



AFRICA REGION

# SOUTH AFRICA

World Bank Group

# COUNTRY CLIMATE AND DEVELOPMENT REPORT

OCTOBER 2022

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# Acknowledgments

This Country Climate and Development Report (CCDR) is a collaborative effort of the World Bank, IFC, and MIGA, produced by a core team led by Bekele Debele (Program Leader for Sustainable Development and Infrastructure), Jacques Morisset (Lead Economist and Program Leader), and Mariano Salto (Senior Energy Economist). The key section contributors are: Elizabeth Ninan, Rudraksh Mitra, Wendy Cunningham, Victoria Monchuk, Thomas Vaughan Bowen, and Jessica Leete Werner Flannery on human development (education, health, social protection and jobs); Marc Schrijver, Reshma Sheoraj, Martijn Regelink, Henk Jan Reinders, Emma Dalhuijsen, Abhishek Saurav, Swee Ee Ang, Catiana Garcia Kilroy, Gonzalo Martinez Torres, Barry Patrick Maher, Rachel Chi Kiu Mok, Aijaz Ahmed, Nathan Rono Tuimising, Rupai Rai, Phillipe Neves, James Seward, Helena Christina Dill, Farah Imrana Hussain, Laurent Damblat, Malango Atupele Mughogho (IFC), Quyen Thuc Nguyen (IFC), Rajeev Gopal (IFC), and Kalina Miller (IFC) on climate finance; Eric Dickson, Collen Masango, Natalia Romero, Rui Su, Monyake Moteane, and Joshua Palfreman on cities, disaster risk management, spatial development, and solid waste management; Julia Fraser, Sarah Jessica Burton, Theodore Covary, Franz Gerner, Joseph Kapika, Rafael de Sa Ferreira, and Frederic Verdol on energy; Edward Andrew Beukes on transport; Peter Goodman and Hardwick Tchale on agriculture; Sarah Moyer, Sohee Gu, Neha Mukhi, MacKenzie Dove, Piet Theron, and Vanessa Satur on climate change vulnerability and nature-based tourism; Bandita Sijapati, Erika Ella Auer, and Ezgi Canpolat on social development and inclusion, with support from Paola Ballon, Jose Cuesta, and Grace Bridgman on data and analytics on multidimensional exclusion and climate risks and Vittoria Franchini on literature review; Joanna Alexandra Watkins, Albertus Schoeman and Adwoa Gyapong on climate governance and institutional framework; Benedicte Baduel and Dumisani Sihle Ngwenya on macroeconomic analysis; Diego Juan Rodriguez and Homero Alejandro Paltan Lopez on water; Charl Jooste on macro climate damage assessment; Facundo Cuevas and Werner Hernani Limarino on macro-micro economic simulation and analysis; and Michael Ehst and Gracelin Baskerin on private sector finance. Ronald Rateiwa, Zano Mataruka, Memory Machingambi, Sebastien Dessus, and Ken Osei from IFC led the private sector role in green development, with support from Bushra Ghulam Mohammad, Vladimir Stenек, Lenore Rosa Celia Cairncross, Kalina B. Miller, Andrew Myburgh; Elizabeth M. White, Jan Olivier Imhof, Maria Florencia Tejeda, Nouhoum Traore, Shining Yang, Gemechu Ayana Aga and Filip Jolevski. Lolette Kritzingervan Niekerk provided strategic advice and writing support to the core team, while Reshma Sheoraj also provided strategic advice and logistical support. Mabel Nomsa Mkhize and Mokgabo Molibeli provided administrative and logistical support throughout the project. Zandile Ratshitanga, Flore de Preneuf and Maria Nghidinwa provided communication and dissemination support, whereas Clarity Global provided editorial support.

Other contributors include:

Modeling and analytical results for the low-carbon transition were provided by the team led by Bruno Merven at the Energy System Research Group (University of Cape Town).

Modelling and analytical results for the water-energy-food nexus were provided by the team led by Fernando Miralles-Wilhelm (The Nature Conservancy and George Mason University) and Silvia Regina Santos Da Silva (George Washington University).

Urban growth analytics identifying possible pathways for a low-carbon, resilient, and inclusive urban development was delivered by a team led by Guillermo Velasco and Ricardo Ochoa (Capsus S.C.).

Policy analysis for Pathways for a Just Urban Transition in South Africa was delivered by a team led by Edgar Pieterse and Anton Cartwright (African Center for Cities, University of Cape Town).

Brent Boehlert of IEC (Industrial Economics, Inc) led the team of climate modelers to provide the climate modeling and damage analysis.

Olivia Tuchten and the team from Promethium led the South African green-manufacturing survey work.

Case study of Emalahleni Local Municipality in Mpumalanga and the social dimensions of inclusive climate-resilient development and just energy transition, was delivered by Peta Wolpe, Holle Wlokas, Teboho Mosuo-Tsietsi, Yakhuluntu Dubazana, Fowzia Davids, Andy Spitz, Yaowen Deng from Synergy Global.

Detailed feedback, suggestions, and comments were received from internal peer reviewers Stephane Hallegatte (Senior Climate Change Advisor, GGSVP), Stephan Dreyhaupt (Principal Economist, Africa Region, IFC), and John Roome (Regional Director for Sustainable Development, South Asia Region), and from external peer reviewer Crispian Olver (Executive Director, South Africa Presidential Climate Commission (PCC)).

The CCDD benefited from discussions with various external stakeholders in South Africa, including the PCC, the National Treasury, academics, civil society organizations, the private sector, and development partners.

The CCDD was prepared under the guidance of Victoria Kwakwa (World Bank Regional Vice President for Eastern and Southern Africa), Hafez Ghanem (former World Bank Regional Vice President for Eastern and Southern Africa), Sergio Pimenta (IFC Regional Vice President), Ethiopis Tafara (MIGA Vice President and Chief Risk, Legal, and Administrative Officer), Marie-Francoise Marie-Nelly (Country Director), Ayat Soliman (World Bank Regional Director for Sustainable Development), Catherine Tovey (former Acting Regional Director for Sustainable Development), Asad Alam (World Bank Regional Director for EFI), Wendy Hughes (World Bank Regional Director for Infrastructure), Kevin Warui Njiraini (IFC Regional Director), Adamou Labara (IFC Country Manager), and Merli Margaret Baroudi (Director of Economics and Sustainability at MIGA).

# List of Acronyms

AFOLU	Agriculture, forestry, and other land use
BRICS	Brazil, Russia, India, China, South Africa
CCDR	Country Climate and Development Report
CGE	Computable general equilibrium
CO <sub>2</sub> -eq	Carbon dioxide equivalent
DFFE	Department of Forestry, Fisheries, and the Environment
ERRP	Economic Reconstruction and Recovery Plan
EU	European Union
EV	Electric vehicle
FDI	Foreign direct investment
GDP	Gross domestic product
GHG	Greenhouse gas
Gt	Gigaton
GTS	Green Transport Strategy
H <sub>2</sub>	Hydrogen
IFC	International Finance Corporation
IPPU	Industrial processes and product use
IRP	Integrated Resources Plan
JTF	Just Transition Framework
MSMEs	Micro, small, and medium enterprises
Mt	Metric ton
NBT	Nature-based tourism
NCCRP	National Climate Change Response Policy
NCPC-SA	National Cleaner Production Centre South Africa
NDC	Nationally Determined Contribution
NDP	National Development Plan
NEES	National Energy Efficiency Strategy
NT	National Treasury
OECD	Organization for Economic Co-operation and Development
PCC	Presidential Climate Commission
PGM	Platinum, palladium, rhodium
PPP	Public-private partnership
PV	Photovoltaic
RE	Renewable energy
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
SA	South Africa
SATIM	South Africa TIMES Model
SAGE	South Africa General Equilibrium
SMEs	Small and medium enterprises
SOE	State-owned enterprise
SRD	Social relief of distress
SSP	Shared Socioeconomic Pathway
UNFCCC	United Nations Framework Convention on Climate Change



# CHAPTER 1: INTRODUCTION

**South Africa (SA) has ambitious development objectives but faces chronic economic and social challenges, exacerbated by recent shocks—including the COVID-19 pandemic—and climate change risks.** The economy grew by about 1 percent per year over the past decade. The country suffers from an incomplete socioeconomic transition and entrenched legacies from apartheid, making it the most unequal country in the world, with high levels of poverty and unemployment. Moreover, the country needs to cope with growing climate change risks and the negative impacts of its own greenhouse gas (GHG) emissions. The government has adopted several bold strategies and legislative actions to address these challenges. To harmonize its development and climate goals, in August 2022 SA adopted a Just Transition Framework (JTF).

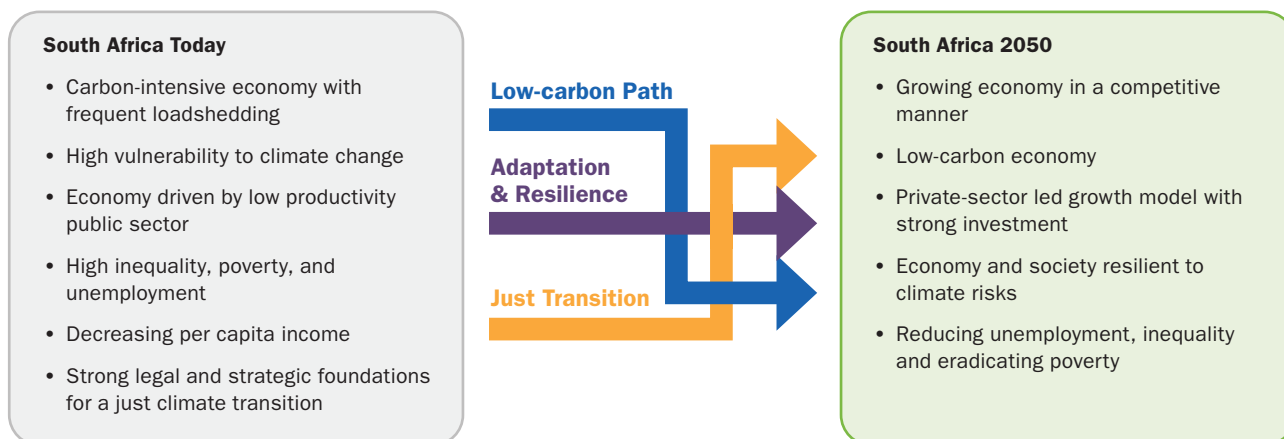
**Aligning the country's ambitious development and climate goals and accelerating implementation requires closer analysis of important questions.** How vulnerable is SA to a changing climate and how intensively should it work to adapt? Is a net-zero emissions target feasible by 2050, and how much will it cost? How can public, private, and external resources be mobilized to help achieve SA's climate goals? What are the trade-offs between economic growth, poverty reduction, and climate action, and how can they be managed? What are the distributional impacts of climate change, and how can SA ensure a just transition that will create jobs while reducing inequalities? Ultimately, what will it take to transition to a more prosperous, equal, and competitive SA that is climate resilient, green, and sustainable?

**The SA Country Climate and Development Report (CCDR) investigates these questions, paying special attention to policy trade-offs between taking climate action, growing the economy, and reducing inequalities.** The CCDR provides recommendations to help policy makers prioritize among a range of options, recognizing uncertainties about future climate change impacts and the availability of technologies and financing. This CCDR has been produced in close collaboration with the Presidential Climate Commission and other South African counterparts in the public and private sectors, academia, organized labor, and civil society.

**The CCDR proposes that SA incorporates three interconnected transitions in its development paradigm to balance development goals with growing climate risks:**

1. **Mitigating climate change—the low-carbon transition:** SA is a carbon- and energy-intensive economy. The CCDR proposes that moving away from coal as the main source of energy would be in the national best interest, delivering substantial local benefits in terms of avoided loadshedding and improved energy security; economic competitiveness; reduced air, water, and soil pollution; and lower GHG emissions. The power sector depends on aging and poorly maintained coal power plants, leading to increasing levels of loadshedding since 2007. To reach its development objectives, SA urgently needs to address its power crisis. Renewable energy (RE) sources are the cheapest and most immediate solution to increase electricity supply and to reduce the strain on existing generation capacity (allowing for the development of required maintenance works). They will contribute to reduce loadshedding—which reached 1,950 hours (or almost 1/3 of total time) in the first 9 months of 2022. Gradually, as the penetration of renewables increases, flexible low carbon generation technologies (like natural gas and battery storage) will ensure system stability.
2. **Adapting to climate change—the resilient transition:** Climate change negatively affects SA's infrastructure, productivity, human capital, and scarce water resources. The country is vulnerable to rising temperatures and variable precipitation that result in droughts, floods, and heatwaves. This vulnerability undermines the country's ability to achieve its long-term development goals. It is crucial for SA to identify key areas exposed to climate risk and set out measures to build a more resilient society.
3. **Protecting poor and vulnerable people—the just transition:** To reconcile development and climate goals while addressing inequality and racial and spatial exclusion, SA needs to pay special attention to its most vulnerable people in its efforts to adopt a low-carbon path and build a resilient economy. The country already starts from a disproportionately low base, and higher poverty from an unjust climate transition would exacerbate existing economic, social, and political tensions. It would also make it harder to reach the consensus needed to adopt and urgently implement the necessary reforms.

**Figure 1: Aligning South Africa's development paradigm with climate change**



Source: The World Bank. Adapted from the National Development Plan: Vision 2030, and the Economic Recovery and Reconstruction Plan 2020.

**For each of these transitions, the CCDR identifies actions that are particularly urgent, are most likely to create synergies between development and environmental objectives, and are pro-poor.** The combination of these actions led to five priority policy packages being identified that should produce the greatest impacts if properly implemented within six months and the next one to three years. Emphasis is on actions that will maximize synergies across the three interconnected transitions, while minimizing the burden on the most vulnerable groups. Given the government's limited fiscal space and the global public good's dimension of the climate change, special attention will be given to both the domestic private sector and external financing, including in the form of grants and concessional loans, will have an important role to play in these transitions. While the CCDR covers many critical areas, it also identifies areas for future research (Box 1)

#### **Box 1: Areas for future analytical work related to climate change and development**

- How the country's health and education systems can be strengthened to respond more effectively to climate risks and provide improved services, especially for poor and vulnerable households.
- The impacts of the projected technology shifts in high-emitting sectors (power and transport) on the labor market; and the skills required by emerging sectors.
- The compounding effects of climate change on poor households' assets, including housing, and these households' access to basic social services.
- In the energy sector, the role of some technologies (like battery storage) and investments required in the transmission sector. Additional studies are needed to analyze the economics of green hydrogen (H<sub>2</sub>) and the potential of regional trade to meet SA's energy demand and support its low-carbon agenda.
- How carbon sinks could help reduce emissions and create jobs while preserving ecosystems.
- The link between climate transition and inclusive development, including opportunities for job creation, micro and small firms, access to productive land and other assets, and increased participatory mechanisms for communities. The climate agenda could become an opportunity to redress historical damages against individuals, communities, and the environment, in line with the JTF adopted by the government.
- Further analysis to operationalize the JTF in Mpumalanga province, host of most coal activities in SA.

## CHAPTER 2: DEVELOPMENT AND CLIMATE CHANGE

**Over the next few decades, SA aspires to move to a path of rapid and inclusive growth, reversing the economic losses of the past decade, which have been exacerbated by the COVID-19 pandemic, while managing the growing risks from climate change and high local carbon emissions.** The government has in recent years prepared several plans and strengthened its institutional framework to cope with climate change as an integral part of its development strategy. Both the domestic business and financial sectors have also started to invest in new and cleaner technologies. The CCDR argues that, it is in SA's interest to scale up and accelerate the efforts to achieve its climate targets as they will help it to achieve its own development goals.

### 2.1 High development ambitions to overcome significant economic and social challenges

**The government has set ambitious goals for the country's economic development in the medium to long term, which aim to accelerate the socioeconomic transition initiated nearly 30 years ago with the end of apartheid, but which remains incomplete.** The *National Development Plan: Vision 2030* aims to accelerate inclusive growth through the following 2030 targets: (i) growing the economy at a rate of 5.4 percent; (ii) reducing the unemployment rate to 6 percent; (iii) increasing investment as a share of GDP to 30 percent; (iv) reducing inequality as measured by the Gini coefficient to 0.60; and (v) eradicating poverty.

**Despite major achievements since the end of apartheid, SA's growth trajectory slowed to 1 percent per year between 2009 and 2019 (significantly lower than other middle-income economies), and the country remains the most unequal in the world (Figures 2 and 3).** This weak performance is explained by: (i) the legacy of outdated policies, including import substitution; (ii) uncompetitive markets in critical sectors dominated by underperforming state-owned enterprises (SOEs) and large businesses; and (iii) lagging reforms in the business environment and in productive factors (such as land and skilled labor).<sup>1</sup> Today, most of the population has access to relevant post-secondary education and skills, but the distribution of land and productive assets remains skewed due to weak property rights, vested interests, and insufficient structural reforms. Spatial exclusion and poor connectivity in historically underserved and disadvantaged settlements has prevented the integration of a large portion of the population in the modern economy. While the extensive use of safety nets for 17.8 million people (extended to 28 million people during the COVID-19 pandemic) has had a positive redistributive effect, inefficient economic and social policies and "state capture" have aggravated the fiscal deficit and public debt, which reached an all-time high of 70.2 percent of GDP in 2020.

**To break the country's cycle of high inequality and low growth, the government announced its Economic Reconstruction and Recovery Plan (ERRP) in October 2020.** This plan aims to address SA's structural weaknesses by focusing on the following three areas:<sup>2</sup>

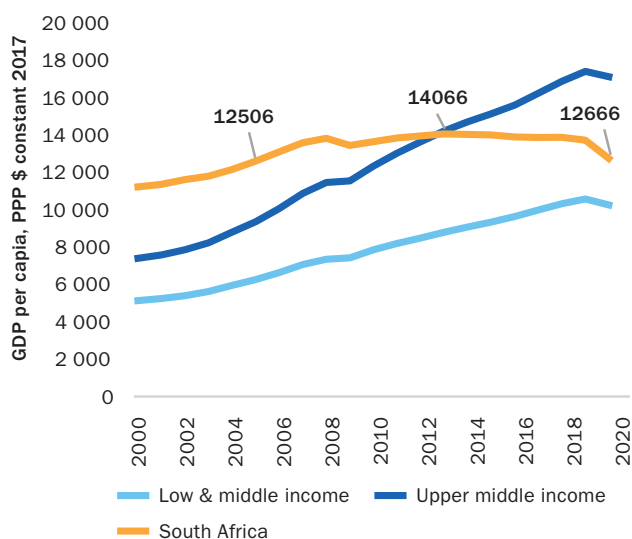
- Aggressive infrastructure investment and delivery;
- Employment-oriented strategic localization, reindustrialization, and export promotion of key sectors;
- Enabling conditions and a supportive policy environment for an accelerated, inclusive, and transformative growth trajectory (with specific focus on measures that support mass employment).

**The ERRP also emphasized the pivotal role of climate action for the country to achieve a more inclusive, sustainable, and resilient economy.** Without mitigation and adaptation measures, SA is expected to face not only a decline in economic growth but also rising poverty and inequality.

<sup>1</sup> See World Bank. 2018. "Systemic Country Diagnostic: An Incomplete Transition: Overcoming the Legacy of Exclusion in South Africa" or Hausmann, Ricardo, et al. 2022. "Macroeconomic Risks After a Decade of Microeconomic Turbulence, South Africa 2007-2020." WIDER Working Paper 2022/3.

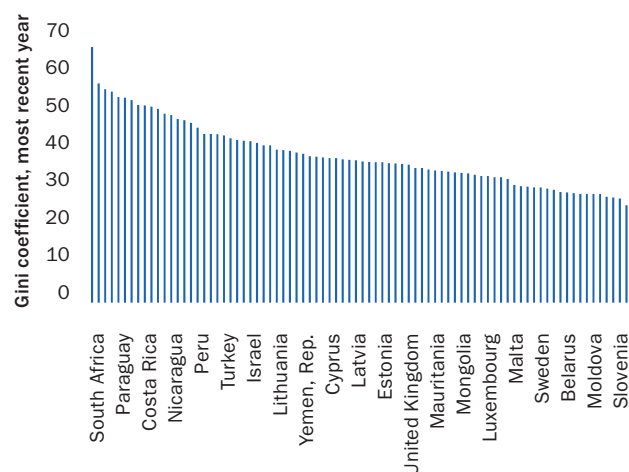
<sup>2</sup> Government of South Africa. 2020. *Building a New Economy, Highlights of the Reconstruction and Recovery Plan*, p. 8.

Figure 2: Per capita income contraction since 2014



Source: World Development Indicators.

Figure 3: Highest inequality in the world



## 2.2 Why climate action matters for SA's development—the cost of inaction

**Embracing climate actions is in SA's interest.** Shifting to a low-carbon economy will generate health and labor productivity gains for the population, improve the country's competitiveness on global markets, and help address its energy crisis through investments mostly into renewables (but also including complementary technologies like storage and natural gas) that are least cost and fast to implement relative to other alternatives. Adaptation and resilience-building measures will reduce the damages associated with climate extreme events (floods, droughts, and heatwaves) and long-term phenomena (rising temperatures, water stress, and sea level rise) on assets, economic activities, and people.

**SA's old and poorly maintained coal-based power fleet is one of the most polluting globally, with negative impacts on its people.** The high level of toxic emissions has lowered air quality, which in turn has led to higher morbidity and a decline in labor productivity.<sup>3</sup> Overall, air pollution is estimated to cause the premature deaths of over 20,000 South Africans every year.<sup>4</sup> The impact is most visible in the eastern coal belt region of the Highveld, home to the country's coal mining and coal-fired power stations. Heavy dependency on coal and related activities also causes water and soil pollution, undermining food and water security and the overall health of the ecosystem. For example, the Olifants River, which serves over 4 million people and some of the country's largest irrigation schemes, draws water from catchments in the coal belt region and is one of the most polluted rivers in SA.

**The country's high carbon intensity (largely due to heavy reliance on coal) is also expected to reduce its competitiveness in international markets.** Globally, consumers are paying greater attention to the carbon footprint of their purchases, leading multinationals to commit to greener trade and production along their value chains. Several governments are also considering penalizing their carbon-intensive imports. SA is vulnerable because of the carbon-intensity of its economy, which was 3.2 times higher than the global average in 2019 (Table 1). It is projected that about half of SA's current exports are at high risk of being penalized by the Carbon Border Adjustment Mechanism, which the European Union is on track to introduce. By 2030, SA could lose about 1 percent of its GDP because of this kind of trade exposure.<sup>5</sup>

**Shifting to least-cost RE options will help to address SA's longstanding energy crisis while achieving a low-carbon pathway for the economy.** As discussed in Chapter 3, this shift is a rational economic decision, as RE (complemented by storage and natural gas) represents the least-cost and fastest-to-implement power

<sup>3</sup> OECD. 2016. *The Economic Consequences of Outdoor Air Pollution*. Paris: Organization for Economic Co-operation and Development. doi:10.1787/9789264257474-en.

<sup>4</sup> Winkler, H. et al. 2017. "Health Costs of Energy Related Air Pollution in South Africa". International Growth Centre. <https://www.theigc.org/project/health-costs-of-energy-related-air-pollution-in-south-africa/>. The causes of death include heart disease, stroke, lung cancer, chronic obstructive pulmonary disease, and pneumonia.

<sup>5</sup> For details, see background paper prepared for the CCDR: The World Bank, Trade and climate change in SA, forthcoming.

**Table 1: Cross-country GHG emissions overview, 2019**

Country	Carbon intensity (tCO <sub>2</sub> /million \$GDP)	Emissions per capita (tCO <sub>2</sub> per capita)	Share of global emissions (%)
South Africa	1,329.2	7.5	1.2
Russia	1,124.1	11.8	5.4
Vietnam	1,098.5	3.5	1.0
India	939.6	1.8	7.3
China	764.3	7.6	27.4
Indonesia	583.6	2.3	2.2
United States	254.8	14.7	13.0
Brazil	237.9	2.1	2.3
OECD	236.9	8.5	31.4
Germany	199.2	7.9	1.6
France	120.7	4.5	0.9
United Kingdom	116.7	5.2	1.0
World average	413.5	4.5	100

Source: World Bank. Note: Total global emissions were 46,288.6 Mt CO<sub>2</sub>e in 2019.

generation option for the country. Moreover, increasing power supply and requiring Eskom's old coal power fleet to meet national environmental regulations will require a massive retrofit program, which may be economically unfeasible given the short remaining lifespan of most of the plants.<sup>6</sup>

**The South African economy is also vulnerable to the physical impacts of global climate change.** The country is already warming at twice the global average and ranks 96<sup>th</sup> of 182 countries in the latest Notre Dame Global Adaptation Index.<sup>7</sup> Mean monthly temperatures are projected to rise by 2°C by the 2050s and by 4.2°C by the 2090s under a high-emissions global scenario.<sup>8</sup> Aridity and drought risks in the country are expected to continue to increase this century, with most models pointing to the likelihood of severe annual droughts increasing by 39 percent by the 2050s, as well as greater probability of extreme storms and other climate-related hazards near the Indian Ocean. These risks are already a reality in SA, which has been hit by several climate catastrophes in recent years, including a water emergency in Cape Town and unprecedented floods in Durban.

