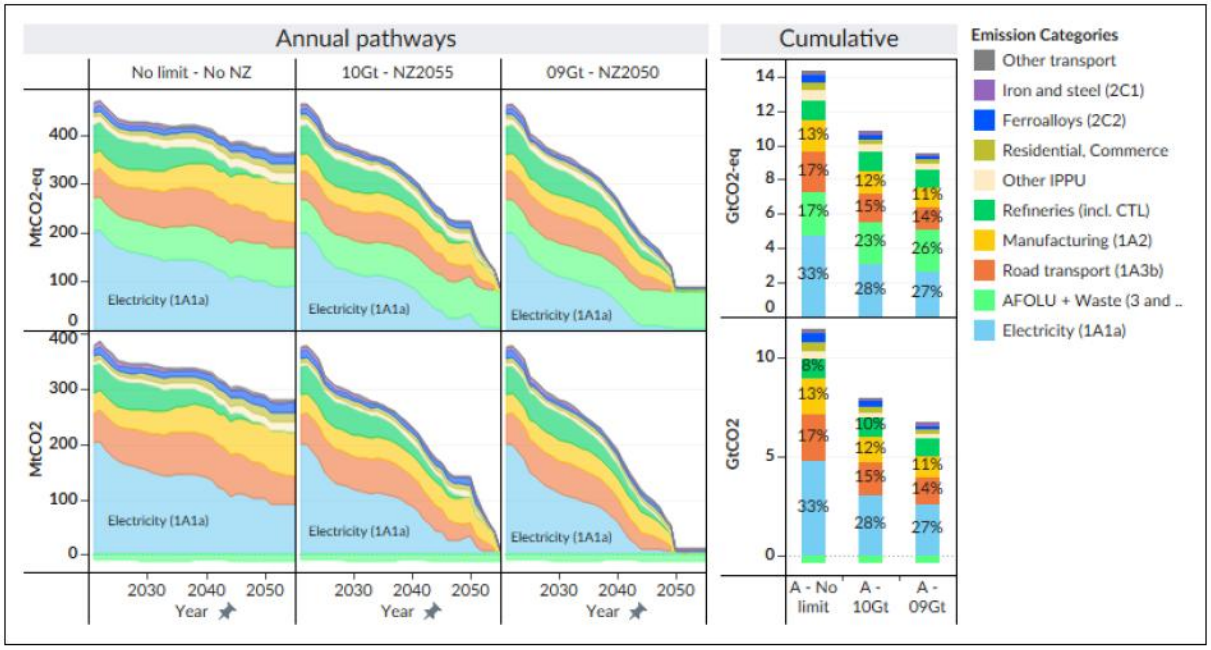

Figure 8 ESRG 2024: World A (coordinated climate action) pathways by sector

[126] PCC. 2021. *South Africa's NDC Targets for 2025 and 2030 Recommendations.* Presidential Climate Commission

[127] UCT ESRG. 2024. *Net zero CO2 emission pathways for South Africa*. University of Cape Town Energy Systems Research Group.

[128] Meridian Economics. 2023. *Achieving Net Zero in SA's Power Sector.*

[129] Meridian Economics. 2024. *Review of the IRP 2023.*

[130] Grace, L. 2024. "Zero-Emission Energy Systems and their Role in Climate Change Mitigation". *J Fundam Renewable Energy Appl*, 14, pp.368.

Goldman Sachs. 2023. *Carbonomics: Updated cost curve shows diverging trends between power and transport*

Results from modelling that underpins the 2024 net zero report by ESRG[131], work by Meridian Economics (2025)[132], and the build rates indicated in IRP 2024 can all be considered towards recommending appropriate build rates for renewables and storage aligned with the NDC targets and fair share budgets considered in this report. The relevant data is shown in the following comparative tables. Note that insufficient data is presented by Meridian to include this data set in Table 5.

Table 3: Average new generation capacity added per year over the period 2026 - 2030 (GW)

	ESRG NZ	Meridian	IRP 2024
Solar[133]	2.06 - 3.04	2.44	2.35
Wind	1.22 - 3.05	2	1.47
Gas	0.7 - 1.65	1.16	1.2
Batteries	0.03 - 0.25	0.12	0.75

Table 4: Average new generation capacity added per year over the period 2031 - 2035 (GW)

	ESRG NZ	Meridian	IRP 2024
Solar	1.1 - 2.06	2.70	2.34
Wind	1.84 - 4.79	2.20	2.74
Gas	0.05 - 1.36	0.30	0.95
Batteries	0.24 - 1.49	1.20	0.2

Table 5: Total New Capacity by 2035 (GW)

	ESRG NZ	IRP 2024
Solar	16.34 - 25.49	26.22
Wind	15.33 - 39.22	22.78
Gas	3.83 - 10.83	10.75
Batteries	1.36 - 8.71	5.44

From the tables, there seems to be broad consensus on capacity build rates and totals between the net zero / NDC-range aligned studies - while recognising that roll-out of any technologies need to be considered within the context of the broader electricity systems in which they operate. It is noted that Meridian indicates a higher build for solar in the 2031-2035 period than the other two reference sources. The Meridian results are extracted from a high solar build scenario which explains this observation in part. The IRP builds more batteries than the net zero / NDC-range aligned studies in the period to 2030 but then builds the lowest additional battery capacity in the period to 2035. The IRP includes more solar and new total gas capacity at the higher end of the ESRG study range.

[131] UCT ESRG. 2024. *Net zero CO2 emission pathways for South Africa*. University of Cape Town Energy Systems Research Group

[132] Meridian Economics. 2024. *Review of the IRP 2023*

[133] Note that the solar figures for IRP 2024 include distributed generation figures. Whilst this is not explicitly stated in the ESRG or Meridian publications, it is implied that this is the case in these studies too.

Although renewables and battery capacities in the IRP 2024 look broadly aligned to the net zero / NDC-range aligned studies, power sector emissions arise from burning of fossil fuels. The IRP includes both gas and coal generation.

For gas generation (which is included in the electricity build plan in all the NDC-range aligned studies), both the choice of technology and the extent of utilisation are the critical determinants of emissions. Two broad types of gas technology options are available, Open Cycle Gas Turbines (OCGT) and Closed Cycle Gas Turbines (CCGT). Closed Cycle CCGTs incorporate a heat recovery system that captures exhaust gases to drive a secondary steam turbine. This significantly increases efficiency over CCGT, but only after sustained operation, making CCGTs more suitable for continuous or mid-merit use. In contrast, OCGTs are less efficient but can start and ramp quickly, making them ideal for short, flexible operation.

As a capacity expansion plan, the IRP does not provide utilisation rates that underpinned their modelling, nor the emissions levels from gas generation. Furthermore, the technology preference is not stated explicitly, although it does note that the addition of 6 GW of CCGT capacity is 'critical' to account for the impending loss of dispatchable coal plant by 2030, suggesting a significant proportion of new gas build is CCGT for mid-merit or continuous operation. This assumption is further supported by a recent announcement by the Minister of Energy and Electricity that gas utilisation rates should be increased to 50% or above to create sufficient anchor demand to support broader industrial gas usage across the economy.[134]

The ESRG modelling also does not explicitly provide gas utilisation rates. It is observed that the total new gas capacity build of the IRP up to 2035 lies on the high side of the ESRG range.

Given the complexities of specifying gas technology options and utilisation rates in terms of emissions, cost and contracting considerations, it is not possible to determine the extent to which the IRP is aligned with the modelling on which the recommended NDC emissions range for 2035 was based. There is a strong possibility, however, that the blanket setting of gas utilisation rates at a minimum of 50% as proposed by the Minister, in the absence of least cost modelling of the options, as well as the high end build rates, could result in building and operation of facilities under the IRP at levels in excess of what is economically optimal for the system and misaligned with the recommended NDC range.

In terms of emissions from coal, there is no new coal built in either the IRP or ESRG work. At the same time, the ESRG modelling reflects a somewhat more rapid decommissioning plan for coal fired power stations than is reflected in Eskom's most recent capacity projection,[135] which is assumed to align with the IRP modelling, with the former reaching 23.5 GW and the latter 26 GW by 2035 (down from 41 GW in 2025). Eskom further suggests that in the long term it aims to reach an energy availability factor of 70%, which is aligned with the IRP figure of 69% for 2035. However, the ESRG model pathways indicate a range of utilisation rates from 14% to 52% depending on the scenario assumptions. The combination of higher installed capacity and utilisation in the IRP will result in emissions from coal being significantly higher than across the range of ESRG pathways.

[134] Creamer, T. 2025. Ramokgopa announces big increase in gas-to-power load factor to 50%-plus. Engineering News, 5 May. https://www.engineeringnews.co.za/article/ramokgopa-announces-big-increase-in-gas-to-power-load-factor-to-50-plus-2025-05-05

[135] https://www.climatecommission.org.za/events/18th-meeting-of-the-presidential-climate-commission

Together the potentially higher coal and gas emissions will limit emissions space available to the remainder of the economy if the country is to remain within the proposed NDC pathway range. Given that the predominance of low-cost mitigation options reside in the power sector, if this sector takes up greater emissions space it is likely that the country's decarbonisation will be more expensive.

Further work is thus required to ensure alignment between the country's generation infrastructure development and operation plans for coal and gas, and the proposed NDC range. This while recognising the challenges associated with delays in the implementation of the previous IRP, including the roll-out of renewables (which in turn leads to the country missing out on the significant socio-economic benefits of developing a localised renewable sector), and the need for ensuring energy security in the country. In addition to resolving the future build out and operation of the generation infrastructure itself, significant investment is required for extensive expansion of the transmission network. Indications of this expansion are in the order of an expected 14 500km over the next 10 years with a ramp up between 2030-2034[136]. Expanding the transmission network, including through financing models that involve the private sector, could thus be a key focus of the NDC.

Other focus points for action to support and accelerate the electricity transition include:

- Market reform to enable the private sector to participate meaningfully and urgently in generation build, and equally to signal a reduced reliance on the coal fleet over time.
- Enhancing capacity at the municipal level to support distribution and acceleration of behind the grid generation feeding back onto the grid.
- Creation of an enabling environment for renewables and storage through supportive policies, streamlined permitting, and grid infrastructure upgrades[137].
- Renewable-energy equipment manufacturing in line with SAREM: Localising turbine towers, PV modules, batteries and grid hardware, to leverage the benefits for socio-economic development and contribution to meeting net zero.

In South Africa, like in many other parts of the world, the transition needs to be properly managed, to avoid potentially significant disruptive impacts on the coal-dependent regions, notably Mpumalanga. Key here economic regeneration and diversification programmes and investments, including avoiding job losses as far as possible through implementation of actions such as retraining and community-development programmes[138].

3.7.2 Energy efficiency

Energy efficiency is one of the most cost-effective and readily available mitigation levers across the economy, including in power, industry, buildings, and transport[139]. Ambitious energy efficiency helps

[136] National Transmission Company South Africa. 2024. *Transmission Development Plan 2024-2034*

[137] PCC. 2023. *Technical Report Supporting the Recommendations for South Africa's Electricity System*. Presidential Climate Commission

[138] PCC. 2023. *A Critical Appraisal of South Africa's Just Energy Transition Investment Plan.* Presidential Climate Commission

[139] PCC. 2023. *Technical Report Supporting the Recommendations for South Africa's Electricity System*. Presidential Climate Commission.

facilitate decoupling of energy use from economic growth. Interventions here include, amongst others, updating building standards for thermal efficiency, mandating energy-efficient appliances and lighting, and promoting industrial process optimization. By reducing the energy required to produce the same output, these measures free up resources in the economy, lower the need for new power capacity investments, and allow investment to flow into other productive areas.

Modelling analyses for South Africa indicate that scaling up energy efficiency yields significant macroeconomic benefits and could significantly alleviate the investment burden of decarbonisation. Energy efficiency was indicated to reduce the power sector's capacity-build requirements and cumulative investment by up to 10%, freeing resources for broader economic growth. In an unconstrained scenario, energy efficiency alone delivers a 1.4% uplift in GDP by 2055; this gain increases to 6.4 % under a 9 $GtCO_2e$, net-zero-2050 pathway[140]. The socioeconomic co-benefits are also pronounced: the model indicates up to a five-percentage-point reduction in the unemployment rate when these measures are fully realised, underlining its critical role in achieving a just and economically resilient transition.

Scaling up efficiency requires institutional support to coordinate programs, monitor progress, and raise awareness. Expanding training and accreditation for energy auditors and installers will build the workforce needed to implement efficiency upgrades countrywide. In addition, creative financing models can help overcome upfront cost barriers for businesses and consumers. By embedding energy efficiency considerations into sectoral planning across the economy, South Africa can significantly lower its overall energy intensity, contributing to its 2030 to 2050 emission goals while delivering cost savings and improved energy security.

3.7.3 Transport

The transport sector is the second highest source of emissions in South Africa, making decarbonisation of the sector critical[141]. The Department of Transport has produced a Draft Just Transport Transition Plan[142] to support the achievement of net zero emissions for land transport, in a just and inclusive way. The Plan considers interventions that span three time periods, being 2025 - 2030, 2030 - 2035, and 2035 – 2050, the first two periods of which fall within the period covered by the 2030-2035 NDC update. While the Plan does not provide modelled data on which to base sector-wide emissions targets, it does set several ambitious targets for individual actions, including the key decarbonisation levers considered in other models as described in Section 3.4, notably electrification of the passenger and freight transport fleet and a shift to freight rail.

The plan is structured into four programmes as indicated in Figure 9.

[140] UCT ESRG. 2024. *Net zero CO2 emission pathways for South Africa*. University of Cape Town Energy Systems Research Group

[141] UCT ESRG. 2024. *Net zero CO2 emission pathways for South Africa*. University of Cape Town Energy Systems Research Group

[142] DOT. 2025. *Draft Just Transport Transition Plan*. Department of Transport

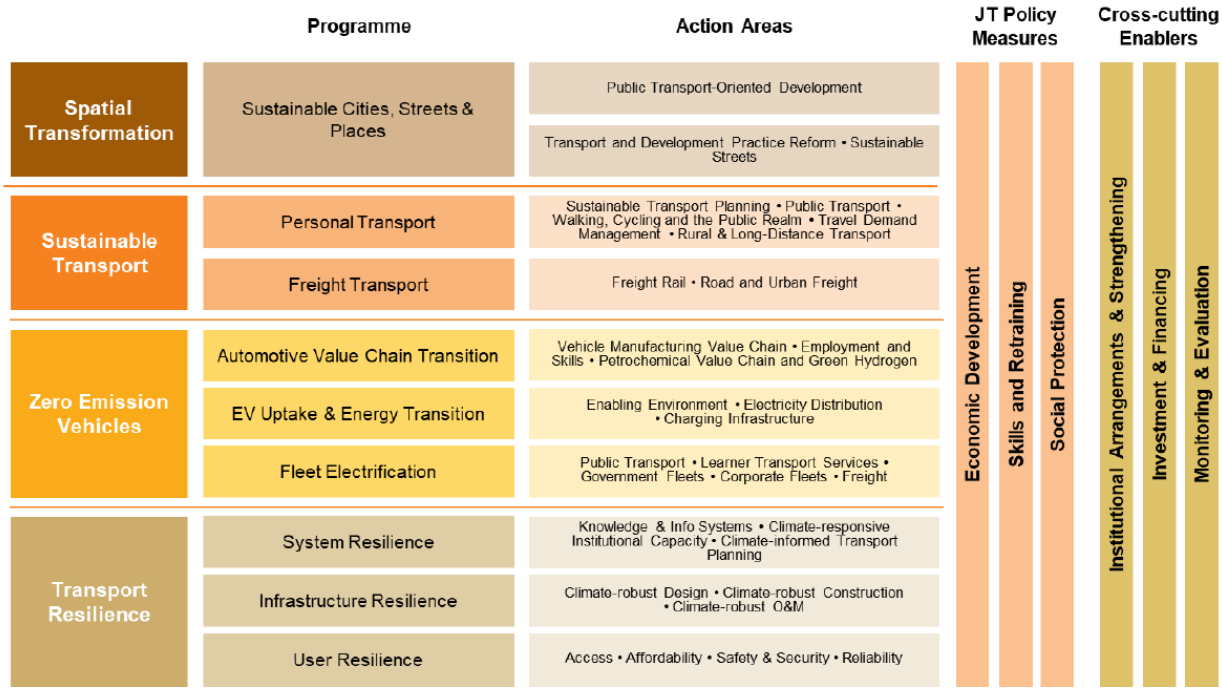

Figure 9 Just Transport Transition Plan

Spatial transformation is included as an essential enabler of decarbonisation of transport. The plan indicates a need for municipal capital expenditure and national grant frameworks to be retargeted toward higher-density, mixed-use development along public-transport corridors; and the rewriting of street design standards to benefit pedestrians, cyclists and bus rapid-transit over private cars; and incentives to reward developers who build within these nodes. The headline indicator here is a decline in average daily trip length in metros, signalling that jobs and services are moving closer to where people live.

For passenger travel the Plan prioritises: (i) restoring and ultimately expanding Metrorail, (ii) completing a limited but high-impact set of BRT corridors, (iii) formalising and recapitalising the minibus-taxi fleet, and (iv) embedding non-motorised-transport infrastructure into every road project. These interventions, coupled with progressively stricter car-restraint measures are expected to raise the share of daily trips by public transport, walking and cycling in metropolitan areas from the current 60% to 80% by 2050. On the freight side, the roadmap to shift tonnage back to rail, fully electrify the core network by 2040 and open access to private operators is essential, both for reducing emissions and for competitiveness.

Pursuing an ambitious electric vehicle (EV) rollout, beginning with freight and public transport, is highlighted to have the potential to decarbonise the roughly 90% of transport emissions that come from road traffic. This requires strong incentives and infrastructure development including installation of public charging stations and addressing upfront costs through incentives or reduced import duties. Critically, a reliable supply of clean electricity is needed to power EVs; hence the success of transport electrification is intertwined with rapid decarbonisation of the electricity sector. The Department of Transport's JTTP targets full zero emission vehicles in public fleets and private cars by 2050 and 20-40% of private cars by 2035.

Mitigation in transport is not only about vehicle technology but also about reducing demand and using more efficient modes. The Plan requires an investment by government in mass public transit systems (rail, buses) and pursual transit-oriented urban development and spatial planning to reduce private vehicle use and commuting distances. Shifting a greater share of freight from road to rail is another priority, as it

can significantly cut diesel use and emissions. By 2050, with improved public transport and logistics, there would be fewer total vehicles on the road even as the population grows, easing congestion, cutting pollution, and improving mobility access for citizens. These measures yield co-benefits in urban air quality and reduced travel costs for households.

Alignment of South Africa's automotive industry with the global EV transition is required to safeguard jobs and industrial capacity. As the global auto markets move to electric drivetrains, South Africa's continued role as a vehicle manufacturer and exporter rests on scaling up electric mobility domestically. Automotive exports built around internal-combustion drivetrains face demand collapse in the jurisdictions banning new ICE sales from 2035 onwards. The government will need to work with manufacturers to retooling existing automotive plants for EV assembly, attract EV production lines, establish battery-mineral beneficiation (PGMs, manganese, nickel, copper), support battery assembly and related supply chains, and retrain workers for EV component manufacturing. These types of interventions will position the sector to retain export market share while meeting domestic transport-decarbonisation goals and creating new employment opportunities in advanced manufacturing.

For aviation, maritime transport, and long-haul trucking, sectors where direct electrification remains technologically and economically constrained, South Africa should investigate long-term investments in sustainable alternative fuels. While significant emissions reductions in these sectors are unlikely within the 2030–2035 timeframe, strategic planning and pilot initiatives are critical to enable post-2035 decarbonisation. This includes advancing research into sustainable aviation fuels, exploring hydrogen and ammonia-based shipping solutions, and preparing for the eventual deployment of hydrogen fuel-cell technologies in freight transport. South Africa's green hydrogen industry, though in early stages, could serve as a pillar for a zero-emission heavy transport system beyond 2040. Aligning policy support and incentives with this timeline will be critical for future mitigation outcomes.

The ESRG study offers alternative data for understanding decarbonisation pathways for the sector that complement the proposals included in the Plan. It highlights that the transition in the transport sector largely occurs after the 2035 NDC period, recognising the criticality of initial investments and infrastructure development starting in the 2030-2035 period. The study indicates a transition in freight vehicles starting in 2030 but accelerating after 2040 (see Figure 11). This transition is predominantly towards electrification of the fleet as opposed to other alternatives such as hydrogen. There is higher uncertainty around the transition of heavy commercial vehicles than for light commercial vehicles.

