

South Africa's Intended Nationally Determined Contribution (INDC)

Introduction

In accordance with decision 1/CP.19 and 1/CP.20 of the Conference of the Parties to the United Nations Framework on Climate Change, South Africa hereby submits its intended nationally determined contribution (INDC) on adaptation, mitigation as well as finance and investment requirements for both. This INDC has been developed on the understanding that the Paris Agreement will be binding, fair, effective and incorporate a “no-backsliding” and a “progressive” approach to enhance climate change mitigation and adaptation implementation and ambition. This implementation and ambition will be enabled by finance and technology and capacity building support. In this context, South Africa has transitioned its international mitigation commitment from a relative “deviation from Business-as-usual” to an absolute peak, plateau and decline greenhouse gas emissions trajectory range.

South Africa is committed to addressing climate change based on science and equity. Climate change is already a measurable reality, and is primarily as a result of the rising concentration due to human induced cumulative emissions of long-lived greenhouse gases (GHG) in the atmosphere since the industrial revolution in the mid 1800's. South Africa has observed and is projecting further trends of marked temperature increases, rainfall variation and rising sea levels as well as an increased frequency of severe weather events. South Africa's response is informed by the findings of the Intergovernmental Panel on Climate Change (IPCC) that warming of the climate system is unequivocal, and the understanding that further mitigation efforts by all are needed to avoid high to very high risk of severe, widespread, and irreversible impacts globally. However, irrespective of any adequate mitigation efforts, the IPCC also concludes that, due to the inertia and long response time lags in the global climate system, adverse impacts of climate change are inevitable. Given that poor countries and communities have the least responsibility for the challenge of global climate change but are the most vulnerable to its impacts, adaptation to the adverse effects of climate change is also a global responsibility and concern.

The nature of the climate change challenge is one characterised by the overuse of a global commons in an unequal world. Along with other developing countries, South Africa is especially vulnerable to its impacts, particularly in respect of water and food security, as well as impacts on health, human settlements, and infrastructure and ecosystem services. In this regard, South Africa is committed to cooperative efforts to adapt to the unavoidable adverse impacts of climate change. With regard to an ultimate solution to the global challenge of climate change, South Africa is firmly committed to working with others to ensure temperature increases are kept well below 2°C above pre-industrial levels, which could include a further revision of the temperature goal to below 1.5°C in light of emerging science, noting that global average temperature increase of 2°C translates to up to 4°C for South Africa by the end of the century.

This temperature goal is an essential starting point for our INDC, and we believe this goal should inform all countries' contributions – in relation to both adaptation and mitigation. More and earlier mitigation means fewer unavoidable impacts, lessening the requirement for adaptation investment. Near zero emissions of CO₂ and other long-lived GHGs are needed in the second half of the century to avoid even greater impacts that are beyond adaptation capability. The solution must lie in collective action.

Context: National Priorities and Circumstances

South Africa's national response considers both development needs and climate change imperatives. South Africa faces the challenge of climate change as a developing country, with overriding priorities to eliminate poverty and eradicate inequality. Eliminating poverty and eradicating inequality requires addressing major challenges in creating decent employment, which in turn requires sustainable economic development, improving basic education, health and social welfare and many other basic needs such as access to food, shelter and modern energy services. In addition, South Africa is presently facing acute energy challenges that hamper economic development. As a result of the historical development pathway of its energy sector, South Africa is currently heavily dependent on coal, with a fleet of old and inefficient coal-fired power plants that are nearing, but not yet at, the end of their design life-cycles as well as being reliant on a significant proportion of its liquid fuels being generated from coal.

Therefore, in the short-term (up to 2025), South Africa faces significant rigidity in its economy and any policy-driven transition to a low carbon and climate resilient society must take into account and emphasise its overriding priority to address poverty and inequality. South Africa's INDC should be understood in the context of these and other national circumstances.