**In the longer term, inaction against those climate risks will worsen labor productivity (including in small and medium enterprises (SMEs)), threaten biodiversity, and negatively affect human and livestock health.** There will also be a significant negative effect on agriculture due to the country's high reliance on rainfed agriculture and on scarce water resources for its irrigated agriculture. Key urban centers that are the economic and population hubs of the country will be further exposed, leading to the destruction of assets and the deterioration of living conditions for millions of South Africans.

**The cost of inaction against climate change is magnified in SA due to high levels of poverty and inequality.** Climate change impacts are unfair: poor households are generally more exposed to air, water, and soil pollution and to rising temperatures, uneven rainfall, and other extreme weather events. In addition, poor households rely on low-quality public health services and have less financial resources to cope with damages. Although the Social Assistance Act has twice been amended (2020 and 2022) to use the Social Relief of Distress (SRD) grant in response to natural disasters, the larger social protection and health systems are currently inequitable and do not adequately incorporate climate adaptation measures to protect human health and vulnerable livelihoods in the face of increasing climate shocks. This means that vulnerable groups, particularly low-income groups, are more likely to shoulder the burdens associated with physical climate risks and the move away from coal dependency.

<sup>6</sup> Eskom estimates that full compliance of its old coal power fleet with the minimum emission standards required by the Air Quality Act of 2004 will require about R300 billion in retrofitting investments (or decommissioning about 16 GW of its coal-fired power plants). Eskom. 2021. "Eskom receives DFFE's decisions on minimum emissions standard; will engage DFFE and key stakeholders on way forward". Media statement, December 14. <https://www.eskom.co.za/eskom-receives-dffes-decisions-on-minimum-emissions-standard-will-engage-dffe-and-key-stakeholders-on-way-forward/>. Accessed September 25, 2022.

<sup>7</sup> The Notre Dame Global Adaptation Index ranks 181 countries using a score that calculates a country's vulnerability to climate change and other global challenges, as well as its readiness to improve resilience. The higher the ranking, the lower the country's vulnerability and the higher its readiness. University of Notre Dame. n.d. "ND-GAIN: Rankings." <https://gain.nd.edu/our-work/country-index/rankings/>. Accessed August 18, 2022.

<sup>8</sup> As defined by CMIP6 under SSP 3-7.0. Pessimistic.



## 2.3 The uneven level of government preparedness

**Aware of the costs of inaction against climate change, the government has adopted some major policies and legislation to address the climate challenge in recent years.**<sup>9</sup> The institutional framework was strengthened in 2020 by the establishment of the PCC as an advisory body to facilitate SA's just transition to a low-carbon economy and climate-resilient society by 2050.<sup>10</sup> The PCC championed the preparation of the JTF, which involved extensive consultation and was approved by Cabinet in August 2022. The JTF provides a people-centered vision of the climate change transition over the next 25 years.

**Together with the National Environmental Management Act (1998), the expected enactment by Parliament of the Climate Change Bill will further strengthen the legal and regulatory framework.** The Bill, tabled for Parliament approval, aims to enable the development of an effective, coordinated, and integrated climate change response. It will enforce mandatory emissions targets for sectors and carbon budgets for high-emitting facilities, and establish adaptation scenarios and a trajectory for reducing national emissions.

**Despite these efforts, the government's level of preparedness remains uneven for at least four reasons.**

1. *Unclear commitment in the Nationally Determined Contribution (NDC) to reach net-zero emissions by 2050.* The current targets are insufficient to attain the 1.5°C preferred global pathway from the Paris Agreement (Box 2).<sup>11</sup> While the government has expressed a strong intention to reach net-zero emissions by 2050 in its Low-Emission Development Strategy and its JTF, and important and high-emitting agencies (such as Eskom and Sasol) have also committed to net-zero emissions targets by 2050, there is still a need for a clear and nationally owned net-zero commitment with a costed implementation plan.<sup>12</sup>
2. *The greening of fiscal policy remains insufficient to support the government's effort.* Progress has been made (Box 3), but the recent carbon budget tagging pilots need to be rolled out to the entire budget to better identify climate-related public expenditures. Further improvements are also required in the evaluation and monitoring of climate-related investment projects, in the allocation of transfers to SOEs and provinces, and in green procurement.
3. *Fragmentation of strategic and technical responsibilities within government.* The new Climate Change Bill should help, as it will give the coordination responsibilities to the Department of Forestry, Fisheries and Environment (DFFE) at the national level. Still, there will be a need to define further the role of the National Treasury (NT), the Department of Mineral Resources and Energy (DMRE), the National Committee on Climate Change, the PCC, and the Department of Planning, Monitoring, and Evaluation. Furthermore, in some ministries climate change is still seen as a fringe issue and has not been fully mainstreamed in key sectoral policies (such as industrial strategies), although provisions in the Climate Change Bill will support mainstreaming. The fragmentation of responsibilities has also prevented the emergence of economies of scale, especially in the development of skills through joint training programs. Some key ministries critical for successful implementation of the JTF (such as the Department of Employment and Labour, Department of Social Development, and Department of Higher Education and Training) are not sufficiently involved in the process.
4. *Limited and uneven implementation capacity, especially at the local level.* Despite its key role in SA's climate change response, the DFFE's capacity is limited to driving and coordinating actions. Many local governments have severe budgetary and technical constraints, particularly rural municipalities, even though they have been tasked with significant climate-related responsibilities, such as disaster risk management, environmental protection, and climate change mitigation.

<sup>9</sup> These policies include the 2011 National Climate Change Response White Paper, the National Development Plan, the 2019 National Climate Change Adaptation Strategy, the 2019 Integrated Resources Plan, the 2016 Integrated Energy Plan, and the Green Transport Strategy (2018–2050).

<sup>10</sup> The PCC is chaired by the President and includes 22 commissioners representing government, business, organized labor, civil society, academia, and youth.

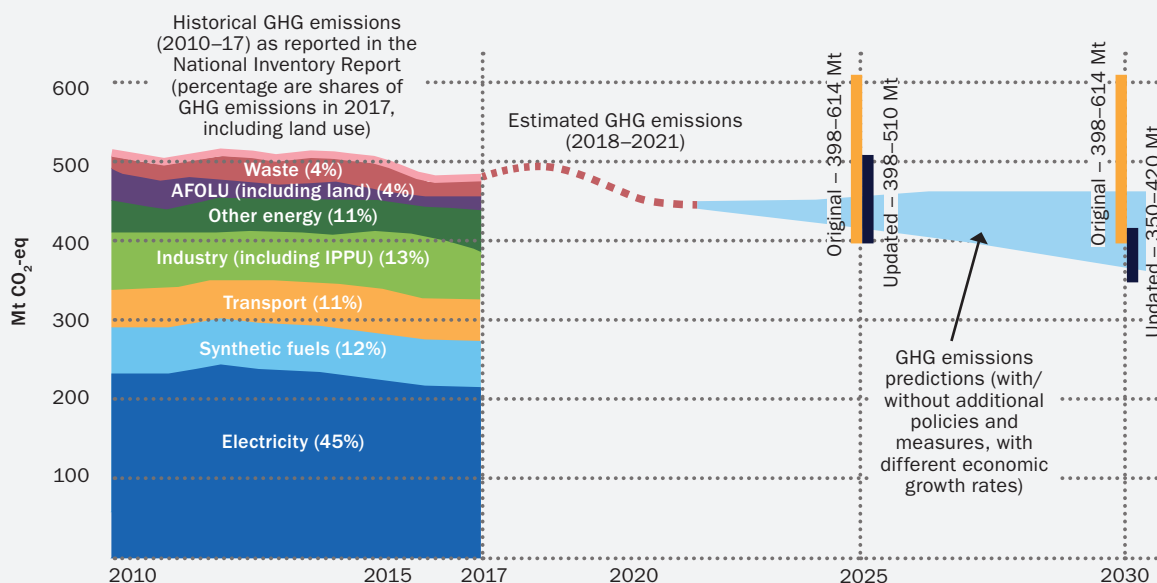
<sup>11</sup> PCC. 2021. South Africa's NDC Targets for 2025 and 2030. [https://pcccommissionflow.imgix.net/uploads/images/1eb85a\\_75d745eb859d43c288f461810b336dd3-compressed.pdf](https://pcccommissionflow.imgix.net/uploads/images/1eb85a_75d745eb859d43c288f461810b336dd3-compressed.pdf).

<sup>12</sup> UNFCCC. 2020. South Africa's Low Emission Development Strategy 2050. <https://unfccc.int/documents/253724>. Accessed June 17, 2022.

## Box 2: South Africa's updated Nationally Determined Contribution (NDC)

The country submitted its first NDC to the United Nations Framework Convention on Climate Change (UNFCCC) in 2015, which was replaced by a more ambitious update in 2021. The updated mitigation targets represent a narrowing of the older “peak, plateau, and decline” trajectory range for 2025 and a narrowing of the range and lowering of the lower-bound level for 2030. The targets are detailed in Figure 4.

**Figure 4: Historical and projected emissions, previous and updated NDC targets**



Source: Energy Systems Research Group, 2021.

## Box 3: Existing fiscal initiatives to support the green transition

In recent years, several fiscal initiatives have been implemented to promote the greening of the South African economy, including:

- A carbon tax and the establishment of the Carbon Offset Administration System.
- Accelerated depreciation allowances for machinery for renewable electricity generation and biofuels production.
- Research and development tax incentives, including for green technologies (150 percent deduction).
- Tax incentives for biodiversity conservation.
- An energy efficiency savings tax allowance.
- Fiscal allocations, such as those to the DFFE for risk mitigation and job creation projects such as Working for Water and Working on Fire.
- Motor vehicle emissions tax to promote the sale of vehicles with lower carbon emissions during their operating phase.
- Incandescent-globe taxes to stimulate the uptake of low-energy light bulbs.

## 2.4 How businesses and financial institutions are responding to climate change

**Climate challenges require a collective response, in which the private sector is expected to play a central role.** Businesses will invest in new technologies, while banks should help finance climate-related projects. Both will also be impacted in their operations by climate risks as they are exposed to droughts and floods.

**In SA, the private sector appears well aware of climate change challenges, and several private sector-led initiatives have emerged in recent years.** About 80 percent of privately owned businesses operating in the non-financial sector are aware of climate risks according to an International Finance Corporation (IFC) survey conducted in July 2022.<sup>13</sup> The high level of awareness reflects good communication between the government and business organizations in recent years. It also reflects the relatively high exposure of many firms to recent climate hazards and catastrophes. Commercial farms have also been increasingly affected by rising temperatures and droughts. During the severe 2018 water crisis in the Western Cape, two-thirds of tourism businesses reported being adversely affected.

**In addition to several analytical efforts to support the country's low-carbon transition, business associations and an increasing number of large companies are committing to more ambitious low-carbon targets.** For example, Vodacom has committed to halving its environmental footprint by 2025. Sasol, one of the largest energy and chemicals companies, aims to achieve net-zero emissions by 2050, including switching grey hydrogen production to green H2 produced from RE. Other initiatives can be found in the mining, real estate, and logistics sectors. Several startups have emerged in response to the low-carbon agenda, such as Mellowcabs, Green Scooter, and EWIZZ.

**Yet many businesses in SA have not started to adjust to climate risks.** Based on the above-mentioned IFC firm survey, about 60 percent of businesses have no development plans to take climate actions in the future. For many, such inaction is explained by the fact that they are operating in low-carbon emitting sectors (for example, services) or in locations that are not directly affected by risks from climate change. Others do not anticipate new market opportunities, or they consider the cost of changing their business strategy to be excessive at this time.

**The response of the private sector to climate change has been further constrained by several barriers in the business environment.** These barriers are not entirely specific to climate change, but they show that cross-cutting and structural reforms will be required to unleash the power of business in SA.<sup>14</sup> They include:

- **Institutional barriers:** Due to the high level of government involvement in the economy, there are extensive regulatory and administrative restrictions—including in strategic sectors such as energy, transport, and water, as evidenced by the Organization for Economic Co-operation and Development (OECD) competition benchmarking. Barriers to domestic and foreign entry, complex rules for licenses and permits, and excessive protection for existing businesses increase the cost of doing business while preventing the emergence of new and more competitive firms. The dominant position of several SOEs hinders entry for private investors in key sectors (Box 4). Recently, institutional delays have undermined the country's efforts to enhance private investment in RE through the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP). Bid window 5 was launched three years ago and has not yet been concluded, lowering investor confidence in the program. Recommendations for reducing these barriers are developed in Chapter 3.
- **Trade and industrial policy barriers:** Supporting SA's low-carbon and green industrialization will require new technologies and competencies, which should be supported by trade and industrial policy reforms and by more flexibility and capacity building in the local labor market. The country's localization and import substitution policies, while preserving some jobs in the short run, have significant negative effects on the welfare of South Africans and neighboring countries. They also undermine the country's ambition to become a regional export hub.<sup>15</sup> The emphasis should also be on catalyzing the development of startups and SMEs, which would enhance local participation, by simplifying onerous and costly restrictions on transferring intellectual property, streamlining procedures for raising offshore capital, and creating incentives for risk capital investments.

<sup>13</sup> For more details, see International Finance Corporation, Green Manufacturing Survey – Survey Report, 22 July 2022 (draft available upon request). These results corroborate results from the 2018 CDP report (formerly the Carbon Disclosure Project). National Business Initiative.

<sup>14</sup> International Finance Corporation. 2019. *Country Private Sector Diagnostic: Creating Markets in South Africa*. <https://www.ifc.org/wps/wcm/connect/b0d223b7-25cb-47ed-9cf1-1d8c4685f5ea/201910-CPSD-South-Africa-EN.pdf?MOD=AJPERES&CVID=mTvKUBu>.

<sup>15</sup> See Kaziboni, L. and M. Stern. 2021. *The impact of local content policies on South Africa: Drawing lessons from foreign investors' experience of the PPPFA and REIP4*. Paper for the TIPS Forum 2021, 2–3 August 2021. Barbe, A. 2022. *Local Content Requirements: Economic Impacts on South Africa*. <https://www.gtapp.agecon.purdue.edu/resources/download/11426.pdf>



#### Box 4: The central role of SOEs in the climate agenda

SOEs are major carbon emitters in SA, yet they play a central role in several key sectors, such as energy and transport. The power utility company (Eskom) alone is responsible for more than 40 percent of the country's emissions and has failed to meet its environmental targets since 2015. To meet net-zero emissions by 2050, the government should ensure that SOEs will incorporate climate objectives in their way of doing business. It should also aim to boost competition in the sectors dominated by SOEs to raise efficiency and innovation over time. It should be a priority for government to implement reforms to improve SOEs' governance and financial and operational performance while promoting sectoral competition and private sector participation.

In the short term, the government could: (i) link the budgetary allocations to SOEs with their investments into low-carbon and climate-resilient infrastructure (for example, transmission lines and grid expansion) and (ii) strengthen SOE climate impact assessments, climate disclosures, creditworthiness, and long-term financial sustainability to attract private climate finance, including through monetizing existing assets.

- *Innovation and skills barriers:* SA was ranked 49<sup>th</sup> out of 138 countries by the World Economic Forum for technology readiness in 2017/18, yet the country has annually spent only 0.6 percent of GDP on research and development over the past few years—far from its official target of 1.5 percent of GDP. It is estimated that research and development in green technologies only represents 7.8 percent of this total.<sup>17</sup> The drive to adopt new technologies has been hampered by excessive localization requirements and tariffs on intermediate inputs where local products are not cost-competitive, unavailable in sufficient quantity, or not available at all. Another key constraint has been the limited domestic availability of skills, as reflected in the publication of an official list of missing critical skills in February 2022. Visa requirements to attract specialist and scarce skills are overly restrictive. Specific recommendations on how to improve the skills of the labor force are developed in Chapter 5.
- *Financing barriers:* Financial institutions' unfamiliarity with and uncertainty about green projects, which often have a long-term horizon, contribute to increasing the funding risk for many businesses. Reforms in the financial sector are necessary to enhance green projects, including the development of de-risking financial instruments (see Chapter 6).

**The financial sector is mainly vulnerable to climate risks through its links with businesses in transition-sensitive sectors. It is also exposed to the climate-related physical risks of assets in vulnerable regions, including in coal areas.**<sup>18</sup> An estimated 39 percent of banks' loan portfolios are currently invested in transition-sensitive industries, such as coal mining, fossil fuel-based electricity production, and real estate. Physical climate shocks in the country's main economic centers, such as Johannesburg, Cape Town, or Durban, will further raise the probability of defaults by borrowing businesses or individuals. Climate risks are exacerbated, because SA has a high credit-to-GDP ratio, at about 138 percent of GDP. Till now, banks have not allocated much of their balance sheet to explicitly labeled green loans.

**The insurance sector is also exposed to climate risks due to investment and underwriting activities, including the direct and indirect effects of weather-related catastrophe losses on property and motor vehicle insurance.** These insurance categories accounted for 72 percent of gross written premiums in 2018. As weather-related damages increase, so do the financial risks to this sector, potentially resulting in higher premiums. Another source of risk lies in the sector's holdings of corporate bonds and equity in transition-sensitive industries.

<sup>16</sup> For a fuller discussion, see International Monetary Fund: The role of SOEs in South Africa: Issues and policy options, published in IMF Country Report No. 22/38, February 2022.

<sup>17</sup> Source: South African National Survey of Research and experimental development. <https://hsr.ac.za/uploads/pageContent/12008/FACT%20SHEET%20N0%2032%20-%20GREEN%20R&D%202017183.pdf>

<sup>18</sup> For more details, see "World Bank. 2022. South Africa - Financial Sector Assessment. Washington, DC: World Bank. © World Bank. <https://openknowledge.worldbank.org/handle/10986/37079> License: CC BY 3.0 IGO."

## CHAPTER 3: MITIGATING CLIMATE CHANGE— THE LOW-CARBON TRANSITION

**Faster and inclusive economic growth and achieving net-zero carbon emissions by 2050 require a significant restructuring of the economy and changes in the behavior of South Africans.** Such transformation is being supported by the government through its various strategies and plans. The power sector will have to lead the transformation, backed by other key emitting sectors (transport, industries, and waste). Sectoral transformation must be accompanied by demand-side changes from businesses and consumers, driven by energy efficiency programs, price incentives (via carbon tax, for example) and improved public spending. Adopting a low-carbon path and achieving net-zero emissions may cost R4.2 trillion (in net present value) compared to the historical average, between 2022 and 2050, or on average about 2.1 percent of GDP per year.<sup>19</sup> This amount is higher relative to GDP than in Vietnam and China, and achieving the 2050 target will require significant policy reforms, the emergence of an adequate and skilled labor force, and a combination of domestic and external resources. As discussed in Chapter 5, this transition will have to be people-centered, ensuring that the most affected groups will be able to manage the projected changes in relative prices and in the labor market.

### 3.1 The energy sector optimization model and sectoral transitions

**SA is a carbon- and energy-intensive economy.** Today, SA is the most coal-dependent country in the G20. GHG emissions from transforming or using energy products represent 81 percent of the country's emissions profile, of which the electricity sector represents 45 percent. Furthermore, the conversion of coal provides about 25 percent of liquid fuels and feedstock in the petrochemicals sector, resulting in upstream emissions accounting for 12 percent of national GHG emissions.<sup>20</sup> Decoupling energy use from economic growth and deploying least-cost RE sources is the single most important action required for SA to achieve its mitigation and development objectives while providing additional climate co-benefits—for example, by reducing local pollution and improving economic competitiveness. The CCDR argues that moving away from coal as the main source of energy is therefore in the national best interest even if the cost of such transition will also require global financial support to implement it in a just manner for all South Africans.

**The CCDR proposes an analytical framework that is built around three models.** The first is a full energy sector model (South Africa TIMES Model (SATIM)) designed to achieve net zero by 2050 in a least-cost manner. It includes a complete description of primary energy sources (coal, liquid fuel, and gas), their transformation, their transmission and distribution, and the final demand by key economic sectors. The second is a computable general equilibrium (CGE) model, the so-called South African General Equilibrium (SAGE) model, that incorporates the impacts derived from the SATIM on the country's main economic variables, especially the level of economic activity and GDP composition. The third is a micro-simulation model that captures the distributional impacts on households and jobs. This chapter focuses on the first two models, while the third is examined in Chapter 5.

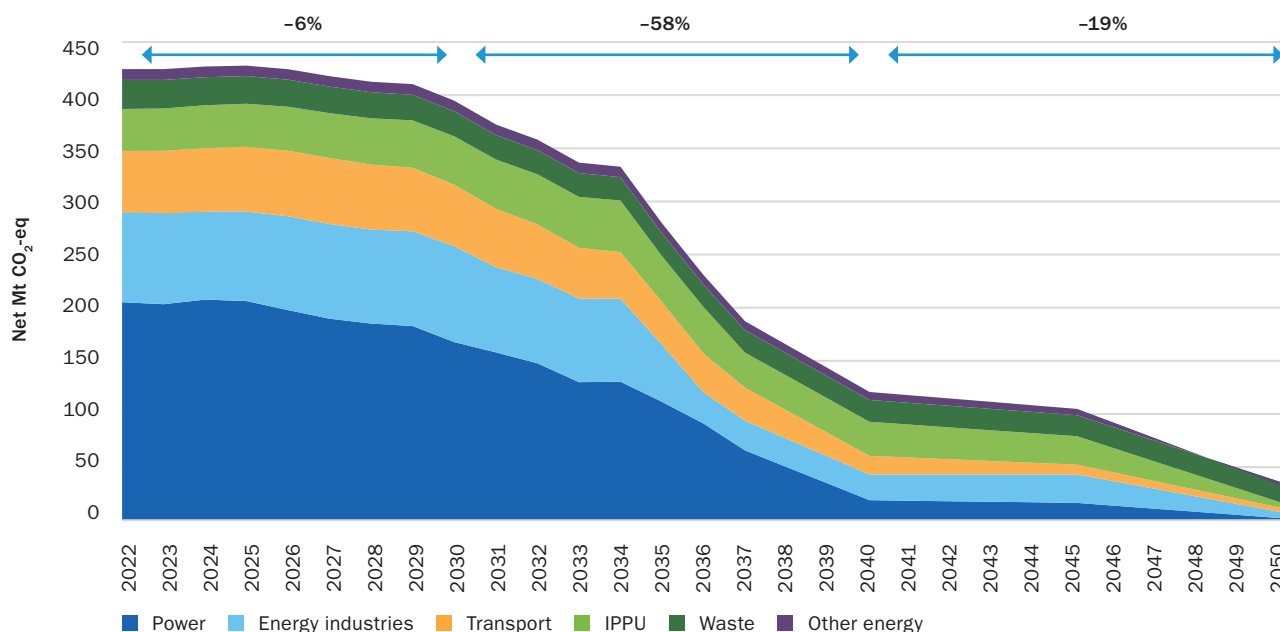
**Several options for achieving net-zero carbon emissions by 2050 have been developed for the CCDR and combined to explore multiple net-zero scenarios for SA.** The reference scenario is a pathway that follows the updated NDC targets by 2030 and the government's ambitions for 2050 as presented in its Low-Emission Development Strategy and JTF. The net-zero reference scenario assumes a cumulative GHG emissions budget of 9 gigatons (Gt) CO<sub>2</sub>-eq over the period 2021–2050, which is aligned with the upper level of the updated NDC until 2030.

**The contribution of the energy sector toward a net-zero target translates into an 83 percent reduction of carbon emissions by 2050.** Almost 60 percentage points of this reduction should take place between 2030 and 2040 (Figure 5). Until 2030, the decline in emissions will arise from changes in the power sector mix as outlined in the Integrated Resource Plan of 2019 (IRP2019) (including coal power plants decommissioning). Between 2030 and 2040, most coal power plants and refineries will be replaced by RE sources, complemented by emission reductions from the transport and industrial sectors. After 2040, additional emissions reductions from hard-to-abate sectors should contribute to reach the net-zero target.

<sup>19</sup> Incremental investments are defined as investments in excess of historical investments levels, estimated at 1.7 percent of GDP. Following the World Bank guidelines, a discount rate of 6 percent was used in the CCDR. The undiscounted value of the investment costs is equal to R4.1 billion between 2022 and 2050.