Passenger vehicle decarbonisation (see Figure 10) occurs later depending on the constraints of the scenario and whether public or private transport is considered. There is also a distinction between private and public vehicles, with the public transport only decarbonising after 2035 and closer to 2040. Private vehicles have begun decarbonising with electric vehicles already available from some manufacturers. The accelerated transition for these vehicles also only begins from 2035 as these technologies become more affordable and the necessary infrastructure is built.

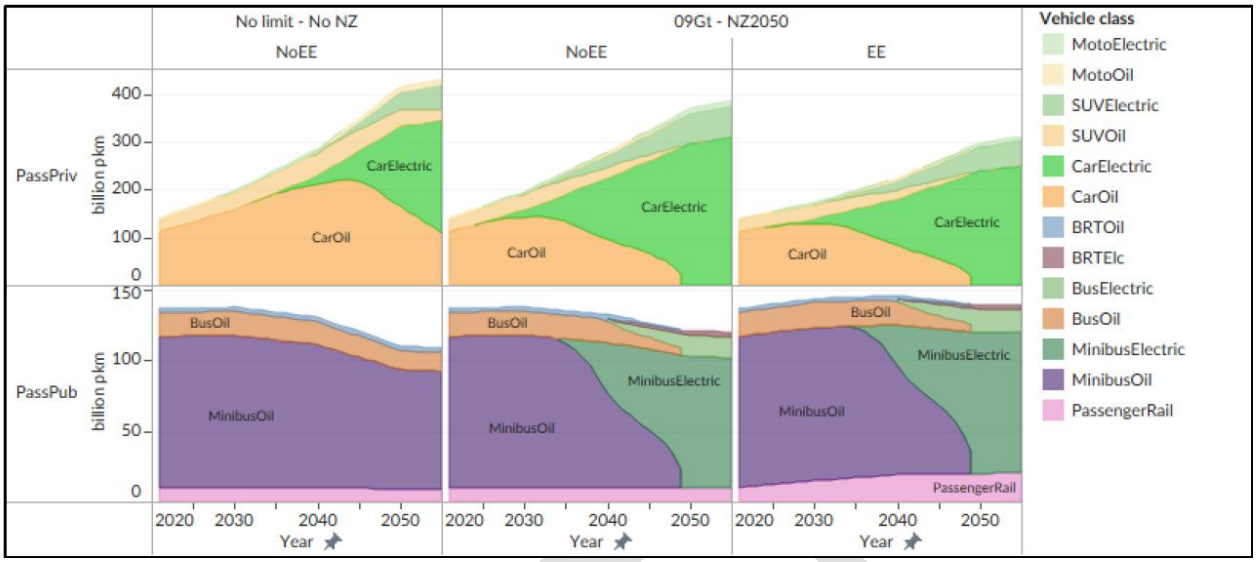

Figure 10 Passenger vehicle decarbonisation

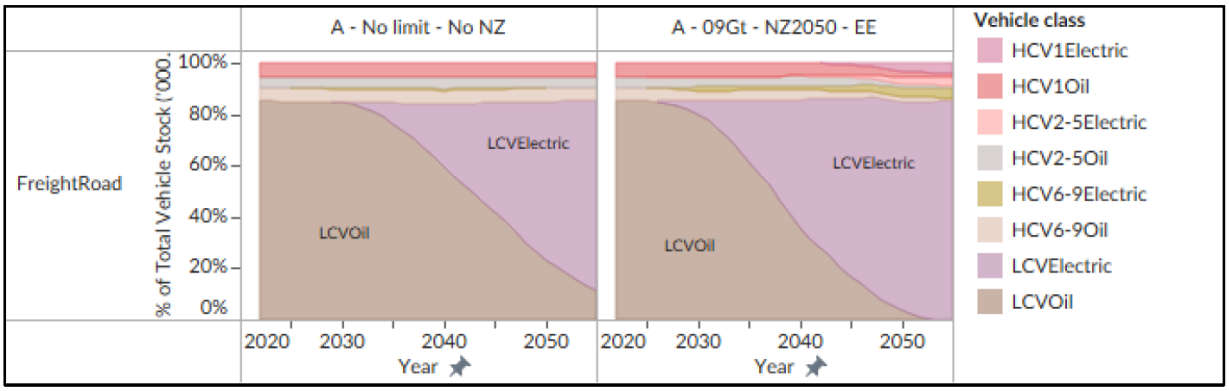

Figure 11 Freight vehicle decarbonisation

Options for representation of transport in the NDC include a formal commitment to implementation of the Plan towards ensuring international accountability and financial support. Further modelling and analysis would also help to determine the overall contribution of implementation of the Plan in achieving the national emissions targets range, which could also support future NDC updates.

3.7.4 Liquid fuels and chemicals sector

Emissions from the liquid fuels and chemicals sector are largely attributed to Sasol's Secunda coal-to-liquids plant, which makes a significant contribution to the national GHG emissions inventory. The Secunda complex is also anecdotally considered to be the largest single source of GHG emissions in the world. This facility is highly interlinked with the company's Sasolburg gas-to-chemicals facility in terms of both material and energy flows, with Secunda providing several materials inputs to Sasolburg. The decarbonisation of these two complexes will be an important determinant for achieving the country's NDC in 2035 and remaining within a constrained carbon budget. Budget taken up by the ongoing operation of these facilities has implications for the budget available to the rest of the economy. Coal-based petrochemicals will inevitably contract as consumers implement coal-exit policies and sustainable aviation fuel mandates.

Sasol regularly publishes decarbonisation plans which outline potential emissions reduction opportunities and trajectories for its facilities[143]. Options that have been considered in the shorter term towards meeting 2030 targets include turning down gas boilers, increased efficiency, and increased use of natural gas as a feedstock, while in the longer-term use of green hydrogen as a feedstock to meet changing market demand and carbon capture and storage are being considered. However, unless there is a significant drop in costs of these longer-term technologies, a phased retirement of coal-based synfuels and chemicals assets will be required.

The ESRG models considered three stylised retirement profiles for the current coal to liquids facilities in their work, a steady linear transition from 2030 to 2050, a stepwise shutdown in 2035 and a steep shutdown between 2045 and 2050, each of which have different implications for carbon budgets remaining for the rest of the economy. It is recognised that this approach is simplistic and does not capture the complexities of decarbonisation of Sasol – including the socio-economic impacts thereof. A clearly articulated decarbonisation route for Sasol's assets thus needs to be considered and ultimately reflected in policy and regulation, not only in terms of implications for the carbon budget available to the rest of the economy but also to meet the demands for chemicals and liquid fuels by the rest of the economy. The NBI[144], Meridian Economics[145], TIPS[146] and UCT[147] have published further thinking on this topic, to complement the public reports published by Sasol.

The remainder of the liquid fuels production sector is made up of the two remaining operational refineries, Astron and Natref, with the balance of refined product being imported. In the shorter-term crosscutting measures such as energy management systems[148], high efficiency motors, waste heat recovery and cogeneration upgrades, could deliver immediate, low-cost abatement while reducing variable operating expenses, where these have not been adopted already. Various technology options are available globally that could support for longer decarbonisation of refineries, although the business case for investment in these refineries will depend on production horizons and potential to import refined product to meet demand. The ESRG work that the two remaining refineries will close by the mid-2030s as the vehicle fleet decarbonises and production infrastructure ages. However, once again this approach is recognised to be somewhat simplistic and may not be representative of the dynamics of how liquid fuel supply in the country may play out.

Looking further, the remainder of the chemicals production industry includes a number of smaller products and producers, which will need to seek out opportunities for decarbonisation. These are unlikely to make a significant contributor to overall achievement of the NDC target.

Decarbonising the liquid fuels and chemicals sector where products are destined for export markets will play a role in helping to protect the broader economy as trade partners tighten climate policies. South Africa could seek capitalise on its abundant renewables availability and catalytic expertise to explore

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[143] Sasol. 2023. *Climate Change Report*

[144] NBI. 2021. *Decarbonising South Africa's Petrochemicals and Chemicals Sector.* National Business Initiative

[145] Meridian Economics. 2023. *Transitioning Secunda, Sasolburg and South Africa's petrochemical value chain*

[146] TIPS. 2024. *Petrochemicals and South Africa's energy transition: Sasol's Secunda coal-to-chemicals-and-liquids facility.*

[147] UCT. 2022. *An analysis of the Secunda Coal-to-Liquids facility in the context of South Africa's energy transition.*

[148] UCT ESRG. 2024. *Net zero CO2 emission pathways for South Africa*. University of Cape Town Energy Systems Research Group.

products to meet new export market opportunities, including those for green ammonia, synthetic fuels and polymers.

As in the power transition, transition in the liquid fuels and chemicals sector should seek to adopt Just Transition principles, worker reskilling, supplier diversification and targeted regional development, into reforms so that communities dependent on petrochemicals value chains can share equitably in the shift to low-carbon value chains while avoiding the social dislocation witnessed in past industrial restructurings.

3.7.5 Industry

Industrial sectors including steel, cement, and ferroalloys play a critical role in industrialisation and global decarbonisation but are also significant sources of emissions. Steel, cement, and construction aggregates underpin the infrastructure expansion required for grid reinforcement, renewable-energy installations and urban housing. Allocating these sectors a marginally larger share of the national carbon budget while simultaneously piloting initiatives such as green hydrogen DRI, low-clinker cements and CCS would help protect the industries during the transition, helping to secure local supply and contain import-inflation risks. Export-oriented high-carbon activities (e.g., thermal coal mining and conventional vehicle production) are likely to decline more quickly because they deliver limited domestic developmental results yet carry high external transition risk.

Opportunities for some short-term emissions savings in industry are possible by 2035 through energy efficiency improvements[149]; electrification using renewables; waste heat recovery; and process optimization. Scaling up energy management systems and cogeneration in industrial plants will reduce fuel use and emissions per unit of output. Having said that, changes to existing process configurations and feedstock changes and other large-scale decarbonisation options for these industries may only be possible after this date. For example, in steelmaking, planning is needed to replace aging blast furnaces with hydrogen-based direct reduced iron (DRI) and electric arc furnaces when reinvestment cycles occur in the early 2030s. Analysis shows that the hydrogen-DRI route can be more cost-effective than retrofitting blast furnaces with CCS[150], provided technology transfer and support are available.

In certain sub-sectors like cement and ferroalloys, low-carbon processes are not yet commercially viable, but substantial emission cuts are still achievable. For example, cement plants can adopt more efficient kilns and substitute clinker with low-carbon materials. Where chemical reactions release CO_2 or methane that cannot be avoided, increased R&D and pilot demonstrations for carbon capture, utilisation, and storage are needed. In the ferroalloys industry, options like biomass/biochar to partially replace coal and CCS for remaining emissions could be explored, recognizing technical limitations and the need for further innovation. Government support could be provided to via tax incentives, grants or public–private partnerships to support commercialisation of breakthrough technologies.

Various of the country's industrial outputs will increasingly be exposed to trade mechanisms like the EU's Carbon Border Adjustment Mechanism. South Africa should plan for such interventions by considering decarbonisation of export industries, potentially positioning itself as a supplier of green commodities

[149] UCT ESRG. 2024. *Net zero CO2 emission pathways for South Africa*. University of Cape Town Energy Systems Research Group.

[150] UCT ESRG. 2024. *Net zero CO2 emission pathways for South Africa*. University of Cape Town Energy Systems Research Group.

(such as green steel, green cement, and sustainable fuels). The country's structural advantages, including abundant renewables and existing industrial knowledge, give it an opportunity to produce these green materials at globally competitive costs. By investing early in clean production capacity, South Africa could maintain access to key markets and even gain new export opportunities in a decarbonising global economy however some technologies are not economically viable at present requiring further development. Supportive policies should encourage industries to pursue diversification into climate-friendly products and value chains, while mitigating transitional risks through worker retraining and regional development programs.

The "last-mile" to net-zero is observed to require steep investments in emergent, as-yet unproven technologies, risks that, absent concessional finance or revenue recycling, could crowd out broader economic growth. Targeted policy levers are therefore critical to help smooth the transition, safeguard GDP growth, and uphold social equity for a just transition. As such, it is at this stage government needs to record a commitment to laying the groundwork for large-scale industrial decarbonisation, by continuing to monitor the evolution of step change options such as green hydrogen and carbon capture and storage and supporting companies in beginning to lay the groundwork for investment in promising technologies. This will require international support. This groundwork will support the setting ambitious decarbonisation targets in later revisions of the NDC.

Mitigation efforts should extend to other greenhouse gases such as fluorinated gases (HFCs/PFCs) from industry and other applications. Enforcing the phase-down of HFC and PFC refrigerants in cooling and refrigeration and transitioning to climate-friendly alternatives through stricter standards and recovery programs for refrigerants help avoid a large volume of future emissions.

3.7.6 Fugitive methane from waste and mining

The land use and waste sectors face greater technical and economic barriers to decarbonisation than power, transport and manufacturing, and so do so more slowly in the modelling analyses. To address methane from waste and fossil fuel operations the regulations and incentives to capture or eliminate methane should be eliminated. Municipalities should scale up landfill gas capture projects and divert organic waste from landfills (through composting and recycling programs) to cut methane emissions while generating usable biogas energy. This is an intervention that can be implemented in the short and medium term, given the co-benefit of avoiding the depletion of limited landfill space and waste of resources.

Similarly, the coal mining sector should implement measures to capture or flare coal mine methane for mines in operation and properly seal off old mines to prevent uncontrolled emissions. These steps not only reduce greenhouse gases but can improve mine safety and local air quality.

3.7.7 Agriculture and other land use

The agriculture and other land use sector represents both a potential source and sink for emissions. Methane (CH_4) arises from manure management and enteric fermentation in livestock. Mitigation efforts in this area can deliver short term climate benefits, given methane's high warming potential[151]. Options here include improved cattle feed and herd management and manure management systems (e.g. biogas digesters). Adopting a more sustainable, lower-red-meat diet could further cut agricultural emissions by

[151] NBI. 2022. *South Africa's Net-Zero Transition*. National Business Initiative

up to 70%[151], while achieving a public health co-benefit. However, because a healthy, sustainable diet can currently cost several times more than the average diet for low-income households, policy intervention will be required to ensure nutritious alternatives are affordable and accessible. Support for farmers (training, subsidies) to improve productivity and transition to higher-value, lower-emission products will be vital in this shift. Nitrous oxide (N_2O) from fertiliser application is a further source of emissions from the agriculture sector, one that can be reduced by modifications to farming practices.

The Land Use, Land Use Change and Forestry (LULUCF) sector is recognised in South Africa's Nationally Determined Contribution (NDC) as a key carbon sink, essential for achieving net zero emissions by 2050. Effective and sustainable management of this sector during this period is crucial to maintaining its long-term sequestration potential. Continued investment in LULUCF will ensure it remains a viable source of carbon removals, while also supporting climate adaptation objectives.

According to the Forestry Sector Master Plan[152], Forestry makes up almost 25% of the agricultural GDP making it a significant sub sector. Whilst the master plan only covers the period up to 2025, there are some aspects that are relevant in the future. The plan includes an action item relating to fire prevention which can reduce LULUCF emissions and manage the land sink. The plan aims to improve forest management and expand the sector. This will have implications for South Africa's land sink and the 2035 NDC should include considerations for how to effectively manage these areas.

3.7.8 Economic diversification

All of the modelling studies agree that economic diversification is critical for mitigation. The studies highlight a suite of growth sectors that can replace at-risk value chains and broaden the economic base. Climate mitigation can be leveraged to drive economic diversification by catalysing emerging industries as the economy is aligned with the country's climate commitments.

To maximize the economic benefits of the transition, South Africa should aim to localise production of renewable energy components and electric vehicles in line with SAREM. Currently, a significant share of value in renewable projects (solar panels, wind turbines, batteries) is imported. By developing local manufacturing clusters for these technologies, for example, attracting solar PV panel assembly plants, wind turbine tower factories, and battery gigafactories, the country can create jobs, build technical capabilities, and reduce import costs. The ESRG analysis indicates that increasing local content in renewables deployment can boost GDP and employment beyond the direct effects of decarbonisation. Likewise, as the global auto industry shifts to EVs, retooling South Africa's automotive sector for EV production is critical. Supporting domestic production of electric cars, buses, and the batteries that power them will preserve the country's substantial automotive export industry and related jobs. Government can facilitate this by working with automakers on increasing investment, providing incentives for domestic EV manufacturing and part sourcing, and updating regulations to include EVs and battery tech. Over time, South Africa can become a regional manufacturing hub for clean technologies, supplying both the domestic market and other African countries with affordable clean technology solutions.

Beyond energy and transport, diversification should extend to other sectors. Encouraging innovation in agriculture and expanding the services sector (such as ecotourism, fintech, or business process outsourcing) can reduce the economy's carbon and commodity dependence. Support for entrepreneurs

[152] DTIC. 2020. *Master Plan for the Commercial Forestry Sector in South Africa 2020-2025.* Department of Trade, Industry and Competition.

and SMMEs in green industries, for instance, startups in recycling/upcycling, sustainable forestry products, or clean cooking solutions, will broaden the economic base and create jobs. Government should use tools like tax incentives, concessional finance, and targeted R&D funding to expand these new areas. Aligning education and vocational training with the skills needed in renewable energy, environmental engineering, electric mobility, and other growth fields is also vital so that the labour force can pivot into these industries.

Economic diversification efforts in South Africa should prioritize coal-mining and heavy-industry regions to enhance regional economic resilience. This can be achieved by developing new economic clusters aligned with national plans, focusing on renewable energy and energy transition technologies such as grid decarbonisation, renewable energy manufacturing, battery and electric vehicle value chains, green hydrogen and ammonia production, and transitional gas-based energy balancing. Additionally, sustainable industrial transformation – including green steel and metallurgy – resilient agricultural systems like regenerative agriculture and sustainable food production, biodiversity and eco-tourism, and urban circular economies supported by sustainable waste management and integrated urban development strategies are key areas for diversification.

Specific initiatives could include establishing special economic zones in coal-dependent areas to promote renewable energy component manufacturing and green hydrogen production, upgrading infrastructure to attract diverse businesses, and investing in broadband and logistics to connect these regions to new markets. Leveraging South Africa's existing mining expertise, the country can also develop as a regional hub for refining and processing "green minerals" critical to global clean-tech supply chains, reducing exposure to volatility in traditional commodity markets. The establishment of the green hydrogen industry for use in export and use in green ammonia and associated value chains is unlikely to occur in the NDC timeframe. However, the groundwork could be laid during this period for realising the opportunity.

By creating alternative economic drivers in coal-dependent regions, diversification efforts complement just transition support by providing new employment opportunities for workers transitioning from mining and power-generation sectors. Over the long term, a more diversified, climate-resilient economy will be less vulnerable to external shocks and better positioned to sustain inclusive growth, consistent with South Africa's development objectives and commitments to a low-carbon future.

Finally, opportunities exist in knowledge-intensive green services. As large emitters adopt energy-efficiency, carbon management and water optimisation technologies, domestic consulting, digital monitoring and engineering services will expand, an area requiring skills development but a smaller share of the national carbon budget.

Economic diversification should be a national priority and integrated into the NDC process, funded through targeted grant and concessional mechanisms, and embedded across sectoral planning, including in the LEDs and the design of SETs.

4 Means of Implementation

'Means of Implementation' refers to the various mechanisms and support, which require financing, for implementing the policies and measures needed to deliver on the country's climate action goals.

Delivering South Africa's updated 2030–2035 NDC will require a coordinated and well-resourced implementation ecosystem, capable of mobilising and deploying financial, institutional, human, and technological resources at scale. This ecosystem must reflect the country's unique development context, including persistent inequality, the pivotal role of municipalities, and the urgency of a Just Transition, while also aligning with international expectations for ambition, transparency, and accountability under the Paris Agreement, through structured implementation tools such as the Just Energy Transition Investment Plan (JET-IP) and enabling financial mechanisms such as the Just Transition Financing Mechanism (JTFM).

South Africa faces a complex climate finance landscape that spans public, private, concessional, and blended sources (discussed in detail in Chapter 4 of this report). Yet current systems remain fragmented and overly reliant on public debt, which limits scalability and responsiveness. To address this, stronger alignment is needed between public finance institutions (such as the DBSA, IDC, and National Treasury), private sector actors (including banks and institutional investors), and mechanisms like the JTFM and the JET-IP. As identified through the PCC process, improved collaboration between these actors is essential to ensure that climate finance is mobilised, allocated, and absorbed in a manner that supports national climate and development goals. While the JET-IP is now in implementation and has seen the disbursement of committed international grants and concessional finance, the JTFM remains in a conceptual and institutionalisation phase, with its operationalisation and governance design still in development.