South Africa's INDC was formulated in the context of, *inter alia*, the environmental right set out in section 24 of the Constitution, and its National Development Plan (NDP) (NPC, 2012), which provides a '2030 vision' to guide the country's sustainable development trajectory where poverty is eliminated and inequalities are reduced by 2030. The implementation of the 2030 NDP vision is further elaborated in its climate policy (the 2011 National Climate Change Response Policy (NCCRP)), climate-compatible sectoral plans and its National Sustainable Development Strategy. Good progress has been made in implementing climate-compatible sectoral plans, such as the integrated energy and electricity plans (IEP and IRP), industrial policy action plans (IPAP) and the new growth path (NGP).

The full implementation of these policies and plans will bend the curve of South Africa's GHG emissions towards a peak, plateau and decline trajectory range. South Africa is putting in place a mitigation system to realise the opportunities of a low-carbon economy while being mindful that an inclusive and just transition requires time and well planned low-carbon and climate resilient development. In order to ramp up implementation of these policies and plans over time, South Africa is investing heavily in transforming its energy sector. At the heart of this part of the transition to a low-carbon energy sector is a complete transformation of the future energy mix, which is designed to replace an inefficient fleet of ageing coal-fired power plants with clean and high efficiency technology going forward. To date, we have facilitated substantial investment in renewable energy and two new high-efficiency coal-fired power stations are nearing completion as part of the ageing plant replacement programme. In addition, programmes to increase efficiency and reduce emissions intensity across the economy are being rolled out.

South Africa is developing a National Climate Change Adaptation Strategy and Plan to be integrated into all relevant sector plans, and upon which its UNFCCC National Adaptation Plan (NAP) will be based. This plan is informed by an assessment of sectoral, cross-sectoral and geographical vulnerabilities to the adverse impacts of climate change, and it will quantify and present pathways for adaptation, towards an inclusive and just transition to a climate resilient economy and society, taking into account local and indigenous knowledge, gender considerations, as well as social, economic and environmental implications. South

Africa considers its adaptation component of its INDC to be an important contribution to the global response to climate change.

Assumptions

South Africa's INDC is premised on the adoption of a comprehensive, ambitious, fair, effective and binding multilateral rules-based agreement under the UNFCCC at the 21st Conference of the Parties (COP21) in Paris. It is assumed that this agreement will attract the **full participation of all Parties to the Convention** and, consistent with scientific requirements in the short, medium and long term, deliver the necessary ambitious mitigation and adaptation commitments, enabled and **supported by significant climate finance** and investment, accessible and affordable technology and substantial capacity building commitments. South Africa expects the Agreement will include effective arrangements for transparency of action and support. It is further assumed that all of these commitments will give effect to the principles of equity and common but differentiated responsibilities and respective capabilities.

It is assumed that this agreement will provide the multilateral rule-based infrastructure, mechanisms and tools to enhance international and regional cooperation on mitigation. Further, that this cooperative effort enables and supports Parties' capability to transition to low carbon economies and societies in a manner that addresses the social, economic and environmental dimensions of their sustainable development.

The adverse effects of climate change have been a stark reality for South Africa for many years. The evidence clearly emphasises the need for Parties to build resilience and adaptive capacity to understand and respond to climate change risk and vulnerability, through developing and optimising climate change adaptation policy, planning, technology, practice and implementation coherence of developmental programmes and actions. It is assumed that the agreement will enhance international and regional cooperation on adaptation that enables and supports Parties capability to increasingly integrate adaptation into their climate resilient sustainable development planning and implementation processes, as well as to support their climate risk management, emergency and recovery responses to unavoidable climate and weather related adverse impacts.

Adaptation component of the INDC (A-INDC)

The adaptation component of South Africa's INDC will address adaptation through six goals, underpinned by key elements of adaptation planning, costing of adaptation investment requirements, equity, and means of implementation. The table below outlines information on the adaptation component of South Africa's INDC, based on the commitments of Parties provided for in Article 4 and the provisions of Article 12 of the Convention. This information enables Parties to meet commitments under Article 4.4 and the provisions of Article 12 of the Convention in relation to adaptation

Element	Undertaking for the period 2020-2030	Assumptions / Methodologies	Adaptation investment (2020 - 2030)
Adaptation objectives and	Goal 1: Develop a National Adaptation	National Development Plan Vision 2030, sector plans and any	\$US 0.17 ¹ bn per annum