<sup>20</sup> Department of Forestry, Fisheries and Environment (2021). National GHG Inventory Report 2017.

**Figure 5: Net GHG emissions (CO<sub>2</sub>-eq) by sectors to achieve net zero by 2050 (including percentage reductions required by decades)**



Source: SATIM.

Note: IPPU = industrial processes and product use. Excludes AFOLU.

**A sensitivity analysis was conducted to explore the impacts of key policies and measures on the low-carbon transition.** The analysis tested the impact of an accelerated low-carbon path (aligned with the lower level of the updated NDC), the implementation of key policies and measures in energy efficiency and transport, and the promotion of green H2 exports. Results show that an increase in low-carbon ambitions up front will accelerate the reduction in the level of emissions until 2030, allowing for a less aggressive approach through 2050. The effective implementation of policies and measures will not change the trajectory but will influence the magnitude of the transition in the power sector, as discussed in the next section. Finally, promoting green H2 exports will slightly augment the demand for electricity in the first decade, while allowing a faster reduction in emissions in the late 2040s.<sup>21</sup>

**The following sections explore the transformation required to achieve a net-zero emissions target by 2050 in power, transport, industrial processes and product use.** Together, these sectors accounted for about 80 percent of the country's total GHG emissions in 2017. The supplementary notes summarize a similar analysis for waste management, which represents 5 percent of total GHG emissions and provide an overview of key challenges in agriculture, forestry, and other land use (AFOLU), which requires further attention in the follow-up to this report.

### 3.1.1 Adopting a low-carbon path in the power and energy industries

**SA is facing a protracted power sector crisis that affects the investment climate and quality of life of its population.** Since 2008, the country has suffered from chronic power shortages with frequent load shedding—in the first nine months of 2022 1,950 hours of loadshedding, almost 1/3 of total time, were registered. It is estimated that the on-grid power supply gap in recent years is between 4,000 and 6,000 MW. This has negative impacts on the overall industrialization and macroeconomic development of the country. The roots of the crisis lie in a power sector structure that is unable to deliver quality electricity service at cost-efficient tariffs and that remains dominated by the embattled national utility, Eskom, and by municipal distribution departments, several of them in financial arrears with Eskom.<sup>22</sup>

<sup>21</sup> The cost of exporting green H2 is still uncertain, detailed planning is required to address key development aspects (like water availability), and the export market is subject to global supply and demand of green H2.

<sup>22</sup> Municipal power distribution service is affected by a combination of financial (e.g., affordability, inadequate tariff structures, etc.), technical and operational (commercial losses, transformer failures, etc.) barriers, as well as legislative and regulatory restrictions (e.g., municipal power and authority, licensing issues, etc.). More recently, increasing loadshedding has forced the replacement of deteriorated distribution assets on emergency basis at under cost recovery tariff.

**SA has developed a suite of relevant policy instruments that can start the just energy transition, but they are not entirely consistent and their implementation has been slow.** For example, the IRP2019 (currently being updated) and the Green Transport Strategy (GTS) have already been approved, but their implementation is lagging. The IRP2019 defines the generation capacity expansion plan up to 2030 and the analysis carried out in this plan positions wind and solar as least-cost technologies. It proposes the decommissioning of about 12 GW of old and inefficient coal-fired power plants, and scales up RE, including 18 GW of new wind and solar PV, 2 GW of storage and 3 GW of gas thermal. The World Bank supports the Eskom Just Energy Transition Project that was selected as a demonstration project by the government to establish a pathway for retiring future coal plants in a sustainable manner. The project will decommission the Komati coal-fired power plant and repurpose the site with renewables (150 MW solar PV, 70 MW wind) and 150 MW batteries. The project will also mitigate socio-economic impacts by supporting affected workers and communities. As part of that just energy transition engagement, the Bank is further supporting Eskom in the preparation of relevant studies for retirement of an additional three power plants, totaling 5 GW.

**Ending load shedding requires improving the energy availability factor of the existing fleet and bringing new generation capacity online in the shortest possible time, while sustainability requires implementation of delayed sector reforms.** Addressing the power sector crisis requires a set of short-term measures to bring new generation capacity online, including addressing delays in the implementation of the IRP2019. However, the long-term sustainability of the sector requires a comprehensive set of reforms, some of which have already been approved or are being developed by the government. For example, the unbundling of Eskom was approved in October 2019; so far, only the transmission unbundling is in development. In addition, the DMRE is amending the Electricity Regulation Act of 2006, but details on the proposed market structure and timelines for implementation remain uncertain.

**Addressing energy poverty, subsidies, and universal access is a key aspect of the just transition.** While the country has made substantial progress toward providing universal access to electricity (currently about 89 percent), energy poverty remains high (about 47 percent in 2017, with pockets of unelectrified areas in new informal settlements).<sup>23</sup> Furthermore, SA has relied on fossil fuel subsidies as a key lever for its industrial development by supporting electricity underpricing and, more recently, to support energy access for poor customers.<sup>24</sup> As a starting point, phasing out these subsidies requires determining electricity tariffs that reflect the efficient cost of service provision, and, subsequently, an implementation mechanism that supports the universal access agenda.

**The expansion and reinforcement of the power network is a key enabler for greening the energy sector, and vice versa.** The energy transition is expected to shift the spatial distribution of the generation fleet towards the western part of SA and closer to big metros. Expanding and reinforcing the distribution and transmission systems (including regional interconnections) will be a key element of the low-carbon transition. The creation of the National Transmission Company of South Africa, as planned by the government, should be accompanied by a business model and regulatory environment to deploy transmission capacity efficiently and at the scale required, including, for example, the possibility of developing transmission through private-public partnerships (PPPs).

## **Investments and policy reforms required for the energy transition**

**The net-zero reference scenario is only one of the possible combinations of technologies to achieve the low-carbon transition, but it emphasizes that the least-cost solution entails a shift away from coal to renewables, complemented by storage and natural gas.** SATIM provides a broad picture of how the power sector could look over the next three decades, but a more complete and granular understanding of the sector will require specific power sector planning studies. The net-zero reference scenario indicates that by 2050, wind and solar could account for 85 percent of electricity generated and 67 percent of capacity installed (Figure 6). Such a transition could include:

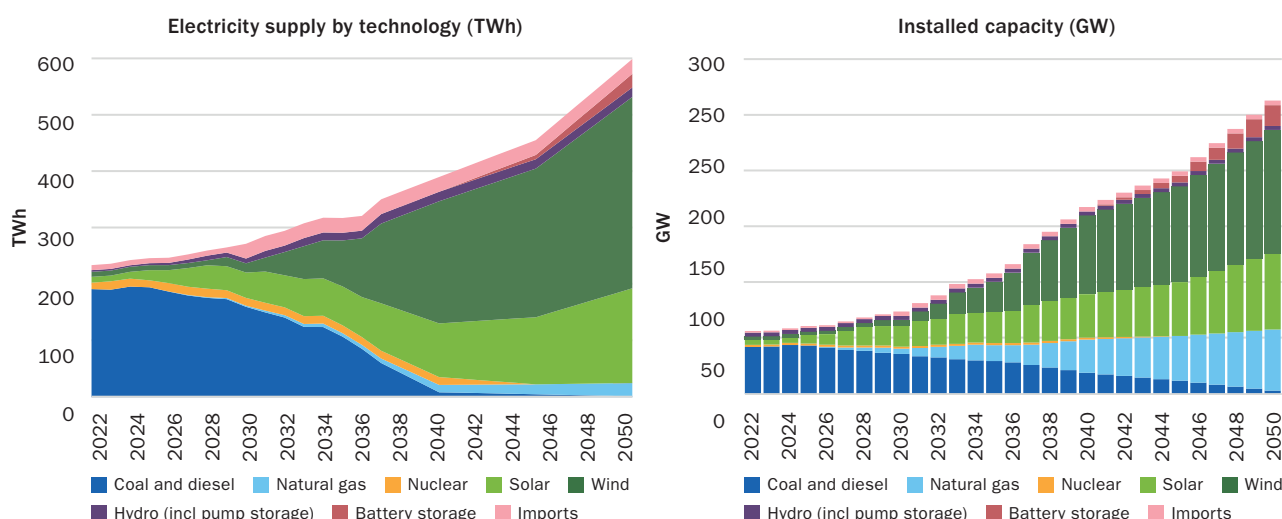
- In alignment with IRP2019, the decommissioning of 10–12 gigawatts of coal power plants by 2030, to mostly be replaced by new investments in solar and wind energy

<sup>23</sup> Energy poverty is a complex and multi-faceted issue driven by a diverse range of social and economic factors, such as rising electricity prices, household incomes, and energy-inefficient homes. See Sustainable Energy Africa. 2017. Energy Poverty and Gender in Urban Southern Africa. [https://www.cityenergy.org.za/uploads/resource\\_432.pdf](https://www.cityenergy.org.za/uploads/resource_432.pdf).

<sup>24</sup> Several studies have concluded that the government's free basic electricity of 50 MW hours per household per month is inadequate for most household uses, including cooking and washing ([https://www.cityenergy.org.za/uploads/resource\\_432.pdf](https://www.cityenergy.org.za/uploads/resource_432.pdf)). Most poor South Africans do not have the means to pay for more electricity beyond the free allowance. Resorting to alternative sources is common, sometimes with devastating impacts.

- Deepening the regional power market to tap additional sources that could provide system stability and support variable RE deployment.
- Complementary use of pumped storage, battery storage and gas turbines (running on natural gas) to fill the demand gap for electricity and contributing with some 30 percent of the total installed capacity by 2050.<sup>25</sup> Battery storage will play a growing role, particularly as the technology matures from the 2040s onwards.
- A 10 Mt per annum land sink, the use of green H2 and carbon capture and storage to offset hard-to-abate emissions in specific industrial processes.

**Figure 6: Net-zero reference scenario: Power sector generation and installed capacity by technology**



Source: SATIM

**These changes in the sources of power generation can be influenced by the implementation of the National Energy Efficiency Strategy (NEES) and new technologies.** For example, the rapid implementation of energy efficiency measures—including by proactively scaling up the local energy service (ESCO) market—will reduce electricity consumption and, thus, the need to invest in new generation capacity before 2030. In contrast, the active promotion of green H2 exports will lead to increased electricity demand, particularly from 2040 onwards, and will therefore require additional investments in renewable generation sources over time.<sup>26</sup> Total incremental investments in the power sector are estimated at R933 billion (net present value) between 2022 and 2050, or 0.7 percent of GDP per year. About 20 percent of these investments will have to take place before 2030. Around 63 percent of these investments will be deployed in wind and solar energies (Figure 7).<sup>27</sup>

**However, this transition will not happen automatically and requires the immediate implementation of a competitive wholesale power market and the development of human capital required to roll it out.** It should be a priority for government to implement sectoral reforms to address the existing energy crisis and develop a competitive wholesale power market with transparent and non-discriminatory access by many sellers and buyers. In addition, developing the mechanisms to ensure the availability of sufficient local human capital is also key to reducing the risk of bottlenecks at different implementation areas (see Chapter 5).

**Furthermore, as the energy transition moves forward, local demand for coal will inevitably decrease over the next two decades which requires a well-managed just transition for workers and communities** (Figure 8). As discussed in Chapter 5, most of this transition will happen within a 100-kilometer radius, to the east of Johannesburg in the Mpumalanga province where most of Eskom's coal-fired power plants, Sasol's coal-to-liquids and chemical complex, and the mines that supply them, are located. A well-managed social and just transition will be critical to protecting the livelihoods of the workers and local communities that depend on the coal value chain.

<sup>25</sup> A gas master plan is currently under preparation by the DMRE. A base case report for this master plan was issued by the DMRE for stakeholder consultations in December 2021.

<sup>26</sup> Green H2 exports will require investment not only for electricity, but also for related transmission infrastructure (existing gas infrastructure is limited and geographically concentrated) and in exporting terminals.

<sup>27</sup> The projected investments in the coal sector are those requested to complete the Kusile coal power plant and associated transmission lines for the Medupi coal power plant between 2022 and 2024.



Figure 7: Investments per source, 2022–2050, % of total power sector

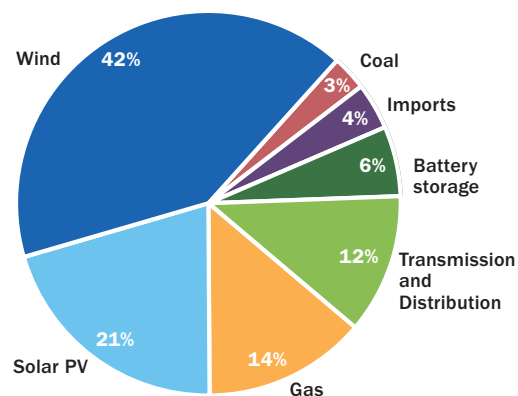
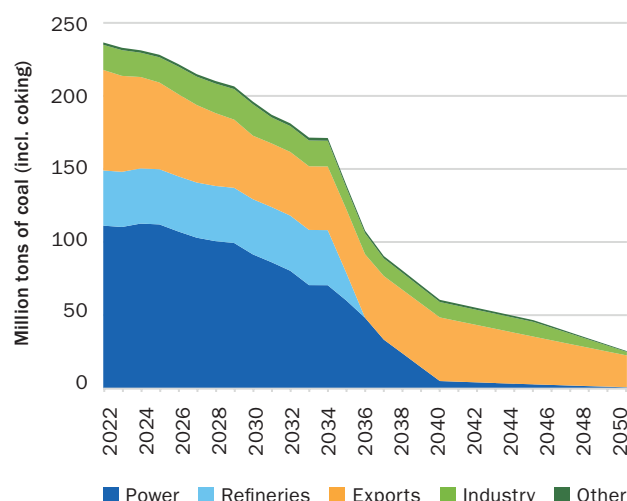


Figure 8: Net-zero reference scenario: Demand for coal, 2022–2050



Source: South Africa General Economy (SAGE) model and South Africa TIMES Model (SATIM).

## Recommendations

**The immediate priority is to ensure security of supply in the power sector as a prerequisite for any low-carbon strategy.** Power shortages are damaging the economy and exacerbating the country's triple challenge of poverty, unemployment, and inequality. Accelerating the rollout of the IRP2019 through a process that will respond to market demand (rather than be heavily reliant on policy decisions) will help bridge the supply gap as it will bring clarity and predictability to private developers. Such a rollout could also consider the following measures:

- *Developing wheeling regulations in line with international best practices.* The existing mechanism of bilateral negotiation leads to delays and lacks transparency. Wheeling regulations should ensure open access for third parties to the grid in a transparent, efficient, and non-discriminatory manner. This would facilitate the deployment of independent power producers, especially in renewables, while preserving the transmission business.
- *Strengthening the financial sustainability of the power sector by reducing Eskom's unsustainable debt levels and improving its operational efficiency.* Concrete action is also needed to reduce and prevent the accumulation of municipal payment arrears.
- *Aligning market structure with the unbundling of Eskom and the new sectoral reality.* Proposed changes in the Electricity Regulation Act should give market participants opportunities to benefit from greater efficiency in the power sector, including diversifying purchasing risks by expanding the number of wholesale buyers and sellers and providing incentives to attract investment on a cost-competitive basis. This should be complemented by adequate secondary legislation, including operation rules for the transmission system, a tariff-setting mechanism to support regulatory independence, the development of market rules, and the harmonization of the tariff structure for all market participants.
- *Improving municipal power distribution services.* Municipalities must rethink their role in the power sector value chain and analyze avenues that allow them to return to sustainable service provision. It is also critical to ensure proper implementation of the free basic electricity policy, including improving the targeting of households that benefit from the policy.

**The government could focus on implementing existing energy sector policies to drive energy transition and low-carbon emissions in a manner compatible with economic growth.** Effective implementation of the IRP2019 should be prioritized, monitored, and updated (as required). Relevant ministries need adequate technical and financial resources. Special attention should immediately be given to:

- *Promoting private investments in renewables.* Despite the success of SA's REIPPPP in attracting private investment in renewables, the program has suffered from significant delays in the last bid window. In July 2022 President Ramaphosa announced several actions,<sup>28</sup> including removing the licensing threshold for embedded generation, doubling the size of REIPPPP bid window 6, developing a different guarantee model to reduce the burden on NT, and taking a more pragmatic approach to localization requirements.<sup>29</sup> These decisions should be implemented urgently through a roadmap and accountability framework, including regular reporting on progress.
- *Safeguarding the shift away from coal with appropriate social and financial measures.* The decommissioning of aging coal power plants will reduce coal demand and coal mine jobs. This effect will be exacerbated in future by the transformation of Sasol's coal-to-liquids chemical complex. Possible government responses to support a just transition are further analyzed in Chapter 5.
- *Accelerating the implementation of policies and measures.* The efficient implementation of the NEES will be a win-win for SA in its effort to lower emissions from the energy sector. Many of the proposed actions require lower investments (compared to new generation) and/or changes in consumer behavior through information and pricing policies.

**New technologies such as battery storage and green H2 are expected to play an important role in SA's low-carbon transition, but some of these technologies still require active support to reach commercial use.** While SA is well positioned to benefit from the future green H2 economy, the sector is still at an early development stage, and several aspects remain relatively uncertain, including technology options, costs, and the specific role of the public sector. Harnessing the requisite investment to unlock this market will require meaningful stakeholder coordination and the creation of an enabling environment. Batteries face similar, but arguably fewer, challenges.

**Harnessing opportunities in the regional market can support the procurement of cost-competitive electricity and support low-carbon objectives.** SA is an active trading member of the Southern Africa Power Pool, the most advanced power pool in Africa. Expanding participation in this regional market (as identified in the IRP2019 and the President's July 2022 speech) can help to tap into vast cleaner energy sources in the region and support low-carbon efforts in a cost-competitive manner.

### 3.1.2 Adopting a low-carbon pathway in transport

**SA has the most developed transport and logistics sector in sub-Saharan Africa, but challenges remain in terms of efficiency and access to services, especially for rural communities and the poor.** The sector is dominated by road-based transportation but also operates regionally important ports and hosts the largest rail and air network on the continent. The transport sector's contribution to GDP was R310 billion in 2021, of which 78 percent was generated by the freight subsector, and it employed over 600,000 people. Key challenges in the sector include: (i) unequal and inefficient public transport services, partly an apartheid legacy; (ii) difficulties in the migration of freight from road to rail; (iii) underinvestment in transport infrastructure, including in maintenance, particularly in rail; and (iv) continued underperformance of key transport SOEs. As a result, logistics costs in SA were at 12.8 percent of GDP in 2013, compared to only 8 percent for the United States and 8.7 percent for the European Union, reducing the country's competitiveness in global markets and making imports more expensive.<sup>30</sup> Some of SA's freight transport infrastructure network (rail and port) was built to service coal exports, and may need to be repurposed to serve other growing industries as a result of the low-carbon transition.

**Transport is the second largest GHG-emitting sector in SA, accounting for 11 percent of the country's total emissions in 2017 and 14.4 percent of energy-related CO<sub>2</sub> emissions.** GHG emissions from road transport account for more than 90 percent of the sector's emissions (see Box 5).

<sup>28</sup> South African Government. 2022. "President Cyril Ramaphosa: Address to the Nation on Energy Crisis". <https://www.gov.za/speeches/president-cyril-ramaphosa-address-nation-energy-crisis-25-jul-2022-0000>.

<sup>29</sup> See Meridian Economics. 2020. *Accelerating Renewable Energy Industrialization in South Africa: What's Stopping Us?* <https://meridianeconomics.co.za/wp-content/uploads/2020/07/Accelerating-renewable-energy-industrialisation-in-South-Africa-July2020.pdf>

<sup>30</sup> Havenga, J.H., Simpson, Z.P., De Bod, A., and Viljoen, N.M. 2014. "South Africa's Rising Logistics Costs: An Uncertain Future." *Journal of Transport and Supply Chain Management* 8(1), Art. #155. <http://dx.doi.org/10.4102/jtscm.v8i1.155>.

## Box 5: Urban form and transportation in SA

Transport in SA's cities is still affected by the legacy of apartheid spatial planning, which perpetuates sprawling development. Low-density, low-income housing developed en masse since 1994 by the state now accommodates a quarter of all households in SA but continues to entrench monofunctional, peripheral residential neighborhoods that offer limited services and economic opportunities.

One consequence of this is that commute distances are unusually long, requiring multiple transfers for those using public transport and private taxis. The poorest tend to travel furthest, with commutes of over two hours being common. Another consequence is that provision of urban transport services is costly, inefficient and leads to higher levels of emissions. Furthermore, the decline in public transport quality has led to a dramatic increase in the rate of motorization, use of minibuses, and congestion, exacerbating carbon emissions and other pollutants. As detailed below, actions that will reduce GHG emissions in the sector can also help achieve development objectives.

### Investments and policy reforms required for the transition of the transport sector

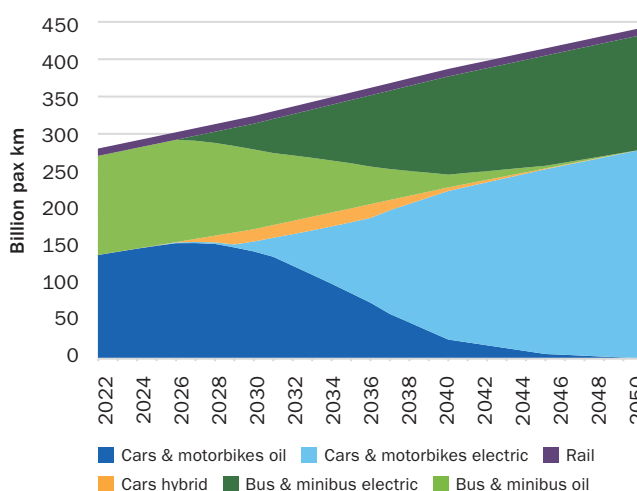
**Adopting a low-carbon pathway in the transport sector requires a reduction in fossil fuel consumption and a shift in the modality of transportation.** Figure 9 illustrates projected changes in the structure of the transport sector in the net-zero reference scenario. The most important changes will occur after 2030, when the production of electric vehicles (EVs) will attain cost parity and aligned with the increase in the supply of more reliable and cleaner electricity.

**If properly implemented, the GTS, issued in 2018 by the Department of Transport, can further support the low-carbon transition while reducing the investments required for the transition.** Key goals of the GTS include:

- *A shift from private to public passenger transport.* A 20 percent relative shift to public transport by 2030.
- *Alternative vehicles.* A minimum of 10 percent of the vehicle population will comprise EVs and hybrid vehicles by 2030, reaching 40 percent by 2050.
- *Minibus conversion to biofuel vehicles.* Ten percent of the minibus taxi fleet will be converted to use biofuels by 2030, reaching 40 percent by 2050.
- *Metrobus to gas.* Ten percent of the municipal bus fleet will be converted to use gas by 2030, reaching 30 percent by 2050.
- *A shift from road to rail for corridor freight transport.* By 2030, the rail share of corridor freight transport will be 30 percent, and by 2050, 50 percent.

**A low-carbon transition in the transport sector is characterized by a high degree of uncertainty in several respects.** These include: (i) the cost-competitiveness of fuel-cell-energy vehicles over battery-energy vehicles in heavy transport; (ii) the potential to locally produce components for fuel-cell-energy vehicles; and (iii) the maturation of autonomous vehicles technology. These uncertainties make it difficult to estimate the costs associated with the investments required for this sector transition, which may also be impacted by the efforts made to reduce transport demand—for example, through improved spatial planning (promoting transit-oriented development).

Figure 9: Net-zero reference scenario: Changes in the structure of the transport sector, 2022–2050



Source: South Africa General Economy (SAGE) model and South Africa TIMES Model (SATIM).



**Despite these limitations, the CCDR estimates the net present value of the investments required for the transition in the sector to be around R380 billion over the period 2022–2050.** The bulk of these costs will arise from the shift to EVs, followed by the investments required to expand rail along major corridors. These estimates do not include the investments required for the transition in the maritime and aviation subsectors.

### **Recommendations**

- **Restoring and improving commuter rail services while enhancing the efficiency of public road transport should be an immediate priority.** This could include supporting the Passenger Rail Agency of South Africa to address infrastructure vandalism, enhance managerial capacity, and accelerate the reconstruction of infrastructure and the modernization program that is already underway. In addition, the devolution of rail networks to municipalities should be considered to optimize their integration with city-level transportation, the land use regulation to promote transit-oriented densification, and provide opportunities to leverage private sector participation.
- **Developing a low-carbon minibus taxis is a priority, but it will require some sector formalization to be viable at scale.** Formalization offers benefits that include the collective management of the fleet and scheduled operations, lowering the overall fleet size and reducing emissions, and opening the space for collective financing to reduce capital costs. Regulatory restrictions on the size of minibus taxi vehicles should also be revisited to support formalization of the sector.

