GREEN ECONOMY BULLETIN

TRENDS, DEVELOPMENTS AND DATA

NOVEMBER 2022

The annual Trade & Industrial Policy Strategies (TIPS) Green Economy Bulletin (GEB) provides an overview, at the national level, of South Africa's progress in creating a more sustainable, inclusive and low-carbon economy. It aims to provide quick access to selected performance indicators that highlight key dimensions of the transition to an inclusive green economy.

South Africa's National Development Plan (NPD) targets an "environmentally sustainable, climate change resilient, low-carbon and just society."[1] Accordingly, the country's Low Emission Development Strategy 2050 charts "the beginning of [South Africa's] journey towards ultimately reaching a net zero carbon economy by 2050."[2]

In line with sustainable development goals, the indicators are grouped into three categories: economic development, social progress and environmental sustainability. As such, social indicators are as important to track as economic and environmental metrics. A truly inclusive green economy involves progress in all three categories of indicators, showing broad benefits to human development alongside the economy and natural environment.

The GEB can be read alongside the Green Economy Coalition's (GEC) Green Economy Tracker, which monitors policy development (available here), as well as TIPS's quarterly The Real Economy Bulletin. From time to time, a deep dive may be included in this Bulletin to provide key insights on a topical green economy area.

[1] NPC. 2011. National Development Plan: Vision 2030, Pretoria: National Planning Commission.

[2] DFFE. 2020. Low Emission Development Strategy 2050. Pretoria: Department of Forestry, Fisheries and the Environment.

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Introduction

A green economy includes the principles of sustainability, inclusivity, equity, efficiency and low-carbon development. References to South Africa's commitment to and pursuit of a green economy can be found in many national policies, plans and strategies, as documented by the Green Economy Coalition's Green Economy Tracker. To date, however. there have been few efforts to measure progress in the transition towards an inclusive green economy. This is changing with the launch of this new publication, the Green Economy Bulletin, which tracks the progress in South Africa against a selected set of economic, social and environmental indicators.

Fourteen metrics have been chosen for measurement. These, while by no means exhaustive, indicate progress (or lack thereof) in the development of green industries and the greening of others. As a green economy can only be sustainable if it is inclusive, equitable and improves human well-being, social indicators are also included in the GEB. They track human well-being through trends in inequality and access to (good quality) basic services, food and education. Then, environmental indicators, such as greenhouse gas (GHG) emissions, the country's biocapacity relative to its ecological footprint and water security, measure the extent to which South Africa lives within or "overshoots" natural thresholds and stocks of natural capital.

Due to the limitations of data coverage, access and availability, certain areas of interest are not covered, such as green jobs and the circular economy. New indicators may be included in future publications of the GEB as data becomes available.

For each indicator, the GEB provides a time series analysis. When data allows, this has been provided up to 2021. The hope is to see positive disruptions to trendlines in the short term as South Africa makes serious gains in achieving an inclusive green economy. The indicators chosen for the GEB are summarised in Table 1.

Table 1: Green Economy Bulleting indicators

CATEGORY	ISSUE	INDICATOR
Economic development	Unemployment	Unemployment rates
	Household income	Household debt / savings rates
	Sustainable energy	Renewable energy as a share of energy generation
	Energy efficiency	Energy intensity
	Green trade	Trade in green goods
	Research, development and innovation	R&D investment levels
	Sustainable mobility	Share of electric vehicles in new passenger vehicle sales
Social progress	Inequality	Income, wealth and carbon inequality
	Education attainment	Adults' highest education attainment
	Access to basic services	Access to energy, water and sanitation.
	Food security	Vulnerability to hunger and access to complex foods
Environmental sustainability	Ecological footprint	Ecological footprint and biocapacity per capita
	Climate change mitigation	GHG emissions
	Water security	Freshwater extractions as a share of internal water resources and water productivity

Source: Authors

Key findings

South Africa has made relatively slow progress in shifting to an inclusive and green development path. For the most part, the country's performance to date shows a continuation of historically unsustainable patterns. Performance against certain indicators remains concerning. Moreover, the COVID-19 crisis has exacerbated unemployment and inequality in the country with considerable stresses and deprivation experienced by many households. In terms of energy, while energy intensity has been on a positive downward trend, the slow uptake of renewable energy over the past years has had little effect on the overall GHG emissions profile. This also leads to a major overshoot in the country's ecological footprint relative to its biocapacity.

But there are reasons to be hopeful. South Africa's performance against certain indicators may well improve in the short to medium term as more funding and focus is given to the production and consumption of green goods and services in the economy. Recent government announcements should allow for the increased rollout of renewable energy and drive a more ambitious GHG emissions' trajectory.

Furthermore, following the announcement in November 2021 of a US$ 8.5 billion partnership with the governments of France, Germany, the United Kingdom and the United States, as well as the European Union, to support a just transition to a low-carbon economy and a climate-resilient society in South Africa, a Presidential Climate Finance Task Team was established to lead the country's efforts to mobilise finance for a just transition. Other announcements in 2022 included more finance from the Development Bank of Southern Africa's Green Fund and World Bank funding for the decommissioning and repurposing of coal-fired power plants.

Also expected soon is the proclamation of the Climate Change Act, currently with Parliament. Among others, it would require municipalities, provinces and national government departments to develop plans, targets and strategies for mitigation and adaptation, would establish a GHG inventory and would compel large GHG emitters to report on and reduce emissions.

All of this bodes well for real shifts in key green economy performance in South Africa over the next five to ten years. The annually updated GEB will track these changes.

Economic development

Transitioning to a green economy means achieving a more sustainable model of economic development. It stresses not only the need to further economic development but also questions the quality of development.

Economic performance is measured in the GEB through a multiplicity of indicators, considering employment, household income, energy supply and demand, e-mobility, and the development, demand and supply of green technologies. Unemployment rates as well as levels of household savings and debt reflect the performance of the economy at large, while the remaining indicators track progress in green industrial and trade strategies.

Unemployment

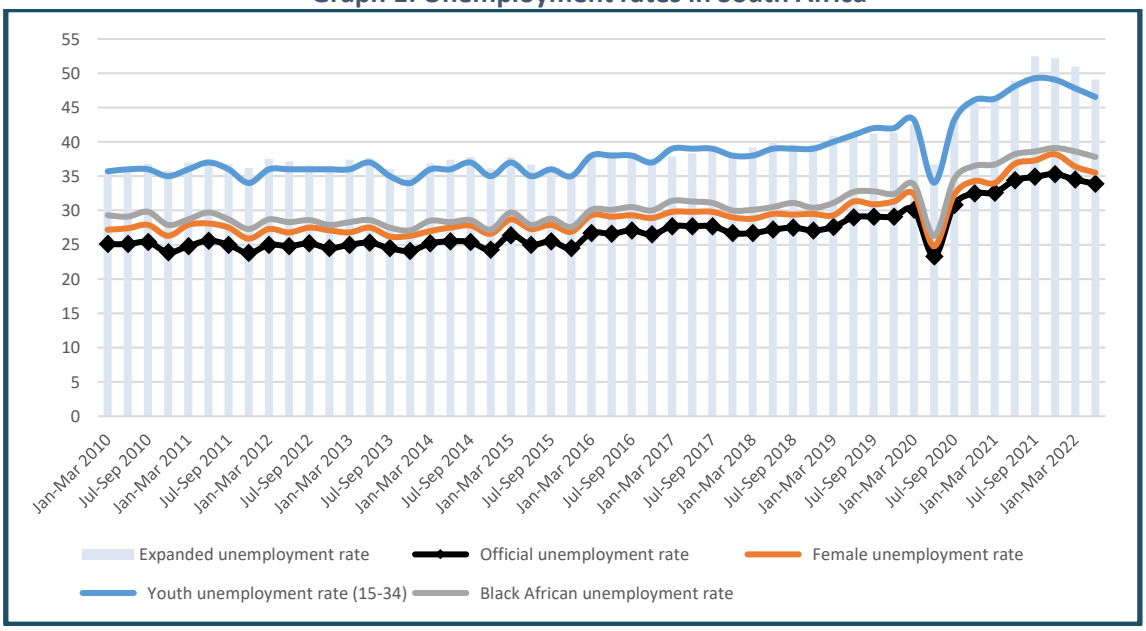
South Africa's official unemployment rate measures joblessness among working-age job seekers. The unemployment rate is a useful measure of the (in)ability of an economy to generate employment and provide stable incomes for the working-age population. Measuring (un)employment helps to understand how changes in economic conditions affect the social fabric and industrial structure, and how social and economic policies could be adjusted.