¹ Currency exchange rate used is 10 South African Rand to 1 US dollar

Element	Undertaking for the period 2020-2030	Assumptions / Methodologies	Adaptation investment (2020 - 2030)
planning for implementation	<p>Plan, and begin operationalisation as part of implementing the NCCRP for the period from 2020 to 2025 and for the period 2025 to 2030</p> <p>Goal 2: Take into account climate considerations in national development, sub-national and sector policy frameworks for the period 2020 to 2030</p> <p>Goal 3: Build the necessary institutional capacity for climate change response planning and implementation for the period 2020 to 2030</p> <p>Goal 4: Develop an early warning, vulnerability and adaptation monitoring system for key climate</p>	<p>future variants thereof are the underpinning foundation for sustainable development planning in South Africa. The NCCRP provides guiding principles and will form the basis for the integrative NAP focused on vulnerable sectors and geographic vulnerabilities.</p> <p>Integrate flexible adaptation sector policies and measures into national and sub-national policy frameworks to enable implementation of climate change adaptation programmes and projects. Sector adaptation plans will be integrated into broader sector plans consistent with relevant sector planning or regulatory legislation.</p> <p>National and sub-national policy and legislation development and budget reprioritisation to enable institutional capability to plan and implement catalytic adaptation programmes and projects.</p> <p>Comprehensive adaptation related training of development planners, regulators and practitioners.</p> <p>Specific adaptation planning at sub-national level, taking into account specific or unique geographical circumstances, will be integrated into sub-national development frameworks, land use schemes and the planning authorisation system in terms of provisions of and standards set in the Spatial Land Use Management Act (SPLUMA).</p> <p>Development of national framework for early warning, vulnerability and needs assessment well before 2020.</p> <p>Develop and support a climate</p>	

Element	Undertaking for the period 2020-2030	Assumptions / Methodologies	Adaptation investment (2020 - 2030)
	vulnerable sectors and geographic areas for the period 2020 to 2030, and reporting in terms of the National Adaptation Plan with rolling five-year implementation periods	change early warning and vulnerability network with the involvement of relevant stakeholders, e.g. SA Weather Services, SA Earth Observation Network, the downscaling modelling and adaptation academic community etc.	
Adaptation needs and costs	Goal 5: Development of a vulnerability assessment and adaptation needs framework by 2020 to support a continuous presentation of adaptation needs	<p>Biennial study of climate related impacts and responses detect through the early warning, vulnerability and adaptation monitoring system, with a view to determine cost effectiveness of responses and recommend improved or alternative responses.</p> <p>Damage costs associated with severe climate related events (wild fires, storms, droughts and floods), including both direct and downstream costs were estimated for the present-day climate and for the near future under low and moderate-high mitigation scenarios.</p> <p>Emission scenarios considered are RCP 8.5 (low mitigation) and RCP 4.5 (moderate-high mitigation). The cost estimates provided are in terms of the 10th and 90th percentiles of annual costs occurring within the periods of interest.</p> <p>Annual costs were estimated for 2020-2030 and 2020-2050.</p> <p>Sectors covered; Water, Agriculture, Forestry, Energy, Settlements, Biodiversity, Disaster Risk Reduction (DRR)</p>	<p>Estimated annual costs range(s):</p> <p>From 1971-2000: \$US 0.4 bn to \$US 22.8 bn with a median value of \$US2.8 bn</p> <p>From 2020-2030: Low mitigation scenario: \$US 0.42 bn - \$US 30.8 bn with a median value of \$US2.9bn;</p> <p>Moderate-High mitigation scenario: \$US 3.4 bn - \$US 29.8 bn with a median value of \$2.8bn</p> <p>From 2020-2050: Low mitigation scenario: US\$ 0.2 bn - \$US 53.1 bn with a median value of \$US3bn</p> <p>High mitigation scenario: \$US 0.2 bn- \$US 50.0 bn with a median value of \$US50 bn</p>
Adaptation investments	Goal 6: Communication of past investments in adaptation for education and awareness as well as for international recognition	Development & implementation of a climate change adaptation communication, education and awareness framework, with a view to drive behaviour change based on the early warning and vulnerability assessments and studies of response effectiveness. Specific indicators for tracking outcomes and scale of domestic	Domestic investment into capacity to facilitate climate change adaptation increased from \$US 0.29 million to \$US 1.4 million from 2011 to 2015