**In the medium to long term, developing more inclusive and spatially integrated urban multi-modal planning is an effective way of improving public transport systems in cities.** The authorities could combine densification policies with strictly enforced restrictions to limit sprawl, revisiting zoning and development regulations to increase the mix of development typologies and planning cities that efficiently use space to enable sustainable development. All these actions will contribute to reducing transport time and congestion and, therefore, carbon emissions. Improving the livability of urban spaces, including reducing travel time and cost, and improving the safety and security of residents, is one of the most important reforms that will help achieve both socioeconomic and climate objectives in SA.

**As the major automotive producer and importer in sub-Saharan Africa, SA has a unique opportunity to take the first mover advantage of the worldwide shift toward EVs.** However, SA's nascent EV market will require significant investments and coordinated support between stakeholders, including developing the enabling environment to expand EV charging stations. As the different initiatives to promote electric mobility progress and lessons emerge, sectoral dialogue and coordination between the government and private sector will be required to develop and roll out more ambitious policies that allow the sector to transform.

**To further reduce the carbon emissions and operating costs of the railway sector, actions should be taken to improve the efficiency of long-distance freight transport by rail.** While this sector has been losing market share to trucks, key steps would be to consolidate its market share for export minerals by improving slot availability and reliability, and to increase capacity and reliability for the general freight business. This will require substantial investments, improved service levels, and committed stewardship. A concomitant improvement in efficiencies in the ports sector, improving port-rail interfaces and the use of climate-smart technologies for port operations, will also improve efficiency and so reduce emissions.

**The low-carbon transition in the transport sector should be done in a way that addresses the sector's objectives of improved inclusion and strengthened maintenance.** Low-carbon technologies in the transport sector generally result in lower transport costs, but inequality and poverty could negatively affect the wider introduction of EVs and the requested changes in public transport systems. An opportunity exists to shape a more inclusive transport sector within and between cities by encouraging non-motorized transport (e.g., cycling) and improvements in the reliability, affordability, and safety of public transportation. The socially progressive transformation of the automotive value chain to EVs will also be critical for job creation.

### **3.1.3 Adopting a low-carbon pathway in industrial processes and product use (IPPU)**

**Emissions from non-energy industries represented 6 percent of SA's total GHG emissions in 2017.** Over 60 percent of those emissions are generated in industrial processes related to the metal industry (iron, steel, and ferroalloys), followed by the mineral industry (cement) and then product uses (refrigeration and air conditioning) at 20 percent and 13 percent, respectively.

**The transition to a low-carbon economy offers new opportunities for the industrial sector.** About 50 percent of the firms surveyed by the IFC anticipate that the transition will enable them to expand their production by adapting their products or developing new ones. These opportunities are significant for the mining industry (Box 6).

#### **Box 6: Opportunities for SA's mineral industry during the transition to a low-carbon economy**

The largest mining subsectors in SA are coal and platinum group metals (including platinum, palladium, and rhodium), which account for about half of total sales in mining. In 2019, coal accounted for R139 billion and platinum group metals for R125 billion of total sales volume. Mining of coal and platinum group metals also accounts for the largest share of jobs. Of the 460,000 direct jobs in mining in 2019, 168,000 direct jobs were linked to platinum group metals and 94,000 to coal mining.

Despite the challenges facing the SA mining industry, its mineral resources and reserves offer opportunities for further growth. Producers are generally well positioned to benefit from increased demand resulting from the energy transition. Iron ore quality is some of the best in the world, and chrome and manganese reserves are among the largest globally. Furthermore, SA has not yet exploited its full potential in niche minerals, such as vanadium and some industrial minerals that are essential for the energy transition.

With its established export infrastructure and abundant supply of high-quality RE resources, SA could become a beneficiation, value-addition, and export hub for refined green-tech commodities, other related commodities that will be in high demand, and manufactured RE products. Many key mining firms extracting “climate action” commodities have operations and offices in SA. Furthermore, many beneficiation facilities exist but have been mothballed in recent years due to electricity shortages. To realize these opportunities, the country needs to develop competitive, low-carbon beneficiation and value-addition capabilities. Moreover, SA needs to lead regional economic integration and the easy flow of goods and services across its borders with neighboring and other key international supplier countries to ensure supply of inputs.

The transition to a low-carbon economy also presents opportunities in the following areas:

- *Automotive industry.* The national uYilo eMobility Programme was established in 2013 to enable, facilitate, and promote e-mobility in SA. Mobility-as-a-service companies such as Uber, Lyft, and Bolt have made commitments to introduce electric or zero-emission vehicles. The Golden Arrow Bus Service has kicked off its electric bus pilot project and has several green initiatives, including installing a solar carport at its central engineering complex. Johannesburg's Metrobus has committed to buying electric buses from 2030 onwards. The Gautrain network will include electric buses powered by micro-grids.
- *Telecommunications and digital data infrastructure sectors.* SA is the main center for data-hosting infrastructure in southern Africa, which requires a lot of energy. Incumbent companies have committed to transitioning to green energy sources to power these facilities globally. A recent 10 MW solar farm built by Amazon Web Services in the Northern Cape is an example of this transition.
- *Battery value chain.* A recent World Bank study estimated significant market opportunity for battery value chain development in SA.<sup>31</sup> Although the current battery market is driven by behind-the-meter installations, grid scale front-of-the-meter and EVs offer large opportunities going forward. SA is well placed to capitalize on the development of the battery storage value chain, as it has many of the minerals needed to manufacture battery storage, including vanadium, manganese, nickel, and cobalt.
- *Green H2.* A range of companies, including Anglo American, Hive Energy, and Sasol, are working with the government to produce green H2 to power mining haul trucks, which reduce diesel consumption by 80 percent. Anglo American plans to roll out a fleet of 40 such trucks at its Mogalakwena platinum mine in Limpopo province by 2024. To generate the fuel for the pilot, Anglo American built the largest electrolyzer in Africa.

<sup>31</sup> World Bank (forthcoming). South Africa and Southern Africa Battery Market and Value Chain Assessment Report.

## **Investments and policy reforms required for the transition of the IPPU sector**

**The government supports the transition to a green industrial sector through the National Cleaner Production Centre South Africa (NCPC-SA).** The NCPC-SA promotes appropriate resource-efficient and cleaner-production interventions, supports building the local skills and capacity required for a green economy, and advises industry and government on the potential benefits of resource-efficient and cleaner production. Since 2011, the NCPC-SA has successfully promoted energy efficiency in more than 450 industrial companies, with cumulative cost savings of R5.3 billion, and reduced CO<sub>2</sub> emissions by 6.4 million tons. The NCPC-SA is also implementing eco-industrial parks with the objective to monitor, mitigate, and/or minimize GHG emissions. However, eco-industrial parks are not yet embedded in the Special Economic Zones Act (2014), weakening the government's effort.

**To reduce emissions, SA introduced a carbon tax in 2019 and started pricing GHG emissions in all sectors.** The carbon tax penalizes firms that use high carbon processes, but delays and uneven implementation have generated uncertainty for the private sector. SA's carbon tax is being implemented in two phases. The second phase was scheduled to start in January 2023 but was subsequently delayed by three years to January 2026. The political economy of the carbon tax is further analyzed in Chapter 6.

**Despite these efforts, the greening of the industrial sector through mitigation policies has not been fully incorporated into current industrial plans and strategies.** None of the existing Industrial Master Plans have a specific focus on green manufacturing. This gap is likely to compromise SA's competitiveness in global markets when a carbon border adjustment mechanism is introduced by the EU. As emphasized in Chapter 2, about three-quarters of SA's exports to the EU are at moderate to high trade risk (including mining and quarrying; metals; agriculture, forestry, and fishing; chemicals; and plastics and rubber).

## **Recommendations**

**Beyond the cross-cutting recommendations made in Chapter 2, specific actions could include:**

- *Strengthen the current carbon tax to further incentivize the shift to the use of low-carbon energy sources.* The current carbon tax rate (R144, or about \$8.70 per ton) and the partial coverage are considered too low to significantly affect business behaviors. To be effective, the rate should be increased faster to make it economical for firms to invest in green technology. As discussed in Chapter 5, such a policy should be accompanied by social measures or by a reduction in other taxes to mitigate impacts on the most vulnerable households and businesses.
- *Review the green industrial policy.* There is a need to review and update industrial policies, including the Master Plans to embed green technology in their aspirations.
- *Facilitate the development of new low-carbon projects by repurposing land and assets.* Developers face several administrative hurdles, one of the most important being the acquisition of land. The further development of eco-industrial parks is promising and could be accelerated through their inclusion in the Special Economic Zones Act, and possibly through the use of fiscal incentives for green investments.
- *Promote SA as a beneficiation/refining hub in Southern Africa for climate minerals, including those used in battery storage.*<sup>32</sup> SA's rich potential in certain climate minerals, its proximity to other countries with similarly rich reserves of important climate minerals, and its comparative advantage in industrial capacity situates it as a facilitator and a hub for beneficiation, value-addition, and export of refined green-technology commodities, other commodities that will be in high demand, and manufactured renewable energy products. Expanding investment in transport infrastructure, improving trade facilitation, and developing resource-based economic corridors will deliver benefits to and beyond SA.

## **3.2 The economic impacts of the low-carbon transition**

**The low-carbon transition in key carbon-emitting sectors cannot be separated from the rest of the economy.** This section explores how sectoral transitions will impact the country's development objectives in terms of economic growth and structural transformation using the SAGE model (see supplementary notes for more details). It complements the results obtained through SATIM in the preceding sections.

<sup>32</sup> SA is located relatively close to existing reserves of key battery minerals—cobalt (DRC), lithium and nickel (Zimbabwe), and copper (Zambia).

### 3.2.1. Growth and climate objectives can be reconciled

#### **SA could reach the net-zero emission target by 2050 with faster economic growth than over the past decade.**

As reported in Table 2, under the net-zero reference scenario, the level of emissions is expected to reduce drastically from 470 CO<sub>2</sub>-eq metric tons in 2022 to 171 CO<sub>2</sub>-eq metric tons in 2040 and 80 CO<sub>2</sub>-eq metric tons in 2050. Concurrently, GDP could almost double between 2022 and 2050, which would be equivalent to average growth per year of about 2.3 percent during this period, or double the rate achieved between 2009 and 2019 (see supplementary notes for further details). This positive impact on growth is mainly explained by the resolution of the energy crisis, productivity gains and an increase in employment that will generate higher income for the labor force. It would, however, remain short of the government's ambitions, which will require further and broader policy reforms to accelerate the rate of economic growth in South Africa.

**Table 2: Impacts of different net-zero scenarios on emissions and GDP, 2022–2050**

	GHG emissions (Mt CO <sub>2</sub> -eq)				GDP (R billion 2019)			
	2022	2030	2040	2050	2022	2030	2040	2050
Net-zero reference scenario	429	398	125	32	4,408	5,235	6,736	8,416
With greater ambition	429	329	119	31	4,378	5,028	6,597	8,375
With efficiency measures	424	389	139	34	4,420	5,324	6,926	8,435
With green H2 exports	427	391	133	33	4,405	5,217	6,945	8,912
With efficiency measures and green H2 exports	422	388	138	36	4,410	5,305	7,072	9,026
With higher foreign savings and greater ambition	429	329	119	31	4,378	5,050	6,756	8,819
With higher carbon tax	423	398	120	27	4,387	5,291	6,786	8,470
<b>Deviation from reference</b>								
With greater ambition	0.0%	-16.0%	-4.0%	-2.0%	-1.0%	-4.0%	-2.0%	0.0%
With policies and measures	-1.1%	-2.1%	8.1%	2.5%	0.2%	1.7%	2.8%	2.8%
With green H2 exports	-0.4%	-1.6%	4.7%	1.3%	0.0%	-0.4%	3.1%	5.9%
With efficiency measures and green H2 exports	-2.0%	-2.0%	8.0%	5.0%	0.0%	1.0%	5.0%	7.0%

Source: SAGE model.

Note: GHG emissions exclude AFOLU.

#### **The sensitivity analysis described in section 3.1.1, conducted around the net-zero scenario, reveals:**

- *There is a potential trade-off between GDP and greater ambition in reducing emissions.* An increase in the level of ambition (from 9 to 8 Gt CO<sub>2</sub>-eq) could accelerate the initial decline in emissions, but it would reduce GDP by about 4 percent by 2030 relative to the reference scenario (Table 2). This option will generate stranded assets in the power sector and require further investments for the sector transitions, crowding out existing resources for productive investments in other sectors.
- *Effectively implementing energy and transport efficiency could be a win-win for climate and economic growth objectives.* The NEES will reduce the demand for energy, leading to lower emissions, and reduce the sector investments. Efficiency gains are also relatively inexpensive, as they mainly require change in behaviors or relatively smaller investments compared to heavy investments in new infrastructure. Concurrently, the GTS will also help accelerate the energy transition in the transport sector.
- *Green H2 exports and derived products could support domestic low-carbon transition and boost GDP, but not before the 2040s.* Promoting a green H2 export industry could increase GDP by about 5.9 percent in 2050 relative to scenarios without it. In the longer term, green H2 would generate economy-wide links through its positive impacts on transport and manufacturing equipment (Table 2). However, the initial effect on the economy is likely to be negative, as it would increase energy demand at a time when new generation is needed to replace aging coal power plants.

**Another finding from the model is that SA could further leverage its low-carbon efforts to advance its development objectives by adopting the right mix of policies and strategies or by receiving further external resources.** This has been corroborated by introducing into the model: (i) an increase in foreign resources allocated to finance the low-carbon transition effort and (ii) an increase in the carbon tax rate.

- *Higher foreign inflows would provide financial space to SA to accelerate its reduction in emissions (greater ambition), while boosting GDP growth in the long run.* An average increase in foreign savings of about \$5 billion per year (or 1.4 percent of GDP) could reduce the crowding out of other productive investments. As a result, GDP would be about 4.8 percent higher than under the reference scenario by 2050 (Table 2).
- *A broader and higher carbon tax will accelerate the low-carbon transition of the economy while accelerating economic growth.* It will accelerate the transition to a low-carbon economy by incentivizing more responsible behaviors, and raise more revenue that can be used by the government to finance the investments and social programs necessary during the transition. Such tax could bring around 1.4 percent of GDP per year in additional revenue to the government over the period 2022–2050. Its political economy and distributional impacts are further discussed in Chapter 5.

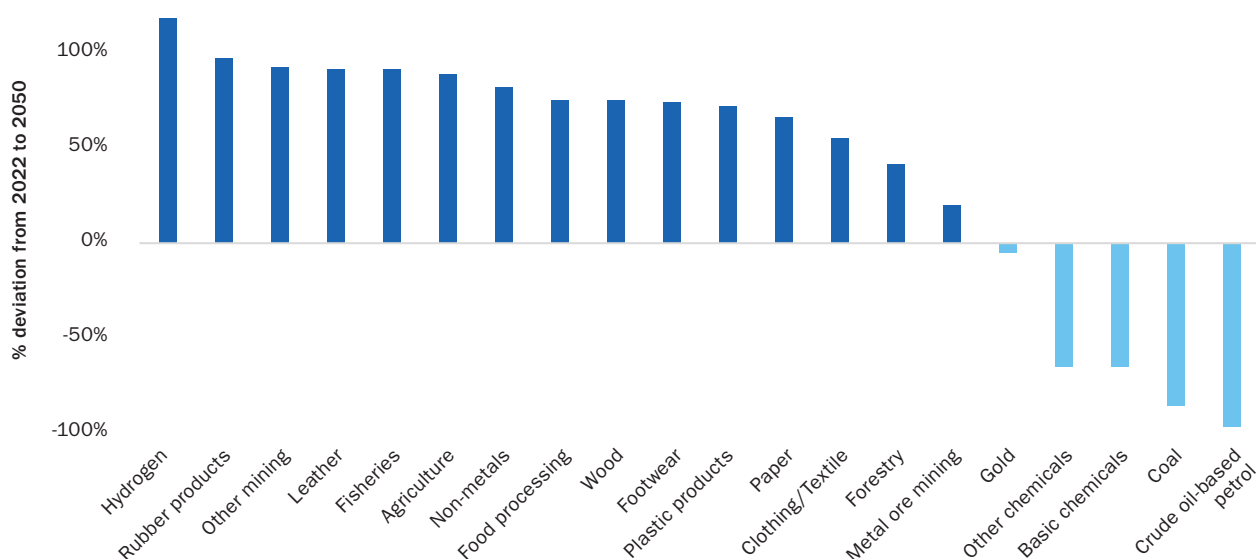
**The low-carbon transition will bring additional important climate co-benefits, which are not monetized in this study.** A decline in coal use will reduce the impact of local pollutants in air and water streams, particularly in the Mpumalanga and Gauteng areas. Phasing down coal mining will also reduce soil contamination and improve food security. Investments in expanding and reinforcing the transmission and distribution grid to integrate more distributed RE generation will create a more resilient power sector. These economic and health benefits should be examined in greater detail, as improvements in human capital will be a key driver of economic growth in the longer term.

**The low-carbon transition would require total incremental investments amounting to R4.2 trillion in net present value between 2022 and 2050.** This would be equivalent to an average of 2.1 percent of GDP during this period. These incremental investments—higher than Vietnam’s (1.2 percent of GDP)—are explained by the magnitude of the shift required to move from an economy highly dependent on coal to RE sources. About 61 percent of these investments would be for the power sector (wind, solar, batteries, and gas), 20 percent for the transport sector, and 19 percent for others (including green H2). It is estimated that about R940 billion will be needed in the first phase of the transition, from 2022 to 2030.

### 3.2.2 The low-carbon transition will change the economic landscape

**The transition to a low-carbon economy is expected to benefit the SA economy in the long run.** Yet it would also create several changes that will need to be carefully monitored during the transition. This is shown by the transformation of the GDP structure between 2022 and 2050 (Figure 10). Sectors such as green H2 and non-coal mining are expected to expand by 8,314 percent and 94 percent respectively (from a low base), while high-emitting sectors, including the chemicals, coal, and crude oil sectors, could gradually disappear from SA’s industrial landscape, down by over 50 percent in 2040 and almost 100 percent in 2050.

**Figure 10: Changes in the selected economic sectors under the net-zero reference scenario between 2022 and 2050**



Source: SAGE model.

Note: The projected increase in the production of hydrogen is 8,314 percent but is not represented accurately because of the scale of the figure.



## CHAPTER 4: ADAPTING TO A CHANGING CLIMATE— THE RESILIENT TRANSITION

**South Africans are increasingly exposed to climate-related risks.** In 2021, the country declared its third national state of disaster for drought in the last four years, and Durban was devastated by major floods in 2020 and April 2022. These climate risks are projected to worsen in the future (see Supplementary Notes for a discussion of the global climate scenarios considered for this CCDR). Several key economic sectors are particularly vulnerable to climate shocks, including agriculture, infrastructure, and tourism (especially nature-based tourism), as are several cities. Climate risks disproportionately affect poor people, who live in locations prone to disasters, have more fragile assets, do not have the resources to adjust their lives to changing climate conditions, and are underrepresented in decision-making processes.

**This chapter focuses on the impacts of global climate change on economic assets, while the next chapter focuses on the distributional impacts on people.** Building a resilient economy will require significant investments in the water, road, and agriculture sectors as well as in cities. The CCDR estimates that these investments will amount to about 1.3 percent of SA's GDP per year or R2.4 trillion in net present value between 2022 and 2050. The necessary investments need to be implemented early to lower the country's vulnerability. To reduce these costs, the government could adopt structural reforms to improve the efficiency of public spending and incentivize private sector investments in green and climate-smart projects.

### 4.1 Sectoral vulnerabilities and adaptation measures

#### 4.1.1 Resilient water

**SA is a water-scarce country, and climate projections show a worsening trend due to rising temperatures and shifting rainfall patterns in the future.** With mean annual precipitation of just 450 mm and over 98 percent of its freshwater resources already allocated for different uses, the country faces an acute water scarcity challenge, especially in the Western Cape province. (Box 7). The water scarcity index is expected to increase under all future climate scenarios, with the largest negative impacts in the Orange, Limpopo, Vaal, Berg, and Olifants Rivers (Figure 11).

**The reliability of bulk water supply is no longer assured for main urban centers.** Key cities and towns such as Johannesburg, Cape Town, Randburg, and Pretoria are all in areas of projected high-water scarcity. The economic costs and negative implications for living conditions, especially for vulnerable groups, can be significant for the country. Another source of vulnerability is the country's heavy dependence on water transfers from Lesotho.

**Despite its scarcity, water is poorly managed.** Agriculture accounts for the largest share of water use (57 percent), followed by industry (around 21 percent) and municipalities (21 percent). On average, SA loses about 35 percent of its municipal water (against a global best practice of about 15 percent) and about 24 percent of its water allocated to irrigation. This water loss costs municipalities about R10 billion each year.<sup>33</sup> Moreover, 40 percent of the country's wastewater is untreated, and a significantly low proportion is reused.

#### Box 7: Water crisis in the Western Cape province

Between 2015 and 2018, the Western Cape experienced one of the worst droughts in its recorded history, which peaked with the globally publicized “Day Zero” countdown for the city of Cape Town in early 2018.

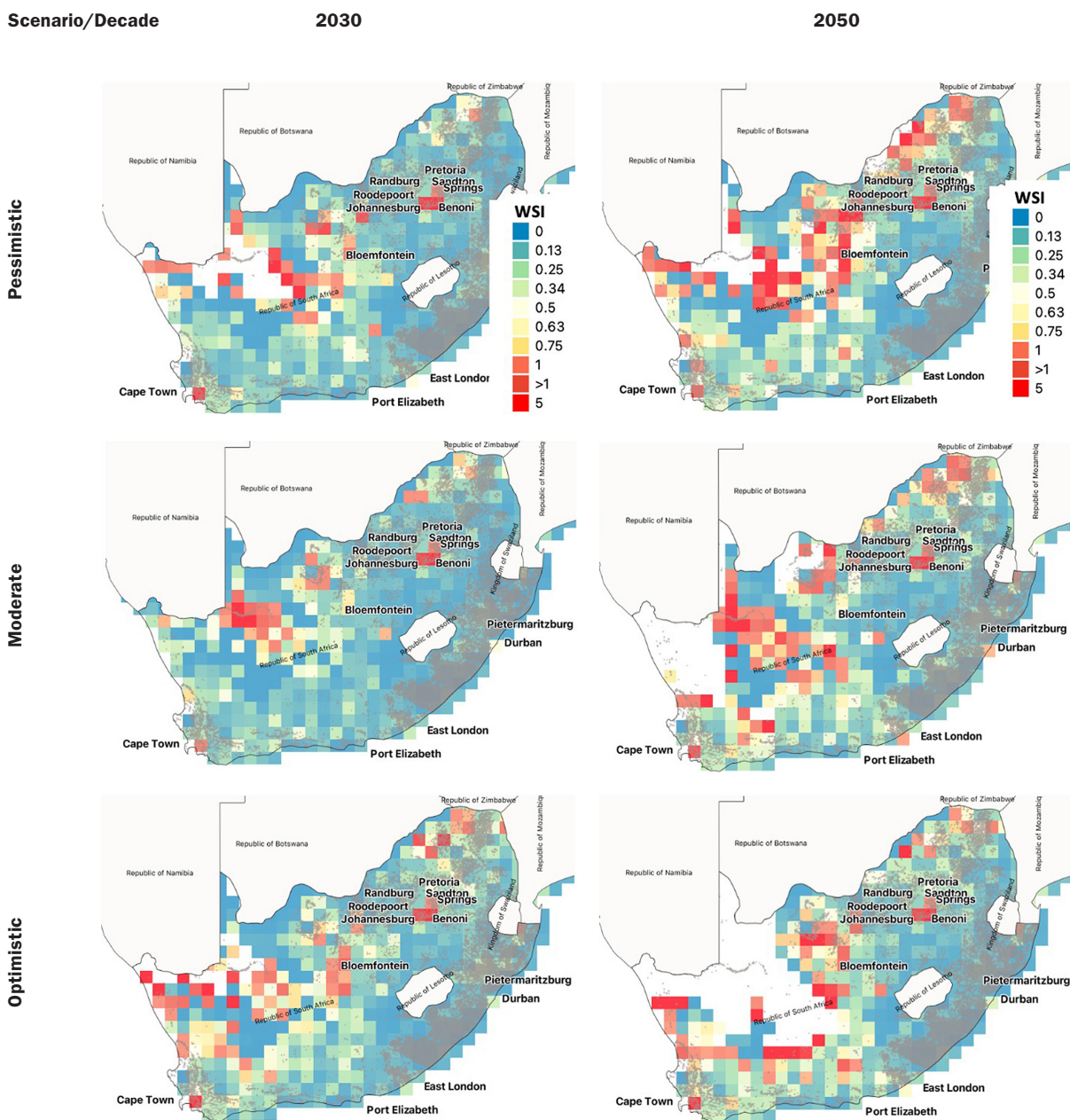
The water shortages and outlook in turn had a considerable impact on the economy and reduced investment confidence in the province and the country more broadly. The total direct economic impact of the drought on the province was up to R15 billion, or about 3.4 percent of provincial GDP and 0.3 percent of national GDP in 2018. The drought resulted in a decrease in tourist numbers; food prices and food insecurity increasing (especially for staple food items such as maize); and loss of employment (about 20,000 jobs were lost in agriculture mostly related to the drought).