A comprehensive approach to Means of Implementation must consider the following key enablers:

- **Financial Resources**: Currently, South Africa relies predominantly on debt instruments for financing climate action. While public sector financing is primarily accessed through budgetary allocations, grants, and concessional loans aligned with policy objectives, private sector finance is driven by commercial imperatives and accessed through market-based instruments such as green bonds, commercial loans, and private equity. Diversifying financial instruments, especially through blended finance and risk-sharing mechanisms, can improve financial resilience and crowd in private capital, while reducing the fiscal burden on the state.
- **Institutional Capacity**: The implementation of climate action demands strong, responsive institutions. In the public sector, this may involve reconfiguring mandates, improving intergovernmental coordination, and enhancing regulatory coherence. For the private sector, strengthening governance standards, aligning with sustainability frameworks, and creating a predictable policy environment are essential to stimulate climate-aligned investment.
- **Human Capital**: Skilled personnel and technical expertise are critical to translating strategies into action. The public sector needs targeted capacity-building to integrate climate priorities into planning, budgeting, and service delivery. Meanwhile, the private sector must continue to cultivate innovation and technical leadership in low-carbon technologies, green finance, and climate risk management.
- **Technological and Material Resources**: Access to appropriate technologies, whether for mitigation, adaptation, or MRV, is uneven across sectors and geographies. Public investment typically focuses on foundational infrastructure and socially beneficial technologies with

uncertain commercial returns. The private sector, by contrast, prioritises scalable and profitable solutions. Mechanisms to accelerate technology transfer and scale deployment are essential to bridge this gap.

Integrating the principles of South Africa's Just Transition Framework across all elements of the implementation system is a critical strategic imperative. This includes ensuring that the costs and benefits of climate action are distributed equitably, that vulnerable communities are protected, and that social and economic transformation is placed at the heart of implementation design. A focus on procedural and distributive justice, especially in the allocation of finance, access to opportunities, and participation in decision-making, will increase the legitimacy and resilience of South Africa's climate response.

Finally, with approximately 91% of climate finance sourced domestically[153], there is an urgent need to scale up access to international concessional finance and improve the enabling conditions for foreign direct investment in climate-related sectors. Clearly defining the distinct roles and comparative advantages of public and private actors is essential to this process. Such clarity will improve the design and deployment of tailored implementation instruments, whether through financial incentives, governance reform, or capacity-building, and ensure that South Africa's climate goals are implemented effectively, equitably, and in line with both national development objectives and global climate commitments.

As noted in the first Biennial Transparency Report, South Africa has received over USD 827.6 million in bilateral and multilateral climate-related finance between 2021 and 2022, while international pledges under the JET-IP totalled USD 11.7 billion by late 2023, of which USD 821 million was committed as grant funding.[154] Despite this, the bulk of climate finance remains domestic, and there are significant funding gaps across mitigation, adaptation, and Just Transition priorities. The PCC has estimated that over ZAR 2 trillion is needed for adaptation and resilience alone by 2050.[155]

In particular, financing for loss and damage, intended to support recovery from unavoidable climate impacts, has not yet been integrated into national financial planning, though it is an increasingly prominent topic in global negotiations.[156] The urgent need to incorporate this dimension within South Africa's Means of Implementation architecture remains a critical policy and planning gap.

4.1 South Africa's Status Quo: NDC Delivery Mechanisms and Institutional Foundation

The delivery of South Africa's NDC relies on a growing set of institutional, policy, and financial mechanisms that form the operational core of the country's climate implementation system. These

[153] CPI, 2023. The South African Climate Finance Landscape 2023. Available at: https://www.climatecommission.org.za/publications/the-south-african-climate-finance-landscape-2023

[154] DFFE (2024) *South Africa's Biennial Transparency Report*, Department of Forestry, Fisheries and the Environment, Pretoria, p. 195

[155] PCC (2024) *Just Transition Financing Mechanism Recommendations Report*, Presidential Climate Commission, Johannesburg.

[156] UNFCCC (2023) *COP28 Decision on Loss and Damage Funding Arrangements*, United Nations Framework Convention on Climate Change, Dubai.

mechanisms, ranging from legislative frameworks and strategic plans to coordination structures and dedicated financing instruments, enable the planning, resourcing, and execution of mitigation, adaptation, and Just Transition measures.

While their level of maturity and integration varies, these systems collectively represent the foundation upon which current implementation efforts rest. They provide both the enabling environment and the delivery infrastructure for translating South Africa's climate commitments into action.

In parallel, South Africa continues to engage in shaping the global climate finance architecture, most notably through the National Treasury's involvement in international platforms such as the G20, where it is advocating for enhanced access to concessional finance and the reform of multilateral development banks (MDBs) to better serve developing country needs.

The following table presents an overview of the key existing national mechanisms and institutional arrangements underpinning the Means of Implementation.

Table 6: Existing Means of Implementation Infrastructure

Enabling Implementation Instruments	Relevant Sector(s)	Description
Policy and regulatory instruments	Public	Government provides legal mandates and strategic direction; not tied to specific financing modes.
Institutional coordination frameworks	Public	Coordination bodies (e.g., PCC, Inter-Ministerial Committees); non-financing in function.
Sectoral masterplans	Public (planning); Private (implementation)	Guides sector investment strategies; relies on private sector for implementation finance.
Climate finance architecture	Public, Private, Blended	Includes DFIs, green funds, taxonomies, and JTFM; spans a range of financial instruments.

Public sector roles are predominant across the first three categories, namely policy and regulatory instruments, institutional coordination frameworks, and sectoral masterplans. These mechanisms are essential for defining strategic direction, enabling cross-sectoral governance, and setting the foundation for implementation planning (see Table 6 below for more details on the country's key climate policy and regulatory instruments). While they do not rely directly on financial instruments, they play a critical enabling role by shaping the regulatory environment, aligning national priorities, and guiding the allocation of public and private resources.

By contrast, the climate finance architecture marks a shift toward implementation and investment mobilisation, where the role of the private sector becomes increasingly prominent. This domain is also the most financially diversified, encompassing a broad range of instruments including grant-based donor funding, concessional and commercial debt, and equity.

Taken together, these institutional and financial mechanisms provide a snapshot of South Africa's current climate implementation infrastructure. They represent both the enabling environment and delivery channels through which mitigation, adaptation, and Just Transition priorities are being advanced.

Importantly, they also highlight the foundational systems upon which further scaling, coordination, and institutional strengthening must be built to meet the country's 2030–2035 NDC targets.

Following on from Table 6 above, the following table provides more detail on the current policy and regulatory instruments used to support the implementation of South Africa's NDC. These instruments represent the overarching framework for implementing the policies and measures required to meet South Africa's climate adaptation and mitigation goals. Accordingly, they guide the allocation of public and private resources.

Table 7: Key Policy, Legal, and Planning Instruments Supporting NDC Implementation

Instrument Type	Mechanism	Description
Legal Frameworks	The Climate Change Act (2024)	The Climate Change Act establishes the legal basis for implementing the NDC through enforceable carbon budgets, sectoral emissions targets, and adaptation planning. It defines institutional mandates, coordination mechanisms, and accountability structures to support implementation, monitoring, and enforcement across all levels of government.
	The Carbon Tax Act (2019)	The Carbon Tax Act provides a market-based tool for implementing the NDC by pricing greenhouse gas emissions. It incentivises emissions reductions in high-emitting sectors and generates revenue that can support low-carbon development and Just Transition measures, while enhancing alignment between climate policy and fiscal planning.
	Carbon Budget and GHG Reporting	Although issued under the Climate Change Act, the carbon budget and GHG reporting regulations are operationally significant and merit specific mention. They establish the rules for measuring, reporting, and verifying emissions, and set out the procedures for allocating and enforcing carbon budgets, providing the regulatory basis for compliance and enforcement.
Strategic & Policy Frameworks	National Climate Change Response Policy (2011) and subsequent Mitigation System Framework	The NCCRP provides the strategic and operational foundation for implementing the NDC. It guides sector-specific mitigation planning, defines institutional responsibilities for emissions monitoring and reporting, and establishes the technical systems and data platforms needed to track progress, enabling coordinated, transparent implementation across government and sectors.
	The National Adaptation Strategy (NAS)	The National Adaptation Strategy (NAS) provides the strategic and technical foundation for implementing the adaptation components of the NDC. It sets out national priorities, institutional responsibilities, and coordination mechanisms for building climate resilience.

Instrument Type	Mechanism	Description
	National Climate Risk and Vulnerability Atlas	The Climate Risk and Vulnerability Atlas offers spatial data and decision-support tools to inform targeted adaptation planning. Together, they support the institutional, informational, and capacity-building elements needed to integrate adaptation into sectoral and subnational planning.
Strategic Framework	National Development Plan (NDP 2030)	Although not climate-specific, the NDP provides the overarching policy framework within which the NDC is situated, with explicit references to climate resilience, low-carbon growth, and sustainable development. Including a brief reference helps contextualise climate instruments within South Africa's broader national development agenda.
Planning Instruments	Integrated Energy Plan (IEP) & Integrated Resource Plan (IRP 2019)	The IEP and IRP serve as the core planning and investment frameworks for South Africa's energy transition. They define the country's long-term energy mix and outline priority areas for public and private investment in renewable and low-carbon technologies. By aligning infrastructure development, procurement policy, and regulatory certainty with national mitigation goals, these plans play a critical role in mobilising finance, guiding technology deployment, and informing institutional decision-making in the energy sector.
	Sectoral Master Plans	The various Sectoral Masterplans collectively serve as industrial policy instruments that drive inclusive economic growth, job creation, and localisation, while supporting South Africa's NDC implementation by enabling sector-specific decarbonisation, enhancing climate resilience, and mobilising investment aligned with just transition objectives.

4.2 Reflections on the 2021 NDC: Continuity and Strengthening

The delivery of South Africa's 2021 NDC was premised on the delivery mechanisms and institutional foundations outlined in section 4.1 above.

This section provides a reflection on how the Means of Implementation requirements may build on South Africa's 2021 NDC, and where new emphasis or additional actions are required. It aims to ensure continuity in implementation and coherence with national and international commitments.

Key thematic areas arising from the 2021 NDC include:

- **Just Transition as a Core Principle**: The 2021 NDC emphasises equity and social inclusion as foundational to climate action.
- **Institutional and Technical Capacity**: The 2021 NDC prioritised building institutional capacity across spheres of government; this is reinforced through the municipal readiness framework and tailored capacity support in the current section.
- **Finance and Access**: The reliance on public finance and the need to unlock international concessional finance is a consistent theme.
- **Adaptation Priorities**: The 2021 NDC identified water, agriculture, and infrastructure resilience as key sectors requiring targeted adaptation finance.
- **Transparency Tools**: Climate budget tagging, monitoring systems, and support for the South Africa Green Finance Taxonomy feature in the 2021 NDC.

While the 2021 Updated NDC provides a strong foundation, insights from recent stakeholder consultations and technical analysis led by the PCC introduce several new areas of focus that reflect evolving priorities and insights related to the Means of Implementation required to deliver South Africa's next NDC for the period 2030-2035. These are not deviations from the 2021 NDC, but rather enhancements designed to strengthen implementation capacity, close delivery gaps, and improve alignment with the Paris Agreement's evolving architecture.

New or expanded areas of emphasis include:

- **Quantified Adaptation Needs**: Building on the estimated USD 3–4 billion need identified in the 2021 NDC[157], stakeholder insights and technical analyses call for a dedicated adaptation and resilience investment plan to structure this investment and ensure it is appropriately prioritised, and to further identify the funding sources and need for the 2030-2035 period. Further details on these proposals are included in sections 4.5.3 and 4.4 of this report.
- **Explicit Link to Paris Agreement Articles 9–11**: While implicit in the 2021 update, stronger emphasis is placed on the need for sustained support in finance, technology, and capacity-building, particularly in the context of Just Transition and subnational delivery. These topics are explored in detail in sections 4.5.4 and 4.5.7 of this report.
- **Integration of Loss and Damage Considerations**: Although not yet a formal element of the NDC structure, stakeholders have highlighted the importance of preparing institutional frameworks for addressing loss and damage, particularly in highly exposed municipalities. Further details

[157] DFFE, 2024. Biennial Transparency Report. Pretoria: Department of Forestry, Fisheries and the Environment. Available at: https://unfccc.int/documents/645057

regarding building capacity especially around loss and damage are included in sections 4.4, 4.5.1and 4.5.2 of this report.

- **Operationalising Equity and Fair Share:** Equity needs to be reinforced not only as a principle but also through practical mechanisms, such as tiered access to finance, social protection targeting, and support for vulnerable sectors. These go beyond the narrative framing in the 2021 NDC by embedding equity in delivery mechanisms. These topics are explored in detail in sections 4.5.2; 4.5.3 and 4.5.7 of this report.
- **Contribution to the Global Stocktake**: The emphasis on transparency and reporting in the requirements positions the Means of Implementation as part of South Africa's contribution to the global assessment of collective progress under the Paris Agreement, strengthening transparency, comparability, and credibility. These topics are discussed further in sections 4.5.6 and 4.5.8 of this report.

The reflections above are grounded in South Africa's climate finance architecture and subsequent identified gaps in the Means of Implementation, which are discussed in the following two sections of this report.

4.3 Climate Finance Architecture

South Africa's current climate finance architecture is composed of an evolving mix of public finance, international climate funds, blended finance mechanisms, and emerging private sector instruments. Together, these components form the financial foundation for implementing the NDC across mitigation, adaptation, and Just Transition priorities.

As of 2024, South Africa has received approximately USD 827.6 million in bilateral and multilateral climate-related support since 2021,[158] and international pledges under the Just Energy Transition Partnership (JETP) totalled USD 11.7 billion, of which USD 821 million was in the form of grants.[159] Of the JETP funds, approximately 47% of pledged grants have already been committed to donor-approved projects, with a further 35% in planning.[160] This demonstrates progress in mobilising finance for mitigation, yet significant gaps remain in adaptation and Just Transition investments.

Current estimates indicate a need for approximately ZAR 2 trillion in adaptation and resilience funding by 2050[161] and over ZAR 4 trillion to decarbonise South Africa's energy system.[162] Despite these scale requirements, adaptation finance is underdeveloped, loss and damage finance remains unaddressed, and community-level financing mechanisms are limited.

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[158] DFFE (2024) *South Africa's Biennial Transparency Report*, Department of Forestry, Fisheries and the Environment, Pretoria, p.195

[159] JET PMU (2023) *JET Implementation Plan*, Presidential Climate Commission, Johannesburg, p.47

[160] JET Grants Register (2025 Q1) *JET Grant Deployment Overview*, Presidential Climate Commission

[161] PCC (2024) *Just Transition Financing Mechanism Recommendations Report*, Presidential Climate Commission, Johannesburg.

[162] PCC (2023b) *Technical Report Supporting the Recommendations for South Africa's Electricity System*, Presidential Climate Commission, Johannesburg

South Africa's current climate finance landscape is composed of a dynamic and evolving mix of public finance, international climate funds, blended finance mechanisms, and emerging private sector instruments. Together, these components form the financial foundation for implementing the NDC across mitigation, adaptation, and Just Transition priorities.

Key elements of the current system include:

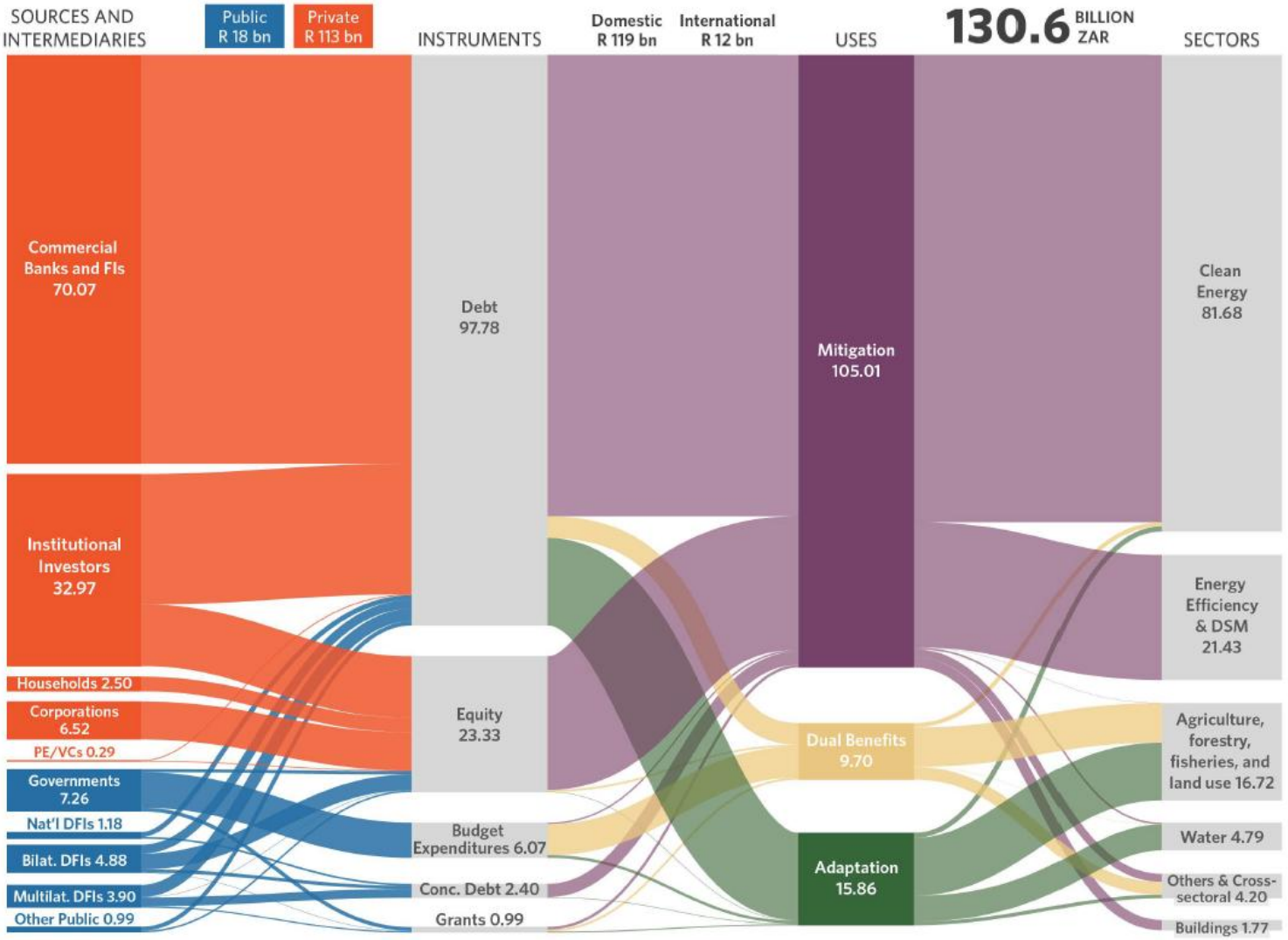
- **National Treasury's Strategic Plan (2025–2030)**, which outlines key systemic enablers of climate finance, including climate budget tagging, disaster risk financing, and local government fiscal reform.
- The **Just Energy Transition Investment Plan** (JET-IP), which aims to unlock $8.5 billion in concessional finance from international partners to support power sector decarbonisation and related social and infrastructure investments. The JET-IP, now in early implementation, is beginning to disburse committed finance to the power sector and related areas such as grid modernisation, new energy vehicles, and green hydrogen.[163] By contrast, the JTFM remains under development. It has been conceptually endorsed but is not yet operational, with its governance, hosting arrangements, and capitalisation still under design.[164]
- **International climate institutions**, such as the Green Climate Fund (GCF) and the Global Environment Facility (GEF), which provide concessional support for mitigation and adaptation projects through accredited South African entities including the DBSA, SANBI, and IDC.
- **Domestic development finance institutions**, particularly the DBSA and IDC, which offer blended finance instruments such as concessional loans, first-loss capital, and guarantees. These tools are critical to improving project bankability and attracting private capital in priority sectors like renewable energy, water, and green industrial development.
- **Private financial sector financing**, through instruments such as green bonds, sustainability-linked loans, and public-private partnerships (PPPs), remains an important but underutilised lever for scaling investment.