Largely stable in the 2010s, unemployment increased in the beginning of the 2020s, reaching 35,3% by the end 2021 (and a peak of 52,5% in the third quarter of 2021 based on the expanded definition, i.e. including discouraged work-seekers). Since then, unemployment has been a downtrend.

South Africa's official unemployment rate stood at 33,9% in the second quarter of 2022, decreasing by 0,6 percentage point from 34,5% in the first quarter of 2022. The unemployment rate, according to the expanded definition, also decreased by 1,4 percentage points to 44,1% in Q2 2022 compared to Q1 2022. A total of 648 000 jobs were gained between the first and second quarters of 2022 while the number of unemployed persons increased by 132 000 to eight million. In the meantime, the number of discouraged work-seekers decreased by 183 000.

Despite some positive developments in 2022, South Africa's unemployment remains staggeringly high, particularly in comparison to an average of 7% across middle-income countries (in 2020). Unemployment is furthermore unequal in its impacts. It disproportionately affects women more than men and Black Africans more than other groups. Overall, the youth are the hardest hit by unemployment. The youth unemployment rate stood at 46,5% in the second quarter of 2022.

Graph 1: Unemployment rates in South Africa



Source: Authors, based on data from Statistics South Africa, Quarterly Labour Force Surveys, downloaded from www.statssa.gov.za.

Progress in addressing the country's high unemployment rate remains a national priority. New job opportunities have emerged in green activities, such as renewable energy, waste management, public transport and natural resource management.[1] New green sectors and their associated value chains are anticipated to lead to increased employment. Moreover, South Africa has committed to a just transition, which must ensure that decarbonisation and responses to climate change occur in a way that addresses unemployment, poverty and inequality.

Household income

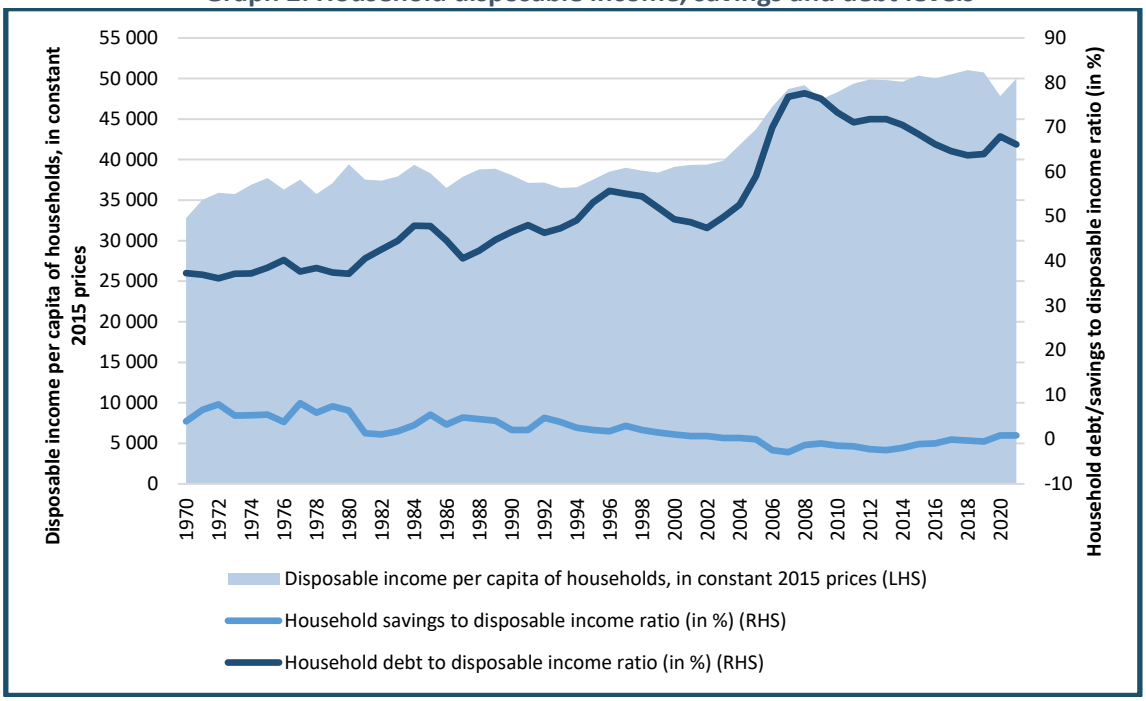
Household income is a flow of gross cash income earned by all members living in a single home. Household income enables the consumption of goods and services and contributes to changes in household wealth or net worth. The indicator, besides serving as a risk measure for lenders (who

[1] Green jobs are not systemically measured in South Africa.

use it for underwriting loans), is a useful economic indicator of an area or community's standard of living. More importantly, income levels and indebtedness impact levels of household savings (which are typically the main source of domestic savings used to finance capital investments). Low household savings inhibit investment potential and dampen economic development. Households that are indebted are also vulnerable to shocks and cannot borrow to invest. For these reasons, the ratios of debt and savings to disposable income are important measures of a country's overall health and sustainability.

South Africa's average disposable household income per capita has been growing at an average 2,8% per annum from 1970 to 2020, equating to a compound annual growth rate of only 0,72%. The general upward trend of per capita household disposable income was arrested in 2020 when average per capita household income, of R50 755 in 2019, declined to R47 830 in 2020. This was partially reversed in 2021, with household disposable income per capita rebounding to R49 995.

Graph 2: Household disposable income, savings and debt levels



Source: Authors, based on data from the South African Reserve Bank, Quarterly Bulletin, National accounts, downloaded from Quantec.

The past 20 years have seen an overall increase in household indebtedness. In 2000, the ratio of debt to household disposable income stood at 49% but, by 2008, this had grown to 78%. Since then, the debt ratio has been slowly decreasing, reaching 66% in 2021.

While high levels of household debt are not uncommon in many countries around the world, South Africa also has low levels of savings to disposable income. Actually, the savings to disposable income ratio was negative from 2006 to 2019. Savings have returned to a more positive trend in 2020 and 2021, with ratio to disposable income of 0,9% in both years. By comparison, savings' rates vary widely from one country to another, from negative (Greece) to high (36% in China, in 2016). The average household savings' rate in the European Union in 2020 stood at 12,3%.

South Africa needs to improve levels of household savings and lower indebtedness. This would lessen vulnerabilities to shocks and increase household resilience while also providing increased flows which could be used to finance capital investment.

Sustainable energy

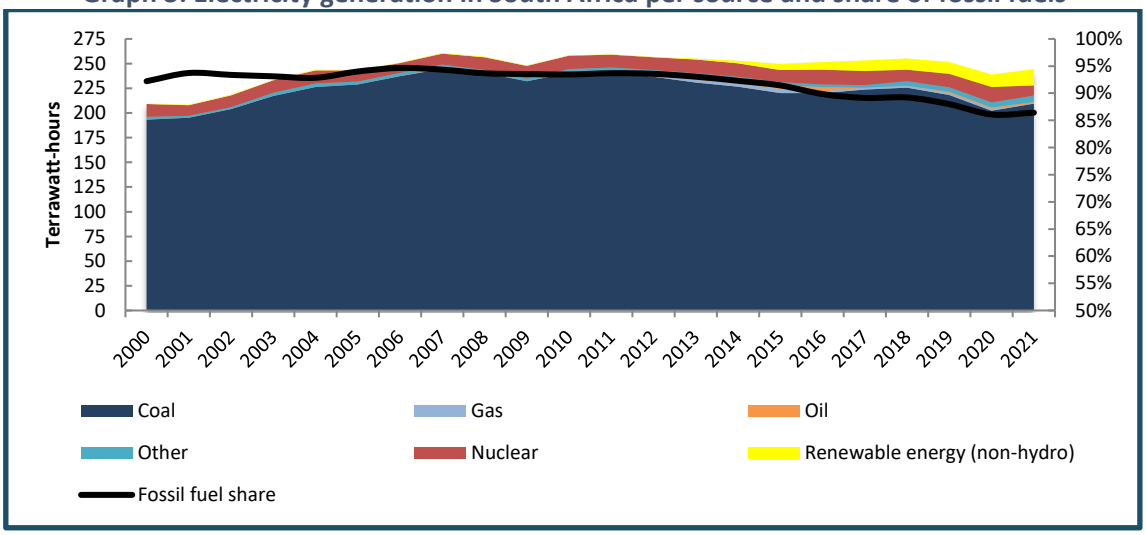
Ensuring the provision of adequate and reliable energy services at an affordable cost, in a secure and environmentally benign manner and in conformity with social and economic development needs, is an essential element of sustainable development. Sustainable energy is an important indicator to measure as it contributes to eradicating poverty, improving human welfare and raising living standards.