<sup>33</sup> <https://2030wrg.org/southafrica-stories/>

More than half of all wetlands have been lost over the past decades, and one-third of the remaining ones are in poor condition.<sup>34</sup>

**Although SA is a water-scarce country, some areas are prone to flood risk. This is projected to intensify in future, especially in the southern and eastern parts of the country.** In 2021, all nine provinces were adversely affected by flooding. And in 2022, the storms and flooding in KwaZulu-Natal killed over 450 people, destroyed properties, caused a crisis of water supply and sanitation provision (and associated impacts on public health), and disrupted commerce due to impacts on Durban's port and highways/railways linking the port to the rest of the country. The damages were estimated at over R17 billion or 0.3 percent of GDP.

**Figure 11: Water scarcity index, 2030 and 2050**



Source: World Bank.

Note: Red areas indicate areas where demand will be greater than availability. Grey shaded areas show the location of poorer households (Relative Wealth Index < 1, derived from Chi et al. 2022<sup>35</sup>).

<sup>34</sup> <https://www.dffe.gov.za/sites/default/files/docs/publications/workingforwetlands2021.pdf>  
[https://www.researchgate.net/publication/361097017\\_Wetland\\_Resources\\_in\\_South\\_Africa\\_Threats\\_and\\_Metadata\\_Study](https://www.researchgate.net/publication/361097017_Wetland_Resources_in_South_Africa_Threats_and_Metadata_Study)

<sup>35</sup> Chi, G., Fang, H., Chatterjee, S., and Blumenstock, J. E. 2022. "Microestimates of Wealth for All Low- and Middle-Income Countries." *Proceedings of the National Academy of Sciences* 119(3), e2113658119.

## **Investments and policy reforms required for a climate-resilient water sector**

To address the country's water challenges, the government has adopted several policies and strategies that call for better water resources management, improved water supply and sanitation services, and alignment of SA's water policies and strategies with climate change impacts. These policies and strategies recommend a series of interventions that will support adaptation, including:

- *Policy and regulatory reforms:* Various strategies have proposed monitoring climate-related data, sharing this data across several tiers of government and non-governmental organizations and citizens, and processing and using this data to guide planning and decision-making, including early warning systems and the development of comprehensive plans to respond to disasters. The importance of coordinated implementation of these policies and strategies has also been emphasized.
- *Investments in supply augmentation:* To address the projected water demand gap, augmentation measures include harvesting water, importing additional bulk water from outside SA, increasing groundwater use, and introducing unconventional water supply options such as treated wastewater reuse and desalination.
- *Demand management measures* such as conserving water, importing water-intensive goods, and recovering water from acid mines are also needed.

**Transitioning from coal to cleaner energy sources can help augment water availability, resulting in both climate and development benefits.** About 7 percent of SA's total water use is to cool down coal-fired power plants and wash coal, so the decommissioning of these plants and the closing of coal mines will result in additional available water. This "saved" water could be allocated to different economic sectors according to the social and environmental benefits they generate for society.

**The private sector has a limited role in SA's water space.** While the private sector is active in major bulk water supply schemes, its role in municipal water supply services is limited in comparison with other middle-income countries. Efforts are under way to improve the enabling environment for public-private partnerships (PPPs) in the broader water supply and sanitation value chain, but implementation remains slow.

**Adapting to climate change and building water resilience will be costly but will bring significant benefits.** The proposed actions under the National Water and Sanitation Master Plan require incremental investments of about 0.4 percent of GDP per year, or a cumulative cost of R720 billion in net present value over the period 2022–2050. This figure is in line with the projected costs for the country to meet Sustainable Development Goal 6 (sustainable access to water supply and sanitation), demonstrating the inextricable link between climate resilience and good development outcomes.<sup>36</sup>

## **Recommendations**

- *Reduce both technical and financial losses in the system.* This starts with fixing dilapidated pipe networks and improving municipal water supply governance, which requires improvements in coordinated planning by the national, provincial, and municipal authorities and strong links with the sectoral strategies for agriculture and urban development. On the supply side, existing plans should account for future climate change impacts on the availability of water resources and changes in water demand.
- *Manage water demand through pricing strategies.* The government could consider forms of water pricing that incentivize more efficient use in agriculture and contribute to more assured municipal supplies. For example, linking water pricing to increased investments in irrigation and other infrastructure could lead to an improved allocation of resources.
- *Close the water service gap and reduce flood risks in poor urban and rural areas, which are vulnerable to water scarcity and extreme weather events.* Over 3 million people still do not have access to a basic water supply service and 14.1 million people do not have access to safe sanitation. Poor households are disproportionately vulnerable to flood risks. Interventions should include mapping and characterizing communities and locations vulnerable to projected shifts in water demand and floods and improving infrastructure in these vulnerable locations through land use planning, development controls, consideration of climate risk in designs, and use of green infrastructure, including nature-based solutions.

<sup>36</sup> <https://www.dws.gov.za/National%20Water%20and%20Sanitation%20Master%20Plan/>



- *Strengthen links between the energy transition and water use.* Transitioning away from coal will free up water resources for other activities. The government could plan in advance how to optimize this by assessing the volume of water that can be reallocated, the mechanisms to reallocate it to main users, the investment costs, and the timeline.
- *Develop innovative financing solutions for water-resilient projects, including through PPP initiatives.* The private sector can complement the government's role in the water sector. However, the enabling environment needs to be improved to promote private sector participation. Enhancing the PPP framework in the water sector, providing performance-based incentives, and developing a clear regulatory framework are key. Costing interventions at a more granular level is also needed.

#### 4.1.2 Resilient agriculture

**Although agriculture only accounted for 2.9 percent and about 5 percent of SA's GDP and employment in 2021, this sector has a central role to play in poverty eradication and inclusive development.** Rural areas report a higher poverty rate than urban centers, and a resilient agriculture has significant implications for the country's food security and exports. There are significant opportunities for expansion and diversification of agricultural activities, including in the Eastern Cape, Limpopo, and KwaZulu-Natal provinces, which are home to a large proportion of smallholder farmers, who are among the poorest in the country.

**Agriculture is vulnerable to climate change.** The combination of higher temperatures, seasonal variations, and lower precipitation has led to water scarcity, land degradation, and greater exposure to pests (Box 8). Smallholder agriculture, which is predominantly rainfed, is particularly vulnerable to climatic shocks and natural disasters. A 2019 report by the South African Insurance Association indicates that 42 percent of farmers incur losses resulting from droughts, followed by 29 percent from storms and 28 percent from floods.<sup>37</sup> Smallholder agricultural development is hampered by large unmitigated climate risks. As a result, yields have been negatively affected and could decrease by 25 percent in the most vulnerable regions. The demand for irrigation is also projected to increase by 15–30 percent under the extreme climate scenario (SSP3, dry) over the next decades.

#### Box 8: Agriculture's vulnerability to rising temperatures and droughts—recent episodes

Between 1998 and 2000, four major droughts were recorded in SA, costing an estimated \$1.6 billion. Droughts between 2015 and 2018 caused the production of summer crops to collapse, severely impacted labor-intensive horticultural production in the Western Cape, and reduced the cattle and sheep herd by more than 50 percent in some areas of the Karoo and the Northern Cape. Those episodes disproportionately affected poor regions and the poor.

**SA's long coastline and rich marine biodiversity provide opportunities for expanding fisheries and aquaculture, but are also exposed to climate change.** SA's fisheries sector accounts for only 0.1 percent of the country's GDP but the commercial sector employs over 27,000 people directly and an estimated 81,000 to 100,000 people indirectly, while the subsistence sector employs 30,000 fishers. Most fishing activity takes place along the western and southern coasts. Climate change affects SA's fisheries and aquaculture sectors differently. Marine fishery stocks are already dwindling due to overfishing, but a changing climate exacerbates these pressures. Climate change impacts on fisheries include changes in the spatial distribution of species and lower abundance and productivity of marine resources. This makes fisheries management less effective. Overall, fisheries production is projected to decline by 13.3 percent by 2030. In contrast, the aquaculture sector is moderately vulnerable to climate change and is projected to grow at 61.8 percent per year over the next decade.

<sup>37</sup> South African Insurance Association. 2019. Sustainable Insurance Solutions for Commercial and Smallholder Farmers in South Africa. <http://www.saia.co.za>.

## ***Investments and policy reforms required for a climate-resilient agricultural sector***

**The government has anchored its strategy of building a climate-resilient agricultural sector on two key priorities:** (i) water management, including irrigation expansion and measures to improve water-holding capacity such as watershed management and soil and water conservation activities; and (ii) climate-resilient infrastructure, covering transport and electricity. Beyond investment, additional support through grants and subsidies may be necessary to promote research and development in greener and more resilient agriculture such as heat- and disease-tolerant breeds, dry farming, and other climate-smart agronomic practices. Nevertheless, weak alignment between several policies and strategies and limited coordination across different agencies and tiers of government during implementation have led to suboptimal outcomes in climate-smart agriculture and smallholder farmer development.

**Another priority for the government is to expedite its land reform policy and secure land tenure for smallholder and emerging farmers.** This should increase opportunities for these farmers to own productive assets and their motivation to invest in irrigation schemes and other infrastructure, as well as sustainable land management and related climate-smart measures. Such initiative should be accompanied by capacity-building programs, including financial support, for these farmers and their communities. The private sector has also launched a few initiatives to help farmers adapt to climate change and so complement the government's efforts.

**The estimated investment needs for adaptation measures in agriculture are about 0.2 percent of GDP or R453 billion in net present value between 2022 and 2050.** About 50 percent of these costs will arise from investments in irrigation programs, while the remainder will be divided between retrofitting and new investments in transport infrastructure (45 percent) and research and development (5 percent). These figures are aligned with those from the International Food Policy Research Institute.<sup>38</sup>

### ***Recommendations***

- *Reduce the risk of water stress for farmers.* This will require increasing investments in irrigated agriculture and reducing costs of existing schemes. Potential interventions include installing solar-powered rainwater-harvesting ponds, rehabilitating smallholder irrigation schemes, and expanding existing commercial irrigation, including public schemes and farm-led irrigation within hydrological limits. Watershed-based interventions will increase water retention and build climate resilience more broadly through pasture improvement, landscape restoration, biomass enterprise development, and community agroforestry. These initiatives can also generate job opportunities for unskilled laborers. The co-benefits could be maximized through better intergovernmental coordination and alignment of fiscal transfers and subsidies to local governments, communities, and farmers.
- *Accelerate security of land tenure among smallholder and emerging farmers* by improving land transfer mechanisms, ensuring new landowners have the necessary skills and support to succeed; strengthening land administration to expedite transfer of ownership and security of tenure, and facilitating partnerships between smallholder and emerging farmers, and larger commercial farmers along the agriculture value chain.
- *Consider carbon credits for generating revenue for farmers.* Using carbon credits would require farmers to adopt green standards and guidelines and a credible monitoring, reporting, and verification mechanism. Building on the recently published green finance taxonomy, the government can identify a set of climate-smart measures and practices in agriculture that could be linked to carbon credits. Those could become a source of income for local rural communities through a transparent trading system as experimented, for example, in Australia and Kenya.
- *Further promote cooperation between the public and private sectors.* Partnerships should be considered for infrastructure projects such as water distribution and other joint activities, including testing and liming soil to ensure more effective fertilizer use, implementing conservation tillage, and preparing grazing plans for communal livestock investments. Researching and developing heat-tolerant breeds and seed varieties; strengthening animal and plant nutrition and health to deal with changes in disease incidence; increasing use of digital technologies to improve yields and increase efficiencies; and adopting regenerative agriculture are important for increasing the climate resilience of this sector.

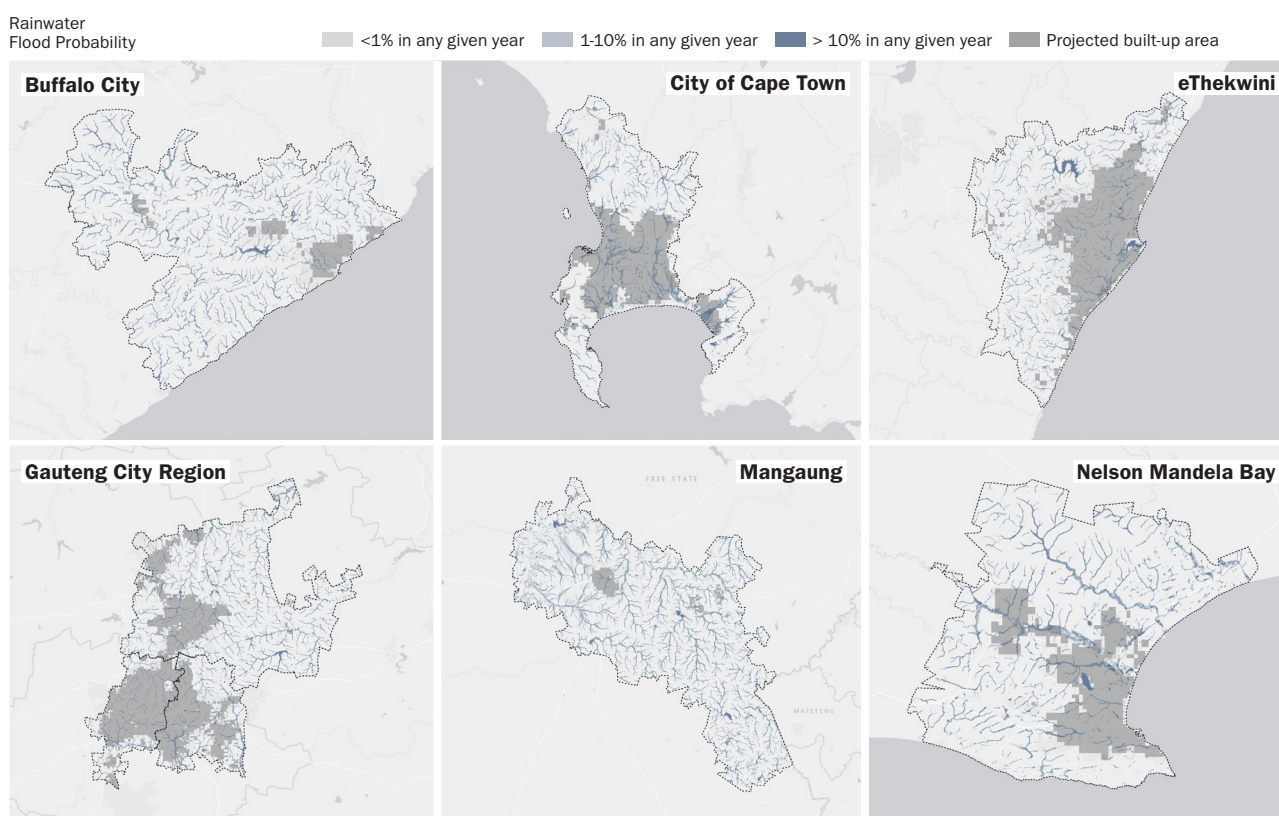
<sup>38</sup> Source: Climate Change and Hunger. Estimating Costs of Adaptation in the AgriFood System. Timothy Sulser et al. International Food Policy Research Institute 2021.

- *Promote inclusive agricultural insurance programs.* Such programs could support farmers by: (i) serving as a proxy for collateral for farmers to access credit; and (ii) protecting them against climate catastrophes. Good statistics and information tools are needed to develop adequate insurance products and their pricing, including by collecting real-time data with automated weather stations and upgrading agricultural statistics portals.
- *Strengthen the resilience of the fisheries and aquaculture sectors.* This could include: (i) adopting new adaptive management measures (such as feedback control systems governed by rules); (ii) empowering fishers to participate in decision-making and management processes; (iii) developing early warning systems; and (iv) improving energy infrastructure to maintain diurnal temperature variation of intensive aquaculture production systems.

### 4.1.3 Resilient cities

**South African cities are highly vulnerable to floods, urban heat, and droughts.** These climate risks are expected to worsen in the future, with up to 19 percent of the urban population exposed to flooding by 2050 (Figure 12). Concurrently, some metropolitan areas could experience a 10 percent reduction in precipitation, increasing the likelihood of major drought episodes. The damages from climate risks could be substantial as about two-thirds of the population is urbanized, and industrial and service activities are highly concentrated in urban centers.

**Figure 12: Pluvial flood hazard in key metropolitan areas of SA under SSP3 scenario (2050)**



Source: SSBN 3 arc second (90 m) Global Hazard Data (World Bank License); Chen, G., Li, X., Liu, X. et al. 2020. "Global Projections of Future Urban Land Expansion under Shared Socioeconomic Pathways." *Nature Communications* 11(537). <https://doi.org/10.1038/s41467-020-14386-x>.

**Recent experiences from the Cape Town “Day Zero” drought and recurrent flood damage in KwaZulu-Natal have demonstrated that damages are localized, including within cities,** with poor households in townships and informal settlements disproportionately affected. Those damages are compounded by inadequate urban spatial planning, infrastructure development, and energy policies. Urban policies that promote transport-oriented densification and green infrastructure could reduce damages. A recent study estimated that the exposure of the population to flooding and landslides will be reduced, by 10 and 2 percent, respectively, in SA’s six major metropolitan areas if such urban policies were implemented.<sup>39</sup>

<sup>39</sup> World Bank. 2022. “Cities and Climate Change in South Africa.” Background paper for the CCDR, forthcoming.

## ***Investments and policy reforms required for climate-resilient cities***

**The general framework for coordinated planning and implementation of climate actions in cities is guided by the National Climate Change Response Policy (2011), the NDP, the Spatial Planning and Land Use Management Act (2013), and the Integrated Urban Development Framework (2016).** Moreover, NT's Cities Support Programme was developed to support the scaling up, alignment, and integration of adaptation strategies in cities' investment plans for infrastructure and service delivery. At the city level, most metropolitan areas have developed climate action plans and have policies, strategies, pilots, and data for promoting sustainable, resilient, and inclusive urban development.

**To build more resilient cities, the government is focusing on better land use planning and compact city development.** Such an approach promotes shorter traveling distances and better access to municipal services, thus facilitating social inclusion. It reduces water consumption and the costs of waste management. Better land use planning and densification policies can also help avoid developments in risk-prone areas, while green infrastructure is expected to build resilience and minimize infrastructure damage and disruption of services during flooding. Digitizing city infrastructure and transport management systems can also help to reduce wastage and improve efficiency. Finally, investments in densification and green infrastructure offer additional social and environmental benefits, such as low traffic congestion, clean air, job creation and lower costs of providing services for municipalities.<sup>40</sup>

**Achieving compact urban growth will require improved coordination.** At the local level, South African municipalities are constitutionally mandated to provide a wide variety of services (such as electricity, water, sanitation, solid waste, and local roads construction and maintenance), but many have insufficient funding and human resources to fully develop climate-smart projects. They will require both financial and technical support from the national government.

**Implementing climate-smart policies in SA's six metropolitan areas will cost an estimated 0.3 percent of GDP per year or R581 billion in present value between 2022 and 2050.** These estimates assume that the incremental cost of adaptation policies is approximately equal to 20 percent of the total cost of urban investments (R2.6 trillion in net present value) required over the next 25 years.

## ***Recommendations***

- *Align climate change and development policies between national and municipal authorities.* Building resilient cities should be the responsibility of local authorities, but many measures will require coordination with neighboring provinces and the national government. Expediting the implementation of the country's Integrated Urban Development Framework will provide an inclusive governance framework for decision and implementation processes.
- *Integrate spatial planning in adaptation strategies* to reduce vulnerabilities for the population and lower the cost of adaptation measures. The World Bank Group has developed an urban planning tool to assess exposure to risks and city-wide impacts of climate resilience policies that local government technical staff can use.
- *Strengthen urban resilience to floods and droughts.* The main climate risk for urban centers is associated with water management and access, which will require retrofitting existing infrastructure and investing in new projects (if possible, in partnership with the private sector). Improving water demand management will require closely engaging with local communities through education and information programs and using incentives/sanctions to promote responsible behaviors.
- *Develop people-centered interventions by engaging local communities* in determining climate adaptation priorities, including disaster risk management and evacuation procedures. A key people-centered intervention is the NT's City Support Program's township economic development program and the Department of Cooperative Governance and Traditional Affairs' small town regeneration program, both of which promote houses and neighborhoods that are livable and climate resilient.

<sup>40</sup> C40 Cities. 2022. Creating Local Green Jobs in South Africa.

<https://c40.my.salesforce.com/sfc/p/#36000001Enh/a/1Q0000001nQa/078oSTl2lqaDZXwf5iJzLeuJQN7i0KuDP690m0F586k>.



#### 4.1.4 Resilient transport

**By regional and even global standards, SA's road, rail, and maritime transport infrastructure is extensive, relatively modern, and climate resilient.** All major and secondary cities are connected by 750,000 km of paved and unpaved roads (over 80 percent is unpaved), while the country is covered by a total length of 22,387 kilometers of railways. SA accounts for about a quarter of the continent's total maritime traffic.

**Overall, transport infrastructure is not highly exposed to climate risks, but this assessment masks variations across subsectors and locations.** Increased extreme heat events could increase the number of disruptions in rail and air traffic by causing buckling of rail tracks and damage to power cables and reducing the maximum take-off weight or requiring investment in longer runways due to less dense air at the airport. Provincial and rural roads that are in a poor state of repair are more vulnerable to climate-related risks. They may be impassable after heavy rains, disrupting normal business sometimes for days or weeks. The poor rely the most on public transport and are likely to be more affected by any weather-related disruptions. In the maritime sector, port operations may face additional delays due to an increase in the frequency of windbound days when it is unsafe to operate cranes. There is already anecdotal evidence of an increase in high winds at the ports of Durban, Port Elizabeth, and Cape Town. The Council for Scientific and Industrial Research in conjunction with Transnet has started to investigate these challenges.

#### ***Investments and policy reforms required for resilient transport***

**The government has yet to mainstream climate change adaptation within its transport planning and decision-making framework.** There is no clear strategy to upgrade existing infrastructure to reduce their exposure to climate risks, due to limited financial resources and a short-term vision. Disruptions due to climate change impacts on the transport system can drastically change the country's supply chain configuration and affect the economy. According to a 2021 study by the United Nations Conference on Trade and Development, every dollar invested in resilient transport infrastructure in developing countries could return \$4 in benefits over the lifetime of the project.<sup>41</sup>

**Improving the resilience of SA's road infrastructure could average about 0.35 percent of GDP per year or about R678 billion in net present value between 2022 and 2050.** By international standards, these costs are relatively low as the government should concentrate mainly on a subset of provincial, rural, and inner-city roads. The cost will vary depending on whether the government retrofits existing infrastructure or invests in new projects. Over the long term, the benefits of adapting road infrastructure proactively will include savings from decreased maintenance and lower vulnerability to climate change impacts. There is no available estimate of the investment costs associated with upgrading railway and maritime infrastructure.

#### ***Recommendations***

- *Improve the government's capacity to forecast and assess climate change risks for transport infrastructure.* This includes developing a baseline data framework that incorporates the likely impacts associated with future climate change scenarios on road, rail, maritime, and air transport at the local, national, and regional levels. The framework should provide a better understanding of the interrelationship between the three transport networks as an integrated response is the most effective. Risks associated with climate hazards can be diversified by offering options to shift across networks.
- *Introduce a life-cycle asset management approach for infrastructure* to sustain the service level of infrastructure while minimizing the overall budget spent on building and maintaining the asset. The approach should include a systematic risk review to guide retrofitting and new investment plans. SA should also adopt climate-resilient design standards for its transport infrastructure, accounting for a changing climate.
- *Upgrade existing rural roads to climate-resilient design standards.* Many provincial roads in climate-vulnerable provinces are in poor condition. They should urgently be made climate resilient, and alternative routes or transport services should be provided to the poor when disasters hit.

<sup>41</sup> UNCTAD. 2021. "World Investment Report 2021." <https://unctad.org/webflyer/world-investment-report-2021>.