The figure below provides an overview of the climate finance landscape, with sources, sectors and mitigation/adaptation focus of various flows.[165]

[163] JET PMU (2023) *JET Implementation Plan*, p. 46–47

[164] PCC (2024) *Just Transition Financing Mechanism Recommendations Report*, p. 8–9

[165] CPI, 2023. The South African Climate Finance Landscape 2023. Available at: https://www.climatecommission.org.za/publications/the-south-african-climate-finance-landscape-2023



Buildings = Buildings and the built environment; DSM = Demand Side Management; Water = Water conservation, supply & demand;
'Others and cross sectoral' includes sectors Circular Economy (R 245 million), General eco-system support (R 665 million), Low carbon transport (R 88 million)
PE/VCs = Private equity and venture capital; 'Other Public' includes State owned enterprises and financial institutions (R 535 million), Export Credit Agency (R 295 million) and Public Funds (R 159 million)

Figure 12 Overview of tracked climate finance flows (2023)

4.3.1 Progress on Mobilising Concessional Climate Finance for the 2021 NDC

Since the submission of South Africa's updated NDC in 2021, substantial progress has been made in mobilising climate finance, significantly supporting the country's transition towards a low-carbon, climate-resilient economy. South Africa has secured diverse funding streams, notably from multilateral sources, bilateral partnerships, and dedicated domestic initiatives, aligning closely with both mitigation and adaptation commitments under its NDC.

Key milestones since 2021 include major investments from the GCF. Notably, the approval of the $235 million Water Reuse Programme in 2023 marked a significant step forward, blending a $200 million low-interest loan and a $35 million grant with over $1.2 billion co-financing. This programme directly supports adaptation efforts by upgrading wastewater treatment and scaling water recycling to mitigate climate-induced water stress, aligning explicitly with South Africa's NDC adaptation objectives.[166]

Another major initiative is the Embedded Generation Investment Programme, approved in 2019 but significantly advanced post-2021. This programme finances 330 MW of renewable energy projects (solar PV and wind) through concessional loans totalling $100 million from the GCF, leveraging an additional $437 million in co-financing, directly supporting mitigation and South Africa's renewable energy targets within the NDC.[167]

Additionally, the JETP, announced at COP26 in 2021, has emerged as a pivotal climate finance mechanism. Initially pledged at $8.5 billion by international partners (France, Germany, UK, EU, US), this package increased to $12.8 billion by 2025. Funding consists primarily of concessional loans and grants to facilitate coal plant retirements and economic diversification in these regions, and to scale renewable energy, green hydrogen, and electric vehicles in significantly enhancing South Africa's mitigation and Just Transition objectives aligned with its NDC.[168]

South Africa's participation in the Climate Investment Funds through initiatives like the Accelerating Coal Transition Investment Program has secured an additional $500 million in concessional finance (pending final approvals). This funding specifically targets coal-dependent regions, promoting the repurposing of coal assets and alternative economic activities, reinforcing Just Transition principles integral to the NDC.[169]

Bilateral and MDB-supported initiatives, such as the Eskom Just Transition Project (Komati Power Station Repurposing), approved in 2022 with a combined finance package of $497 million, represent a significant advance. This project integrates extensive worker retraining and community development with renewable

[166] GCF, 2023. *Climate Change Resilience through South Africa's Water Reuse Programme – FP209*. Green Climate Fund. Available at: https://www.greenclimate.fund/project/fp209

[167] GCF, 2019. *Embedded Generation Investment Programme (EGIP) – FP106*. Green Climate Fund. Available at: https://www.greenclimate.fund/project/fp106

[168] The Presidency, 2025. Grants Register Frequently Asked Questions. Available at: https://justenergytransition.co.za/wp-content/uploads/2025/03/GrantsRegisterFrequentlyAskedQuestions-Published2025Q1.pdf

[169] CIF. n.d. *Accelerating Coal Transition (ACT) Investment Plan for South Africa.* Climate Investment Funds

energy infrastructure, showcasing a practical model for socially responsible coal phase-down aligned with South Africa's NDC mitigation ambitions.[170]

Domestic initiatives have also been notable. The DBSA's Green Fund disbursed ZAR 782 million across 55 projects supporting mitigation (renewable energy, energy efficiency) and adaptation (sustainable agriculture, ecosystem restoration), catalysing local-level climate action since its inception.[171]

Table 8: Key Climate Finance Flows Supporting South Africa's 2021 NDC

Project/ Programme	Year Approved	Funding Source	Amount	Focus Area	NDC Alignment
Water Reuse Programme (GCF)	2023	GCF	$235 million	Adaptation (Water Security)	Enhances water resilience (Adaptation)
Embedded Generation Investment Programme	2019	GCF	$100 million	Mitigation (Renewable Energy)	Supports renewable energy targets (Mitigation)
Just Energy Transition Partnership (JETP)	2021	Bilateral (IPG countries)	$9.3 billion (pledged)	Mitigation, Just Transition	Coal retirement, renewable expansion (Mitigation)
Accelerating Coal Transition Program	2021	Climate Investment Funds	$500 million (pending)	Mitigation, Just Transition	Coal asset repurposing (Mitigation)
Eskom Just Transition Project (Komati Repurposing)	2022	World Bank, Canada	$497 million	Mitigation, Just Transition	Coal-to-renewables, community transition
South Africa Green Fund	2013-2017	Domestic (SA Government)	ZAR 757 million (~$80m)	Mitigation, Adaptation	Supports local climate initiatives (Mitigation & Adaptation)

Note: Some projects were approved before 2021 but advanced into key implementation or disbursement phases in the post-2021 NDC period.

4.3.2 Public Finance Instruments and Strategic Frameworks

Domestic public finance remains a central pillar of South Africa's climate finance architecture, particularly in enabling early-stage investments, de-risking private capital, and supporting non-commercial climate

[170] World Bank, 2023. *Factsheet: Eskom Just Transition Project.* Available at: https://www.worldbank.org/en/news/factsheet/2023/06/05/factsheet-eskom-just-energy-transition-project-in-afe-south-africa

[171] Development Bank of Southern Africa (DBSA), 2017. *South Africa Green Fund*. Available at: https://www.dffe.gov.za/sites/default/files/docs/southafricasgreenfund_financingthetransitiontowards_inclusivegreeneconomy.pdf

priorities such as adaptation, capacity building, and social infrastructure. It is important to note that public finance encompasses both domestically mobilised resources and international donor contributions, including bilateral and multilateral grants and concessional finance. While international donor finance is covered comprehensively in subsequent sections, this subsection focuses specifically on domestic sources and instruments. National Treasury plays a lead role in steering these efforts through strategic planning, fiscal integration, and the design of enabling instruments.

Accordingly, a key anchor is the National Treasury's Strategic Plan (2025–2030), which outlines systemic enablers for climate finance delivery. These include the development of a climate budget tagging framework to track public expenditure on climate-related initiatives, a National Disaster Risk Financing Policy to support adaptation and resilience investments, and a review of the local government fiscal framework to align subnational financing with climate priorities.

These frameworks are essential to strengthening the predictability, transparency, and effectiveness of public climate finance. They also aim to address structural constraints, such as fragmented funding channels, underinvestment in adaptation, and weak subnational implementation capacity, by improving the flow of public funds to where they are most needed.

At the implementation level, budget allocations for climate programmes remain limited and are often embedded within broader infrastructure or service delivery budgets, making them difficult to identify and track. The introduction of climate budget tagging is a critical step toward addressing this gap, enabling better alignment between national commitments and fiscal planning.

Moreover, domestic public investment is increasingly expected to play a catalytic role by crowding in private capital through blended finance structures, guarantees, and other de-risking instruments. However, this requires closer coordination between policy mandates and financing instruments, as well as strengthened capacity within implementing departments and entities.

Efforts to reform the local government fiscal framework are also particularly important. Municipalities are at the frontline of climate risk and service delivery but face significant barriers to accessing climate finance. Treasury's proposed reforms aim to improve financial sustainability, introduce performance-based incentives, and ensure municipalities can access and absorb climate-aligned investment more effectively.

The JET-IP and the JTFM form the backbone of South Africa's strategy to mobilise and direct climate finance in support of its decarbonisation and equity objectives. The JET-IP and JTFM serve complementary roles: the JET-IP focuses on large-scale investment in the energy transition, while the JTFM focuses on mobilising and allocating financial resources to support socially inclusive and equitable climate transition projects in South Africa. Its activities are designed to overcome systemic and project-specific barriers that inhibit the flow of finance to just transition projects.

The Just Energy Transition Investment Plan

The JET-IP is a cabinet-endorsed financing framework that sets out South Africa's initial investment strategy for implementing a Just Energy Transition. Its primary objective is to enable the decarbonisation of the power sector, currently the country's largest source of greenhouse gas emissions, while delivering social, economic, and environmental co-benefits.

Purpose: The JET-IP aims to catalyse investment in South Africa's just energy transition by supporting the accelerated decommissioning of coal-fired power, scaling up renewable energy and battery storage, and expanding grid infrastructure. It also identifies

investments in new energy vehicles, green hydrogen, and limited funding for skills development and municipal resilience. It also includes funding for social protection, skills development, and local economic diversification to mitigate transition risks for workers and communities.

Structure: The JET-IP outlines an initial USD 11.6 billion[172] commitment in concessional finance from the International Partners Group (IPG), including the EU, UK, US, Germany, and France. These funds are expected to catalyse additional private and public investment over time. The Plan focuses on five key sectors: electricity, new energy vehicles, green hydrogen, skills, and municipal resilience.

Current Status: The JET-IP is currently in the early stages of implementation, with several investment pipelines under development. A Project Management Unit has been established to oversee coordination, and stakeholder feedback continues to shape the operational priorities and governance arrangements. The Plan, currently for 2023-27, is designed as a living document and will evolve as financing terms are finalised and sectoral strategies are refined. Stakeholder feedback via the PCC is influencing design elements such as governance and inclusion, and the plan is being refined into a more detailed implementation strategy aligned with South Africa's just transition framework.

The Just Transition Financing Mechanism

The JTFM, in development under the guidance of the PCC, is designed to fill critical financing gaps for high-impact, socially inclusive investments that are not easily supported by commercial markets. It plays a crucial role in ensuring that the benefits of the transition are equitably distributed and that vulnerable groups are not left behind.

Purpose: The JTFM's core objective is to mobilise and allocate finance for interventions that advance Just Transition outcomes, with a particular emphasis on historically marginalised and coal-dependent communities. Beyond targeting socially impactful projects that may struggle to attract commercial finance, the JTFM is also intended to guide systemic reforms in South Africa's broader financial ecosystem, integrating just transition principles such as distributive, procedural, and restorative justice into all forms of transition finance, including climate, development, and industrial finance.

Structure: The JTFM is built around two dedicated financing windows:

- A grant window for social infrastructure, early-stage project preparation, skills development, and community-led initiatives;
- A blended finance window that combines concessional and commercial funding to de-risk partially bankable projects and attract private co-finance.
- The mechanism employs a tiered access model, which enables differentiated support based on the capacity and readiness of implementing entities, particularly municipalities. It is designed to simplify access for under-resourced areas while offering catalytic finance for more advanced projects.

Current Status: The JTFM has been conceptually endorsed and is in the process of being institutionalised. Key next steps include finalising its operational and governance structure, establishing a host institution in line with PFMA compliance, and securing

[172] The Presidency, 2023. Just Energy Transition Implementation Plan 2023-2027. Available at: https://justenergytransition.co.za/wp-content/uploads/2024/10/JET-Implementation-Plan-2023-2027-1.pdf

initial capitalisation. Stakeholders have emphasised the importance of transparency, multi-stakeholder oversight, and alignment with broader public finance systems.

Together, the JET-IP and JTFM constitute the two most advanced platforms for operationalising climate and Just Transition finance in South Africa. They represent distinct but complementary approaches, one focused on large-scale infrastructure and sectoral reform, the other on social inclusion, equity, and systemic risk reduction. Both are essential to achieving the country's NDC goals in a way that is both ambitious and fair.

4.3.3 Institutional Ecosystem and Governance Architecture

South Africa's climate finance architecture is supported by an institutional ecosystem involving national departments, subnational governments, technical agencies, and coordination platforms. These institutions perform critical functions across the climate finance value chain, including policy development, strategic planning, fiscal integration, implementation, and monitoring.

Key institutions involved in the governance and coordination of climate finance include:

- The **Department of Forestry, Fisheries and the Environment** (DFFE) serves as the national focal point for climate change. DFFE is responsible for coordinating the implementation of the NDC, managing the carbon budget system, and supporting access to domestic and international climate finance.
- The **Presidential Climate Commission** (PCC) provides independent oversight and acts as a platform for stakeholder dialogue on South Africa's climate transition. It plays an advisory role in embedding Just Transition considerations into national climate planning and implementation processes.
- **National Treasury** is responsible for integrating climate considerations into public finance systems. This includes the development of enabling instruments such as climate budget tagging, the Green Finance Taxonomy, and public finance strategies aligned with climate and development goals. Treasury also represents South Africa in international climate finance forums.
- **Operation Vulindlela**, a partnership between the Presidency and National Treasury, facilitates structural reform in key sectors such as energy, transport, and water, areas that intersect closely with climate investment priorities.
- **Provincial and local governments** are increasingly engaged in climate-responsive planning, particularly in areas of service delivery, infrastructure development, and adaptation. Their constitutional mandates, planning frameworks (e.g. IDPs), and spatial governance functions place them in a central role in implementing climate-aligned development at the local level.
- **Technical and research institutions**, including the South African Weather Service, SANEDI, and the Council for Scientific and Industrial Research (CSIR), support climate finance implementation through data provision, modelling, scenario development, and analysis. These inputs are essential for informing policy, project design, and climate risk management.

Coordination among these institutions has been enhanced in recent years through the establishment of dedicated tools, such as the JET-IP and JTFM, yet structural and operational fragmentation persists. Aligning mandates and improving information sharing between national and subnational levels remains a key consideration in strengthening the delivery of climate finance.

The review of the local government fiscal framework, led by National Treasury as part of its 2025–2030 Strategic Plan[173], represents a significant development within the institutional architecture. The review, expected to be completed by 2028, is expected to address issues related to municipal financial sustainability, access to climate finance, and the development of performance-based incentives for climate-aligned infrastructure and service delivery.

Municipalities continue to operate under uneven conditions of readiness, with many facing limitations in project preparation, financial planning, and institutional capacity. Differentiated support mechanisms, such as the tiered access model proposed under the JTFM, have been introduced in response to these disparities, with the objective of expanding access to climate finance across municipalities with varying capabilities.

Overall, institutions and coordination mechanisms form the backbone of South Africa's climate finance delivery system. Their configuration and operational effectiveness will continue to shape the pace and scope of NDC implementation.

4.3.4 Sectoral Masterplans

South Africa has developed a suite of sector-specific masterplans that embed climate, industrial, and social policy objectives. These plans provide detailed implementation pathways, including financing, localisation, technology deployment, and human capital development. Their alignment with NDC implementation is summarised below:

Table 9: Summary of Means of Implementation Elements in Key Sector Masterplans

Masterplan	Means of Implementation Elements	Relevance to NDC Implementation
South African Renewable Energy Masterplan (SAREM)	• Market certainty through IRP and procurement pipeline • Localisation incentives • Blended finance • Skills development • Just Transition localisation targets	Supports renewable energy rollout, industrialisation, skills development, and equitable growth
Hydrogen Society Roadmap (HSRM)	• National coordination framework • Catalytic projects with co-financing • R&D and innovation • Technical and Vocational Education and Training alignment • Regulatory and fiscal policy support	Enables industrial decarbonisation, technology development, and export market creation aligned with mitigation and Just Transition goals
Steel Industry Master Plan	• Public-private fund • Localisation through state owned enterprise procurement	Aligns with green economy development, emissions reduction in

[173] National Treasury, 2025. National Treasury Strategic Plan 2025-2030. Available at: https://www.treasury.gov.za/publications/strategic%20plan/National%20Treasury%20Strategic%20Plan%202025-2030.pdf

Masterplan	Means of Implementation Elements	Relevance to NDC Implementation
	• Export development • Green steel target • Industrial standards reform	heavy industry, and climate-aligned trade strategy
Automotive Industry Master Plan	• Automotive Production and Development Programme incentive scheme • Infrastructure coordination • New Energy Vehicle readiness • Transformation and localisation • Investment promotion	Directly supports decarbonisation of transport sector and new energy vehicle transition as part of mitigation strategy
Biodiversity Economy Strategy	• Value-chain development • Institutional roles • Community-based enterprise models • Monitoring and evaluation indicators	Aligns with adaptation, nature-based solutions, and inclusive climate resilience strategies
Retail-Clothing, Textile, Footwear and Leather Masterplan	• Local procurement commitments • Cluster development • Trade support • Countering illicit trade • Stakeholder collaboration	Promotes sustainable industrial practices and supports economic resilience through localisation and job creation
Poultry Sector Master Plan	• Tariff protection • Industry growth targets • Export promotion • Stakeholder coordination	Enhances food security and supports sustainable agricultural practices contributing to adaptation efforts
Sugar Value Chain Master Plan	• Local market restoration • Diversification • Stakeholder engagement • Sustainability initiatives	Supports rural development and sustainable agriculture, contributing to adaptation and mitigation
Forestry Sector Master Plan	• Afforestation initiatives • Value chain development • Stakeholder collaboration • Sustainability practices	Promotes carbon sequestration and sustainable land use, aligning with mitigation and adaptation goals
Agriculture and Agro-processing Master Plan	• Policy alignment • Infrastructure development • Farmer support • Market access • Trade facilitation	Enhances climate-resilient agriculture and food systems, supporting adaptation strategies
Cultural and Creative Industries Masterplan	• Investment in creative sectors • Skills development • Infrastructure support • Policy frameworks	Encourages sustainable economic diversification and social inclusion, indirectly supporting adaptation
Tourism Sector Masterplan	• Recovery strategies • Infrastructure development • Skills training • Marketing initiatives	Promotes sustainable tourism practices, contributing to economic resilience and adaptation

Masterplan	Means of Implementation Elements	Relevance to NDC Implementation
Furniture Industry Master Plan	• Local production incentives • Skills development • Stakeholder collaboration • Sustainability focus	Supports sustainable manufacturing and economic diversification, aligning with mitigation efforts

The sufficiency of the sectoral masterplans for meeting 2030–2035 mitigation targets has not yet been assessed. However, an analysis of the Means of Implementation elements across South Africa's sector masterplans reveals several elements related to the Means of Implementation.

1. **Institutional Capacity**: Almost all masterplans contribute meaningfully to institutional strengthening and financial mobilisation, either through instruments targeted investment strategies, incentive mechanisms, or governance reform. These two instrument categories emerge as the most commonly addressed enablers of NDC implementation.

2. **Finance and Investment:** Financial mobilisation is a central feature across many masterplans, with proposals for public investment, incentive structures, concessional finance, and blended financing arrangements. Several plans are also aligned with the activities recommended by the JTFM, identifying grant and co-financing needs based on sector maturity and equity considerations.

3. **Human Resource Development**, including capacity building, technical training, and alignment with labour market needs, is a prominent feature across energy, industrial, and biodiversity-related masterplans. This emphasis reflects a cross-sectoral recognition of the skills gap as a binding constraint to implementation.

4. **Technology and infrastructure**: Components related to technology and infrastructure are well-articulated, particularly in masterplans focused on the green economy, new energy vehicles, green hydrogen, and the steel sector. These plans often link infrastructure upgrades and technological innovation to industrial development and emissions reduction objectives.

5. **Climate Change Considerations**: Most of South Africa's sectoral masterplans were not originally designed with climate change as a central focus. They primarily aim to revitalise industries, drive localisation, create jobs, and boost competitiveness. However, some, like the South African Renewable Energy Masterplan (SAREM), Hydrogen Society Roadmap (HSRM), and to a limited extent, the Steel, Forestry, and Automotive Masterplans, do incorporate climate-related objectives, such as enabling the energy transition, reducing industrial emissions, or promoting green technology development. For the majority of other masterplans though, climate considerations are either absent or addressed peripherally, if at all. As a result, while these plans can indirectly support NDC implementation, through enabling green industrialisation or improved resource efficiency, their alignment with climate goals is uneven and not systematically integrated across all sectors.