South Africa's economic development is historically rooted in a Minerals-Energy Complex, i.e. energy-intensive industrial activities underpinned by mineral extraction and abundant, cheap coal-based electricity. Coal has been at the core of this economic strategy and remains at the centre of South Africa's energy systems to date. Besides the massive impact on GHG emissions, the coal value chain is responsible for widespread land degradation as well as air and water pollution,[2] leading to dramatic health impacts. For instance, 97% of sulphur dioxide (SO_2) emissions in South Africa are linked to coal combustion for power generation. Kriel Power Station in Mpumalanga emits the most SO_2 of all hotspots in Africa and is ranked second the world.[3]

Energy use in South Africa is heavily dominated by fossil fuels, with coal underpinning about 86% of electricity generation and about 20% of liquid fuel production. Overall, coal accounted for more than 70% of energy consumption in the country in 2019. Including oil (22%) and gas (3%), fossil fuels represented 95% of South Africa's energy consumption. Renewable energy only accounted for about 2%.

As shown in Graph 3, the dominance of coal persists at the electricity supply level although the share of fossil fuels in electricity generation has declined slightly in the past decade from 94% in 2011 to 86% in 2021. South Africa's share of renewable energy (non-hydro) in electricity production in 2021 was up to 6,8%, compared to 2,5% in 2015 and 0,2% in 2010. New announcements of large-scale renewable energy procurement by the state, municipal plans for independent power production, major corporate investments in this area as well as the emergence of an enabling framework in some municipalities for small-scale embedded generation should drive further uptake in renewable energy in the years to come.

Graph 3: Electricity generation in South Africa per source and share of fossil fuels



Source: Authors, based on data from BP statistical review of world energy, 2021, downloaded from https://www.bp.com.

[2] Coal mining and power generation consume 5% and 2% of South Africa's water (Department of Water Affairs, 2013).

[3] See https://www.greenpeace.org for more data on SO_2 emissions worldwide.

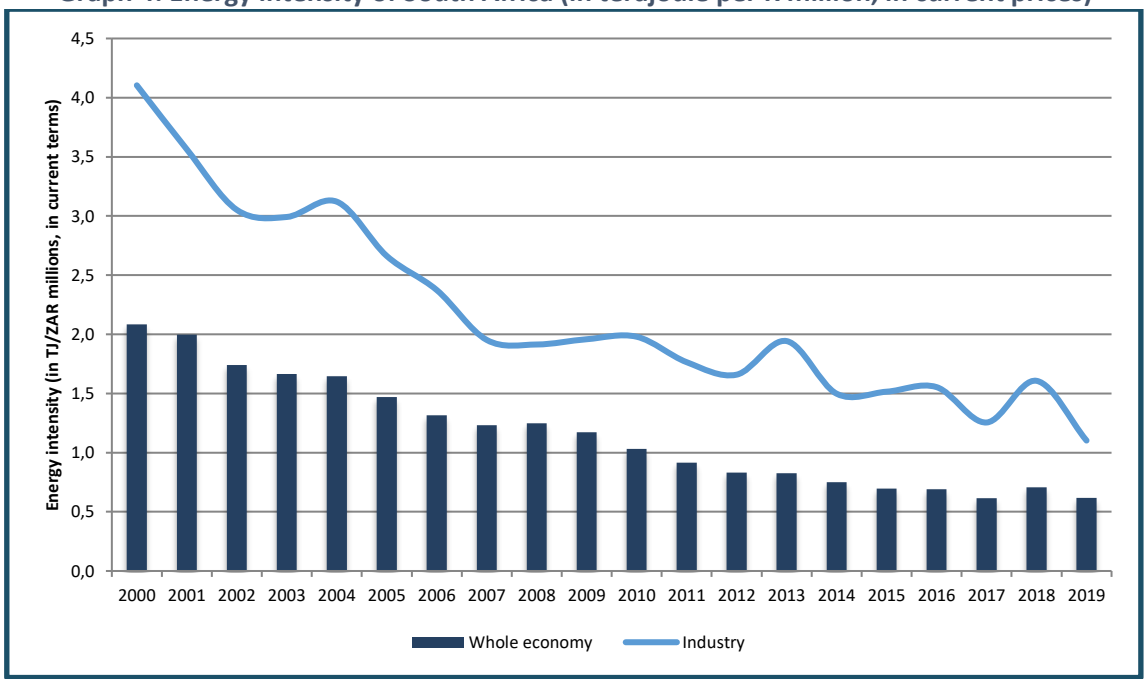
While the contribution of renewable energy to the electricity mix is progressively rising, energy use in the country continues to be heavily dominated by fossil fuels, and coal in particular. Increasing South Africa's share of renewable energy in the electricity mix (and energy supply overall) needs to be aggressively pursued if progress on the pathway to net-zero emissions is to be achieved. Opportunities also exist to materially decrease the role of oil in transport, as illustrated by the potential penetration of electric vehicles (see sustainable mobility section, page 8).

Energy efficiency

Energy intensity is defined as the amount of energy used to produce a given level of output or activity. Using less energy to produce a product or provide a service results in reduced energy intensity. South Africa's economy is historically resource inefficient, on the back of low prices for energy and water, and a weak environmental regulatory framework. This has started to change in the past two decades, with fast-rising electricity prices as well as heightened environmental regulations.

This is illustrated by the trend in energy intensity, calculated as units of energy used per unit of gross domestic product (GDP). South Africa's energy intensity has decreased significantly since the 1990s, particularly from 2000 onwards, indicative of a progressive decoupling of economic outputs from energy use.

Graph 4: Energy intensity of South Africa (in terajoule per R million, in current prices)



Source: Authors, based on data from the Department of Mineral Resources and Energy, datasets on energy balances, downloaded from http://www.energy.gov.za and Statistics South Africa, GDP timeseries, downloaded from http://www.statssa.gov.za.

Despite some significant progress, South Africa remains a resource-intensive economy. Further efforts are required to drive efficiency in energy, water, carbon and material use. Driving efficiency remains, in most cases, the cheapest and cleanest form of improving the sustainability and competitiveness of production. It is also the backbone of a low-carbon, climate resilience and competitive economy.