Element	Undertaking for the period 2020-2030	Assumptions / Methodologies	Adaptation investment (2020 – 2030)
		<p>investment and any international support will be developed and reported.</p> <p>Adaptation investments were gleaned from official annual reports. The years covered are 2010 – 2015.</p>	<p>Implementation investment in adaptation programmes increased from \$US 0.71 bn to \$US 1.88 bn from 2010 to 2015.</p> <p>Support from the international financial mechanisms: Adaptation fund: \$10 Million; UNEP: \$3.5 Million</p>
Equity considerations in adaptation	<p>South Africa views adaptation as a global responsibility in the light of Article 2 of the Convention as further codified in the UNFCCC as a temperature goal. Further understanding climate impacts as being driven by global inaction / action on mitigation, the adaptation burden is therefore a global responsibility. It is in that light that South Africa considers its investments in adaptation as a contribution to the global effort, which should be recognised as such. Further information is provided in the equity section of the INDC.</p>		

Mitigation component of the INDC (M-INDC)

In keeping with South Africa's commitment to progress its contribution to the global effort to mitigate climate change in line with the principle of common but differentiated responsibilities and respective capabilities, South Africa's mitigation component of its INDC moves from a "deviation from business-as-usual" form of commitment and takes the form of a **peak, plateau and decline GHG emissions trajectory range**. South Africa's emissions by **2025 and 2030 will be in a range between 398 and 614 Mt CO₂-eq**, as defined in national policy. This is the benchmark against which the efficacy of mitigation actions will be measured. The table below outlines elements in para 14 of 1/CP.20, further specifying the mitigation component of South Africa's INDC:

Reference point (including, as appropriate, a base year)	Peak, plateau and decline (PPD) is a GHG emissions trajectory range after mitigation. The starting point for PPD considered here is 2020 year-end.
Time frames and / or periods for implementation	<p>The time-frames within the PPD trajectory range that are communicated in South Africa's INDC are 2025 and 2030, in which emissions will be in a range between 398 and 614 Mt CO₂-eq.</p> <p>The INDC reflects SA's full mitigation potential as assessed in 2014.</p> <p>The policy instruments under development include a carbon tax, desired emission reduction outcomes (DEROs) for sectors, company-level carbon budgets, as well as regulatory standards and controls for specifically identified GHG pollutants and emitters.</p> <p>South Africa will use five-year periods of implementation at the national level, specifically, 2016-2020 focused on developing and demonstrating the above mix of policies and measures in order to meet South Africa's</p>