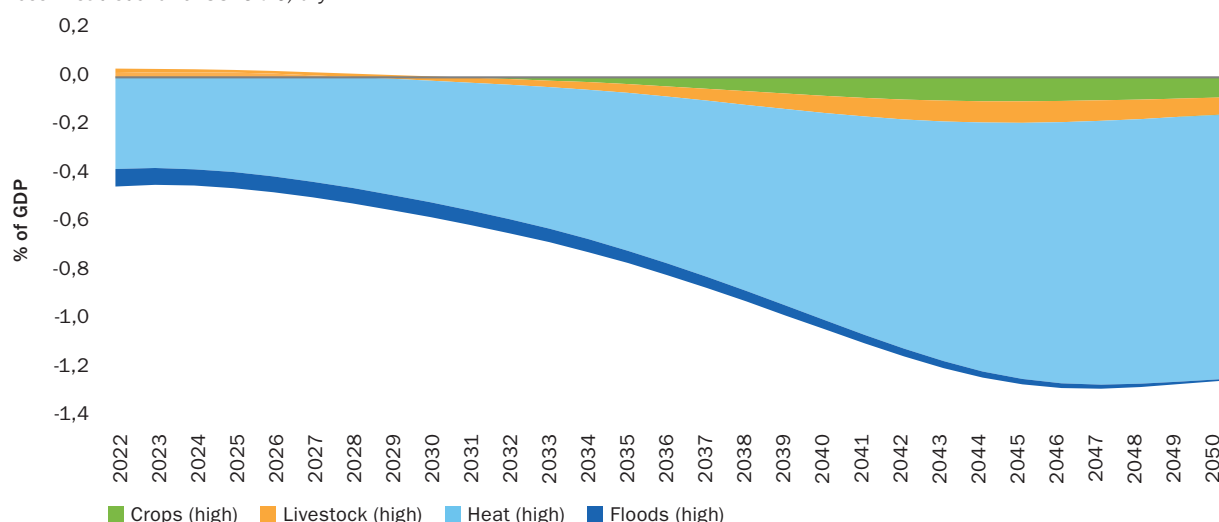
## 4.2. The macroeconomic damages of climate risks and the costs of adaptation

To estimate the overall economic damages from climate risks, a standard macro-structural model was adapted by introducing four damage functions.<sup>42</sup> These functions include (i) built up capital and land asset damages due to floods; (ii) rainfed crop damages due to changes in temperature and precipitation; (iii) livestock damages due to heat stress and availability of grazing pasture due to drought; and (iv) labor productivity impacts due to heat stress. Further details on these transmission mechanisms are in the Supplementary Notes. While these functions incorporate some of the major risks faced by SA, they are not exhaustive as they do not account for the broader impacts of water scarcity on the economy, the potential damages on human capital (education, health, and social protection), possible economic tipping points. By contrast, the damages from tropical storms and rising sea levels have not been incorporated because they are not expected to significantly impact SA's economy before 2050.<sup>43</sup>

While five major global climate scenarios (Shared Socioeconomic Pathways (SSPs)) were selected to assess SA's future climate projections, the results are only presented for the pessimistic scenario—SSP3-7.0, dry. The overall damages derived from the forecasting model are expected to be relatively limited for SA's economy, amounting to around R1.5 trillion in net present value between 2022 and the end 2050, or on average 0.8 percent of GDP (Figure 13).<sup>44</sup> They will, however, increase over time, reaching up to 1.2 percent of GDP per year between 2040 and 2050. Climate damages related to heat shocks on labor productivity account for 80 percent of total damages across the four channels considered.

**Figure 13: Projected economic damages from climate risks per year, 2022–2050**

Pessimistic scenario: SSP3-7.0, dry



Source: Macro-structural model, World Bank. Note: Crops = impacts on rainfed crops; floods = impact on built-up capital and land; heat = heat stress impact on labor productivity; and livestock = impact on pasture-grazing livestock.

The relatively moderate vulnerability of SA's economy to climate risks is explained by its moderate exposure to sea-level rise, at least until 2050, and to tropical storms. These two risks tend to account for the biggest economic damages globally. In addition, agriculture accounts for only 2.9 percent of GDP in 2021, when it is a major economic sector in many developing countries. Finally, the country benefits from relatively resilient infrastructure and good-quality buildings.

However, these overall estimates of damages mask significant variations both geographically and across income groups. As illustrated in Figure 14, the spatial distribution of damages from climate risks will be uneven across provinces. Damages are also expected to be bigger in major urban centers, where most economic activities and the population are concentrated, with the poorest households disproportionately affected.

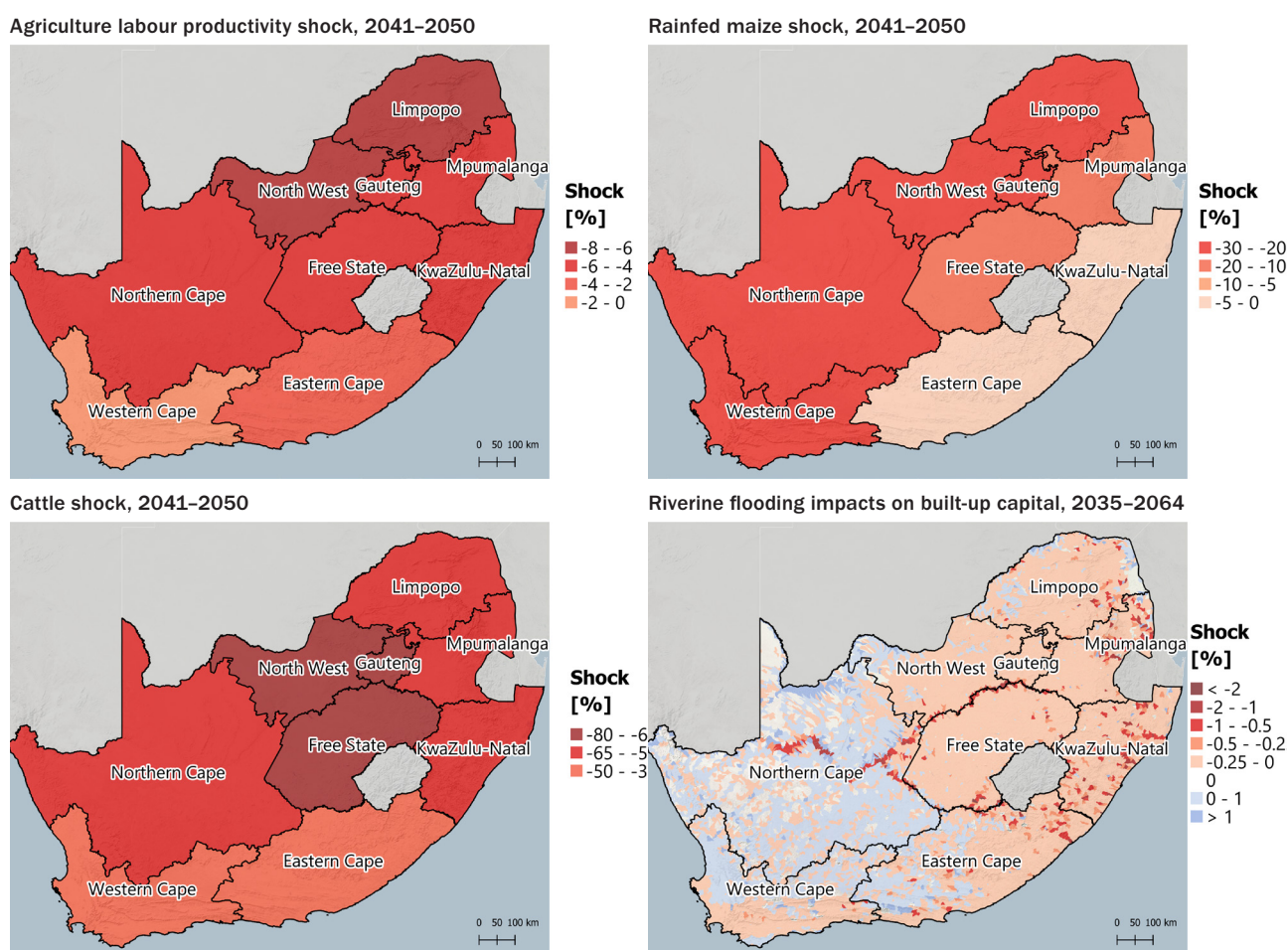
<sup>42</sup> For details, see Burns, Andrew, Charl Jooste, and Gregor Schwerhoff. 2021. "Climate-Modeling for Macroeconomic Policy: A Case Study for Pakistan," World Bank working paper.

<sup>43</sup> SA's mean sea level has risen by 3 mm per year, consistent with the global average. According to recent studies, the projected sea-level rise by 2100 around South African coasts is a little higher (by about 7–14 percent) than the global mean sea-level rise. The studies also indicate significant sea-level rise for SA's coasts in the later part of the century. Source: <https://iopscience.iop.org/article/10.1088/2515-7620/ac4a90/pdf>.

<sup>44</sup> These projections are consistent with historical damages, including those during the Western Cape droughts (2015–2018) and more recent flooding in KwaZulu-Natal, both of which were estimated to be less than 0.5 percent of GDP.

The CCDR used two complementary methodologies to estimate the costs of adaptation measures needed to address the country's climate vulnerability. First, using a top-down approach following a methodology developed by the World Bank Group, the annual financing requirements to upgrade the country's assets are equal to 3 percent of their value.<sup>45</sup> The adaptation cost following this methodology would amount to about R1.8 trillion in net present value over the period 2022–2050, or an average of 0.93 percent of GDP per year. Second, using a bottom-up approach by adding all the financial requirements estimated for water, agriculture, cities, and road infrastructure in the preceding sections (Table 3). Using this approach, the total adaptation cost would amount to R2.4 trillion in net present value between 2022 and 2050, or about 1.3 percent of GDP per year. While these two figures should be interpreted with caution, they are quite similar.

**Figure 14: Spatial distribution of damages from climate risk in high-risk scenario, SSP3-7.0, dry**



Source: Industrial Economics, Incorporated (IEC), South Africa Climate Change Economic Damage Estimation, July 2022.

The bottom-up approach indicates that the most important costs will be in building a resilient water system, followed by resilient cities and transport. It also shows that the financing requirements in the water sector will be higher between 2022 and 2030 than in the next decades given the urgency to address SA's water challenges upfront.

**Reforms in fiscal policy and management can reduce the cost of investing in adaptation.** Given the “public goods” nature of the necessary investments, there is a need to improve public investment management and increase coordination across different tiers of government to enable the emergence of economies of scale in the design, implementation, and resourcing of green infrastructure projects.<sup>46</sup> Horizontal coordination at both the national and local levels is necessary to align annual budget planning with medium-term investment planning, and recurrent expenditure (for operation and maintenance) with capital expenditure. Using internationally

<sup>45</sup> Hallegatte, S. et al. 2017. *Unbreakable: Building the Resilience of the Poor in the Face of Natural Disasters: Climate Change and Development*. Washington, DC, World Bank.

<sup>46</sup> Most of the benefits from adaptation interventions accrue to broader society, so leaving those investments to the market, which tends to focus on near-term profits, or to individuals, who focus on private benefits, and may fail to generate the necessary upfront investments in adaptation, especially if there are financial constraints.

compatible guidelines and a taxonomy for adaptation projects improves their transparency and comparability and helps mobilize resources. New investments from existing and new firms can be encouraged by making climate information, associated risks, and instruments to address them available; promoting disclosure of information; lowering barriers to entry; and using the right pricing signals.

**Table 3: The incremental investments required for resilient development in key sectors**

Sectors	2022–2030		2022–2050	
	R billion, net present value	% GDP	R billion, net present value	% GDP
Resilient water	360	0.6	720	0.4
Resilient agriculture	134	0.2	453	0.2
Resilient cities	172	0.3	580	0.3
Resilient transport	200	0.3	678	0.3
Total financing needs	866	1.37	2,431	1.3

*Note: Using a discount rate of 6 percent per year. The cost of resilient transport is only for road infrastructure.*

**These measures should be complemented by targeted actions on climate-related investments, including:**

- Conducting periodic risk assessments of public assets and contingent liabilities owned by general government institutions and developing the use of markets and insurance instruments.
- Improving the efficiency of climate-resilient public investments by: (i) introducing performance indicators for the allocation of fiscal transfers from the national government to provincial and local governments; (ii) systematically tagging and monitoring those expenditures in the budgets of the national and local governments; and (iii) evaluating projects using a social welfare-equivalent discount rate (in contrast to a market-based discount rate) to enhance rapid interventions.
- Adopting green public procurement procedures such as construction standards or land-use regulations that explicitly account for climate risks (including for SOEs).
- Enhancing the PPP legal framework to create incentives for greater private sector participation in climate resilient-infrastructure projects by allowing risk-sharing on investments in new technologies, innovative business practices, and climate-smart performance-based contracts.
- Considering tax incentives to stimulate private operators to spend more on improving the resilience of their own assets or to expand their investments for the well-being of the community through corporate social responsibility measures.

**SA has already initiated some of these measures, but it is important to operationalize them at scale.** In addition to these cross-cutting fiscal measures, the government can use financial sector policies to stimulate more and better climate-resilient investments from both the public and private sectors. These measures are further detailed in Chapter 6.



## CHAPTER 5: PROTECTING THE POOR AND VULNERABLE—THE JUST TRANSITION

**SA's climate agenda must not exacerbate the country's social and economic inequalities.** The social compact established at the dawn of SA's democracy has made some progress but needs to be renewed. The government will need to build broad support for its climate reforms. The labor force must be supported in the transition toward a low-carbon economy, while reducing the disproportionate risks faced by poor and vulnerable households.

**The government has recently adopted the JTF, which puts people at the center of the country's climate strategy.**<sup>47</sup> This framework seeks to propose concrete solutions to mitigate the impacts on people and communities as well as businesses affected by the shift away from coal and climate risks. It is based on the principle that inclusive development is good for the climate change agenda, and vice-versa. For example, expediting land reform and securing land rights and equitable access to finance and water for irrigation will help both to increase yields (and earnings) and build climate resilience of the agricultural sector. In the urban space, the spatial exclusion legacy of apartheid has relegated the poor and vulnerable to live on the periphery in informal settlements far away from jobs and other municipal amenities. More affordable housing, water and sanitation, and electricity, as well as better access to good-quality education, skills training, and health services are important elements to support the climate resilience of the poor.

**This chapter discusses the different channels through which the low-carbon and resilient transitions could affect the poor in SA.** While moving toward a low-carbon and more resilient economy will improve the livelihood of South Africans in the long term, the transition costs need to be managed as the poorest households are expected to be the most impacted by losses in employment in high carbon-emitting sectors and by higher prices of goods and services in the short term. They are also the most exposed to floods and droughts, especially in urban centers. The recommendations will highlight the need to manage these costs and to enable workers to take new opportunities that emerge over time.

### 5.1 Managing the social impacts of the low-carbon transition

**The low-carbon transition is expected to affect people's well-being through its effects on the economic growth trajectory, composition of GDP, employment, relative prices, and co-benefits on health.** These impacts will differ across households, depending on factors like their location, levels of education, household composition, and consumption patterns.

**To capture part of these distributional impacts, the CCDD explored how the macroeconomic impacts explored in Chapter 3 would translate into distributional and poverty impacts.** This is done with the SAGE model, outlined in Chapter 3, which was linked to a macro-micro simulation modeling approach based on household welfare distribution and characteristics drawn from the 2018 National Income Dynamics Survey.<sup>48</sup> This modelling exercise suggests that the shift toward a low-carbon economy is not expected to significantly impact both poverty and inequality in the long-term (Table 4). However, this result could be misleading because the assumption that people will fully adjust to changes in relative prices is inaccurate in the short run. Many households are unable to adjust their consumption patterns to new prices, while workers cannot move from one job to another due to rigidities in the labor market. The model also does not cover the potential gains in terms of human capital due to lower air, water, and land pollution.<sup>49</sup>

**The main challenge is therefore to better understand the adjustment costs during the transition and to intervene appropriately to minimize them.** This is done by examining successively the adjustment costs from energy prices reflecting the cost of service and the movements in the labor market.

<sup>47</sup> Presidential Climate Commission. 2022. "Framework for a Just Transition in South Africa."

<sup>48</sup> The microsimulation model is the Global Income Distribution Dynamic model, adapted to the climate change CGE, by the World Bank.

<sup>49</sup> An extension would be to include a positive link between the reduction in GHG emissions, health improvements, and labor productivity. For details, see Vietnam's CCDD, July 2022.

**Table 4: Impact of the low-carbon transition on poverty, economic security, and inequality**

	2020	2030	2040	2050
<b>Reference scenario</b>				
\$1.90 a day (% of population under line)	21	16	10	8
\$3.20 a day (% of population under line)	38	32	24	21
\$5.50 a day (% of population under line)	56	51	42	38
Gini coefficient	0.67	0.67	0.66	0.67

Source: World Bank's microsim model.

### 5.1.1 Mitigating the impact of price increases during the transition

**As the low-carbon transition progresses, removing fossil fuel subsidies and expanding the use of the carbon tax may affect electricity tariffs.** Even if the quality of the electricity service increases due to the elimination of loadshedding, the burden of any tariff adjustment will be greater for the poorest households, who spend as much as 27 percent of their income on energy (compared with the country average of 14 percent).<sup>50,51</sup> This regressive impact on poor households may be exacerbated as there are significant gender, racial, and geographical disparities in energy poverty. Female-headed households are generally more vulnerable than male-headed ones, and black female-headed households are the most vulnerable.

#### Recommendations

- *Manage the regressive impacts of rising electricity costs by:* (i) deploying least-cost renewable energy; (ii) actively promoting energy efficiency; (iii) reducing distribution losses and addressing infrastructure vandalism; (iv) defining a tariff mechanism that accurately reflects the cost of service provision; and (v) reviewing the free basic electricity policy based on lessons learned, the need to align it with the future market structure, and the possibility of using revenues from the carbon tax to complement it (Box 9).

#### Box 9: The political economy of carbon taxes

Broadening the scope of the carbon tax and increasing its rate will help reduce GHG emissions and generate benefits for most of the population as more jobs will be created through a shift toward more labor-intensive industries, and more exports generated through improved competitiveness in international markets. Yet, it will also negatively affect some segments of the local economy, including workers and businesses (and SOEs) in high-emitting sectors, and poor households.

The government should carefully weigh options for how to best allocate the revenue collected from the carbon tax: ensuring a just transition will require several measures to support affected households (and businesses). International experience reveals that supporting affected parties through financial assistance is important both to ensure a fair transition and to consolidate political support in favor of reforms (as in Sweden and Germany).

### 5.1.2 Supporting the transition to a low-carbon economy through labor mobility, skills development, and MSME support

**The low-carbon transition is expected to have a modest effect on the net number of jobs in SA over the period 2022–2050.** Using the SAGE model, about 500,000 (net) direct jobs could be created in climate-related sectors, which would be a small share of the 16 million (net) jobs that are expected to be created in SA over the period. This small but positive result on jobs is similar to what has been found in the literature in other countries.<sup>52</sup>

<sup>50</sup> Sustainable Energy Africa. 2014. *Tackling Urban Energy Poverty in South Africa*.

<sup>51</sup> This figure might have to be adjusted when accounting for the cost of loadshedding.

<sup>52</sup> See, Fankhauser, Samuel, Sehlleier, Friedel, and Stern, Nicholas. 2008. "Climate Change, Innovation and Jobs." *Climate Policy*, Earthscan ISSN. 80513.

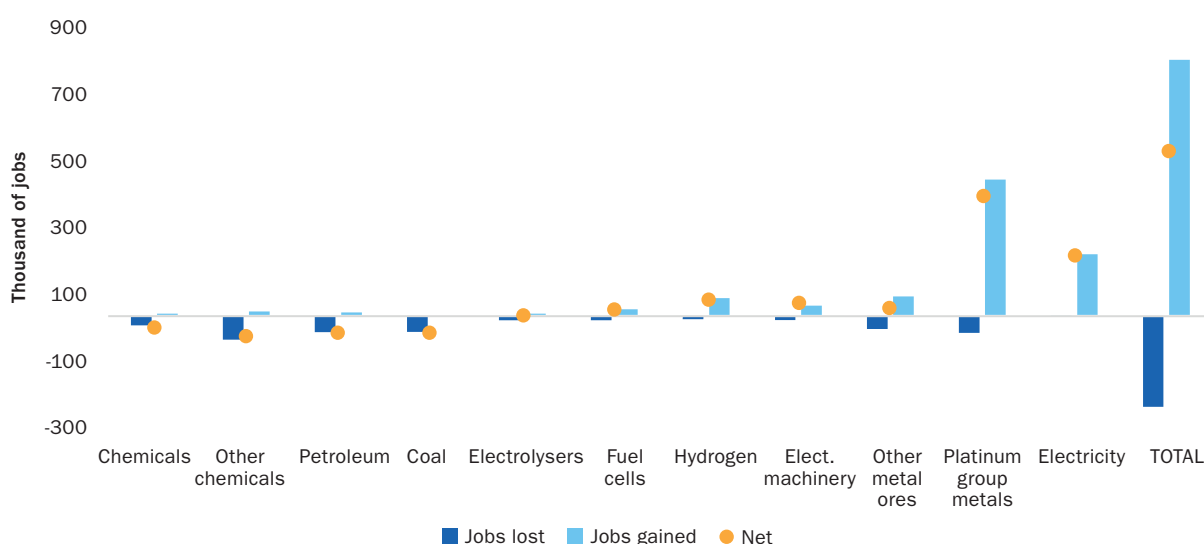
**The projected moderate net effect on jobs is likely to mask significant movements across and within sectors (Figure 15).**<sup>53</sup> When only considering the 11 industries most affected by the low-carbon transition, SA could expect to lose about 302,000 direct jobs and gain as many as 815,000 direct jobs over the same period. Assuming a job multiplier of 2, in line with the literature, about 0.6 million jobs will be lost, and 1.6 million jobs would be gained due to the transition.<sup>54</sup>

- Job creation is mainly expected in non-coal mining sectors and in renewables. Additional jobs could arise in RE value chains, green manufacturing, construction and, to some extent, services and utilities. The gain in the non-coal mining sector is the result of the higher local and global demand for minerals and metals needed to produce cleaner energy sources (see Box 7).
- Job losses are expected in all sectors, but the biggest losses would be in high-emitting sectors, including petroleum and coal, which will employ almost no workers by 2050. Other jobs at risk are in chemicals, transport, and, to a lesser extent, steel and other metals.

**The cost of the adjustment in the labor market will be magnified because the job losses are expected in sectors with large proportions of unskilled or low-skilled employees.** For example, over 90 percent of coal workers were low- or semi-skilled in 2021, making it more difficult for them to find other jobs.<sup>55</sup> There are also gender differences in the types of vulnerability experienced by workers and therefore the types of support that they will require during the transition. For example, because women generally work in indirect jobs, such as services provided by small firms to workers and firms in coal-related industries, they may not have access to severance payments provided by employers. The job losses will also be concentrated in locations that are heavily dependent on fossil fuel and coal activities such as the province of Mpumalanga.

**The pace of job creation and loss should be monitored carefully as it is projected to vary over the period (Figure 16).** The magnitude of job creation is expected to gradually increase as the economy moves toward low-carbon emissions, with the greatest positive impact during the 2040s. However, the bulk of job losses is projected to occur during the 2030s when SASOL is projected to close its coal-to-liquid operations and Eskom should decommission several of its fuel/coal plants. This asymmetry will make it difficult for dismissed workers to find immediate new opportunities.

**Figure 15: Direct job gains, losses, and levels in key industries closely associated with the low-carbon transition, 2022–2050**



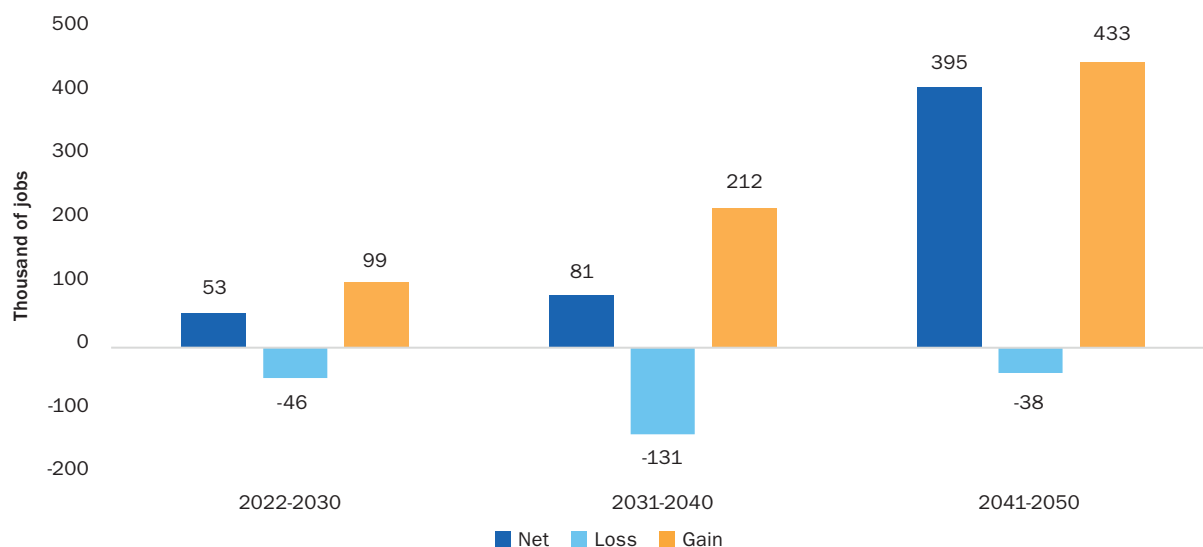
Source: World Bank Staff SAGE and microsim models.