Sustainable mobility

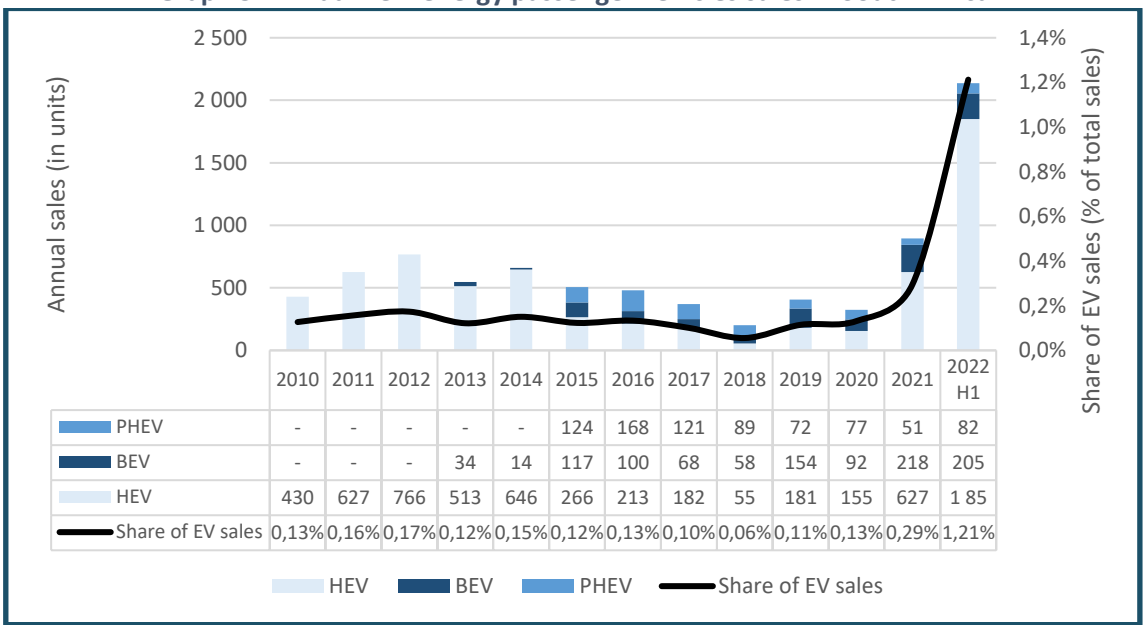
Sustainable mobility is another cornerstone of a low-carbon, climate-resilient and inclusive society. Achieving sustainable mobility hinges on a multi-pronged strategy, covering more inclusive cities, an increase in non-motorised transport and public transportation, a shift to e-mobility and a socially-progressive transformation of the automotive and liquid fuel value chains.

The introduction of New Energy Vehicles (NEVs) provides a (partial) window into South Africa's transition to sustainable mobility. NEV sales in South Africa remain marginal. They comprised under 0,3% of all new passenger vehicle sales in 2021. Furthermore, poor economic performance, high interest rates, the advent of COVID-19 with its impacts on travel and reduced demand for vehicles by car hire companies, as well as high household indebtedness, all drove a drop in overall vehicle sales in 2019 and 2020.

Despite historically low sale volumes, the share of NEVs in vehicle sales more than doubled in 2021 with about 900 units sold in the year. Although growing each year, few electric vehicle models are available for purchase in South Africa, and those that do are primarily in the premium sector. Charging infrastructure also needs to be rolled out across the country while the pricing of NEVs, in part due to the absence of a supportive policy framework, remains relatively high. All of these factors have kept NEVs out of reach of most customers (while only a third of South African households can afford a private vehicle in the first place).

Shifts are, however, likely in the medium term, with increasing interest from manufacturers, consumers (including government in providing public transport services) as well as the impetus provided by the implementation of the country's green transport strategy and the publication in 2021 of the *Auto Green Paper on the Advancement of New Energy Vehicles in South Africa*. Data for the first half of 2022 suggests continued growth in the penetration of NEVs into the local market, indicative of a positive trend largely driven by soft-hybrid vehicles.

Graph 5: Annual new energy passenger vehicles sales in South Africa



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022 H1
PHEV	-	-	-	-	-	124	168	121	89	72	77	51	82
BEV	-	-	-	34	14	117	100	68	58	154	92	218	205
HEV	430	627	766	513	646	266	213	182	55	181	155	627	1 85
Share of EV sales	0,13%	0,16%	0,17%	0,12%	0,15%	0,12%	0,13%	0,10%	0,06%	0,11%	0,13%	0,29%	1,21%

Source: Authors, based on data from naamsa – the Automotive Business Council
Note: HEV: soft-hybrid vehicle; PHEV: Plug-in hybrid vehicle; BEV: Battery electric vehicles. No fuel cell electric vehicles are sold in South Africa.

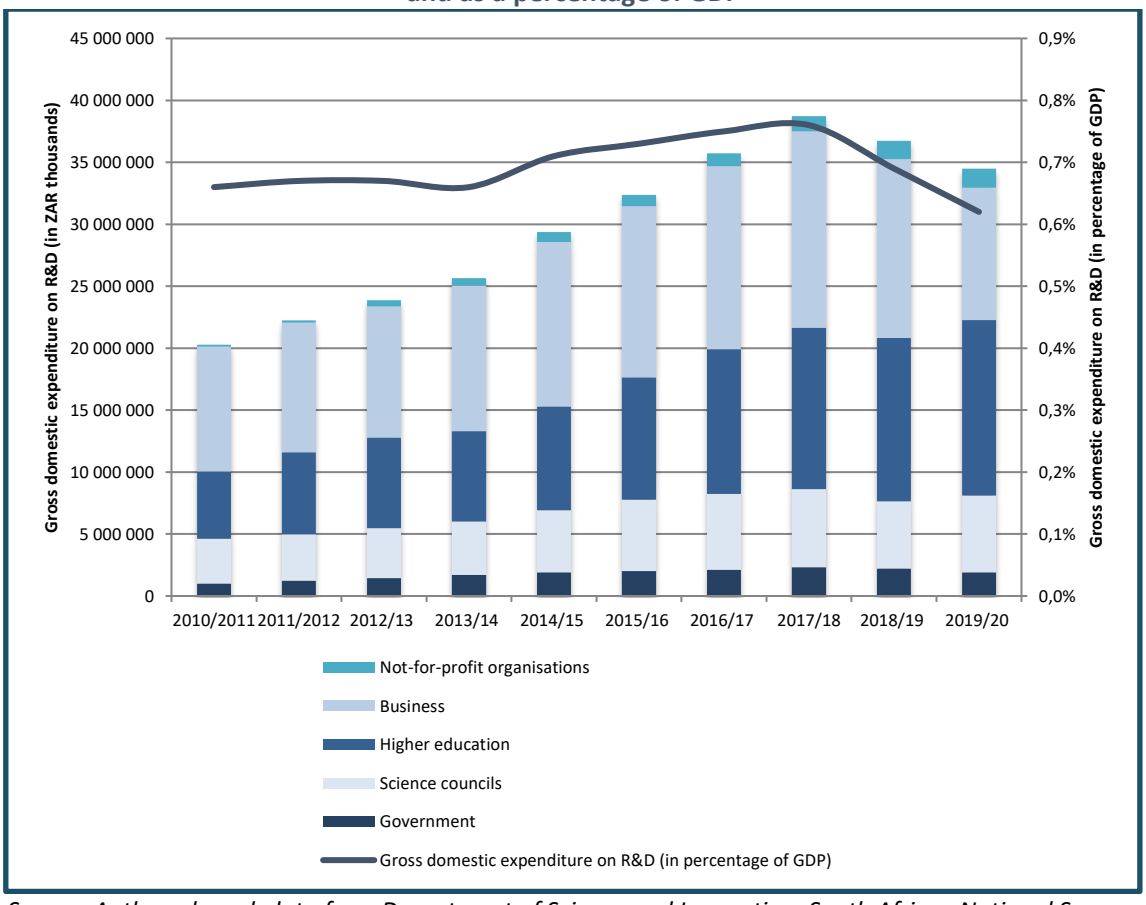
Research, development and innovation

Research and development (R&D) plays a pivotal role in driving a country's economic development. While the rate varies per country, studies have found that, on average, every dollar invested in R&D generates nearly two dollars in return. The transition to a green economy relies in part on the development, adoption and diffusion of new technologies, from renewable energy, to e-mobility, to smart agriculture, to resource efficiency. As such, investment in R&D is a crucial component underpinning the transition.

South Africa's R&D expenditure levels are relatively low, although they grew between 2010/2011 and 2017/2018 from R20,2 billion to R38 billion (in current values) or from 0,66% to 0,76% of GDP in those years. In 2019/2020, R&D expenditure dropped to 0,62% of GDP or R34 billion. While the data for 2020/2021 is not yet fully available, indications are that R&D expenditure experienced significant declines in all sectors and across all enterprise types.