	<p>Cancun pledge, and the periods 2021-2025 and 2026-2030 for this INDC. This level of effort will enable South Africa's greenhouse gas emissions to peak between 2020 and 2025, plateau for approximately a decade and decline in absolute terms thereafter.</p> <p>Periodic domestic reviews will ensure a dynamic system, in which the stringency of short-term carbon budgets can be adjusted in successive implementation periods to ensure that South Africa remains within the overall carbon budget, which is the area under the PPD trajectory range. Depending on the latest available science, the success of this mix of mitigation policies and measures, new accessible and affordable technology, increased capability and emerging mitigation opportunities the PPD trajectory range may also be adjusted, without compromising the overall ambition of South Africa's long-term contribution to the global mitigation effort.</p>
Scope and coverage	<p>Economy-wide, all sectors, six greenhouse gases (GHGs), with a material focus on three GHGs: carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O). Sources considered are the ones in the latest GHG inventory (see below). IPCC major categories: energy, IPPU, waste and AFOLU (agriculture, forestry and other land use).</p> <p>Increased disaggregation over time will be enabled through the introduction of mandatory GHG reporting domestically, no later than 2016, with regular reporting to the UNFCCC as multi-laterally agreed.</p>
Planning processes, assumptions and methodological approaches including those for estimating and accounting for anthropogenic greenhouse gas emissions and, as appropriate, removals	<p><i>Planning processes:</i> The approach to the current INDC is based on national climate policy (NCCRP) and the national development plan (NDP), and will be given effect through energy, industrial and other plans and legislation.</p> <p><i>Assumptions:</i> In accordance with the Convention, it is assumed that the extent to which developing country Parties will effectively implement their commitments will depend on the effective implementation by developed country Parties of their commitments under the Convention relating to financial resources, development and transfer of technology, and capacity building. The INDC is put forward within the context of equitable access to sustainable development and will take fully into account that equity, economic and social development and poverty eradication are the first and overriding priorities. In this context, South Africa's INDC assumes the finalisation of an ambitious, fair, effective and binding multilateral agreement under the UNFCCC at COP 21 in Paris that further elaborates these commitments.</p> <p><i>PPD trajectory range:</i> South Africa's NCCRP "details the 'peak, plateau and decline trajectory' used as the initial benchmark against which the efficacy of mitigation actions will be measured". This is the PPD trajectory range in the INDC. Values for key years are specified in the NCCRP.</p> <p><i>Mitigation potential:</i> Initial detailed studies of mitigation potential (2007) informed the foregoing, with a base year 2003 for projections; these have been updated (2014; base year 2010), with the intention of on-going updating and improvement.</p> <p><i>Methodologies for Estimating Emissions:</i> 2006 IPCC guidelines</p> <p><i>Metric applied:</i> 100-year Global Warming Potential, as in the IPCC's 4th Assessment Report (AR4). Note that the current GHG inventory, consistent with the 2006 IPCC guideline reporting requirements, used GWPs from the Third Assessment Report (TAR) and indicated that future inventories will use GWP values from AR4.</p>

	<p><i>Approach to AFOLU:</i> Agriculture, forestry and other land use (AFOLU) are included as one of the major IPCC categories. The greater uncertainty in AFOLU emissions should be noted, as well as the intention to reduce uncertainty over time.</p>
How the Party considers that its intended nationally determined contribution is fair and ambitious, in light of its national circumstances, and how it contributes towards achieving the objective of the Convention as set out in its Article 2	<p>A relative fair share of aggregate commitments required to limit temperature increase to well below 2°C above pre-industrial levels requires understanding of what others will do, and an equitable effort-sharing paradigm, such as the proposal for the Paris agreement to elaborate an equity reference framework.</p> <p>In the absence of a multi-laterally agreed equity reference framework, South African experts, applying Convention principles of responsibility, capability and access to equitable sustainable development, determined a carbon budget that is larger than the PPD trajectory range outlined in this INDC. South Africa has used this evidence base to evaluate whether its INDC is a relative fair effort. In the context of this objective assessment of South Africa is of the view that its contribution is both fair and ambitious.</p> <p>The PPD trajectory range is an ambitious and fair effort in the context of national circumstances, and priorities to eliminate poverty and inequality, promote inclusive economic growth and reduce unemployment. It presents a trajectory that is consistent with a just transition to a low carbon and climate-resilient future.</p> <p>South Africa is committed to a response to climate change based on science and equity, which has informed this INDC and will continue to inform our climate change response.</p> <p>We consider that equity applies to mitigation, adaptation and support for both. Hence further details on equitable access to sustainable development are outlined below.</p> <p>IPCC AR5 has provided relevant scientific information on the limited remaining future global carbon budget consistent with achieving the objective of the Convention as set out in its Article 2. Within the context of the Convention principles of equity and common but differentiated responsibility South Africa's shift from a "deviation from business-as-usual" commitment to a peak, plateau and decline GHG emissions trajectory range in its INDC fully aligns with the IPCC AR5 future global carbon budget. Carbon budgets are an important form of flexibility at the national level; if emissions are below the benchmark trajectory range in a given year, they can exceed it in another year.</p>

Support component of INDC (S-INDC)

The key challenge for South Africa is to catalyse, at an **economy-wide** scale, financing of and investment in the transition to a low carbon and climate resilient economy and society. In this context, South Africa's S-INDC comprises indicative scales of finance and investment required for both adaptation and mitigation, based on analyses of specific sectors and initiatives. The finance and investments are required to enable and support the deployment of low carbon and adaptation technology as well as building the capacity to govern, regulate, install and operate these technologies.