<sup>53</sup> Globally, the International Labour Organization estimates that moving to a renewables-dominated energy sector will generate nearly 25 million jobs, with the largest growth in construction and the manufacture of electric machinery. However, over 6 million jobs will be shed, mostly in “dirty” industries such as petroleum extraction and refining.

<sup>54</sup> Michael Kilumelume, Bruno Morando, Carol Newman, and John Rand. 2022. “Spillovers from Extractive Industries.” WIDER Working Paper 2022/10, January 2022.

<sup>55</sup> Source: National Employment Vulnerability Assessment (2019) and Quarterly Labor Force Survey (2022, Q1).

**Figure 16: Job gains and losses in 11 carbon-related industries, by sub-periods**



Source: World Bank Staff SAGE and microsim models.

**Based on these findings, the government could act on two fronts.** First, it should ensure that the employment gains obtained from the low-carbon transition materialize in the private sector. Efforts could include leveling the playing field between startups and existing firms, implementing measures to enhance competitiveness, improving the business climate, and facilitating access to finance and other inputs for both startups and growing firms. SA's rigid labor markets will make it difficult to absorb new workers and to facilitate movement across sectors and locations. While significant reforms are needed such as improving collective bargaining processes and reducing hiring costs, enhancing labor market mobility through better labor market intermediation services would magnify the positive impacts of the low-carbon transition on the composition of the labor force.<sup>56</sup>

**Special emphasis should be placed on developing new skills as workers will need the right set of skills to take advantage of the low-carbon transition.** SA's education, and technical and vocational education and training systems are not yet providing the skills needed for individuals, who are ill-prepared. Those inefficiencies should be urgently addressed by the private sector and the government.

**The second front is to minimize the economic losses of the transition on affected workers.** The government will need to facilitate the adjustment of the labor market through measures such as reskilling and retraining programs and intermediation and job placement programs. Some workers might be unable to find a new occupation quickly, so safety nets such as temporary income support, unemployment insurance, or early-retirement benefits will be needed. If displaced workers cannot move quickly into new jobs, the welfare impacts of the transition will be more severe.

**The cost of the measures required to support a just transition of the labor market is estimated at about 0.3 percent of GDP per year or R581 billion in net present value from 2022 to 2050.<sup>57</sup>** Such costs will raise the total financing requirements of the transition, but they could be partially leveraged from efficiency gains within current social and labor programs.

## Recommendations

- **Strengthen support to workers exiting the labor market involuntarily.** Measures could include the following: (i) scaling up transition services provided by public and private employment services, which will need to become full-service career and job information centers with new tools to efficiently channel clients toward new employment opportunities; (ii) scaling up public employment programs to provide income support for communities in regions most affected by the transition; (iii) supporting self-employment beyond existing

<sup>56</sup> For a fuller discussion of the labor market in SA, see <https://www.imf.org/en/Publications/WP/Issues/2021/06/11/Labor-Market-Reform-Options-to-Boost-Employment-in-South-Africa-460735>.

<sup>57</sup> This cost figure assumes an average training cost per worker of R20,833 and a total of about 1 million workers to train between 2022 and 2050.

programs provided by the Department of Small Business Development; and (iv) providing income support through severance payments or early retirement packages, the Unemployment Insurance Fund, and social assistance grants similar to the SRD grant and linking these grants with active labor market programs; and (v) providing access to equitable, high-quality healthcare by accelerating implementation of SA's national health insurance plan.

- *Consolidate mechanisms to identify and monitor the demand for green skills and develop a comprehensive response.* The government has published the List of Occupations in High Demand as a first step. However, this list does not identify which specific occupations will be green nor quantify the skills shortages for the listed occupations. The extent to which sector education and training authorities recognize the need for green skills also varies. There is a need for a comprehensive assessment of the capacity of the current education system (including technical and vocational education and training) to respond to the expected increase in the demand for green skills, including partnerships and private sector initiatives.
- *Boost job creation through SME support.* SMEs can meet part of the new opportunities generated by the shift to a low-carbon economy. Startups can help drive innovation and the development of promising green industries, while local suppliers and distributors can build links with bigger companies. However, important challenges prevent SMEs from reaching their full potential (Box 10).

### **Box 10: Boosting job creation through SME support**

More than 98 percent of businesses across SA are SMEs, which employ between 50 and 60 percent of the country's workforce and are responsible for a quarter of job growth in the private sector. This sector is a critical engine of the economy, accounting for 39 percent of GDP.

Entering the low-carbon transition, small enterprises already face significant challenges, including limited access to low- and medium-cost funding, dependence on a small number of clients, and insufficient management skills. A sluggish economy has negatively affected SMEs and the economic impact of COVID-19 has exacerbated these trends. There are, however, various new opportunities for SMEs including in the RE value chain, such as logistics, installers, and maintenance of small-scale embedded generation.

### **Recommendations**

- Facilitate access to low-cost funding for SMEs, especially for entrepreneurs or leaders from disadvantaged backgrounds. Efforts to improve financial inclusion, provision of seed money to entrepreneurs, and access to low-interest loans are critical.
- Leverage technology to reach new customers or provide a distinctive value proposition. Digital technologies create opportunities to enhance outreach and efficiency, overcoming the scale of disadvantage SMEs have relative to larger players.
- Develop clearer market access strategies. A better understanding of, for example, shifting demand, potential new client bases, and local substitutes for products allows SMEs to shift their focus to new target markets to sustain demand.
- Develop team skills and capabilities and empower leadership. By investing in capability building, particularly at a leadership level, SMEs can create more capacity for senior leaders to focus on growth and strategy to ensure sustainability.

Source: Adapted from McKinsey, *How South African SMEs can survive and thrive post COVID-19*, July 10, 2020.

### Box 11: Managing the energy and mining transition in Mpumalanga

The province of Mpumalanga will be the most affected by the low-carbon transition as it is home to over 80 percent of the country's coal-fired power plants and coal mines, as well as Sasol's coal-to-liquid industrial complex. It is estimated that between 150,000 and 200,000 jobs (about 18 percent of the employed provincial labor force) are at risk, including about 75,000 coal miners and 15,000 jobs in the transport sector. Other at-risk jobs are in formal and informal services, some of which have been traditionally female-dominated activities. Beyond jobs, municipalities' revenues and services will also be affected. For example, coal accounts for almost half of local revenues in eMalahleni. Eskom and coal mining companies provide key public services like water and electricity to communities close to their sites. Without additional support, these municipalities may struggle to continue providing these services.

Managing the economic and social impacts associated with the shift away from coal in Mpumalanga should be a priority and should be guided by a comprehensive provincial development strategy (roadmap) developed and owned by the government and its social partners. The roadmap should not only manage the impacts of the transition, but also seek to develop new opportunities building on comparative advantages offered by the province. While the roadmap should guide development of detailed action plans in the medium to long term, urgent demonstration of benefits from the transition is imperative, combining: (i) temporary financial assistance to affected workers through the Unemployment Insurance Fund, severance payments to formal workers, and short-term grants to informal workers; (ii) active labor programs by scaling up the activities of the Department of Employment and Labour's labor centers and of the Expanded Public Works Programme and Community Works Programme; and (iii) targeted support to informal and small enterprises to encourage economic diversification to other mining activities, renewables, manufacturing, and agriculture, including by transferring productive assets to local entrepreneurs and communities.

The roadmap should be supported by a clear communication strategy to explain the cost and opportunities of the transition. To successfully implement such a transition, the government needs to build broad consensus among social partners. This could be done by setting up a high-level steering committee comprising relevant ministries and representatives of the Mpumalanga provincial government, labor unions, private sector and local communities.

## 5.2 Managing the social impacts of increased climate change-induced shocks: Building resilience

**Without rapid and inclusive adaptation responses, climate change could drive almost 1 million South Africans into poverty or economic fragility by 2030.**<sup>58</sup> This would be a significant setback for a country that already experiences high levels of poverty and inequality. The financing required to implement adaptation policies targeting vulnerable communities could range between 0.5 percent and 0.7 percent of GDP per year or between R968 billion and R1,356 billion in net present value over 2022–2050. The bulk of these financing needs will arise from upgrading existing infrastructure and developing new infrastructure to support the poorest households in the most vulnerable areas. Other investments will also be needed to modernize SA's existing early warning systems, while the cost of expanding insurance schemes and post-disaster financial assistance instruments could be covered by efficiency gains in the management of the existing social protection system.

### 5.2.1 Who are the most affected by climate change-induced shocks?

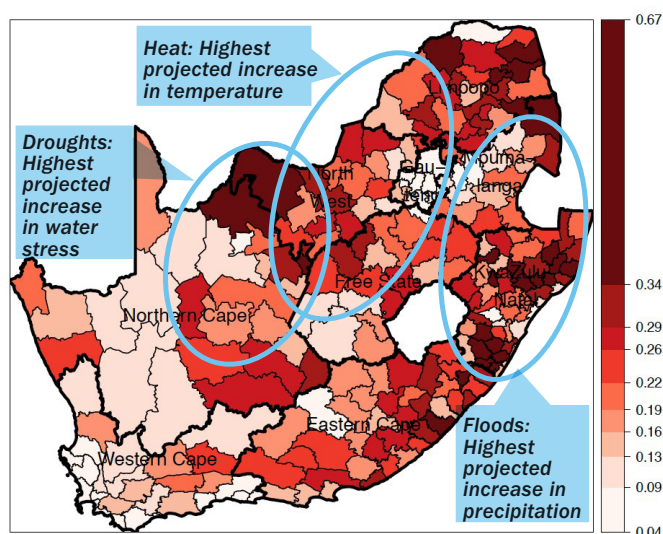
**Figure 17 shows that poorer locations are more vulnerable to climate risks than richer ones.**<sup>59</sup> The projected increase in the intensity of precipitation is the highest for the KwaZulu-Natal coast, which includes some of the poorest districts. Similarly, the risk of water scarcity is concentrated in the Northern Cape and North West, while the biggest impacts associated with higher temperature are expected to occur in Limpopo. The disproportionate impact of climate risks on the poorest households has also been found within cities.

<sup>58</sup> Hallegatte, S., M. Bangalore, L. Bonzanigo, M. Fay, T. Kane, U. Narloch, J. Rozenberg, D. Treguer, and A. Vogt-Schilb. 2016. *Shock Waves: Managing the Impacts of Climate Change on Poverty*. Climate Change and Development Series. Washington, DC: World Bank.

<sup>59</sup> For details on the scenario and model used for the projections see: <https://climateknowledgeportal.worldbank.org/country/south-africa/climate-data-projections-expert>.



**Figure 17: Climate change affects poorer areas disproportionately more**



Source: World Bank and Stats SA. Notes: The shading reflects the poverty headcount ratio across municipalities (darker is poorer). Municipal-level poverty maps constructed from 2011 Census and 2010/2011 HIES. The projections for water stress, temperature, and precipitation (indicated by the circles) are done for the SSP3-7.0, dry scenario over the period 2040–2059.

The highest level of multidimensional exclusion is observed in the North West and Limpopo provinces, which are simultaneously more exposed to temperature increases and to droughts than the national average.<sup>60</sup>

This World Bank study also reveals that non-white households are more climate insecure because they are more exposed to climate shocks and have fewer coping strategies due to their limited resources, low level of education, and their dependence on climate-sensitive economic activities.<sup>61</sup> In many urban and rural areas, black families live in poor and climate-sensitive areas and low-cost substandard houses without adequate access to shelter and basic services.<sup>62</sup>

**Women face specific vulnerabilities and risks from climate change, particularly in rural areas.** Female workers account for an estimated 60–80 percent of the agricultural (formal and informal) labor force, which is highly exposed to climate risks. Due to traditional gender norms, women tend to

perform tasks impacted by drought or water scarcity, such as collecting water for domestic duties and smallholder farming. Additionally, women who live in poorly serviced areas such as informal settlements and townships have less access to credit, agricultural inputs, and extension services, as well as to climate decision-making structures that would enhance their adaptive capacity.<sup>63</sup>

### 5.2.2 How to protect those most affected by shocks

**The government has developed relatively advanced early warning systems and post-disaster strategies to protect the most vulnerable people when disasters occur.**<sup>64</sup> While hydrometeorological infrastructure and related data are generally well established in most provinces, the forecasting ability of the local authorities is uneven. There is also a lag in the development of digital information systems to communicate with residents. Currently, the National Disaster Management Centre, under the Department of Cooperative Governance and Traditional Affairs, is responsible for implementing the national disaster management framework. However, experience from recent floods and disasters has shown its limited capacity to guide the proper evacuation of affected people to safety, exacerbated by the weak coordination between the national and local authorities. Moreover, the mechanisms in place to help those affected by disaster require urgent reforms to improve the timely provision of relief and the use of build-back-better practices.

**A priority for the government is to reduce the exposure of the poor in informal settlements by upgrading infrastructure, improving drainage, initiating resettlement programs away from at-risk areas, and undertaking ecosystem-based conservation and management.** However, despite these efforts, there are still large disparities in the quality of public infrastructure and services between poor and affluent areas. In larger metros like those in Gauteng City Region, settlements have continuously expanded in flood-prone areas at rapid rates over the past few years.

<sup>60</sup> For details on the methodology, see Ballon, P., Cuesta, J., and Bridgman, G. 2022. "Multidimensional Exclusion and Climate Risks in South Africa." Draft, forthcoming.

<sup>61</sup> World Bank. 2022. "Social Dimensions of Climate Change and Just Transition in South Africa."

<sup>62</sup> Mani, S., Osborne, C., and Cleaver, F. 2021. "Land Degradation in South Africa: Justice and Climate Change Tension." *People and Nature*.

<sup>63</sup> Rao, N., Lawson, E. T., Raditloane, W. N., Solomon, D., and Angula, M. N. 2019. "Gendered Vulnerabilities to Climate Change: Insights from the Semi-Arid Regions of Africa and Asia." *Climate and Development*. Arends, U. F.

<sup>64</sup> The World Bank. 2021. "A regional analysis of weather, climate, water, and early warning services in Southern Africa: Status quo and proposed actions."

**Post-disaster financial assistance, such as access to emergency borrowing, and social protection are essential ways to help firms and people recover from climate shocks.** In December 2020 and May 2022, two pieces of legislation were passed to explicitly mandate that the SRD grant program provide support to households affected by natural disasters. The implementation of the new legislation and the aligned investments made to prepare the program to respond to disasters in a timely and transparent manner, at scale, will be key to strengthening the shock-responsiveness of the social protection system.

**Insurance products can reduce the financial burden associated with damages.** However, these instruments have low penetration. Smallholder farmers, for example, have weak access to weather-indexed insurance due to the limited availability of agrometeorological infrastructure in most parts of the country and excessive premiums. The government can use its own financial resources to help domestic insurance markets reach households and businesses with insurance products, so expanding the population's financial resilience to disasters. The Turkish Catastrophe Insurance Pool and the Mongolian Livestock Insurance Pool are good examples of PPPs that have substantially increased insurance penetration at the local level, including for the poorest households.

**Several local communities have developed climate adaptation strategies, which include livelihood and crop diversification, conservation techniques, and traditional knowledge and practices.** For example, women in the Musina, Makhado, and Thulamela municipalities of the Limpopo province rely on crop diversification and mixed cropping to cope with the decline in rainfall.<sup>65</sup> In other provinces, soil and water conservation techniques are being implemented by local communities to manage the risk of flooding, while improving soil moisture and organic matter retention.<sup>66</sup> Migration is also an adaptation strategy by some populations affected by climate change. In SA, non-white and low-income households tend to include more climate factors in their decision to migrate than other groups.<sup>67</sup>

## Recommendations

- *Invest in digital technology to improve weather risk forecasting and early warning systems.* An up-to-date and reliable information system is the cheapest option for effective prevention. Developing digital databases that remotely monitor the variations of water, precipitation, and vegetation indices has become increasingly common practice among other countries in Sub-Saharan Africa. The use of apps and SMSes to timeously inform citizens about weather events could be expanded.
- *Support income diversification in rural areas toward climate-resilient activities such as aquaculture, ecosystem-based conservation, high-value crops, and agro-industry.* Smallholders will require support through skills development and financial assistance programs, including through partnerships between smallholders and commercial farmers in climate-resilient value chains.
- *Prioritize investments in infrastructure and social services in informal urban settlements.* Early coordinated action is needed to prepare the urban poor for natural hazards by upgrading buildings and infrastructure. Alternative means of delivering basic goods such as food, water, and medicine should be in place in areas where road access could be disrupted by climate-related disasters. Remote working options for those affected by transport disruptions is also important.
- *Implement a modernized, disaster-responsive social assistance program.* The government could prioritize the implementation of the December 2020 and May 2022 legislation by (i) establishing formal contingency protocols for future, large-scale use of the SRD grant in response to climate shocks; (ii) integrating the South African Social Security Agency and the SRD grant into disaster risk management coordination mechanisms at the national and local levels, and empowering the Disaster Management Agency and its disaster management councils to fulfil their coordination mandate; (iii) coordinating/integrating the multiple administrative databases used by government agencies to identify poor and vulnerable households; and (iv) providing the budget required to run these grants efficiently—for example, the estimated costs of scaling up the SRD grant to protect poor and vulnerable households in response to droughts would be about R672 million per year or 0.01 percent of GDP in 2022.<sup>68</sup>

<sup>65</sup> Nyahunda, L., and Tirivangasi, H. 2022. "Adaptation Strategies Employed by Rural Women in the Face of Climate Change Impacts in Vhembe District, Limpopo Province, South Africa." *Management of Environmental Quality: An International Journal*.

<sup>66</sup> Osbahr, H., Twyman, C., Adger, W. N., and Thomas, D. S. G. 2010. "Evaluating Successful Livelihood Adaptation to Climate Variability and Change in Southern Africa." *Ecology and Society*.

<sup>67</sup> Mastroiillo, M. et al. 2016. "The Influence of Climate Variability on Internal Migration Flows in South Africa." *Global Environmental Change* 39.

<sup>68</sup> Assuming a benefit amount of R2,100 for a six-month period for 320,000 households on average per year. It is acknowledged that there are large variations in the needs in each year.

## CHAPTER 6: MAKING IT ALL HAPPEN

What will it take for SA to reconcile its development and climate goals through implementing the interconnected resilient, low-carbon, and just transitions? The first condition is to identify the main sources of funding as the three interconnected transitions will require significant investments. The second condition, related to the first one, is to prioritize the actions to be taken in the near future—those that should not be delayed or will have the greatest impact. The third and final condition is to identify a fit-for-purpose governance and institutional framework necessary for efficiently implementing these actions.

### 6.1 Financing the three transitions by mobilizing private, public, and external resources

#### 6.1.1 Determining the financing requirements

**Pursuing the interconnected resilient, low-carbon, and just transitions could require additional financing of 4.4 percent of GDP per year, or R8.5 trillion in net present value through 2050 (Table 5).** About 49 percent of this amount will be needed along the low-carbon path, in particular power and transport, while another 28 percent will support measures to strengthen the resilience of cities and the water, agriculture, and transport sectors. The last 23 percent will support the just transition. It is important to emphasize that SA will need about R2.4 trillion before 2030. All these estimates are derived from the analysis in the preceding chapters, but they should be interpreted with caution, due to uncertainties about the future evolution of technologies and other parameters, including the magnitude of climate projections, business and household behaviors, and government policies, especially beyond 2030.

**Table 5: Estimated financing needs**

	2022–2030			2022–2050		
	Cumulative needs R billion		Average per year	Cumulative needs R billion		Average per year
	Undiscounted	Net present value	% of GDP	Undiscounted	Net present value	% of GDP
Low-carbon transition	1,348	940	1.6	14,386	4,169	2.1
Resilient transition	1,164	866	1.4	6,228	2,431	1.3
Just transition	776	574	1.0	5,309	1,937	1.0
<b>Total</b>	<b>3,288</b>	<b>2,380</b>	<b>4.0</b>	<b>25,923</b>	<b>8,537</b>	<b>4.4</b>

Source: World Bank.

Note: Net present values are calculated at a discount rate of 6 percent.

**These financing requirements are relatively low, in terms of GDP, compared to those projected in the most climate-vulnerable countries, such as Vietnam.** However, they will need to be funded in a macroeconomic and financial situation where the country's savings and investment rates have been declining over time. The government's spending has exceeded its revenue in recent years (dissaving by about 3–5 percent of GDP per year), while private savings have been historically low at around 15 percent. To finance the three climate transitions, the country will have to consume less and/or allocate a greater share of its savings toward green and clean investments by adopting a series of reforms in fiscal, monetary, and financial policies.

#### **At least three potential avenues exist for financing the three transitions:**

- Encourage domestic private investments to shoulder the just transition. This will require (i) using pricing instruments (through taxation and subsidization) to shift the allocation of capital toward climate-related projects; (ii) greening the financial sector (for example, taxonomy and disclosure); and (iii) developing market-based instruments and de-risking tools (such as insurance products) to better share the burden of risk between the public and private sector. To further mobilize private savings, the government could also prepare a list of bankable green infrastructure transactions (including through PPPs).

- Increase public financing by raising additional revenue (for example, through a carbon tax) and achieving efficiency gains in spending through improved public investment and financial management as the government's borrowing capacity will be constrained in future due to its relatively high level of debt distress.
- Garner more resources from multilateral and bilateral development partners and tap into foreign direct investment (FDI) inflows and capital from institutional investors (including through the issuance of climate-themed bonds on international markets) as the country does not have enough domestic savings. Many interventions that are efficient and essential to reduce GHG emissions or to build climate resilience would not meet private sector investment criteria and would require concessional resources and/or grants from the international community.

**The contribution of these three sources of financing will depend on how innovative solutions can be found to mobilize them.** It will also be influenced by the nature of the interventions that they will finance. For example, the social transfers to affected people requested by the just transition should be mainly financed by the public sector as they will compensate losses. In contrast, the projected investments in renewables during the low-carbon transition should be financed to a large extent by local and foreign private investors, as demonstrated by the experience with the REIPPPP. The cost of adaptation measures should be partially financed by the taxpayers in the most important carbon-emitting countries, who are responsible for the rise in global emissions and the related impacts on SA's economy. Mapping the list of interventions will be important as it will help determine the right balance between private and public financing and external resources and the magnitude of the effort necessary to mobilize them.

### 6.1.2 Mobilizing private savings through complementary financial instruments

**Self-financing: The private sector will need to save more and to allocate part of its savings toward resilient and low-carbon investments.** Self-preservation will motivate businesses and property owners to directly invest their retained earnings in climate action activities—for example, to retrofit their own buildings or houses. Yet, such a shift might not be automatic or as large as required because of competitive uses, asymmetric information, and public good challenges—individuals will underinvest if they expect others to benefit from their investments. This is especially challenging for many climate-related investments where collective benefits are greater than individual gains.

**The government can motivate households and businesses to invest more into climate actions in at least three ways.** First, it can help collect and disseminate information on climate risks that are not always well understood by all market participants. The recent issuance of the national Green Finance Taxonomy in April 2022 has catalogued assets, projects, and sectors that are eligible to be defined as “green” or environmentally friendly, sending a positive signal to potential investors. Second, regulators can mandate firms to disclose, for example, their climate risk assessments and their carbon emissions throughout the value chain. Monitoring, when associated with penalties, has proved to be effective in controlling emissions. Third, the authorities can use pricing strategies to incentivize individuals and firms to invest more in green or clean technologies—such as the carbon tax or tax rebates for environmentally friendly products and inputs.

**Banking: Green loans are still in their infancy, representing only a small share of total financing provided by local banks.** In recent years, efforts have been made to stimulate such loans, including the introduction of Voluntary Principles for Environmental and Social Risk by SA's Banking Association in 2014. The five biggest banks—comprising more than 90 percent of banking sector assets—have strategies and processes that consider climate change issues, and they have also signed up to the Equator Principles—a risk management framework for project finance more geared to social issues.