Measured in constant 2015 Rands, the business sector's contribution to R&D expenditure declined in 2019/2020 to R8,7 billion from a high of R14 billion in 2014/2015 and 2017/2018. Public sector expenditure on R&D (which includes government, science councils and higher education institutions) grew from just over R13 billion in 2010/11 to R18 billion in 2019/2020 in constant terms. Most of this was from an increase in higher education institutions' R&D expenditure – this grew from R7 billion in 2010/2011 to over R11,5 billion in 2019/2020. Not-for-profit institutions' combined expenditure on R&D also grew strongly, from R0,2 billion in 2010/2011 to R1,2 billion in 2019/2020.

Graph 6: Gross expenditure on R&D, by sector, Rand, constant 2015 and as a percentage of GDP



Source: Authors, based data from Department of Science and Innovation, South African National Surveys of Research and Development, downloaded from https://www.dst.gov.za.

R&D expenditure is reported using two distinctive frameworks: research fields and socio-economic objectives. Using these two measures, the "green" share of R&D stood at between 16%-18% in 2010/2011 and increased slightly to between 17%-20% in 2016/2017.[4] In 2017/2018, green R&D reached 19% based on socio-economic objectives.[5] In that year, most green R&D activity was undertaken by Higher Education Institutions and Science Councils. "Plant production and plant products" R&D received the greatest share of total green R&D expenditure, at 22%. This was followed by R&D on "environmental knowledge" (13%), "natural resources" (12%), "natural sciences, technology and engineering" (11%) and "economic framework" (11%).

Increasing the gross expenditure on R&D as a share of GDP would support economic development and an accelerated transition to a green economy. Government has a target of increasing R&D spend to 1,1% of GDP by 2024, and 1,5% by 2030. The OECD average in 2019 stood at 2,7%.[6]

Green trade

As the transition to a green economy unfolds, green technologies (so-called "greentech") increasingly permeate every sector. Looking ahead, the development of green industrial capabilities will be a fundamental determinant of global competitiveness.

Trade in environmental goods and services provides a proxy to understand the role of greentech in the economy. It consists of a heterogeneous set of goods and services aimed at the protection of the environment and the sustainable management of natural resources. Examples include goods and services to prevent or minimise pollution or natural resource depletion or to repair damage to waterways and re-establish biodiversity.

The global drive towards green and greener products creates an opportunity to invest in South Africa-produced and developed green goods and services. Appropriate localisation policies and more green R&D finance can support the emergence of locally-developed "environmental goods and services" for both domestic adoption as well as export markets. There are high potential areas for South Africa, including in its exports to the region. Currently, however, South Africa imports more "green goods" than it exports.

Graphs 7 and 8 display South Africa's exports and imports of green goods.[7] After a period of growth (up to 2011 for exports ad 2013 for imports), exported and imported green goods have declined. South Africa exported the most green goods in value terms in 2011, at about US$8,5 billion. In share of total exports, South Africa's green exports reached a peak in 2007, when they comprised 12,5% of total. In 2020, this dropped to about 6,3% of South Africa's overall annual exports. "Pollution management" goods have been and remain by far the largest share of

[4] Montmasson-Clair, G., Mudombi, S. and Ryan, G. 2019. Measurement of green economy research and development 2010/11-2016/17, Pretoria, Department of Science and Innovation and Trade & Industrial Policy Strategies. Available at https://www.tips.org.za.

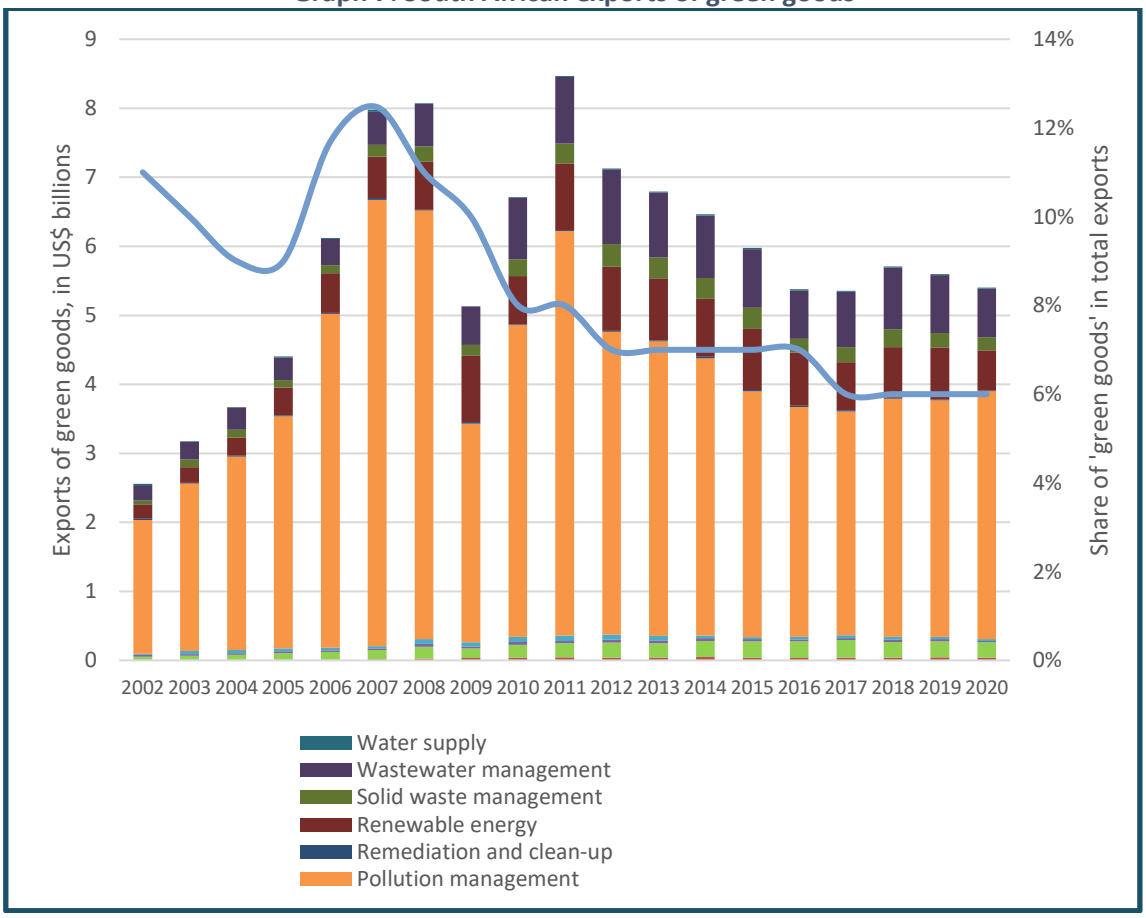
[5] CeSTII. 2021. HSRC Fact sheet no. 32 – Green R&D 2017/18, Pretoria, Department of Science and Innovation, Human Sciences Research Council and Statistics South Africa. Available at: http://www.hsrc.ac.za.

[6] See the OECD Science and Technology Indicators Database (http://oe.cd/msti) for main data.

[7] For methodological considerations regarding the definition of green goods, refer to Montmasson-Clair, G., Wood, C., Mudombi, S. and Deonarain, B. 2017. A Green Economy Industry and Trade Analysis: Assessing South Africa's Potential. Pretoria: Department of Environmental Affairs, Department of Trade and Industry, Department of Science and Technology, United Nations Environment Programme and United Nations Industrial Development Organization.

the total, followed by "wastewater management" and "renewable energy" goods. Within "pollution management", the export of catalytic converters (listed as "machinery and apparatus for filtering or purifying gases") comprises the main share of total value, accounting for between 44 and 49% of 'Pollution Management' exports between 2002 and 2020.[8]