South Africa has already investing about 6% of what would be the upper end of the costs of its adaptation per annum for the period 2021 to 2030. Since 2010 South Africa has invested



in adaptation, with an increasing national capacity building expenditure over time from US\$0.28m in 2010 to US\$1.2m in 2015 per year. Over the same period, the total annual investment in implementation increased from US\$0.18 to US\$0.59 bn per year in the Agriculture and Forestry sectors; from US\$ 0.23bn to US\$0.36 bn in the Energy sector, from US\$0.01 bn to US\$ 0.02 bn in Human Settlements sector; from US\$ 0.03 bn to US\$ 0.05 bn in Biodiversity sector; from US\$ 0.17 bn to US\$ 0.59 bn in the Water sector; and from US\$0.02 bn to US\$ 0.7 bn in the disaster risk reduction and emergency response sector. The total investment in adaptation therefore increased from US\$ 1.64 bn in 2010 to US\$ 2.31 bn in 2015.

Some of the key programmes that will have to be scaled up further, include:

1. Working for Water (WfW) and Working on Fire estimated at US\$1.2 bn per year.
2. Working on Wetlands estimated at US\$0.12 bn per year.
3. Water Conservation and Demand Management estimated at US\$5.3 bn per year.
4. Land restoration estimated at US\$0.07 bn per year.

South Africa seeks recognition of its national investments in adaptation as part of its relative fair global effort and analysis of future scenarios indicate a significant increase in requirements. For the period 2021-2030 relative to 1971-2000, under RCP8.5 (low mitigation), an increase of 4% in the median of costs is projected, with a 35% increase in the 90th percentile of costs (that is, extreme years are already significantly more expensive). The corresponding figures are similar for RCP4.5 (medium-high mitigation): no change is projected in terms of the median of costs, but a 31% increase is projected in terms of the 90th percentile. For the period 2021-2050, the median of year-costs is projected to be 12% more expensive than the 1971-2000 value under low mitigation, with a 132% increase in the cost of extreme years (90th percentiles). For the case of medium-high mitigation these values are projected to be a 2% decrease in the cost of median-years, but with a similar increase of 119% in terms of the costs of extreme years.

South Africa has already made significant investments in mitigation. As part of a Renewable Energy Independent Power Producer Procurement Programme (REI4P) has approved 79 renewable energy IPP projects, total 5 243MW, with private investment totalling ZAR 192 billion (approx. US\$ 16 billion). Another 6300 MW are under consideration. Investment in public transport infrastructure was US\$ 0.5 billion in 2012, and is expected to continue growing at 5% per year. South Africa established a South African Green Fund with an allocated US\$ 0.11 billion in the 2011 to 2013 budgets to support catalytic and demonstration green economy initiatives. Resources for the Fund will have to be increased in future to enable and support the scaling up of viable and successful initiatives, including contributions from domestic, private sector and international sources.

Analysis of the incremental costs of mitigation actions indicates that significant finance and investment will be required in the long-term. The following estimates are of total incremental costs required:

1. Estimated incremental cost to expand REI4P in next ten years: US\$3 billion per year.
2. Decarbonised electricity by 2050 - estimated total of US\$349 billion from 2010.
3. CCS: 23 Mt CO₂ from the coal-to-liquid plant - US\$0.45 billion.
4. Electric vehicles - US\$513 billion from 2010 till 2050.
5. Hybrid electric vehicles: 20% by 2030 - US\$488 billion

These costs are derived from energy systems and economic modelling. Further work is needed to prepare detailed business plans for finance and investment in mitigation. These numbers are presented for information to clarify the order of magnitude of mitigation finance and investment requirements.

Some technologies that could help South Africa to further reduce emissions that have been identified include: Energy efficient lighting; variable speed drives and efficient motors; energy efficient appliances; solar water heaters; electric and hybrid electric vehicles; solar PV; wind power; carbon capture and sequestration; and advanced bio-energy.