South Africa's sectoral masterplans are key instruments of industrial policy, outlining strategies to stimulate growth, localisation, and transformation across priority sectors and provide a solid foundation for operationalising the NDC through sectoral strategies. While some plans, particularly in renewable energy, green hydrogen, and heavy industry, include indicative investment requirements, most do not systematically quantify financing needs beyond 2030 or align explicitly with climate objectives.

The efficacy of implementation relies on alignment and coordination across these masterplans; specific references to climate change mitigation and adaptation plans (current gap) and tailored support based on institutional maturity. It is therefore important for the relevant authorities to ensure that sectoral strategies are appropriately aligned with NDC targets. This, in turn, should inform the scale and nature of the funding and support required, and ensure that such support is sufficient to enable delivery for the 2030-2035 period and beyond.

4.3.5 International Concessional Climate Finance

International concessional climate finance represents a significant component of public climate finance available to South Africa, complementing domestic resources by providing grant-based support and concessional loans primarily through bilateral and multilateral channels. Unlike domestic public finance, international concessional finance is sourced externally and is often designed to leverage additional private sector investment, reduce risk, and fill gaps in sectors where market returns are limited, such as adaptation and resilience-building projects.

South Africa continues to access international climate finance predominantly through multilateral climate funds, notably the Green Climate Fund (GCF) and the Global Environment Facility (GEF). These entities provide concessional finance that supports climate mitigation and adaptation aligned with South Africa's NDC targets, particularly in sectors facing significant upfront investment or limited commercial viability.

Between 2021 and 2022, South Africa received over USD 827.6 million in climate-related concessional finance, comprising approximately USD 816.9 million from bilateral sources and USD 10.7 million from multilateral funds, provided in the form of grants, concessional loans, and equity[174]. Furthermore, international pledges under the Just Energy Transition Partnership (JETP) totalled approximately USD 11.7 billion by early 2025, including USD 821 million explicitly earmarked as grant financing.[175] Of the pledged JETP grant funds, around 47% have already been committed to donor-approved projects, with an additional 35% in advanced planning stages, indicating a growing pipeline of internationally supported climate projects.[176]

South Africa benefits from having three accredited national entities to the GCF and/or GEF:

1. Development Bank of Southern Africa (DBSA)
2. Industrial Development Corporation (IDC)
3. South African National Biodiversity Institute (SANBI)

These institutions serve as critical conduits for channelling concessional finance into the national climate response. The DBSA and IDC focus primarily on large-scale infrastructure, clean energy, and green industrialisation projects, using blended finance structures to attract private investment and enhance project bankability. SANBI is mandated to support biodiversity conservation and ecosystem-based adaptation, often through smaller, grant-funded initiatives that deliver community-level resilience benefits.

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[174] Department of Forestry, Fisheries and the Environment (DFFE), 2024. *Biennial Transparency Report*. Pretoria: DFFE.

[175] JET Grants Register, 2025. *JET Grants Register – Frequently Asked Questions, Q1 2025*. Pretoria: South African Presidency.

[176] JET Project Management Unit (JET PMU), 2023. *JET Implementation Plan*. Pretoria: South African Presidency.

All three entities operate as both intermediaries and implementing partners, tasked with designing and submitting fundable proposals, ensuring compliance with fiduciary, environmental, and social safeguards, and overseeing project implementation in alignment with international fund standards.

Despite having accredited entities and growing climate finance needs, South Africa faces persistent barriers in mobilising international concessional finance at scale. These include:

1. **Capacity and pipeline constraints**: Limited technical capacity and project preparation support at subnational and sectoral levels inhibit the development of bankable proposals.
2. **Lengthy approval processes**: Engagement with multilateral climate funds often involves protracted application and due diligence timelines, which do not always align with the urgency of climate action.
3. **Governance and fiduciary complexity**: Meeting GCF/GEF accreditation, environmental and social safeguards, and MRV requirements requires strong institutional coordination and sustained resourcing.
4. **Uneven distribution**: Much of the concessional funding accessed to date has been concentrated in the energy sector, with limited flows to adaptation or Just Transition-focused programmes.

International concessional finance will be critical for de-risking mitigation in high-cost sectors, supporting mitigation enabling infrastructure, funding adaptation projects with limited commercial returns, and supporting equity-enhancing investments aligned with the Just Transition. As international concessional climate finance becomes increasingly linked to performance and additionality requirements, strengthening South Africa's capacity to access, absorb, and report on these flows will be essential to unlock this type of finance at scale.

Enhanced project preparation facilities, streamlined coordination between accredited entities, and a stronger enabling environment for concessional finance absorption, particularly at subnational level, will all be vital to ensure that South Africa can attract the finance to ensure that it can meet its NDC targets in a timely and inclusive manner.

4.3.6 Blended Finance and Development Finance Institutions

Development finance institutions (DFIs) such as the Development Bank of Southern Africa (DBSA) and the Industrial Development Corporation (IDC) play a pivotal role in South Africa's climate finance architecture. As mission-driven lenders, they are uniquely positioned to bridge the gap between public policy objectives and private sector investment requirements by structuring and deploying blended finance instruments that de-risk climate-aligned investments and attract additional capital at scale. These instruments, such as concessional loans, credit guarantees, and first-loss capital facilities, lower the cost of capital or absorb higher risks, thereby improving the bankability of projects that might otherwise struggle to secure private investment.

Blended finance solutions offered by DFIs are especially critical in sectors where upfront costs are high, payback periods are long, or where regulatory uncertainty presents barriers to entry. Through these mechanisms, DFIs enable the mobilisation of private capital into mitigation, adaptation, and Just Transition-related investments that align with national development priorities and climate commitments.

To further unlock scale and efficiency in climate finance delivery, DFIs are pioneering the use of aggregation platforms that consolidate smaller or early-stage projects, particularly those in municipalities, the informal sector, or among SMMEs, into investable portfolios. This approach helps reduce transaction

costs, standardise documentation, and improve predictability for institutional investors. Complementary risk-sharing mechanisms such as co-financing arrangements, partial guarantees, and revenue buffering tools are also being used to mitigate lender exposure and enable greater participation in underserved or high-impact sectors.

By combining concessional and commercial finance, DFIs act as leverage points in the broader climate finance ecosystem. Their efforts are central to South Africa's strategic orientation for NDC implementation, particularly in hard-to-abate sectors such as heavy industry and long-distance transport, and in emerging areas like green hydrogen, grid infrastructure, electric mobility, and climate-resilient urban systems.

While most private capital mobilisation to date has occurred in the energy sector, DFIs are increasingly expanding their role in financing integrated, multisectoral investments that support the broader objectives of the Just Transition — namely, reducing emissions while promoting job creation, local economic development, and social equity. As South Africa's climate finance needs continue to grow, the design and operationalisation of fit-for-purpose blended finance instruments by DFIs will remain critical to ensuring that the country's transition is not only ambitious, but also inclusive and implementable.

4.3.7 Private Sector Investment and Market Instruments

The private financial sector is a critical, though still underutilised, pillar of South Africa's climate finance architecture. Mobilising large-scale investment from commercial banks, institutional investors, and capital markets is essential to meet the financing needs of the country's NDC and Just Transition commitments. While some progress has been made in developing climate-aligned financial instruments, systemic barriers continue to limit the scale, depth, and pace of private sector participation.

South Africa has seen growing interest in green bonds, sustainability-linked loans, and public-private partnerships (PPPs) as vehicles for climate investment. Green bonds, issued by both public and private entities, are used to finance renewable energy, clean transport, water infrastructure, and energy efficiency projects. Notable issuers include the City of Cape Town, the DBSA, and several commercial banks.

Sustainability-linked loans are increasingly used by corporates seeking to align lending terms with environmental performance indicators, such as emissions reduction or energy intensity targets. Meanwhile, PPPs offer a pathway to leverage public capital and regulatory certainty to crowd in private capital for large-scale infrastructure investments. These instruments, while promising, remain limited in scale and are often confined to well-established borrowers or projects with strong revenue profiles.

Despite a supportive policy environment, several persistent barriers constrain private investment in climate-related sectors[177]:

- Policy and regulatory uncertainty or misalignment, especially around energy and carbon pricing frameworks;
- Project bankability issues, particularly for adaptation or community-level initiatives with limited or uncertain revenue streams;

[177] PCC, 2024. The Presidential Climate Commission's Recommendations on a Just Transition Financing Mechanism. Available at: https://pccommissionflo.imgix.net/uploads/images/PCC-JTFM-Recommendations-Report.pdf

- Underdeveloped capital markets for climate investment, with a limited pipeline of standardised, investable projects;
- Lack of financial intermediaries capable of originating and structuring climate-aligned deals, especially for SMMEs and municipalities.

These challenges are especially acute in sectors like adaptation, waste, and nature-based solutions, where commercial returns are harder to secure without concessional support and blended finance.

To address these gaps, South Africa has initiated several measures to align its financial system with national climate and development priorities. A cornerstone of this effort is the Green Finance Taxonomy, launched by National Treasury in 2022. The taxonomy provides a science-based classification system for identifying sustainable economic activities, improving transparency, and reducing greenwashing risks. It also helps financial institutions, investors, and regulators assess the climate alignment of portfolios and lending practices.

In parallel, work is underway to integrate climate risk into financial regulation, expand the use of Environmental, Social and Governance (ESG) disclosure frameworks, and improve access to sustainability-linked financial products. These efforts are designed to enhance investor confidence, deepen green capital markets, and accelerate the shift of private capital toward low-carbon and climate-resilient assets.

Accordingly, the DFFE is in the process of finalising its draft national framework[178] for participation in cooperative approaches under Article 6 of the Paris Agreement. The framework provides guidance on the implementation of Article 6.2; Article 6.4 and Article 6.8 in South Africa.

With regards to Article 6.2, the South African framework establishes the rules, institutional arrangements, and procedures for the trading of carbon credits at a bilateral / multilateral level, where the trades are reflected in the respective emission balances of the participating countries. The carbon credits in this market are known as Internationally Transferred Mitigation Outcomes (ITMOs), which are authorised by the participating countries to ensure alignment with national priorities, environmental integrity, and the achievement of NDC mitigation targets.

The draft framework positions Article 6 of the Paris Agreement as a means to raise ambition while also stimulating the domestic green economy. Article 6.2 aims to facilitate bilateral or multilateral transfers of mitigation outcomes, emphasising stringent environmental integrity, additionality, robust MRV, and clearly defined corresponding adjustments. ITMO generation is conditional on host country authorisation.

Article 6.4 introduces the Paris Agreement Crediting Mechanism (PACM), a new international carbon credit market mechanism under international supervision. PACM is therefore a new carbon credit standard or programme, that has been designed to supersede the Clean Development Mechanism, which was the previous UN programme mandated under the Kyoto Protocol. South Africa's approach to Article 6.4 aims to leverage PACM projects to attract large-scale investment into transformative mitigation activities. This mechanism supports project-level interventions in sectors with higher abatement costs, facilitating technology transfer. Article 6.4 projects in South Africa will follow stringent rules ensuring additionality, sustainable development co-benefits, and alignment with national priorities.

[178] DFFE, 2024. *Draft South African Framework for Article 6 of the Paris Agreement*. Available at: https://www.dffe.gov.za/sites/default/files/docs/draftsa_article6_framework.pdf

Article 6.8, by contrast, focuses on non-market approaches to facilitate cooperation without the direct exchange of emissions reductions. South Africa recognises the potential of Article 6.8 in addressing broader climate finance and capacity-building gaps, particularly supporting adaptation and resilience-building activities. The Article 6.8 framework will enhance international cooperation through knowledge sharing, technology transfer, and capacity-building initiatives, which align closely with the updated NDC's emphasis on integrated climate resilience and adaptation measures.

South Africa's Article 6 framework could complement and strengthen the Means of Implementation by:

- Mobilising **international climate finance** through different mechanisms;
- **Incentivising mitigation** beyond the policies and measures articulated in the NDC;
- Supporting **project-level finance** in sectors with higher abatement costs;
- Reinforcing **transparency and environmental integrity** through a national registry and corresponding adjustment mechanism.

As such, Article 6 is not a substitute for domestic finance and implementation systems, but an additional lever to scale ambition, crowd in international capital, and accelerate technology transfer in priority mitigation sectors.

4.4 Means of Implementation Gaps for Achieving the 2030-2035 NDC Mitigation and Adaptation Ambition

Meeting the higher-ambition mitigation and adaptation goals proposed in this updated NDC will be impossible without a commensurate step-change in the means of implementation that underpin them. Finance, technology, capacity, and transparency must all expand in scale, speed, and coordination: public budgets need climate-tagging and predictable allocations; the Just Transition Financing Mechanism and Climate Change Response Fund must crowd-in public concessional and private capital at project level; technology deployment has to accelerate through local manufacturing incentives and open-licensing partnerships; and institutional capacity must be strengthened.

Only by knitting these elements together, obtaining international support for them, and holding every sphere of government and stakeholder accountable for delivering them, can South Africa translate its elevated ambition into achievable emissions reductions, climate-resilient development, and a just economic transformation.

The current climate finance landscape in South Africa, while expanding in scope and complexity, continues to exhibit several structural and operational gaps that constrain effective mobilisation, coordination, and deployment of resources:[179,180]

- Fragmented coordination between public sector institutions, private investors, and multilateral platforms limits the efficient allocation and flow of climate finance.

[179] CPI, 2023. The South African Climate Finance Landscape 2023. Available at: https://www.climatecommission.org.za/publications/the-south-african-climate-finance-landscape-2023

[180] PCC, 2024. The Presidential Climate Commission's Recommendations on a Just Transition Financing Mechanism. Available at: https://pccommissionflo.imgix.net/uploads/images/PCC-JTFM-Recommendations-Report.pdf

- High transaction costs and limited aggregation mechanisms hinder the bankability of small and distributed projects, particularly those originating from municipalities, SMMEs, and civil society.
- Uneven subnational access to climate finance persists due to institutional capacity constraints, lack of project preparation support, and structural funding barriers.
- Transparency and tracking systems for climate-related public expenditure remain underdeveloped, making it difficult to assess alignment with NDC targets or the effectiveness of deployed resources.

A particularly critical gap is the significant underinvestment in adaptation measures relative to mitigation measures. Despite adaptation's prominence in national climate policy, financial flows remain disproportionately allocated toward mitigation projects. Adaptation finance is insufficiently prioritised at both national and subnational levels, leading to persistent vulnerabilities, especially within rural and climate-exposed municipalities. Additionally, there is currently no dedicated adaptation finance coordination mechanism equivalent to the JET-IP for mitigation, limiting strategic coherence and effective resource mobilisation for adaptation initiatives. It is anticipated that climate resilient sector and regional development strategies will feed into an overarching Just Adaptation and Resilience Investment Plan, being developed by DFFE, and providing the basis for investments made by the Climate Response Fund.[181]

South Africa's current climate finance architecture does not yet include dedicated financial instruments or planning mechanisms for loss and damage. While the issue is receiving growing international attention, domestic architecture remains focused on mitigation and adaptation, leaving a significant gap in support for communities recovering from unavoidable climate impacts. Addressing this will require clear institutional roles and integration into future financing frameworks.

Despite the expanding institutional and financial infrastructure described in the Climate Finance Architecture chapter above, South Africa's current Means of Implementation framework still faces several critical limitations. These gaps affect the country's ability to mobilise, absorb, and deploy the scale of resources needed to implement its updated NDC in a timely, equitable, and resilient manner. Addressing these weaknesses is essential to transition from planning to delivery and to meet the ambition level required by national targets and international obligations.

1. **Insufficient adaptation finance and the absence of a dedicated institutional centre**:

   Adaptation remains significantly underfunded relative to its critical importance, receiving less than 20% of tracked climate finance between 2020 and 2022 [182]. Municipalities, particularly in rural and climate-vulnerable areas, struggle to access funding due to limited internal capacity, weak project preparation support, and the absence of a dedicated financing channel for adaptation initiatives.

   While the 2023 approval of the $235 million GCF-funded Water Reuse Programme[183] marked progress, no comparable flagship adaptation programme exists at national scale. Unlike

[181] PCC, 2024. Presidential Climate Commission Annual Review. Available at: https://theethicalagency.co.za/wp-content/uploads/2024/04/PCC-Annual-Report-Design.pdf

[182] CPI, 2023. The South African Climate Finance Landscape 2023. Available at: https://www.climatecommission.org.za/publications/the-south-african-climate-finance-landscape-2023

[183] Green Climate Fund (GCF). (2023). *FP209: Climate Change Resilience through South Africa's Water Reuse Programme ("WRP")*. Available at: https://www.greenclimate.fund/project/fp209

mitigation, which benefits from structured mechanisms such as the JET-IP and REIPPPP, adaptation suffers from a lack of institutional coordination. This results in a fragmented finance landscape and hampers efforts to aggregate funding, provide technical assistance, and develop pipelines for resilience-building investments.

The absence of a dedicated institutional "home" for adaptation finance has left successful models, such as SANBI's Enhanced Direct Access[184], isolated and unscaled. This institutional vacuum curtails the expansion of integrated water-climate infrastructure and exacerbates spatial inequality in climate risk exposure, ultimately weakening South Africa's national adaptation response.

Achieving the country's adaptation objectives requires a substantial and sustained increase in targeted finance. Both the PCC[187] and the Energy Systems Research Group (ESRG)[185] stress the need for dedicated funding streams sourced from the national budget, climate funds, and concessional international finance. These priorities must be integrated into South Africa's overarching climate finance strategy and supported by institutional capacity to cost, plan, implement, and monitor adaptation interventions effectively.

An enabling development in this space is the National Disaster Risk Financing Policy under formulation by National Treasury.[186] This policy aims to establish a structured framework for mobilising and allocating resources for disaster preparedness, response, and recovery. Such a mechanism is especially vital for under-resourced municipalities frequently exposed to climate-related shocks. By linking disaster risk financing with broader adaptation planning, the policy will enhance long-term climate risk management and resilient infrastructure development.

Stakeholder consultations and reviews of national climate finance strategies have consistently highlighted the need for a standalone adaptation and resilience investment plan.[187,188] This plan should:

- Prioritise sectors with the highest climate risk and adaptation co-benefits, such as water security, climate-smart agriculture, and infrastructure resilience;

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[184] South African National Biodiversity Institute (SANBI). (2021). *A Blueprint for Enhanced Direct Access in South Africa*. Available at: https://www.sanbi.org/wp-content/uploads/2022/01/Final-Blueprint-for-Enhanced-Direct-Access-in-South-Africa-For-Circulation.pdf

[185] UCT ESRG. 2024. *Net zero CO2 emission pathways for South Africa*. University of Cape Town Energy Systems Research Group

[186] National Treasury. (2025). *Strategic Plan 2025–2030*. Available at: https://www.treasury.gov.za/publications/strategic%20plan/National%20Treasury%20Strategic%20Plan%202025-2030.pdf

[187] PCC (2023). *A Critical Appraisal of South Africa's Just Energy Transition Investment Plan (JET-IP)*. Available at: https://pccommissionflow.imgix.net/uploads/images/PCC-analysis-and-recommenations-on-the-JET-IP-May-2023.pdf

[188] Ramaphosa, C. (2024). *Address by President Cyril Ramaphosa at the Climate Resilience Symposium 2024, CSIR International Convention Centre, Tshwane*. The Presidency. Available at: https://www.thepresidency.gov.za/address-president-cyril-ramaphosa-climate-resilience-symposium-2024-csir-international-convention

- Address fragmentation in current adaptation funding arrangements, often overshadowed by mitigation-focused pipelines;
- Establish a structured foundation for improved project costing, preparation, and targeting of domestic and international finance.

Despite policy recognition of adaptation within national climate strategies, no formal mechanism exists to prioritise or ringfence adaptation investments. This limits South Africa's ability to systematically mobilise, blend, and deploy resources, particularly for community-based and municipal-led interventions. The absence of a dedicated facility renders adaptation efforts fragmented, underfunded, and secondary to mitigation objectives.

According to the 2023 South African Climate Finance Landscape report[189], less than 20% of tracked finance between 2020 and 2022 was allocated to adaptation. Key sectors such as water resource management, climate-smart agriculture, and disaster risk reduction continue to face significant funding shortfalls despite their high exposure to climate risk.

This persistent underinvestment underscores the urgent need to mobilise long-term, scalable adaptation finance through dedicated investment plans, ringfenced funding streams, and strengthened local project pipelines, especially to build resilience in the communities and sectors most vulnerable to climate impacts.