Graph 7: South African exports of green goods



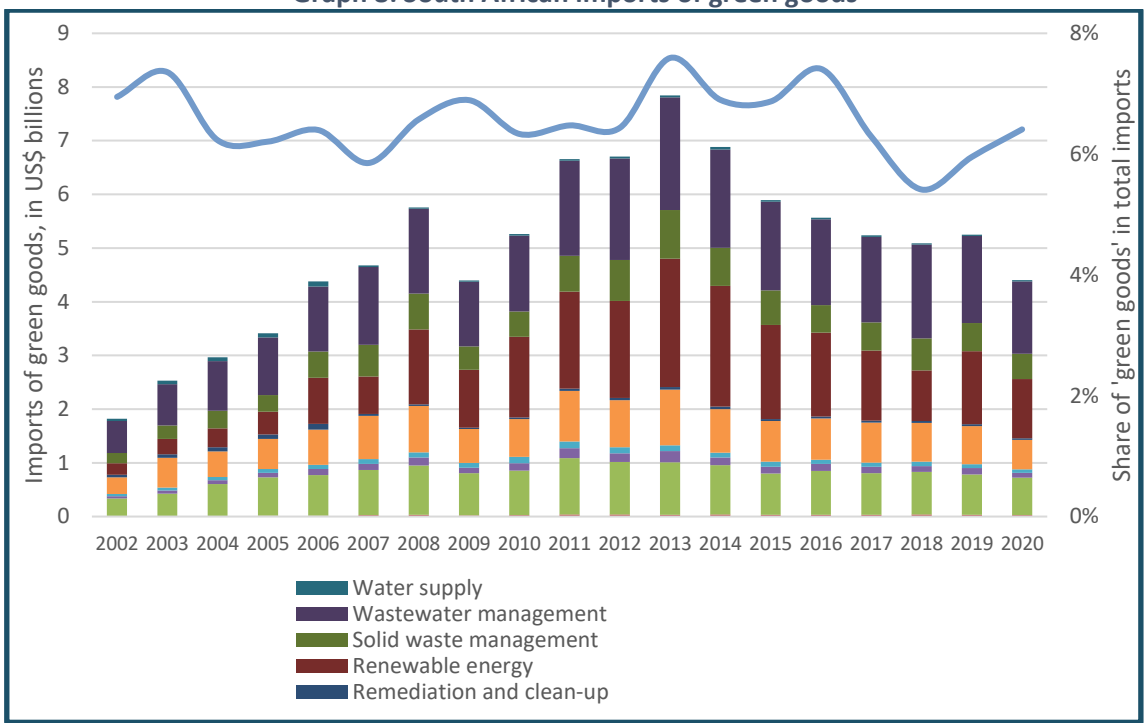
Source: Authors, based on data from Trade Map, downloaded from https://www.trademap.org.

Most green imports to South Africa are in "wastewater management" and "renewable energy" components. With "wastewater management" imports, the largest single imported product category over time has been "appliances for pipes, boiler shells, tanks, vats or the like". The share of green imports was the highest in 2013, at nearly 8% of total and close to US$8 billion in that year. More than US$500 million was each spent on imports of "wind-powered generating sets" and "semiconductors including photovoltaic cells" in that year.

Green goods declined to 5,5% of total imports and just over US$5 billion in value in 2018 and declined further in 2020, when green imports to South Africa amounted to US$4,4 billion. In 2020, this total represented 6,4% of total imports.

[8] Exports of catalytic converters are set to decrease as internal combustion engine vehicles are replaced with NEVs. While this may have a negative impact on South Africa's green goods exports, it is also anticipated that demand for platinum group metals (PGMs) may be positively impacted by the rise of fuel cells. Insufficient data and modelling exist to know whether a decline in PGMs demand due to a reduction in the demand for catalytic convertors will be ameliorated by the alternate use of PGMs as catalysers in fuel cells and electrolysers in hydrogen production.

Graph 8: South African imports of green goods



Source: Authors, based on data from Trade Map, downloaded from https://www.trademap.org.

The production of "green goods and services"' can open domestic production to larger and often completely new global markets, thereby encouraging or even providing the basis for investment in and development of green industries. With supportive national policies and institutions in place, trade opportunities offered by a global green economy could enhance South Africa's economic development.

By contrast, over the coming years, South Africa, which has among the most carbon-intensive exports globally, is set to be directly impacted by the shift away from carbon-intensive goods and jurisdictions. Most notably, the European Union's Green Deal, through the implementation of a Carbon Border Adjustment Mechanism (CBAM), is set to impact South Africa's exports from 2025, starting with the steel, aluminum and chemicals sectors. This provides yet another reason to shift South Africa's trade to new green opportunities.[9]

Social progress

An inclusive and equitable green economy means that the benefits and opportunities presented by this "new"' economy are fairly shared and that vulnerable households are protected from the negative impacts of the transition towards a green economy. Broadly speaking, the green economy should result in a net-positive transition for society at large, as evidenced through improvements in the quality of life of citizens. This means, among other things, improved access to water, sanitation and energy. Access to quality education services and nutritional food are also necessary conditions for citizens to thrive and to be able to participate in (and benefit from) the transition to a green economy. Good access to these services improves societal welfare and resilience.

[9] Monaisa, L. 2022. The EU's Carbon Border Adjustment Mechanism and its implications on South African Exports. Pretoria: Trade & Industrial Policy Strategies.

For these reasons, the GEB measures social progress through indicators of inequality, access to basic services, education attainment and food security. These indicators, while not exhaustive, provide a useful set of insights against which to understand and track social development trends in the country.

Inequality

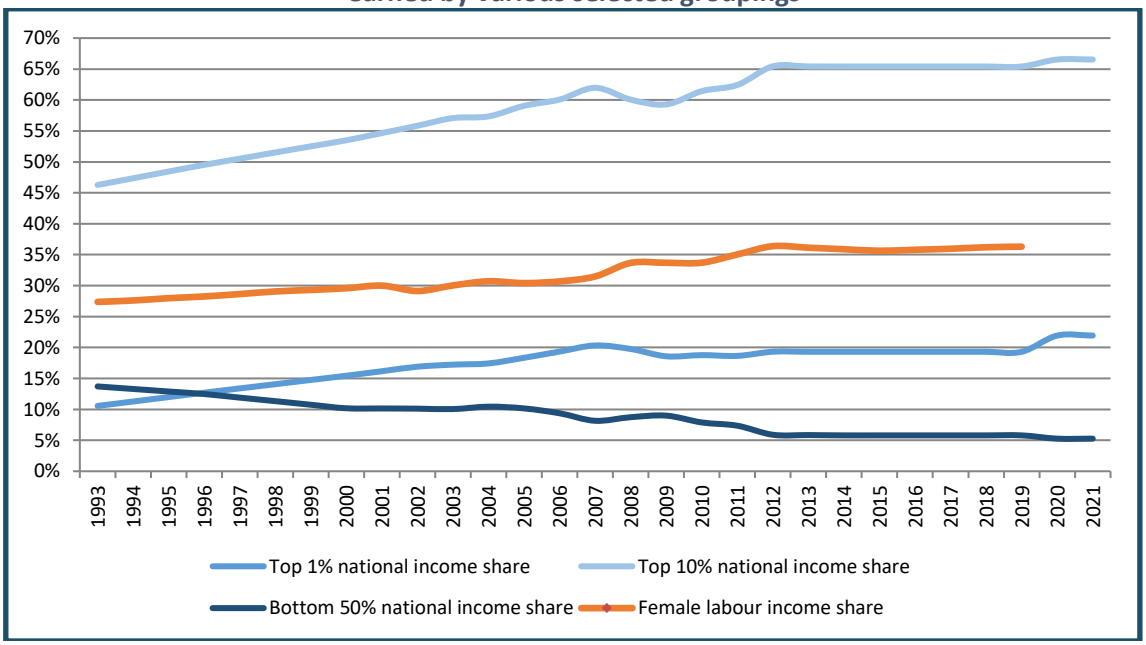
An inequality measure is often a function that ascribes a value to a specific distribution of income in a way that allows direct and objective comparisons across different distributions. The persistence of inequality directly jeopardises the achievement of Sustainable Development Goals, such as eliminating extreme poverty, boosting decent work and transforming economic structures.

South Africa is the world's most unequal country and has experienced sustained levels of inequality over many years across various dimensions. Inequality can be measured in a number of ways, including as income inequality, wealth inequality and carbon inequality.

The top earners in South Africa are increasingly capturing a growing share of income, while the lowest earners are earning less and less as a share of total income. The top 10% of earners accounted for an estimated 66% of all income earnings in South Africa in 2021. Globally, the top 10% of income earners accounted for 52% of all income earnings in the same year. The top 1% of income earners in South Africa received 22% of all income in 2021, up from 10% in 1993, while the bottom 50% of income earners took home a significantly smaller share of total income, at 5% of total income in 2021 down from 14% in 1993.