South Africa is implementing a mitigation system to move from analysis of mitigation potential to full implementation, however, human and institutional capacity needs to be further enhanced. The information on investments estimated in energy and economic models indicate relatively small impacts on GDP. Other socio-economic implications, notably any negative impacts on employment, need to be avoided and will be studied empirically as further mitigation measures are put in place. Current analysis of investments in renewable energy projects shows that these have a positive impact on the economy. Such analysis should further provide enhanced information through financial analysis and specific investment proposals. South Africa proposes that the COP should consider a process for improvement of information on finance and investments required, and how this can be integrated into existing reporting by developed and developing countries. The international frameworks should also effectively operationalize support for the enhancement of existing human, intellectual and institutional capacity, at the domestic and regional levels.

Equitable access to sustainable development

The core principles of equity, responsibility, capability and sustainable development are the basis of South Africa's INDC. Equity relates to adaptation, mitigation and all forms of investment and support.

Equity does not only relate to Parties' respective mitigation actions, as those least responsible for the problem of global climate change, namely poor countries and communities, are most vulnerable to its impacts. Those countries therefore need to take urgent and costly adaptation actions. If insufficient mitigation is implemented globally, and average global temperatures exceed 2 °C, even more adaptation will be required, effectively shifting the burden of climate action onto developing countries. Those who have a greater responsibility for cumulative emissions that have driven up GHG concentrations in the atmosphere should, as a matter of fairness, assist those less responsible. Furthermore, investments in adaptation represent a significant opportunity cost with respect to investments required to reduce poverty and inequality, create employment, improve education and address other development challenges.

Regarding mitigation, as noted in the table above, analysis by South African experts reports that a fairly apportioned overall carbon budget for South Africa for the period from 2015 to 2050 would exceed the budget implied by the upper limit of the PPD trajectory range, although other approaches to equity report a much lower number.² South Africa considers the PPD range to be an equitable contribution to the global mitigation effort, given South Africa's current and historical emissions and its national circumstances (especially its development challenges). The PPD emissions trajectory range focuses on the trend in emissions over time. Additionally, defining a carbon budget or space over time provides

² The carbon budget approach of Chinese (CASS / DRC joint project team 2011) and Indian researchers (Jayaraman, Kanitkar & dsouza 2011) allocates 7-11 Gt CO₂ –eq to South Africa for the period 2000–2049, and a meta-analysis of different approaches shows that the analysis of different effort-sharing approaches yields carbon budgets for South Africa that are significantly smaller than the PPD trajectory range. Only the lower PPD is within the range calculated using the PRIMAP tool in 2020. In 2025 and 2030, none of the PPD values overlap with the calculated ranges.

flexibility in emissions for a given year. The national carbon budget range for the period 2021-2025 is 1.99 -3.01 Gt CO₂-eq and for 2026-2030 is in the range of 1.99 to 3.07 Gt CO₂-eq.

An assessment of equity also needs to take into account means of implementation. Generally, South Africa needs time for development, which is necessary to eliminate poverty, reduce inequality, increase employment and promote inclusive economic growth, while simultaneously seeking to contribute to mitigation and assist our vulnerable communities in adapting to climate impacts. Some specific finance and investment requirements for both adaptation and mitigation have been initially quantified above.

Uncertainties

Uncertainty should be noted in two respects. Firstly, the greater uncertainty in AFOLU emissions (relative to other sectors) has been noted above. South Africa's current understanding is that our land sector is estimated to be a net sink. The intention is to reduce uncertainty in data over time, with a view to a comprehensive accounting approach for land-based emissions and removals. Secondly, trace gases are less material and data is more uncertain than for the three major gases. For the current GHG inventory, submitted to the UNFCCC as part of SA's first biennial update report (2014), data was gathered for CO₂, CH₄ and N₂O. Certain HFCs and PFCs were reported on in the IPPU (industrial processes and product use) sectors. Fluorinated gases are estimated to have contributed less than 0.3% to the total GHG budget over the period 2000 – 2010. A process is under way to estimate SF₆ emissions from power generation. Uncertainties such as the above are to be bounded over time. In the on-going process of implementing the mitigation system, methodologies will be improved.³

Uncertainties exist in the adaptation methodology used to estimate costs. These methodologies can be further improved and will benefit from exchanges with others using similar methodologies.

³ National policy indicates that the national GHG Emissions Trajectory Range may be reviewed in the light of monitoring and evaluation results, technological advances or new science, evidence and information.