2. **Underdevelopment of project pipelines with detailed feasibility and costing:** While high-level strategies such as the JET-IP and sector masterplans provide clear investment priorities, they are often not accompanied by investment-ready project pipelines. Many proposed projects lack technical feasibility studies, cost modelling, and bankability assessments. Without this foundational groundwork, finance mobilisation efforts remain stalled and opportunities for blended or concessional finance go unrealised. This is evident in the slow uptake of concessional finance linked to adaptation or cross-sectoral resilience priorities, where municipal or provincial projects often lack the due diligence required by multilateral lenders.[190,189,191]
3. **Lack of structured mechanisms for social ownership models and cooperatives:** Community-based enterprises and cooperative models, especially in sectors such as energy, agriculture, and waste, are increasingly recognised as key to ensuring a Just Transition. However, the current Means of Implementation framework does not provide dedicated financial, technical, or policy support to promote these models. As a result, the transformative potential of local ownership and value retention is not being realised at scale. The DBSA's Green Fund and the Adaptation Fund's Small Grants Facility confirmed this, and while it offered early lessons, these have not yet scaled or been replicated nationally.

[189] CPI, 2023. The South African Climate Finance Landscape 2023. Available at: https://www.climatecommission.org.za/publications/the-south-african-climate-finance-landscape-2023

[190] World Bank. (2021). *Enabling Private Investment in Climate Adaptation and Resilience: Current Status, Barriers to Investment and Blueprints for Action*. Available at: https://documents.worldbank.org/en/publication/documents-reports/documentdetail/790381637634432058

[191] Kulima Integrated Development Solutions. (2022). *Finance for Adaptation at the Level of Local Government in South Africa*. Available at: https://www.kulima.com/wp-content/uploads/2022/11/Finance-for-adaptation-at-the-level-of-local-government-in-South-Africa-Final.pdf

4. **Weak data systems for tracking climate finance and Just Transition outcomes:** Although several initiatives are underway, including the development of a climate budget tagging framework and the South Africa Green Finance Taxonomy, the country's data systems for climate finance remain fragmented, inconsistently reported, and poorly integrated. The absence of standardised indicators for tracking Just Transition outcomes further undermines transparency, learning, and accountability. This challenge has become more acute as major new international flows require integrated tracking across multiple institutions. Current systems lack the interoperability and reporting protocols to ensure coordinated reporting across local, and international partners.

5. **Foreign exchange (forex) risk and limited de-risking mechanisms:** Exposure to exchange rate volatility remains a major deterrent for international investors, particularly in adaptation sectors and municipal infrastructure where revenue certainty is lower. The current framework does not include dedicated forex risk-sharing facilities such as currency hedging or partial guarantees, limiting South Africa's ability to attract and retain foreign concessional and private capital. This has been noted in bilateral project negotiations following the JETP announcement, with concessional loans priced in hard currency and limited instruments available to hedge against depreciation risk for domestic implementers.

6. **Absence of formal Article 6 integration into investment frameworks:** While South Africa is developing its national Article 6 framework, it has not yet been embedded within the country's Means of Implementation or investment mobilisation architecture. This represents a missed opportunity to channel international carbon finance into projects, particularly in high-cost or hard-to-abate sectors. Formal integration would help crowd in results-based finance while strengthening transparency, additionality, and ambition. As countries begin operationalising Article 6 under the Enhanced Transparency Framework, South Africa's delay in embedding carbon market participation into its investment strategies could reduce competitiveness and delay access to results-based finance opportunities.

7. **Absence of Interim Milestones and Progress Tracking**: A key limitation in South Africa's current Means of Implementation framework is the lack of clearly formalised interim milestones and an integrated, publicly accessible tool for tracking implementation progress. While the 2035 targets set a clear medium term direction, the absence of intermediate benchmarks, particularly for 2030 and 2035, reduces the ability to assess whether progress is on track and to make timely course corrections. Although foundational elements of monitoring and evaluation exist, such as the National Climate Change Response Database (NCCRD) and sectoral M&E systems, they are not yet coordinated into a comprehensive system that links directly to Means of Implementation enablers.

8. **Further Improvement of Coordination and Delivery Priorities**: Improved collaboration can reduce duplication, accelerate project pipelines, and ensure that investments support a balanced portfolio of mitigation, adaptation, and Just Transition objectives. To improve alignment and efficiency, enhanced coordination is required across national entities such as the DBSA, IDC, and National Treasury, as well as with private financial institutions and mechanisms such as the JET-IP and JTFM.

   The National Treasury Strategic Plan (2025–2030) outlines several mechanisms to address challenges. These include:

   - The development of a climate budget tagging framework to improve transparency and track public climate-related expenditures;

- A proposed National Disaster Risk Financing Policy, aimed at strengthening adaptation finance;
- Ongoing reforms to the local government fiscal framework to improve financial sustainability and incentivise climate-aligned service delivery at the municipal level.

Addressing these systemic and operational gaps will be essential to elevate the effectiveness, fairness, and scalability of South Africa's climate response, particularly in the context of increasing global scrutiny, limited fiscal space, and growing domestic climate risk. Progress since the 2021 NDC update highlights that without structural reform to the climate finance ecosystem, many new financial commitments risk remaining underutilised.[192]

4.5 Proposed Requirements to Address Gaps in Means of Implementation

Building on the insights and analyses above, which have been drawn from stakeholder consultations and technical assessments, the following sections outline key proposed recommendations to address gaps in the country's Means of Implementation framework, with the aim of delivering South Africa's next NDC, for the period 2030-2035.

4.5.1 Building Institutional Capacity for NDC Implementation

The successful implementation of South Africa's updated NDC will depend on robust institutional and technical capacity across all levels of government. While notable progress has been made in establishing the legal and policy foundations for climate action, such as the Climate Change Act, sectoral emission targets (SETs), and policy measures, implementation capacity remains uneven across national departments, provinces, and municipalities.

Key priorities include:

- **Building capacity** within national line departments (e.g. Energy, Transport, Agriculture, Human Settlements) to integrate NDC targets into sectoral planning, budgeting processes, and programme delivery.
- **Enhancing municipal capabilities**, particularly in under-resourced and rural areas, to conduct climate risk assessments, design and deliver adaptation projects, and access climate finance.
- **Upskilling technical staff** in key areas such as emissions monitoring, data analysis, spatial planning, and climate-resilient infrastructure design.
- **Developing targeted training programmes** and toolkits to support officials at all levels in aligning climate objectives with service delivery and infrastructure development mandates.

Stakeholder consultations conducted by the PCC have repeatedly highlighted institutional fragmentation and misalignment of roles and mandates as critical barriers to effective implementation. There is a clear call for comprehensive capacity assessments across spheres of government, with particular emphasis

[192] DFFE, 2024. Biennial Transparency Report. Available at: https://unfccc.int/documents/645057

on aligning responsibilities between national, provincial, and local levels. This is especially urgent for municipalities responsible for delivering services in energy, water, waste, and land use.

To respond effectively, implementation support should be tailored to municipal readiness levels, using frameworks such as the PCC's municipal transition readiness model. This requires identifying context-specific gaps in governance, staffing, planning systems, and infrastructure condition.

The PCC's municipal transition work and NDC implementation reports further underscore the need to empower political and administrative leaders to champion climate objectives and institutional reforms. Leadership capacity is essential to bridge gaps between high-level policy and local delivery.

In addition to technical and institutional limitations, many municipalities face structural challenges in accessing climate finance. These include limited experience in project preparation, weak internal revenue bases, and inadequate capacity to meet the fiduciary, environmental, and reporting standards required by funders. Without targeted support, such as embedded technical assistance, project preparation facilities, and streamlined grant application processes, these municipalities risk being excluded from climate investment flows.

This reinforces the need for differentiated support approaches, such as the JTFM tiered structure, which recognises varying levels of readiness and provides tailored financing access to under-resourced local governments and communities.

4.5.2 Skills Development and Workforce Readiness that Supports Economic Diversification and the Just Transition

A critical component of economic diversification, green industrial development and Just Transition implementation is the development of a robust skills pipeline aligned with the needs of emerging low-carbon sectors. Stakeholder consultations and analysis by the Presidential Climate Commission[193] have consistently emphasised the need for expanded public investment in Technical and Vocational Education and Training (TVET) institutions, university curricula reform, and the establishment of sector-specific training pathways. Green hydrogen, renewable energy, electric mobility, sustainable agriculture, and public transport all require targeted skills development strategies to ensure a capable, inclusive, and locally based workforce. While skills development is recognised across sectoral masterplans, a more coordinated approach is needed, linking DFIs, industrial policy actors, education departments, and employers to ensure that training systems are responsive to evolving labour market needs and Just Transition imperatives.

4.5.3 Enhancing Access to and Absorptive Capacity for Climate Finance

South Africa requires significantly scaled up and sustained financial flows to implement its updated NDC. The Energy Systems Research Group's (ESRG) net-zero modelling confirms that ambitious mitigation and adaptation pathways, particularly mitigation aligned with a 9 Gt carbon budget, will require substantial upfront investments in infrastructure, clean technologies, institutional reform, and resilience-building systems. These financial demands far exceed current levels of climate-related public expenditure and place increased pressure on the country's ability to mobilise and deploy resources effectively. Meeting

[193] PCC, 2025. Stakeholder perspectives on the PCC's Recommendations for South Africa's updated 2030-2035 NDC

these needs will require not only greater access to international and domestic finance, but also improved absorptive capacity, the ability of institutions at all levels to plan, manage, and implement climate investments in a timely, efficient, and impactful manner. Strengthening both the supply of and demand for climate finance is therefore essential to bridge the gap between ambition and delivery.

Enhancing access to international climate finance**,** including from the Green Climate Fund, Global Environment Facility, and bilateral and multilateral sources, is required to support both mitigation and adaptation objectives. A study by the Climate Policy Initiative estimates that R334 billion to R535 billion is required annually to meet South Africa's current NDC, necessitating a three- to fivefold increase in current levels.[194]

However, absorptive capacity in the context of climate finance entails more than just receipt of funds; it refers also to the institutional, technical, and financial systems that must be in place to use the money to implement projects, programmes, and policies that address climate change.

Accordingly, priorities for enhancing absorptive capacity include:

- Scaling up public budget allocations for climate action and systematically embedding climate-related priorities into the Medium-Term Expenditure Framework (MTEF) to ensure sustained government commitment and alignment with NDC goals.
- Accelerating the development of bankable project pipelines, particularly for municipalities and locally driven adaptation initiatives, is critical to unlocking climate finance at scale. A consistent finding from PCC consultations and technical assessments is that while national strategies such as the JET-IP set strong programmatic priorities, they often lack the specificity, feasibility data, and implementation readiness required to mobilise large-scale investment. Bridging this gap will require targeted investment in detailed, investment-ready project inventories, supported by technical assistance, robust feasibility assessments, cost modelling, and clear implementation roadmaps.
- The development of sector-specific investment metrics and standardised project costing templates (PCC, date). These instruments are essential to enhance the maturity, comparability, and financial credibility of project proposals, especially in JET-IP priority sectors such as energy, transport, and green industrial infrastructure. Sector-tailored feasibility studies, along with consistent benchmarks for emissions reductions, social co-benefits, and financial viability, will support more effective aggregation of investment-ready opportunities and facilitate access to concessional and private finance.
- Strengthening coordination between national departments, DFIs, and municipalities will be key to identifying, refining, and scaling viable projects across critical sectors.
- Establishing dedicated national climate financing instruments, such as green banks or climate bonds, that can effectively blend domestic public resources with international and private capital, thereby reducing the cost of capital and increasing the bankability of climate-aligned investments.

[194] CPI, 2023. The South African Climate Finance Landscape 2023. Available at: https://www.climatecommission.org.za/publications/the-south-african-climate-finance-landscape-2023

- Building institutional capacity to absorb and manage increased climate finance flows, with a focus on strengthening fiduciary systems, ensuring adherence to environmental and social safeguards, and implementing robust monitoring and results-based reporting frameworks.

- The private sector is the dominant contributor to climate finance in South Africa, accounting for approximately 86% of the average R131 billion mobilised annually between 2019 and 2021. This funding largely comes from domestic commercial sources such as banks and institutional investors. In contrast, the public sector contributes only 14%, including national, provincial, and local government spending, as well as international public finance. Domestic sources comprise 91% of total climate finance, while international sources represent just 9%, indicating untapped potential for foreign investment. Key areas for upscaling include increasing adaptation financing (which currently receives just 12% of funds), enhancing international public finance, leveraging blended finance mechanisms to de-risk investments, and strengthening policy and regulatory frameworks to create a more investment-friendly climate landscape.[195]

- One of the most influential structural factors shaping South Africa's ability to mobilise and absorb climate finance, particularly for large-scale mitigation efforts, is the ongoing reform of the electricity sector. Key reforms include the unbundling of Eskom, the creation of an independent transmission system operator, and revisions to grid investment planning and access. These shifts have a direct impact on the pace and scale of renewable energy deployment, the financial viability of independent power producer (IPP) projects, and the development of a credible national transmission investment strategy. Stronger institutional coordination between the electricity reform roadmap and national climate finance strategy will be essential to accelerate implementation, unlock viable investment pipelines, and align governance systems with the priorities of the JET-IP.[196]

- To mitigate exposure to foreign exchange (forex) risk, there is increasing recognition of the need for dedicated forex risk-sharing instruments. These may include currency hedging facilities, partial guarantee schemes, or other structured financial tools capable of absorbing exchange rate shocks. Such mechanisms could be embedded within the design of national climate finance vehicles, such as the proposed JTFM, the proposed Climate Transition Sovereign Wealth Fund, or future green banks, to improve the risk-return profile of climate investments and enhance alignment with international financing flows. [195]

- A dedicated adaptation investment plan would help reframe adaptation as a core development priority, rather than a secondary or residual concern, and anchor it within South Africa's broader strategy for inclusive, climate-resilient growth. Such a plan would not only strengthen national resilience but also advance social equity, by targeting the vulnerabilities of the sectors and communities most at risk.

- To translate adaptation finance into implementable projects on the ground, climate finance mechanisms, such as the JTFM and any future adaptation-specific mechanisms, should include

[195] CPI, 2023. The South African Climate Finance Landscape 2023. Available at: https://www.climatecommission.org.za/publications/the-south-african-climate-finance-landscape-2023

[196] World Bank. (2023). *South Africa Sustainable and Low-Carbon Energy Transition Development Policy Loan (P179077)*. Available at: https://documents1.worldbank.org/curated/en/099100323115510137/pdf/BOSIB02d0677f90780ba15086a6eb691a1d.pdf

dedicated technical assistance and project preparation windows for local government. These services are critical to help municipalities, particularly those in rural or under-resourced areas, identify, design, and structure adaptation projects that are bankable and aligned with local development priorities. Without this targeted support, many municipalities will remain unable to access available funding or effectively respond to climate risks.

- A dedicated adaptation finance facility is needed that can operate within the broader framework of the JTFM or a complementary climate finance platform such as the Climate Change Response Fund (CCRF). This facility would play a catalytic role by blending public, concessional, and private capital for adaptation investments, while also offering technical assistance, project preparation, and risk mitigation instruments. It would be specifically tailored to address the unique barriers facing adaptation initiatives, particularly in rural and under-resourced municipalities, and could help channel funds toward sectors such as climate-resilient agriculture, water management, and community infrastructure. Establishing such a facility would provide a more structured and coherent institutional response to the growing demand for scalable, localised adaptation investment.

4.5.4 Aligning Finance with Industrial and Localisation Priorities

The NDC should contribute to inclusive, sustainable development. This includes actively promoting local manufacturing, value-chain development, and decent green jobs, especially in regions and sectors most affected by the transition. The PCC Electricity Planning Report and ESRG modelling of Net Zero CO_2 emission pathways for South Africa [197] indicate that localisation of renewable energy, electric vehicles, and clean technology components is feasible and desirable with the right industrial policy support.

The alignment between South Africa's climate finance framework and its green industrial development objectives is emerging as a critical enabler of NDC implementation. Analysis from the PCC highlights that industrial sectors such as green hydrogen, electric vehicles, and public transport require tailored policy support to scale.[198] This includes strategic coordination between industrial policy, localisation targets, and the role of State-Owned Enterprises and DFIs, notably the IDC and DBSA, in mobilising capital for climate-smart industrial infrastructure. Public procurement, investment incentives, and blended finance mechanisms are already being used in select sectors, but the absence of a unified green industrial strategy aligned with Just Transition goals may constrain South Africa's ability to unlock value chains and scale climate-related manufacturing capacity. These dynamics point to a need for more deliberate integration of green industrial development within the broader Means of Implementation ecosystem.

Implementation pathways should include:

[197] UCT ESRG. 2024. *Net zero CO2 emission pathways for South Africa*. University of Cape Town Energy Systems Research Group

[198] PCC (2023). *Green Hydrogen Dialogue Report*. Available at: https://pccommissionflo.imgix.net/uploads/documents/Green-Hydrogen-Dialogue_Summary-Report.pdf

- Incentivising domestic production of renewable energy infrastructure, batteries, and new energy vehicle components.[199,200,201]
- Aligning climate targets with industrial development policies, by identifying and addressing misalignments between sectoral masterplans and increased NDC ambition, particularly where masterplans fall short in decarbonisation timelines, or lack sufficient provisions for localisation incentives, technology innovation, and low-carbon skills development.
- Supporting small and medium enterprises (SMMEs) to access green value chains and transition opportunities.
- Prioritising industrial diversification in Mpumalanga and other vulnerable regions to reduce dependence on fossil fuel economies.

4.5.5 Strengthening Article 6 Readiness

South Africa's domestic carbon market, established prior to, but supported by the Carbon Tax Act, is emerging as a key instrument that could mobilise private investment in climate mitigation and advance low-carbon development.[202] It allows regulated emitters to reduce their tax liability by surrendering eligible carbon offsets. While the mechanism provides cost flexibility for emitters and potential revenue for mitigation projects, its full potential has yet to be realised due to regulatory, institutional, and market limitations.

Recent reforms under Phase 2 of the Carbon Tax, which begins in January 2026, will increase the upper range of offset allowance from 10% to 15%. This change is expected to significantly boost demand for certified, locally generated carbon credits, particularly from sectors such as renewable energy, forestry, waste, and agriculture. The policy shift also signals a stronger commitment to carbon pricing as a lever for market-based mitigation and reflects the strategic role of offsets in scaling up domestic emissions reduction efforts.[202]

To provide greater legal and procedural clarity, National Treasury is finalising a Framework for the Approval of Domestic Carbon Standards, expected in 2025. This framework will define which standards and methodologies are eligible for use under the Carbon Tax offset mechanism, with a focus on expanding participation from small-scale, community-based, and municipal projects. This is expected to lower entry barriers, increase inclusivity, and diversify the carbon project pipeline in alignment with development and Just Transition goals.

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[199] Department of Trade, Industry and Competition (DTIC). (2024). *Parliamentary Question PQ 217*. Available at: https://www.thedtic.gov.za/wp-content/uploads/PQ-217.pdf

[200] Department of Trade, Industry and Competition (DTIC). (2023). *Electric Vehicle (EV) White Paper*. Available at: https://www.thedtic.gov.za/wp-content/uploads/EV-White-Paper.pdf

[201] National Treasury. (2025). *2025 Budget Review*. Available at: https://saicawebprstorage.blob.core.windows.net/uploads/resources/2025-Budget/2025-Budget-Review.pdf

[202] Kerr, S., Hu, X. Filling the climate finance gap: holistic approaches to mobilise private finance in developing economies. *npj Climate Action* 4, 16 (2025). Available at: https://doi.org/10.1038/s44168-025-00220-x

In parallel, a broader regulatory framework for carbon trading is being developed by the DFFE[203] to support the formalisation and scaling of both compliance and voluntary markets. This will provide institutional certainty, clarify the legal treatment of carbon credits, and enable integration with international carbon mechanisms such as Article 6 of the Paris Agreement and CORSIA (the Carbon Offsetting and Reduction Scheme for International Aviation). A well-regulated domestic market will enhance transparency, reduce double counting risks, and improve market credibility, attracting more investment in low-carbon projects.

South Africa is in the final stages of developing its national Article 6 framework, which will govern the authorisation of Internationally Transferred Mitigation Outcomes (ITMOs) under both Article 6.2 and 6.4. This framework includes criteria for host country authorisation, as well as robust MRV and corresponding adjustment systems.

Integration with international markets could improve the fungibility of South African carbon credits, enhance alignment with global mitigation strategies, and unlock new sources of climate finance. Importantly, the Article 6 framework is being designed to uphold environmental integrity and social equity, reinforcing South Africa's leadership in shaping a just and sustainable global carbon market.