**The Sustainable Finance Initiative sponsored by the NT has emphasized two sets of actions:**

- Adopt international best practices to identify green projects, help banks to track their green credit growth consistently and transparently against their targets, and apply eligibility criteria to a relatively broad range of sectors or projects. Many banks need to strengthen their internal expertise and integrate green finance procedures into their existing operations. Financial institutions also need clearer information about the requirements for incorporating environmental and social risk assessments into credit underwriting policies and operations.



- Mobilize green credit by providing long-term seed funding to supplement banks' finances for green projects. This initiative will help reduce the mismatch between the short terms of most deposits and the longer terms typically required by green projects. Startups and SMEs could be supported through grants, tax rebates, subsidized interest rates, and technical assistance.

**Non-banking financial institutions: Domestic institutional investors—ranging from pension funds to insurance companies and collective investment funds—could finance part of the climate agenda.** These investors own about R10 trillion (or 1.6 times the value of GDP in 2021) in financial assets that could be allocated toward green or climate-focused assets and investments. Similarly, venture capital and private equity funds, which are key sources of early and growth stage finance for startups, remain underdeveloped in SA (only about R21 billion per year). To increase the role of these institutional investors in climate finance, a combination of upstream reforms is required, including modernizing regulations, introducing new instruments and credit-enhancement products, and building capacity. For example, the authorities could consider easing restrictions on exports of intellectual property to encourage the growth of startups.

**Non-life insurance companies could play a more important role to reduce the cost of climate risks for households and firms.** The non-life insurance market, which includes disaster-related products such as health and agricultural insurance, has sufficient financial capacity to offer additional financial protection against natural disasters. Increased access to these products, through better information and subsidized prices for targeted beneficiaries, will reduce the exposure of the private sector and lower the government's contingency liabilities and the need to develop public disaster assistance programs.

**Another key non-banking actor could be development finance institutions such as the Development Bank of Southern Africa and the Industrial Development Corporation.** These two institutions own an estimated R100 billion and R144 billion of financial assets, respectively, as of March 2021. While these institutions have limited direct lending capacity, they have traditionally supported infrastructure finance via a life-cycle approach from conceptualization through the provision of debt and equity finance, which will be important for climate-resilient projects.

**Capital markets:** The emergence of new sustainable finance products (such as green bonds) and the increasing focus on green sectors provide an opportunity for SA's relatively well-developed capital markets to raise significant funding for the climate transition.<sup>69</sup> To leverage those investments, market participants often look for strong transaction benchmarks (which could be provided by the NT) to build confidence and unlock potential businesses (see more details in subsection 6.1.4). Additional measures could include providing incentives (such as tax exemptions for buying green bonds) and developing a pool of local and well-trained green bond verifiers to decrease issuance costs and limit the risk of greenwashing. The Financial Markets Act (2012) should be amended to strengthen the regulatory framework while allowing for more innovation, market entry, and competition in capital markets. This should include a more inclusive framework for green instruments, alternative investment funds, and platforms that can channel more capital to sustainable (including green) assets. Furthermore, it is important to integrate climate-related financial risks into governance, risk management, and disclosure practices of financial institutions including banks, insurers, retirement funds, and collective investment schemes.

**Blended finance:** Blended finance instruments have emerged as a key vehicle to share the risks of projects between the private and public sectors or between domestic and external investors. Today in SA only R4.9 billion of climate finance is blended, mainly structured between 10 percent of public finance and 90 percent of private finance. An additional structure could be to blend concessional financing (including guarantees) by international financial institutions with commercial financing to ensure that investments are deemed feasible by the private sector. There is also substantial scope for leveraging blended finance for climate-related projects by strengthening the PPP framework. Two recommendations would be to: (i) amend NT Regulation 16 to rationalize approvals for smaller projects and establish clear timeframes, which can enable small green infrastructure projects to be undertaken more quickly, and (ii) calibrate project preparation requirements for smaller projects with the flexibility to follow one-stage bidding procedures, which can significantly expedite project delivery. The approval process could be streamlined by avoiding duplications and multi-step reviews, and frequent changes in procurement documents.<sup>70</sup>

<sup>69</sup> Listed firms, including the major banks, are required by the Johannesburg Stock Exchange to comply with the King Code of Corporate Governance (King IV), which expects governing bodies to demonstrate integration of environmental and social aspects in value creation and integrated reporting.

<sup>70</sup> The World Bank. 2022. "South Africa PPP Framework Review", draft.

### 6.1.3 Public financing should act as a catalyst

**Public financing for climate mitigation and adaptation investments will be constrained by limited fiscal space, as emphasized by the recent International Monetary Fund/World Bank Group debt sustainability analysis.**<sup>71</sup> Public debt, already on the rise in the years before the pandemic, jumped to about 70 percent of GDP in 2020 as the government deployed a policy package to mitigate the pandemic's impact. However, as part of its debt strategy, the government can rely on borrowing instruments specifically dedicated to financing green projects, such as green and sustainable bonds or targeted concessional finance (see next subsection). It will be important to monitor the contingent risks associated with the eventual use of PPP or blended instruments as well as the financial situation of SOEs. As mentioned earlier, the government can act as a catalyst for private financing by adopting the fiscal and financial reforms required to stimulate the development of green banking, specific capital market instruments, and blended finance.

**The government could directly contribute to financing the (collective) investments necessary for the resilience and low-carbon transitions as well as the social transfers for the just transition by increasing its savings in two ways:**

- **Collect more revenues.** A menu of taxes or tariff surcharges could be considered to incentivize responsible behaviors by households and businesses and to help finance public investment in climate-related areas. For example, the carbon tax, could be gradually applied to all sectors with a rate converging toward R1,415 per ton (or about \$88 per ton) by 2050. Modeling results show that such a strategy could bring R1.2 trillion in additional revenues between 2022 and 2050, peaking in the early 2030s before gradually declining as a result of lower carbon emissions over time. The revenue could be allocated to finance the transition costs of the low-carbon process, as discussed in Box 9.
- **Enhance fiscal efficiency.** The government also needs to spend more efficiently, including through improving the allocation and financial management of public investments. Improving investment efficiency will free up scarce public resources for climate-related investments and other expenses. Additional reforms could include strengthening green public procurement rules and introducing new criteria to allocate transfers to provinces and SOEs (for example, by linking them more closely to these recipients' performance in climate-related areas). As outlined in Chapter 5, new assistance programs to the most vulnerable could be financed through revamping the social protection system.

### 6.1.4 Tapping funds from development partners and institutional investors and (re)directing FDI inflows

**Although SA should mobilize further domestic public and private financing for its climate agenda, external resources are critical to meet its climate goals.** Without external support, the domestic financing effort could reduce the resources available for investing in physical and human capital. Beyond affordability, it is also a matter of common but differentiated responsibility as the country is to a large extent a victim of damages caused by GHG emissions generated by other countries. As climate change is partly a global public goods, grants or long-term concessional financing should be made available to support efficient measures toward a low-carbon economy and stronger climate resilience. The country has not yet become a major recipient of climate financing from donors, having received only about R38 billion (\$2.4 billion) per year in climate financing in recent years, primarily in the form of loans. Only about 11 percent of this assistance was in the form of grants.

**The Paris Agreement and the recent Glasgow Agreement have led to a major international commitment to financially support the implementation of NDCs in developing and emerging countries.** South Africa has been one of the early beneficiaries of the Glasgow Agreement. France, Germany, the United Kingdom, the United States, and the European Union have pledged R131 billion (\$8.5 billion) over the next three to five years to support SA's just transition plans. A Presidential Climate Finance Task Team has been mandated to design an investment plan with a focus on the power sector transition, green H2 development, and EV industrialization and uses. New initiatives are also under way to bring in concessional financing from multilateral development banks—such as the World Bank Group, the African Development Bank, and the New Development Bank—and bilateral partners.

<sup>71</sup> International Monetary Fund. 2022. "International Monetary Fund Country Report for South Africa," No. 22/38.



**Looking forward, SA and development partners should collaborate to mobilize additional external concessional funds.** This could include tapping into the UNFCCC's financial mechanisms, including the Green Climate Fund and the Global Environment Facility. As mentioned earlier, blended finance (mixing domestic and international resources) could help spread the risks and crowd in private capital (alongside appropriate domestic policies). Such solutions should involve technical assistance grants and credit enhancement mechanisms (for example, first loss) that partially de-risk pools of climate finance investments in select circumstances. As part of this support, development partners should consider the use of concessional resources to lower the cost of financing. To the extent that many of the benefits associated with climate change adaptation and mitigation measures accrue to future generations, part of the cost of borrowing should be delayed. The international community should help provide these long-term financing instruments (such as concessional debt with a long grace period).

**Beyond the donor community, SA could rely on multinational companies and potential new foreign investments.** Several of the global companies with a presence in SA such as BMW, Vodafone, Volkswagen, and General Electric have made global commitments to reduce their carbon footprint. To mobilize more FDI toward green sectors, the government could review the performance of existing investments and identify sectors and locations for untapped opportunities, and gaps in its policy and regulatory frameworks. It should also provide clearer and more predictable guidelines and regulations for licenses and permits, local content requirements, and expropriation. It could also consider supporting these investments by adjusting the existing tax incentives (such as accelerated depreciation, tax allowances, and duty free) to make them more favorable for investments in climate-related sectors. Such incentives have proved relatively effective in other emerging and industrialized countries. The development of eco-industrial parks can also be accelerated as it will help realize economies of scale for investors.

**Lastly, global institutional investors can be leveraged by using innovative financing solutions such as green and sustainable bonds.** In 2014, SA was the first country in Sub-Saharan Africa to issue a green bond, but only 18 corporate issuances totaling \$1.3 billion had taken place up to the end of 2021. The green bond market could be expanded by providing tax exemptions for the coupon of green bonds and by building further capacity for green bond verifiers so that issuance costs could be decreased. The government can provide benchmarks for private issuers by proceeding with public offers in line with the debt sustainability framework, the Green/Sustainable Bond Principles, and the applicable taxonomy, which will identify eligible projects to be financed.

## 6.2 Prioritization is key

**This CCDR comes at a critical time for informing major climate strategies currently being considered or implemented by the government.** It uses multiple analytical and diagnostic tools to identify options for both the public and private sectors to enhance synergies between building climate resilience, achieving net-zero emissions, and advancing socioeconomic development—and to reduce trade-offs. It identifies specific recommendations for key sectors and cross-cutting measures in fiscal, monetary, and labor market policies. It also emphasizes that the benefits associated with climate measures will require SA to address existing structural deficiencies. Yet, the country will be unable to adopt all measures recommended in the report at the same time due to financial and capacity constraints. Table 6 summarizes the prioritization framework that was used to select key areas of intervention, organizing actions according to their levels of urgency and impact.

**Table 6: Prioritization criteria**

Urgency	Impact		
		High	Medium
		Action has immediate impact and facilitates the achievement of other development objectives	Action with impacts that will be realized over several decades
	High Delay in action increases the cost of achieving the same end point	Actions that cannot be postponed and will produce a high and immediate impact (quick wins)	Actions that may need long-term planning and immediate mobilization of political capital and financing
	Medium Delay in action does not increase the cost of achieving the same end point	Actions that require time to conceive, fund, and implement but may deliver high impact	Actions that require time to conceive and implement, with uncertain or long-term impacts

**Using this prioritization framework, this report presents five priority policy packages that require the most pressing attention by the government to achieve its adaptation, mitigation and development goals.** These packages include the most urgent and effective measures to be implemented in the short-term and those that will require more time (between one and three years) to identify the policies, responsibilities, and budgets required. To maximize their effectiveness, all five packages should ideally be implemented within the next three years.

**Priority package 1: Accelerate the clean energy transition to end loadshedding and reduce emissions.**

- *Short-term:* Immediate steps to address the power crisis and the low-carbon transition include: (i) streamlining the approval process of private investments in renewables that suffer from delays due to complex and redundant procedures; (ii) completing the unbundling of Eskom transmission and developing an action plan with concrete milestones to improve the availability of Eskom's generation fleet that could trigger financial support from National Treasury; (iii) engaging with municipalities to help them procure electricity from renewable energy-independent power producers, define programs to enhance their operational and commercial efficiency, and address infrastructure vandalism; and (iv) accelerating the implementation of energy efficiency programs to scale up the energy service company (ESCO) market.
- *One to three years:* The following structural reforms should be considered: (i) develop a competitive power market to reduce the risk from Eskom's role as single purchaser; (ii) develop a mechanism for transparent and non-discriminatory access to the transmission grid; (iii) review the tariff-setting methodology and structure to ensure tariffs are designed to reflect the efficient cost of service provision, including net billing provisions for rooftop solar photovoltaic (PV) power; and (iv) develop mechanisms to attract private sector participation for the development of the transmission and distribution system.

**Priority package 2: Manage the shift away from a coal-dependent economy by renewing the social compact.**

- *Short-term:* Develop a comprehensive regional/provincial roadmap for Mpumalanga, where the decommissioning of coal-fired plants starts in October 2022 with the decommissioning and repurposing of Komati.<sup>72</sup> This roadmap should include active support to those affected by the transition (such as provision of temporary income support, labor intermediation and job-seeker services, severance, and reskilling programs), as well as a clear approach to creating new opportunities in low-carbon sectors, such as renewables, agriculture, and tourism. It should be underpinned by information and civil participation in public debates, with the aim of providing broad-based economic empowerment opportunities. The successful implementation of the roadmap, with early positive results, will demonstrate that the planned climate transition will be people-centered and offers new opportunities to all. This is critical to rally broader support for the transition in a difficult political economy situation.
- *One to three years:* Implement the above identified roadmap by capitalizing on the projected demand for new low-carbon activities, including in renewables. The authorities (in coordination with the private sector) should identify, quantify, and disaggregate the types of occupations required for the green transition, including the details of the skills and competencies required for each occupation. This information will have to be regularly updated and disseminated to training providers, businesses, and job-seekers. Concurrently, reforms should be considered to improve the quality of the general education and training system so that workers will have the foundational and technical basis to learn new skills and adapt to economic disruptions. More generally, the government will need to align its industrial, fiscal, and labor policies with the objective to promote further economic diversification toward climate-smart value chains (including by empowering micro-, small, and medium enterprises in both the formal and the informal economy).

**Priority package 3: Prioritize and coordinate investments and policies to build resilience against water scarcity and extreme weather events in the most vulnerable areas.**

- *Short-term:* Strengthen the existing early warning system with the further use of digital information and tools for better communication as well as improved coordination among different agencies. To better protect vulnerable people against natural hazards, the recent extension of the social relief of distress grant to climate should be made operational as soon as possible. To address their vulnerability to water stress,

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<sup>72</sup> Please refer to section 3.1.1 for further details.

municipalities and metros should develop a comprehensive and integrated water resources management plan that will be immediately actionable when disaster hits. This should include policy, regulatory, technical, and financial measures to deal with emergencies.

- *One to three years:* The focus should be on building resilient cities through effective land-use planning and developing/upgrading buildings and infrastructure. This should include the adoption of investment plans that will prioritize areas and identify financing mechanisms (including public-private partnerships (PPPs)). Further attention should be paid to water management in rural areas exposed to drought by developing modern irrigation schemes and strengthening policies and regulations for water use to support climate-smart agricultural activities. Water management in urban areas is equally critical and should include demand-side management measures (such as reducing non-revenue water) and a comprehensive water security plan with climate considerations at city level (starting with key urban areas) to better prepare for disasters. The government should incentivize climate-related investments by implementing cross-cutting reforms in public investment management and procurement. Among others, amendments to the Public Financial Management Act (1999) should be considered to operationalize climate budget tagging and to align policies with the low-carbon agenda. Another important step will be to support the use of insurance and risk-hedging instruments to reduce the cost of damages from climate-related events for businesses, farmers, and households.

#### **Priority package 4: Become the regional catalyst for climate innovation and financing.**

- *Short-term:* The government should send strong signals to the market that it will support the shift toward a green and clean economy. This can include clear commitments on the enabling environment for inclusion of RE in the energy mix, the use of pricing instruments to incentivize businesses to shift toward new technologies, including broadening the existing carbon tax to high-emitting sectors, extending carbon trading in agriculture and other land uses, and redirecting current subsidies toward green technologies in a fiscally neutral way. The development of blended financial instruments, including PPPs, could make innovative projects less risky, while supporting start-ups and small- and medium-sized enterprises. It will also be important to facilitate technology and skills transfers from large corporations and potential international investors to local businesses and workers. Easing working permit approvals for qualified foreign workers could also bring short-term benefits.
- *One to three years:* Innovation will require competition and skilled human capital, which will need to be supported by appropriate policies. This could include the review of existing industrial and local content policies and the development of synergies with neighboring countries through the development of value chains (especially for climate-smart minerals beneficiation and manufacturing of renewable energy products), underpinned by trade facilitation and selected high-return regional investments (such as ports and corridors, energy infrastructure). The promotion of joint research and innovation centers and skills development programs would provide the economies of scale required for effective innovation.

#### **Priority package 5: Utilize local ambitions on climate to mobilize external resources.**

- *Short-term:* The government should act quickly to approve and share a comprehensive investment program, including financing plans for shifting the economy to a low-carbon growth path over the next three to five years. This will allow the country to capitalize on recent positive developments, including the landmark commitment from the United States, United Kingdom, France, Germany, and the European Union in 2021 to provide \$8.5 billion over three to five years to help bring local carbon emissions within the limits of the Paris Agreement by 2030. Expediting the ongoing amendments of the PPP framework regulations for faster approval of small and green projects will send a strong signal to the market and encourage potential investors.
- *One to three years:* Mobilizing external resources for climate-related projects will require deeper reforms. A review of the existing fiscal incentives system should be carried out so that incentives can be redirected toward clean and green sectors. Encouraging private (both domestic and foreign) investments in strategic sectors will reduce the dominant role of several state-owned enterprises, which often act as barriers to innovation. Further emphasis should be given to the development of linkages between foreign direct investment and local industries through technology transfers, suppliers' contracts, and training programs.

To attract institutional investors, the government could play a more active role on the green bonds market to help benchmark the cost of issuances by South African corporations. The application of the recently approved green taxonomy (and alignment with ongoing work under the just transition financing framework) will provide clarity to banks and investors on the list of projects qualified to be financed by green or sustainable loans and bonds.

**Although each package is important individually, it is their combination that will transform SA into a more resilient, sustainable, and inclusive economy.** These five packages attempt to strike a balance between actions that will address existing challenges in mitigation (#1), adaption (#3), and the just transition (#2) as well as to create new opportunities for economic activities (#4) and financing (#5). When selecting actions, preference should be given to those promoting synergies across climate mitigation and adaptation actions. For example, scaling up renewables to meet energy security will also promote resilience of the energy sector to climate change and create jobs

**These policy packages will to a large extent determine how much progress SA will achieve in the next few years.** However, their implementation will require the development of more granular action plans that clearly identify the policies, responsibilities, and budgets needed to implement them.

### 6.3 A new governance framework for effective implementation

**As SA seeks to achieve its development goals, it needs to deal decisively with climate change.** The CCDR helps shift the discussion from “what to do” to “how to do it” by identifying clear priorities that need to be implemented.

**There are political economy risks associated with the policies and investments proposed in the resilient, low-carbon, and just transitions.** Some of the proposed actions will have asymmetric effects, requiring trade-offs. For example, broadening the carbon tax will help reduce CO2 emissions and is expected to generate benefits for most of the population as it will generate a shift toward cleaner and more competitive activities. Yet, it will also negatively affect some segments of the local economy, including workers and businesses (and SOEs) in high-emitting sectors and poor households. Many interventions in the resilient transition will require a coordinated national or provincial approach, which will curtail the decision-making authority of provincial authorities on public investment and implementation. In Mpumalanga, for example, the provincial government will have to manage the transition away from coal mining with active support (including financial assistance) from the national government and in cooperation with other provinces.

**To a large extent, these political economy challenges explain why SA has missed key opportunities for climate action in the past—and, as a result, also missed its declared targets to reform the energy sector and other climate-related measures.** Many of these problems are rooted in the weakness of the institutional framework surrounding the climate change agenda in SA. Fortunately, there are several actions that the government and its partners can take to facilitate adoption and reduce resistance.

**The existing institutional framework lacks a clear anchor in the government as parallel policies, strategies, and plans, which may not be in full alignment, are developed by different ministries and agencies.** Changes in governance are also needed, such as more effective coordination mechanisms across provinces to facilitate adaptation investments in climate-vulnerable regions. The existing fiscal decentralization rules, by decoupling spending and revenue responsibilities in the provinces, limit incentives for provinces to invest in infrastructure. Market signals may also be confusing, as subsidized natural resource prices often encourage more exploitation rather than sound management, while laws and regulations are not always enforced. Together, these shortcomings complicate decision-making and implementation of the required adaptation and mitigation measures. Several institutional reforms are needed, including:

- *Streamlining the governance of SOEs.* This includes completing Eskom’s unbundling and creating an independent transmission system operator; improving the operational and financial performance of SOEs (Eskom and Transnet in particular); and ensuring tariff mechanisms for regulated activities are based on the cost of efficient service provision and support regulatory independence.

- *Urgently implementing the Climate Change Bill.* The Bill legally obliges local and provincial governments to assess climate change needs and then develop climate change response implementation plans. As a next step, these plans should be integrated into existing social development plans. The Bill provides specific green targets that the government must reach within stringent timeframes. It also provides a framework for the implementation of carbon taxes on heavy polluters and sectoral carbon budgets. It will help harmonize current national, sectoral, and subnational climate strategies and facilitate the finalization of climate-relevant sectoral plans, specifically in energy and transport, as well as in urban development and agriculture.
- *Establishing a solid institutional anchor.* The speedy enactment and implementation of the Climate Change Bill will provide institutional clarity and address various technical elements. Yet the roles and responsibilities for leading the climate agenda still need to be clearly mapped out, leading to confusion and fragmentation. The Presidency should own the climate change agenda by leading coordination and strategic communication, and ensuring accountability. It should also arbitrate the possible trade-offs and build broad agreement on development objectives and emissions targets. The role of the NT should be elevated in responding to climate change through better use of its levers in planning, budgeting, debt financing, intergovernmental relations, and tax policy. Implementation requires clarifying the roles and responsibilities for advancing the climate change agenda among key actors, including national and line departments, and advisory bodies. Furthermore, mechanisms to support coordination horizontally and vertically should be strengthened by revitalizing several existing committees (for example, the Inter-Ministerial Committee on Climate Change and Inter-Governmental Committee on Climate Change) and introducing ad-hoc arrangements to tackle pressing issues. Urgent action is needed to champion the just transition agenda in Mpumalanga, starting with developing a provincial development roadmap with a clear and costed implementation plan and accountability framework. Finally, it is vital to define roles for monitoring and evaluating the climate change response between the PCC, DFFE, and Department of Planning, Monitoring and Evaluation.
- *Building capacity, including by professionalizing the public sector and developing relevant skills at various levels of government, as well as developing a new financing mechanism for local government.* It is necessary to identify key gaps between the human and financial resources required and those available to deliver on new climate-related mandates and explore innovative ways to fill those gaps. Subnational government can be supported through earmarked, revolving funds which target climate change activities and are replenished based on annual targets/key performance indicators met, while conditional grants can be amended to support adaptation and mitigation measures through the introduction of climate-specific criteria.
- *Mainstreaming climate thinking into fiscal policy and management.* Effective implementation will require incorporating climate considerations into the annual budget cycle and long-term expenditure planning by updating public finance regulations and practices to include climate change in fiscal risk management, budgeting, reporting, and asset management. This will also require finalizing the framework for climate budget tagging to enable the tracking of climate change expenditures. Greening public procurement practices and fiscal transfer rules from the national government to SOEs and local authorities will further facilitate climate action.
- *Increasing public participation in the climate change response.* Mobilizing support from a broad coalition of stakeholders, including the private sector and organized labor, will be critical for success as there is a disconnect between public perception and the government's actions. A forthcoming IFC review of public opinion surveys in SA shows a general lack of awareness about climate change-related issues (although the climate emergency is recognized as a global problem) and mixed perceptions about prioritization and policy responses among different stakeholders. Several countries have brought broad coalitions of actors together in the form of social compacts. The establishment of the PCC in 2020 was an excellent first step, but the government needs to gain the trust of stakeholders through clear messaging and the implementation of the agreed reforms. Without early and meaningful engagement with communities and labor unions, as well as ministries responsible for reskilling or upskilling (Department of Higher Education and Training), job placement (Department of Employment and Labor), and income support (Department of Social Development), there is a risk that climate reforms and policies can create tensions, leading to protests and pushback that delay the swift progress needed to attain policy objectives.