Inequality has a particular racial and gendered character in South Africa. Black Africans have the highest unemployment rate and also earn the lowest wages when they are employed. Whites earn substantially higher wages than all the other population groups. Female workers earn approximately 30% less, on average, than their male counterparts. And while the share of total income earnings going to female workers increased between 1993 and 2013, it has remained constant at about 36% of total income earnings since then.

Graph 9: Income inequality in South Africa, expressed as the share of total income earned by various selected groupings

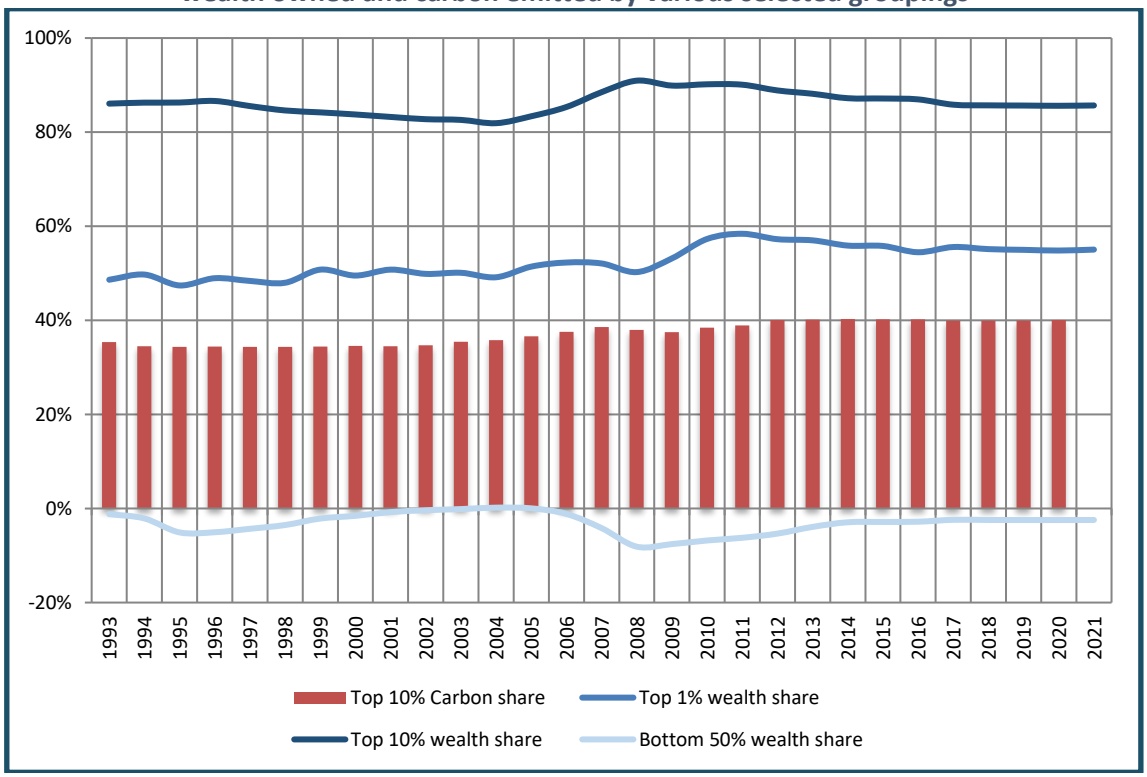


Source: Authors, based on data from World Inequality Database, downloaded from https://wid.world.

Wealth inequality in South Africa is even more stark than income inequality. It is measured as the total value of non-financial and financial assets (housing, land, deposits, bonds, equities) held by households, minus their debts, reported for individuals over the age of 20. In South Africa, the top 1% of the population, some 350 000 adult individuals, held 55% of all wealth in 2021. The top 10% held 85.6% in 2021, down from 90.9% in 2008. This is higher than the global picture, where the top 10% accrued 76% of all wealth in 2021. By contrast, the bottom 50% in South Africa has had negative wealth for some time: the levels of their debt owed exceeds the market value of their assets. In 2021, the bottom 50% had -2% of the country's wealth. This compares to a global average of 2% of wealth held by the bottom 50% in 2021.

With carbon inequality, emissions per capita are a function of consumption levels, particularly of household energy, transport, food and other goods and services and are strongly linked to wealth. South Africa's top 10% of emitters contributed an average of 27.9 tCO_2e per capita in 2020. This was more than seven times the country's "average" per capita in that year (4.1 tCO_2e). This is also more than seven times the average GHG emissions per capita for a middle-income country (which was 3,8 tCO2e per capita in 2019).[10] The top 10% of emitters in South Africa were responsible for around 40% of the country's total GHG emissions in 2020.

Graph 10: Wealth and carbon inequality in South Africa, expressed as the share of total wealth owned and carbon emitted by various selected groupings



Source: Authors, based on data from World Inequality Database, downloaded from https://wid.world.

South Africa should continue to support and expand policies that seek to address (gender and racial) inequality. Looking ahead, investment in education and infrastructure, promoting greater accountability and equality in big business, fostering small businesses (including through land reform and support for township enterprise) and, overall, empowering communities through

[10] Data from Climate Watch. Available at: https://data.worldbank.org.

community and worker organisations are some of the possible avenues to reduce the income and wealth gap in the country.[11]

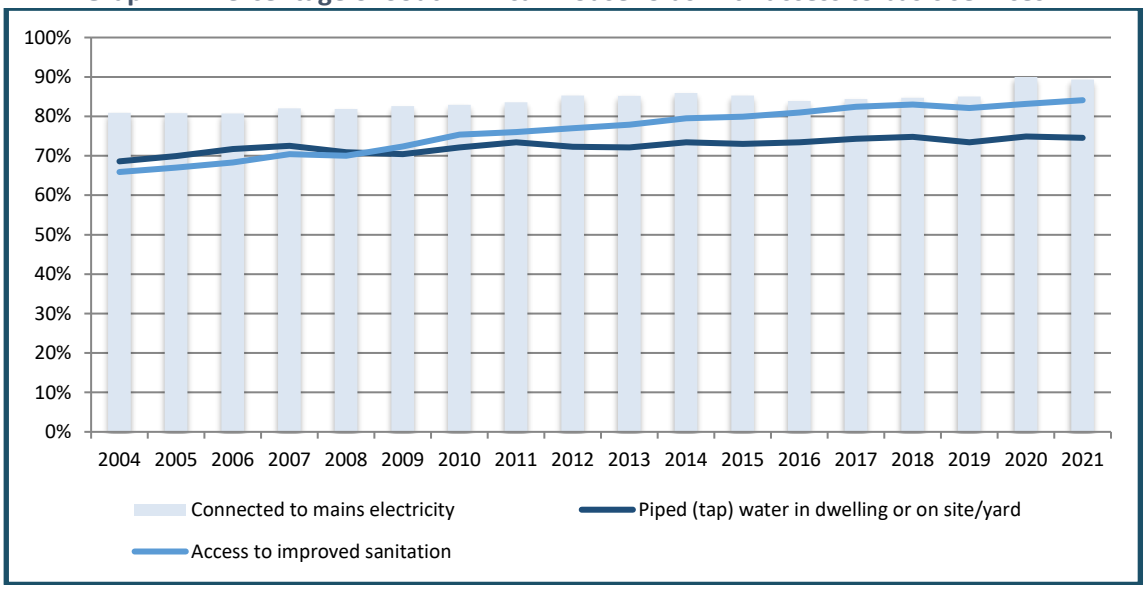
Access to basic services

Besides the financial metrics discussed above, social progress is also a function of household access to good quality, reliable, affordable key utility services, such as energy, water and sanitation.

The lack of energy security is currently heralded as the single largest constraint on South Africa's current economic development. Government has taken action both to address the immediate crisis and to make rolling power interruptions a thing of the past.

About 90% of the world population had access to electricity in 2019. For middle-income countries, this percentage stood at 93,5%.[12] While 89,3% of South African households had connections to mains electricity in 2021, power cuts and the cost of electricity remain obstacles to accessing this basic service. Loadshedding hours increased from 0 in 2016 and 2017, to 859 hours in 2020 and 1 169 hours in 2021.[13] And 2022 will set a new record, having already exceeded 1 900 hours of loadshedding at the time of writing.