The expansion of South Africa's carbon market offers a pathway to scale private finance for mitigation. The increased offset allowance under the Carbon Tax and the potential use of offsets under future mandatory carbon budget regulations could further incentivise project development and expand market participation.

To fully realise this potential, the regulatory and policy framework for South Africa's carbon market should:

- Be integrated with other climate policy tools, including the carbon budget system and long-term mitigation strategy;
- Operate within a unified national registry supported by credible MRV systems;
- Promote community-driven and Just Transition-aligned projects, especially in under-resourced areas;
- Deliver clear policy signals to guide investor confidence and pipeline development.

A well-structured carbon trading framework and aligned carbon tax rules can serve not only as flexible mitigation instruments, but also as strategic climate finance mechanisms, channelling investment into low-carbon development, fostering innovation, and delivering inclusive, cost-effective climate action.

4.5.6 Data Systems, Transparency, and Accountability

Robust, interoperable data systems are foundational to South Africa's ability to implement, monitor, and adaptively manage its NDC commitments. As the country moves from policy design to execution, the ability to track progress, assess outcomes, and course-correct in real time will depend on well-integrated monitoring, reporting, and verification (MRV) systems, spanning mitigation, adaptation, and Just Transition measures. These systems must align with both national development goals and South Africa's international obligations under the Enhanced Transparency Framework (ETF) of the Paris Agreement.

[203] DFFE, 2024. *Draft South African Framework for Article 6 of the Paris Agreement*. Available at: https://www.dffe.gov.za/sites/default/files/docs/draftsa_article6_framework.pdf

A priority is the institutionalisation of the National Climate Change Monitoring and Evaluation System under the Climate Change Act. This will provide a unified framework to track implementation across sectors, enabling consistent reporting and performance monitoring. Complementary actions include:

- Upgrading the national greenhouse gas inventory system to ensure timely, disaggregated, and quality-assured data that supports both national planning and international reporting.
- Developing and rolling out sector-specific adaptation indicators that link climate resilience outcomes to service delivery, land use, and infrastructure performance.
- Creating public-facing dashboards and portals to enhance transparency, enable citizen oversight, and support data-driven policy engagement.
- Improving vertical integration between national and municipal data systems, including through localised climate indicator frameworks, to better capture subnational implementation progress.

One of the most important enablers of transparency in climate-related public expenditure is National Treasury's Climate Change Budget Tagging Framework, currently in development. This system will enable the systematic identification, classification, and reporting of climate-related spending across all spheres of government. It provides the foundation for aligning South Africa's budgetary processes with its climate priorities and for meeting ETF-related transparency requirements.

However, expenditure tagging alone is insufficient. There is a growing need for project-level tagging systems, particularly for climate finance and Just Transition-related investments. These would allow for more granular tracking of financial flows and outcome metrics, ensuring that climate finance is reaching intended beneficiaries, sectors, and geographies.

A significant gap in the current system is the absence of a standardised framework for tracking Just Transition finance. Without clear definitions, methodologies, and metrics, it is difficult to assess how much finance is supporting equitable and socially inclusive outcomes. To address this, South Africa should develop and adopt a Just Transition finance tagging framework, including a suite of disaggregated project-level indicators such as:

- Job creation (by type, geography, and demographic group),
- Social protection coverage,
- Local economic inclusion,
- Community ownership and governance models.

Such a framework would:

- Improve alignment with procedural and distributive justice principles;
- Enhance accountability for social outcomes and reduce the risk of "Just Transition washing";
- Harmonise reporting across government, DFIs, and international partners;
- Enable cross-sectoral and cross-instrument comparisons over time.

To further improve classification and transparency, South Africa should formally adopt the South African Green Finance Taxonomy as the national standard for identifying and tracking green investments. The taxonomy offers a consistent methodology for classifying environmentally sustainable activities, aligned with both domestic priorities and global frameworks.

Applying the South African Green Finance Taxonomy consistently across government budgeting systems, DFI investment pipelines, and project appraisal frameworks will significantly enhance the credibility and comparability of climate finance data. This alignment will not only support more robust tracking and classification of green investments, but also improve compatibility with environmental, social, and governance investment criteria. In doing so, it will strengthen investor confidence and help unlock access to both domestic and international green capital by signalling regulatory clarity and policy coherence.

The absence of clearly defined interim milestones and performance benchmarks weakens the ability to track NDC progress and make timely adjustments. While long-term targets (e.g., for 2035) exist, there is a need for shorter-term reference points, particularly for 2025, 2030, and 2032, to inform adaptive management, budget alignment, and implementation reviews.

In parallel, the development of a public-facing climate implementation dashboard, tracking indicators such as project delivery rates, finance flows, emissions reductions, institutional reforms, and social outcomes, would significantly enhance transparency and public trust. Such a tool would enable civil society, labour, and local communities to monitor delivery, assess equity impacts, and hold institutions accountable in real time.

4.5.7 Embedding Just Transition Measures in Implementation

A Just Transition is both a guiding principle and a practical requirement for the successful implementation of South Africa's NDC. The Presidential Climate Commission's Just Transition Framework emphasises that climate action must not deepen existing inequalities but should actively support workers, communities, and sectors most vulnerable to the socioeconomic impacts of decarbonisation.

To operationalise this principle, the means of implementation must include targeted measures that ensure social inclusion and equitable outcomes. These should comprise:

- **Social protection programmes**, including income support, retraining, and job placement services for affected workers;
- **Dedicated investment** in regional economic diversification, particularly in areas highly dependent on fossil fuels or carbon-intensive industries;
- **Participatory governance structures** that enable community-led planning, oversight, and accountability in the design and delivery of transition-related programmes;
- **Monitoring systems** for equity outcomes, with disaggregated data on employment, access to finance, and vulnerability reduction to assess progress and inform course correction.

Many of the interventions essential to a Just Transition, such as community enterprise development, reskilling programmes, and participatory governance structures, are not financially viable under traditional commercial models. While these initiatives generate significant social value, they often lack immediate or measurable returns on investment. Consequently, they require grant-based financing mechanisms that prioritise developmental impact and equity over financial profitability.

Scaling up dedicated grant allocations within both national and international climate finance systems is critical to ensure that Just Transition priorities are properly resourced. These grants should be ringfenced for socially focused projects, with transparent criteria and robust tracking systems to monitor delivery and impact. Without such targeted support, there is a risk that Just Transition objectives will remain aspirational, leaving vulnerable communities behind in the shift to a low-carbon economy.

A particularly important area requiring greater institutional support is the promotion of social ownership models and community-based enterprises, especially in sectors such as renewable energy, sustainable agriculture, and waste management. The PCC's research and stakeholder engagements consistently highlight the transformative potential of cooperatives and social enterprises to build local economic resilience, foster inclusive participation, and retain value within communities. These models can ensure that the benefits of climate finance are democratically governed and locally embedded.

To operationalise this, mechanisms within national climate financing instruments should be designed to support social ownership structures through ringfenced grant windows, technical assistance for governance and compliance, and preferential procurement policies.[204] These interventions can reduce entry barriers, build institutional capacity, and catalyse scalable, community-led investment models that advance both climate and development objectives. Currently, no structured mechanism exists to promote and finance such socially rooted enterprises, highlighting a gap in the inclusiveness and transformative potential of South Africa's Means of Implementation framework, including institutional capacity, technology transfer and financing.

4.5.8 Embedding Interim Milestones and Strengthening Public Accountability

Interim milestones for critical enablers such as finance mobilisation, institutional capacity building, and Just Transition outcomes would enable adaptive management, improve accountability, and support timely recalibration. Likewise, the development of a public-facing climate implementation dashboard, covering indicators such as project implementation rates, climate finance flows, institutional reform status, and equity outcomes, would enhance transparency, procedural justice, and stakeholder engagement. It would also empower civil society, labour, and communities to monitor delivery and hold institutions accountable.

Addressing these gaps would support more responsive implementation, reinforce public confidence in the integrity of the NDC process, and help ensure that South Africa's climate ambition is matched by timely and transparent action.

4.6 Summary of Means of Implementation Instruments and Actors

The Means of Implementation section has identified the full ecosystem of enablers required to deliver South Africa's updated NDC. This includes a range of financial instruments, institutional roles, and technical support mechanisms. These can be effectively summarised using a two-dimensional framework: (1) public vs private sector roles, and (2) types of financing instruments (grants, debt, equity). The table below maps these categories across the key functions addressed in this Means of Implementation chapter.

[204] PCC, 2024. Recommendations of the Just Transition Financing Mechanism Report. Pretoria: Presidential Climate Commission. Available at: https://www.climatecommission.org.za/publications/pcc-recommendations-of-the-just-transition-financing-mechanism-report

Table 10: Mapping Means of Implementation Instruments and Actors by Sectoral Role and Financing Type

Means of Implementation Function	Public Sector Instruments / Roles	Private Sector Instruments / Roles	Grants/Debt/Equity
Adaptation finance	• National Budget Allocations (e.g. infrastructure, water, agriculture, human settlements) • Just Transition Financing Mechanism – Grant Window (supports social resilience, local adaptation) • National Adaptation Strategy (sets priorities and coordination mechanisms) • Disaster Risk Financing Policy (mobilises and allocates funding for climate shocks) • Climate Resilience Indicators and Planning Tools (e.g. National Climate Risk and Vulnerability Atlas) • Municipal Support Programmes (technical assistance and capacity building for local governments) • Public Sector Project Preparation Facilities (especially for rural or under-resourced municipalities)	• Blended Finance Co-Investment (private sector leverages public capital for adaptation infrastructure) • Project Delivery Partnerships (e.g. engineering firms, NGOs, and businesses implementing adaptation projects) • Insurance and Risk Transfer Solutions (climate risk insurance, index-based products) • ESG-Aligned Investors (seeking returns from resilient supply chains or community-based adaptation) • Technology Providers (climate-smart agriculture, water efficiency, early warning systems) • Impact Investors (funding adaptation with measurable development co-benefits)	**Grants**: Ringfenced adaptation grants; JTFM grant window **Debt**: Concessional loans via DFIs **Equity**: Limited role; possible via impact funds
Mitigation investment	• JET-IP (Strategic roadmap for concessional finance and public investment in the energy transition)	• Renewable Energy Project Developers (IPPs investing in solar, wind, battery storage, etc.)	**Grants**: AM-linked support; early-stage pilots **Debt**: Green bonds, concessional and commercial debt

Means of Implementation Function	Public Sector Instruments / Roles	Private Sector Instruments / Roles	Grants/Debt/Equity
	• Integrated Resource Plan (IRP)-linked Public Procurement (e.g. REIPPPP to procure renewable energy from IPPs) • Public Infrastructure Finance (e.g. Eskom grid investment, public transport, energy-efficient buildings) • State-Owned Enterprises (e.g. Eskom, Transnet leading decarbonisation of key infrastructure) • Development Finance Institutions (e.g. DBSA, IDC) (concessional and blended finance for mitigation projects) • Carbon Tax and Regulatory Incentives (steering investment in cleaner technologies and industrial decarbonisation)	• Industry Decarbonisation (investments in energy efficiency, fuel switching, process innovation by mining, steel, cement, etc.) • Private Low-Carbon Infrastructure Projects (e.g. green buildings, clean transport, distributed energy systems) • Green Bonds and Sustainability-Linked Loans (private capital instruments linked to emissions reduction targets) • Private Equity and Climate Venture Funds (supporting scalable mitigation solutions and green innovation)	**Equity**: Private equity, venture capital
Integration of Means of Implementation in Sectoral Masterplans	• Lead evaluation of investment and implementation needs for 2030–2035 and beyond; mandate updating of sectoral masterplans (in alignment with the SETs) to include detailed Means of Implementation components (finance, technology, skills, institutional capacity); coordinate planning across DFFE, National Treasury, DMRE and DTIC. • Evaluate alignment of increased NDC ambition with sectoral masterplans' decarbonisation	• Provide updated technology roadmaps, cost projections, and investment signals to inform sectoral plans; co-develop implementation pathways with public agencies.	Grants and concessional finance to support planning and capacity building; commercial finance for scalable pilots aligned with sectoral pathways.

Means of Implementation Function	Public Sector Instruments / Roles	Private Sector Instruments / Roles	Grants/Debt/Equity
	timelines, localisation incentives, technology innovation, and low-carbon skills development.		
Municipal implementation	• National Treasury Support (e.g. Local government fiscal reform, climate budget tagging, performance-based grants) • DFFE (policy guidance, coordination of municipal adaptation planning, reporting obligations) • Technical Assistance Facilities (e.g. Just Transition grant window, GIZ, DBSA project preparation support for municipalities) • Municipal Climate Strategies and Plans (including IDPs, SDFs, and climate-resilient infrastructure plans)	• Public-Private Partnerships (PPPs) (delivery of climate-smart infrastructure and services, e.g. energy efficiency retrofits, waste-to-energy) • Implementation Contractors (engineering, construction, O&M companies delivering municipal climate projects) • Consultants and Advisory Services (supporting feasibility studies, MRV, project preparation, capacity building) • Technology and Service Providers (e.g. providers of metering, digital MRV platforms, electric vehicle charging, etc.)	**Grants**: Just Transition support; project preparation **Debt**: Municipal borrowing, blended models **Equity**: N/A
Carbon market development	• Carbon Tax Offset Allowance (set by National Treasury under the Carbon Tax Act) • Framework for Approval of Domestic Standards (regulatory clarity for offsets) • Article 6 Framework (including host country authorisation and corresponding adjustments) • National Carbon Registry (credit issuance, tracking, retirement – usually state-run)	• Project Developers and Aggregators (including consultancy firms, NGOs, community enterprises) • Carbon Credit Buyers (local emitters under the carbon tax, corporates seeking voluntary offsets) • Voluntary Carbon Market Participants (brokers, standards bodies, verifiers, certifiers)	**Grants**: Capacity-building for communities; technical assistance for pipeline development **Debt**: Offset-financed infrastructure (e.g. waste, renewable energy, etc.) **Equity**: Upstream investment in offset-generating assets

Means of Implementation Function	Public Sector Instruments / Roles	Private Sector Instruments / Roles	Grants/Debt/Equity
	• Regulatory Oversight and Policy Development (e.g. by DFFE, National Treasury) • MRV and Crediting Infrastructure (national systems to ensure integrity and reporting) • Public Carbon Market Funds or Facilities (to support early-stage or community-linked projects) • State-supported Trading Infrastructure (if a national exchange or clearinghouse is established)	• Trading Platforms / Exchanges (if privately operated) • Private Carbon Investment Funds (venture capital, climate funds investing in offset projects) • Technology Providers (MRV tools, digital registries, blockchain-based platforms)	
Institutional & technical capacity	• Training Programmes (delivered by national departments, SETAs, or development partners to build climate-related skills in government) • Monitoring & Evaluation (M&E) Systems (e.g. climate impact indicators, national M&E framework under the Climate Change Act) • National Climate Change Response Database (national system for collecting and managing climate action data across sectors and spheres) • DFFE Sector Support (technical and policy support to provinces, municipalities, and line departments for NDC implementation)	• Innovation by Private Consultancies ajd Academia (methodology development, advanced analytics, MRV system design, climate risk tools) • Research and Capacity Building by Universities and NGOs (supporting policy innovation, climate education, knowledge sharing platforms) • Third-Party Verification & Audit Services (ensuring data integrity and accountability across MRV systems)	**Grants**: Government training and technical assistance grants **Debt**: Limited **Equity**: N/A

Means of Implementation Function	Public Sector Instruments / Roles	Private Sector Instruments / Roles	Grants/Debt/Equity
Just Transition measures	• Social Protection Programmes (e.g. government-led income support, job placement, and skills development schemes for affected workers) • Municipal Grant Funding (targeted support for municipalities in high-transition-risk areas to implement inclusive development initiatives) • JTFM (public and blended funding facility supporting socially inclusive projects and community resilience)	• Corporate Retraining (re-skilling and redeployment initiatives by companies transitioning away from high-emitting operations) • Local Procurement (private sector sourcing strategies to support local businesses and stimulate economic diversification in transition-affected regions)	**Grants**: Community enterprise grants; skills funds **Debt**: JTFM co-financing, project loans **Equity**: Social impact funds
Data, tracking, transparency	• National Climate Change Response Database (central platform for tracking climate actions and outcomes across government and sectors) • MRV Systems (national and sectoral systems for emissions and performance tracking aligned with the Enhanced Transparency Framework) • South African Green Finance Taxonomy (standardised classification system for identifying environmentally sustainable investments) • Climate Budget Tagging (mechanism under development by National Treasury to track climate-related public expenditure)	• Reporting Alignment with International Standards (e.g. Sustainability Accounting Standards Board, Task Force on Climate-related Financial Disclosures) • ESG-Linked Finance (private investment instruments tied to environmental, social, and governance performance, requiring robust reporting frameworks)	**Grants**: Technical Assistance for systems development and integration **Debt**: Funded via donor loans, systems upgrades **Equity**: N/A

This table underscores the differentiated yet complementary roles of the public and private sectors across the Means of Implementation. The public sector plays a foundational role in areas where commercial returns are limited or long-term, such as adaptation, institutional capacity, data systems, and equitable service delivery. In contrast, private sector involvement becomes more pronounced in areas with clearer revenue potential or cost recovery models, including renewable energy, industrial decarbonisation, and carbon markets.

The table also illustrates how different financing instruments support distinct aspects of the implementation landscape. Grants are particularly important for enabling social equity, supporting municipal and community-level initiatives, and catalysing early-stage or high-risk projects, especially in adaptation and Just Transition contexts. Concessional and blended debt remains the dominant vehicle for financing large-scale infrastructure and early stage mitigation interventions, given the risk involved. While equity plays a more limited role overall, it plays a critical and large role in scaling commercial technologies such as renewable energy, batteries and electric vehicles.

Together, these insights reaffirm the importance of a mixed-instrument and multi-actor approach, tailored to the unique risks, returns, and developmental co-benefits of each implementation domain.

5 Conclusions

South Africa's 2035 NDC must speak with precision, ambition, and credibility. Drawing on the evidence in this report, the following recommendations set out the specific procedural steps and substantive content changes proposed to close the identified gaps and put the country on a well below 2°C-aligned, climate-resilient, and just development pathway:

1. Commit to a 2035 NDC emissions target range of 248 - 329 MtCO aligned with emissions levels that represent South Africa's 2035 fair share contribution to the global mitigation effort.
2. Run an inclusive NDC process informed by all economic clusters. Mandate active roles for National Treasury, DTIC, COGTA and line departments; align with the gazetted Climate Change Act trajectory, the LEDS, SETs and NDP; and integrate climate targets into the Medium-Term Strategic Framework and public-procurement processes. Mandate updating of sectoral masterplans (in alignment with the SETs) to include detailed Means of Implementation components (finance, technology, skills, institutional capacity). Evaluate alignment of increased NDC ambition with sectoral masterplans' decarbonisation timelines, localisation incentives, technology innovation, and low-carbon skills development.
3. Centre the just transition on economic diversification. Accelerate value chains for renewable-energy equipment, electric-vehicle and battery manufacturing, green hydrogen, regenerative agriculture, the circular economy and biodiversity-based enterprises, with priority support for SMMEs and coal-region green industrialisation.
4. Decarbonise while safeguarding employment and growth. Increase the roll-out of renewable energy in the electricity sector and promote shifts to electrified and modal-shift transportation in the transport sector.
5. Embed systemic adaptation by reforming priority systems: water, food/agriculture and the built environment. Use the Anticipate-Adapt-Recover framework and implement a requirement for climate risk and vulnerability assessments in spatial plans.
6. Implement a dedicated adaptation finance facility inside the CCRF or JTFM. Blend grants, concessional loans and private capital to finance resilient infrastructure, ecosystem-based solutions and community projects, supported by clear eligibility criteria and a robust project pipeline.
7. Introduce climate budget tagging across all spheres of government, with transparency of mitigation, adaptation and just-transition spending in the national and provincial budgets, tying future allocations to climate-aligned Integrated Development Plans.
8. Create a single public dashboard for transparency and adaptation management. Integrate the NCCIS and SETs reporting into an open platform tracking emissions, resilience indicators, finance flows and diversification metrics, with annual progress reports and interim milestones for 2032 and a formal review in 2035.
9. Close the municipal implementation gap. Ring-fence technical assistance grants for climate risk assessments, early-warning systems and resilient service delivery, conditional on updated IDPs and vulnerability-based project pipelines.

10. Strengthen the domestic carbon market and Article 6 readiness. Align carbon tax phases and ITMO authorisation procedures. This will enable private sector investment in mitigation projects and priority should be placed on these projects that have adaptation benefits as well.

Implementing these measures can transform the 2035 NDC from a pledge into a structured investment and governance blueprint, one that can withstand international scrutiny, drive inclusive economic renewal, and safeguard South Africa's people and ecosystems against escalating climate risks.

Appendix 1: 2021 Updated NDC vs. NDP2030

Topic	NDP 2030 Focus Area	NDC 2021	Identified Gaps
Compatibility of Emission Reduction Targets with NDP Socio-Economic Goals	Economic Growth (5.4% annual GDP target)	NDC emphasizes renewable energy expansion (e.g., Integrated Resource Plan 2019), which could stimulate growth in green industries	The NDC contributes to South Africa's socio-economic development goals, as outlined in the NDP 2030 and the Economic Reconstruction and Recovery Plan, by promoting green industrialisation, renewable energy expansion, and climate-resilient infrastructure. While the NDC supports broader job creation objectives through its just transition framework, detailed employment strategies, regional economic diversification plans, and poverty alleviation measures are primarily addressed through complementary national development policies, including the NDP and the Presidential Climate Commission's Just Transition Framework. However, recent economic performance highlights the scale of the challenge: South Africa's average GDP growth has remained close to 1% annually, and unemployment reached 32.9% in 2024, sharply diverging from the NDP's targets of 5.4% growth and 6% unemployment by 2030. These figures underscore the urgency of ensuring that NDC-aligned investments in renewable energy, green manufacturing, and adaptation projects are strategically leveraged to contribute to tangible employment creation and inclusive economic growth.
	Job Creation (11 million new jobs)	NDC's just transition framework aims to reskill workers for renewable energy (e.g., solar, green hydrogen) and electric vehicles.	The NDC supports the broader objective of job creation through its just transition commitments but does not set quantified employment targets. Detailed sectoral job creation strategies and economic diversification plans are referenced to complementary national development frameworks such as the NDP 2030 and the Presidential Climate Commission's Just Transition Framework.

Topic	NDP 2030 Focus Area	NDC 2021	Identified Gaps
	NDC's adaptation investments (e.g., climate-resilient infrastructure) align with NDP's social wage and public services objectives.	NDC's adaptation investments (e.g., climate-resilient infrastructure) align with NDP's social wage and public services objectives.	The NDC supports poverty alleviation indirectly through adaptation investments that enhance resilience and access to public services but does not set direct poverty reduction targets. Financing for these measures is contingent on international climate finance, with funding strategies to be operationalised through national development and fiscal planning frameworks.
	Equitable Development	NDC highlights "just transition" principles to protect vulnerable communities during energy shifts.	The NDC advances equitable development through its focus on protecting vulnerable groups during the transition but does not address broader redistributive mechanisms such as land reform or housing, which fall within the scope of national development policies like the NDP 2030.
Support for NDP Infrastructure and Industrial Priorities	Energy Security	NDC prioritizes renewable energy (28 GW new capacity by 2030) and grid modernization, aligning with NDP's Infrastructure Plan 2050.	The NDC aligns with the NDP's energy security objectives by promoting renewable energy and grid upgrades but is dependent on the effective implementation of programmes such as the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP). Delays in these programmes could undermine energy security targets critical for economic growth.
	Industrial Transformation	NDC supports green hydrogen and electric vehicle manufacturing, which could diversify the economy	The NDC promotes industrial diversification through support for emerging sectors like green hydrogen and electric vehicles. However, it does not explicitly integrate these initiatives with the NDP's Industrial Policy Action Plan or broader sectoral strategies. This creates a risk of fragmented industrial development, with climate-aligned sectors growing in parallel rather than in synergy with national industrialisation goals. Stronger alignment is needed to ensure that green industrialisation is fully embedded within South Africa's broader economic transformation agenda.

Topic	NDP 2030 Focus Area	NDC 2021	Identified Gaps
	Human Settlements	NDC's adaptation measures (e.g., climate-resilient housing) align with NDP's goal to retrofit historic spatial patterns.	The NDC supports the NDP's objective of creating climate-resilient and inclusive human settlements. However, it does not explicitly align with broader housing finance reforms proposed in the NDP, such as expanding title deed transfers, supporting affordable housing, or scaling up social rental programs. Without stronger integration with these reforms, the climate resilience measures risk operating in isolation from the NDP's broader human settlement transformation agenda.
Coal Dependency vs. Decarbonization	NDP 2030 emphasizes maintaining energy security to support economic growth, with planned investments in new coal-fired power stations (e.g., Kusile) to ensure baseload capacity.	The NDC 2021 sets more ambitious emission reduction targets (350–420 $MtCO_2e$ by 2030) and supports a transition toward lower-carbon energy sources, but does not explicitly define a coal phase-out timeline or plant retirement schedules.	There is a clear conflict between the NDP's reliance on coal for energy security and the NDC's decarbonisation goals. South Africa's energy system remains heavily dependent on coal, with approximately 80% of electricity generated from coal-fired power stations operated primarily by Eskom. Although the NDC commits to a lower-carbon energy future, recent policy signals suggesting the possible extension of coal plant lifetimes could further undermine both the NDC's emissions targets and the NDP's long-term energy security aspirations. Without a managed transition plan, continued investment in coal risks entrenching carbon lock-in and delaying critical progress. Resolving this tension requires accelerating coal plant retirement schedules, scaling up renewable energy deployment, and linking the transition to regional economic diversification strategies, particularly for coal-dependent areas such as Mpumalanga.
Funding Misalignment	NDP 2030 relies on coordinated budgeting through frameworks like the Medium-Term Expenditure Framework (MTEF) to fund infrastructure, social	The NDC 2021 estimates a need for approximately USD 8 billion per year in international climate finance to achieve its mitigation and adaptation targets but	The NDC's external climate finance expectations are not yet fully embedded within South Africa's domestic fiscal frameworks. This creates a risk that climate action funding could compete with critical national priorities such as social grants, infrastructure development, and economic recovery efforts. The urgency of mainstreaming climate finance into national budgeting processes has grown, particularly in the wake of the COVID-19 pandemic, which intensified fiscal pressures

Topic	NDP 2030 Focus Area	NDC 2021	Identified Gaps
	protection, and development priorities, balancing limited fiscal resources.	does not detail how climate finance requirements will be integrated into domestic budget planning.	through expanded social protection measures and increased demands on public investment. Continued reliance on uncertain external climate finance flows risks undermining both climate objectives and broader development goals. Integrating climate finance systematically into South Africa's Medium-Term Expenditure Framework and other national budget instruments is essential to ensure predictable, sustained funding for the implementation of the NDC and the achievement of the NDP's social and economic priorities.
Institutional Fragmentation	NDP 2030 emphasises integrated, coordinated governance across departments to drive national development priorities and improve policy coherence. Strong institutional capacity and streamlined decision-making are identified as critical enablers	The NDC 2021 is led by the DFFE, focusing on climate policy and international obligations, but is not fully embedded within broader economic and development governance structures overseen by the Presidency.	Fragmentation between climate policy leadership (driven by the DFFE) and broader national planning (coordinated by the Presidency) has created persistent coordination gaps, weakening the integration of climate and development priorities. The slow finalisation and only partial implementation of the Climate Change Act have further undermined the early enforcement of NDC targets and delayed progress toward the NDP's governance reform goals. These challenges are compounded by weak interdepartmental collaboration, which has contributed to broader service delivery backlogs and hindered the alignment of climate objectives with national development efforts. Strengthening cross-sectoral governance, accelerating the full implementation of the Climate Change Act, and embedding climate action systematically across all spheres of government are critical steps to ensure the effective realisation of both the NDC's mitigation and adaptation commitments and the NDP's broader socio-economic transformation agenda.

Appendix 2: 2021 Updated NDC vs. UAE Consensus

Topic	UAE Consensus	NDC 2021	Identified Gaps
Mitigation Ambition and Scope	Mandates economy-wide absolute emission targets aligned with 1.5°C, including sector-specific pathways (e.g., 79% reduction in building-sector emissions by 2035)[205]	Sets a 2030 emissions range of 350–420 $MtCO_2e$ (19–32% below 2010 levels), rated "Insufficient" by Climate Action Tracker	South Africa's targets lack the UAE's sectoral granularity and whole-of-economy integration. The NDC does not explicitly link its 2030 targets to its 2050 net-zero goal
Renewable Energy and Energy Efficiency	Calls for tripling renewable energy capacity and doubling energy efficiency globally by 2030[206]	Mentions renewable energy expansion but lacks quantified targets (e.g., no tripling roadmap). The Integrated Resource Plan 2019 retains coal dependent	South Africa's NDC omits explicit renewable energy/efficiency benchmarks aligned with COP28 targets, risking misalignment with global goals
Fossil Fuel Transition	Urges a "just, orderly, equitable" fossil fuel phase-out, with UAE NDC 3.0 targeting net-zero by 2050 via sectoral decarbonization[207]	Acknowledges coal dependency but lacks a coal phase-out timeline. New coal plants (e.g., Kusile) still underpin energy plans	South Africa's NDC avoids explicit fossil fuel transition language, retaining ambiguity on coal retirement and gas expansion
Adaptation and Finance	Emphasizes scaled adaptation finance and operationalized loss/damage funding	Allocates USD 3–4 Billion for adaptation (2021–2030) but lacks clarity on sourcing funds or linking to international mechanisms	South Africa's adaptation plans are underfunded and lack integration with global financial frameworks (e.g., Loss and Damage Fund)

[205] PCC. 2023. Recommendations from the PCC on South Africa's Electricity System. Presidential Climate Commission.

[206] PCC. 2022. Putting climate-resilient development pathways into practice: Climate information and services. Presidential Climate Commission.

[207] PCC. 2023. Recommendations from the PCC on South Africa's Electricity System. Presidential Climate Commission.

Topic	UAE Consensus	NDC 2021	Identified Gaps
Just Transition Mechanisms	Operationalizes a Just Transition Work Programme, prioritizing workforce reskilling and community engagement[208]	Highlights "just transition" principles but lacks actionable plans for coal-dependent regions (e.g., Mpumalanga)	South Africa's NDC does not specify timelines, funding, or institutional frameworks for transitioning coal workers
Legal and Implementation Frameworks	Supported by binding laws (e.g., Federal Decree-Law No. 11/2024) and institutionalized stakeholder engagement[209]	Relies on non-binding policies (e.g., Carbon Tax) and delayed enactment of the Climate Change Bill	Lacks enforceable compliance mechanisms, risking implementation delays
Methodological Transparency	Uses 2019 baseline data and sector-specific modelling for targets[209]	Inconsistent baseline references (e.g., 2010 vs. 2017) and opaque Land Use, Land Use Change and Forestry (LULUCF) accounting	Discrepancies in methodologies hinder comparability and accountability

208 *PCC. 2023.* Electricity planning and recommendations report. *Presidential Climate Commission.*

209 *DFFE. 2024*. South Africa's 1st Biennial Transparency Report to the UNFCCC. *Department of Forestry, Fisheries and Environment.*

Appendix 3: LEDS 2020 vs. 2021 Updated NDC

Topic	LEDS 2020	NDC 2021	Identified Gaps
Alignment of Timeframes and Long-Term Vision	The LEDS articulates a clear long-term vision for achieving a net-zero carbon economy by 2050. It follows a phased approach with emissions peaking by 2025, plateauing between 2026 and 2035, and declining thereafter.[210]	The 2021 NDC explicitly references the LEDS as its guiding long-term strategic framework and confirms that its 2025 and 2030 targets are informed by the LEDS' vision. It sets ambitious near-term targets, aiming to reduce emissions to a range of 350–420 $MtCO_2e$ by 2030. However, it remains primarily focused on the 2025 and 2030 milestones and does not establish explicit interim targets beyond 2030, creating uncertainty about the trajectory toward the 2050 net-zero goal.	Although the NDC explicitly acknowledges the LEDS as its long-term strategic reference, it does not establish clear interim milestones between 2030 and 2040. This creates ambiguity about how near-term commitments are intended to progress toward the 2050 net-zero goal. Strengthening the NDC by introducing explicit interim targets would improve alignment with the LEDS, enhance policy coherence, and support a more credible and structured decarbonisation pathway.
Sectoral Ambition and Specificity	Proposes detailed Sectoral Emission Targets (SETs), emphasising energy transition measures such as renewable energy expansion, coal phase-down strategies, and sector-specific mitigation interventions.[210]	Sets economy-wide emissions targets for 2025 and 2030 but lacks detailed sector-specific emissions pathways. While referencing sectoral policies (e.g., IRP 2019, Green Transport Strategy), it does not establish clear sectoral emission targets or quantified reductions for energy, transport, industry, agriculture, forestry and other land use (AFOLU), and waste sectors.	The absence of explicit sector-specific pathways limits the ability to assess how each major sector will contribute to national emissions reductions. To enhance alignment with the LEDS, the next NDC update should develop clear, sector-specific emissions pathways, detailing how energy, transport, industry, AFOLU, and waste sectors will achieve their share of the reductions.

[210] DFFE. 2020. *South Africa's Low-Emission Development Strategy 2050.* Department of Forestry, Fisheries and Environment.

Topic	LEDS 2020	NDC 2021	Identified Gaps
Legal and Implementation Frameworks	visions a regulatory framework linked explicitly to the Climate Change Bill (now Act), proposing mandatory carbon budgets, sectoral emissions targets, compliance mechanisms, and robust governance arrangements.[211]	Highlights the establishment of governance structures such as the Climate Change Bill (now enacted as the Climate Change Act) and the Presidential Climate Commission to oversee the just transition and mitigation efforts. However, it continues to rely heavily on voluntary policy measures (e.g., carbon tax) and does not clearly set out binding sectoral obligations.	Although important governance structures have been established, the NDC lacks clarity on the transition from voluntary to legally binding measures. To fully align with the LEDS and the 2024 Climate Change Act, the next NDC must clearly define mandatory carbon budgets, sector-specific emissions targets, and enforcement mechanisms to strengthen legal accountability.
Adaptation and Resilience Integration	Focuses primarily on mitigation, with very limited attention to adaptation or resilience-building measures.[211]	Provides a significantly expanded adaptation component compared to the LEDS, identifying adaptation priorities, sector-specific actions, and indicative financial requirements (USD 6 billion estimated for 2021–2030). However, mitigation and adaptation actions are largely presented separately, without clear integration or cross-sectoral planning.	While the NDC substantially strengthens adaptation planning compared to the LEDS, both documents treat adaptation and mitigation as parallel rather than integrated strategies. Future NDC updates should explicitly develop integrated adaptation–mitigation strategies, enhancing long-term resilience, maximising co-benefits, and reducing socio-economic vulnerability, especially for at-risk communities.
Financial and Technical Support Frameworks	Explicitly recognises the critical role of international finance, technology transfer, and capacity-building for achieving mitigation and adaptation targets. Anticipates that implementation will	Sets a clear expectation for international financial support of at least USD 8 billion per year by 2030. However, it provides limited detail on domestic financial mobilisation strategies, allocation	While the NDC establishes a clear international finance target, it lacks a detailed financial mobilisation strategy. Future NDC updates should outline specific domestic and international

[211] DFFE. 2020. *South Africa's Low-Emission Development Strategy 2050.* Department of Forestry, Fisheries and Environment.

Topic	LEDS 2020	NDC 2021	Identified Gaps
	depend heavily on securing external funding support.[212]	mechanisms, or concrete plans to access international climate finance.	funding mechanisms, financing pathways, and mobilisation plans to support implementation, particularly to address the long-term investment needs identified by the LEDS.
Methodological Transparency and Consistency	Provides historical emission baselines and projections but lacks detailed methodological explanations, including specific assumptions, modelling frameworks, and clarity on Global Warming Potential (GWP) values used.[212]	Presents economy-wide emissions targets and trajectories but does not provide full methodological transparency. Details on baseline assumptions, sectoral modelling approaches, and GWPs used for calculations are limited or unclear.	Both the LEDS and the NDC show methodological transparency limitations, particularly regarding baseline definitions, sectoral projections, and GWP assumptions. Future updates must enhance consistency by clearly aligning emissions accounting methodologies across LEDS and NDC documents, ensuring comparability, credibility, and clarity.
Just Transition and Social Considerations	Emphasises the principle of a just transition, including support for workforce reskilling, social protection, and economic diversification in coal-dependent regions. However, it provides only broad guidance without specific timelines or detailed implementation strategies.[212]	Strongly reinforces the commitment to a just transition, referencing the role of the PCC and the need for social dialogue. However, it lacks concrete, time-bound plans for vulnerable sectors and communities most affected by the energy transition.	While both documents prioritise a just transition, neither provides detailed, actionable plans for implementation. Future NDC updates should articulate specific policy and investment actions to support affected workers, sectors, and communities, ensuring practical realisation of equity and social justice principles.

[212] DFFE. 2020. *South Africa's Low-Emission Development Strategy 2050.* Department of Forestry, Fisheries and Environment.

Appendix 4: 2021 Updated NDC vs. the First Biennial Update Report

Topic	NDC 2021	2024 BTR1	Identified Gaps
Alignment of Targets and Progress Tracking	Sets 2025 (398–510 $MtCO_2e$) and 2030 (350–420 $MtCO_2e$) economy-wide targets, excluding emissions from natural disturbances in the land sector	Reports 2022 GHG emissions at 464 $MtCO_2e$ (excl. LULUCF), within the 2025 target range but exceeding the 2030 upper limit.	The BTR1 shows early progress toward 2025 targets but highlights a significant gap for 2030. Current policies may not suffice to meet the 2030 target, requiring accelerated mitigation.
Sectoral Coverage and Methodological Consistency	Covers Energy, IPPU, AFOLU, and Waste sectors, using 2006 IPCC Guidelines and SAR GWPs.	Adopts 2019 IPCC Refinement and AR5 GWPs, improving LULUCF reporting (now a net sink of 43,181 $GtCO_2e$ in 2022).	Discrepancies in GWP values and land-sector accounting create challenges for tracking NDC targets against historical data. Recalculations reduced Energy sector emissions by 14,294 $GtCO_2e$ (2007–2022), but baseline inconsistencies remain.
Policy Implementation and Monitoring	Relies on 28 key policies (e.g., Carbon Tax, REIPPPP, Climate Change Act) to meet targets.	Identifies 28 mitigation policies but lacks aggregated GHG reduction estimates due to inconsistent methodologies and data gaps.	No comprehensive analysis of cumulative policy impacts. Critical policies like the Just Energy Transition Investment Plan (JET-IP) are noted but not yet quantified.
Financial and Technical Support	Assumes USD 8B/year international support by 2030 for implementation.	Reports USD 816.9 Million received (2021–2022), mostly as loans (72%), with limited grants (28%). Adaptation projects remain underfunded.	Funding falls short of NDC requirements. Lack of clarity on how bilateral/multilateral support aligns with sectoral needs (e.g., coal phase-out, grid modernization).
Adaptation and Loss/Damage Reporting	Allocates USD 3–4B for adaptation (2021–2030), prioritizing water,	The total identifiable adaptation finance from BTR, including both explicitly adaptation-labelled and cross-cutting projects with adaptation components, amounts to USD	Adaptation finance gap exceeds 90%. Local governments lack capacity to implement the National Climate Change Adaptation Strategy due to funding and skills shortages. No quantified

Topic	NDC 2021	2024 BTR1	Identified Gaps
	agriculture, health, and settlements.	7,640,209, with limited integration of indigenous knowledge and gender-responsive approaches.	loss/damage framework despite R113 Billion (~USD 6.8 Billion) in climate-related losses since 1980.
Institutional and Legal Frameworks	Envisions mandatory carbon budgets and Sectoral Emission Targets (SETs) under the Climate Change Act.	Climate Change Act enacted, but only partially implemented. SETs and carbon budgets not yet implemented. Provincial/local governance structures (e.g., Municipal Forums) delayed until 2025.	Weak enforcement mechanisms risk implementation delays. Limited coordination between national and subnational entities hinders policy rollout.
Transparency and Public Engagement	Commits to inclusive stakeholder participation in NDC implementation	Conducted hybrid consultations but lacks metrics for tracking gender/youth engagement or just transition outcomes.	No disaggregated data on job creation/losses in coal-dependent regions (e.g., Mpumalanga). Limited public access to the National Climate Change Information System.