Graph 11: Percentage of South African households with access to basic services



Source: Authors, calculated from Statistics South Africa, General Household Surveys, downloaded from https://www.statssa.gov.za.

Government is currently addressing energy security by diversifying the country's energy sources.[14] Measures are aimed at improving the performance of Eskom's existing power stations and adding as much new generation capacity to the grid as possible, as quickly as possible. A key focus has been to remove barriers to new generation capacity and unlock energy supply from many different sources – including Eskom, independent power producers, businesses and households – as part of a collective national effort.

[11] Makgetla, N. 2020. Inequality in South Africa: An Overview. Pretoria: Trade & Industrial Policy Strategies.
[12] See https://sdg-tracker.org for more global data on this indicator.
[13] CSIR. 2022. Statistics of utility-scale power generation in South Africa in 2021. Pretoria: Council for Scientific and Industrial Research. Available at: https://www.csir.co.za.
[14] The Presidency Republic of South Africa. 2022. Confronting the Energy Crisis: An Action Plan to End Load Shedding.

Quality access to water and sanitation is another area of concern for society. Particularly, safe and readily available water is paramount for public health, whether it is used for drinking, domestic use, food production or recreational purposes. Improved water supply and sanitation, and better management of water resources, can boost countries' economic development and contribute greatly to improved quality of life and poverty reduction.

The percentage of South African households with access to basic water and sanitation services has increased materially since the advent of democracy. Statistically, in 2021, about 75% of households had access to piped water in their dwelling or yard, while about 84% of households had some access to improved sanitation. However, in 2020, 29% of South Africans still reported water-related disruptions.[15]

Globally, while in 2015, 90% of the world's population had achieved access to an improved drinking water source, in 2020, only 74% had access to *safe* drinking water.[16] In South Africa, according to the Department of Water and Sanitation's 2022 Blue Drop Report, 34% of water supply systems are in the high and critical risk categories[17] – 72.2% of water supplied meets microbiological compliance requirements and 73.3% chemical compliance.

With sanitation, in 2016, 2.3 million households still relied on pit latrines without ventilation for sanitation.[18] And, in 2019, 37 out of 257 municipalities in South Africa still provided bucket toilets – to 42 434 consumer units (of 12.5 million). The Free State, Eastern Cape, Northern Cape and North West provinces accounted for this bucket toilet provision. Globally, only 54% of the world population had access to a safely managed sanitation service in 2020.[19]

Looking ahead, enhancing supply and boosting the productivity of water use (through water efficiency improvements and demand management) are critical to improving water and sanitation services. Renewed efforts to address service backlogs, particularly in informal settlements and rural areas, are necessary to provide quality access to all. Partnerships between stakeholders are crucial to increase expenditure spending for water and sanitation services.

Education attainment

One of the basic indicators of the development of national economies is the degree of education and knowledge of its society. Therefore, education, especially higher education, is considered to be a national priority which contributes to economic development as well as the progress of society in general.

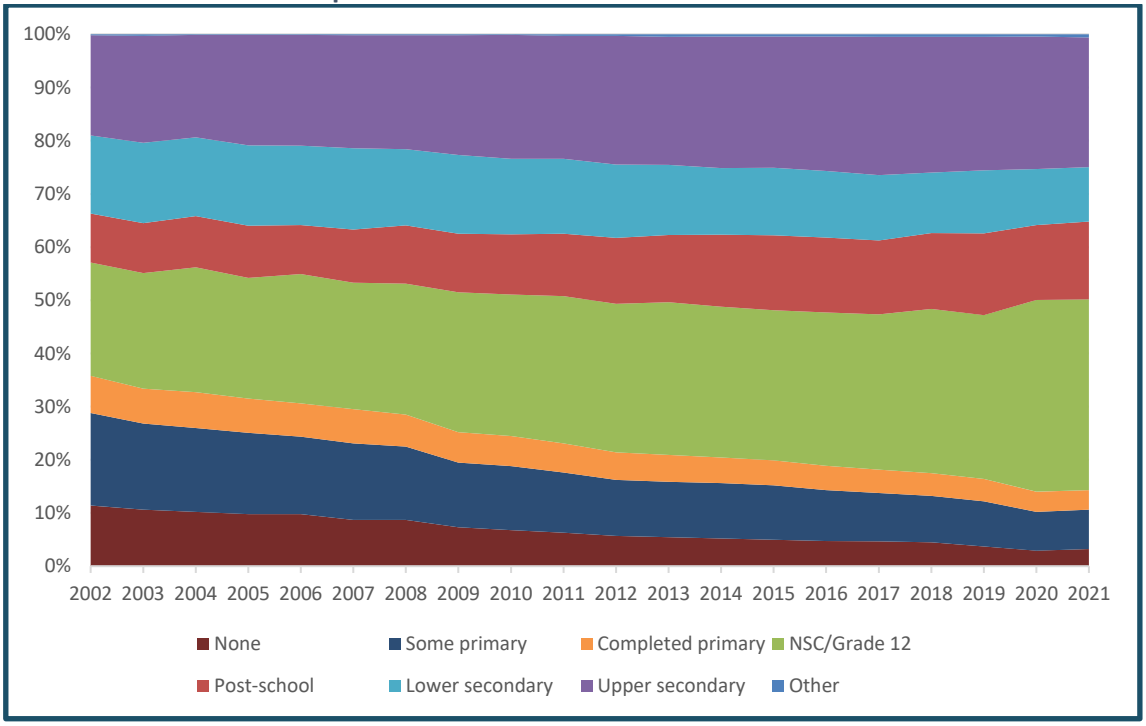
Access to and quality of community services (such as education and healthcare) remain highly skewed in the country, further weakening the already low resilience of many vulnerable communities to climate-related impacts. This is starkly illustrated by the state of education, including the level of educational attainment, i.e. the highest level of education that a person has successfully completed.

[15] Statistics South Africa. 2020. General Household Survey.
[16] See https://datatopics.worldbank.org and https://www.sdg6data.org for data.
[17] DWS. 2022. Blue Drop Progress Report 2022. Pretoria: Department of Water and Sanitation. Available at: https://ws.dws.gov.za.
[18] Mudombi, S. 2020. Unpacking water and sanitation access in South Africa: a renewed call for more action, Pretoria: Trade & Industrial Policy Strategies.
[19] See https://www.sdg6data.org for more global data.

In spite of significant expenditure and progress to rectify the legacy of apartheid, South Africa has one of the most unequal school systems, with the widest gap between the test scores of the top 20% of schools and the rest. Inadequate infrastructure (86% of public schools had no laboratory in 2018; 77% had no library; 72% had no Internet access) and the absence of essential facilities (19% had no toilet or only pit latrines) are key persisting problems.[20] Beyond infrastructure, overcrowded classrooms, problematic teacher skills and ability, insufficient teaching time and also lack of transport are widespread problems, particularly in low-income areas.

Despite these challenges, the share of adults with no education (i.e. they have attended no formal schooling at all) declined from 11% to 3% between 2002 and 2020. Over the same period, the percentage of adults with a National Senior Certificate or Grade 12 qualification increased from 21% to 36% and adults with post-school qualifications, as a share, grew from 9% to 14%.

Graph 12: Adult education level in South Africa



Source: Authors, calculated from Statistics South Africa, General Household Surveys, downloaded from https://www.statssa.gov.za.

While improvements in overall education levels are positive, many learners still struggle to read for meaning. An estimated 78% of Grade 4 children are not able to read for meaning in any South African language.[21] Globally, in 2019, 41% of children of Grade 3 age were proficient in reading.[22]

Furthermore, while 76% of Grade 12 learners who took the National Senior Certificate examination in 2021 passed, this represented only 59,9% of those who registered for Grade 12.[23] More broadly, only just over half the learners make it from Grade R to Grade 12 without

[20] See https://www.education.gov.za for full data.
[21] McCain, N. 2022. Expert panel convenes to get all SA children reading as part of 2030 goal. Cape Town: News24. Available at: https://www.news24.com.
[22] See https://unstats.un.org for more global data.
[23] Vermeulen, J. 2022. South Africa's matric pass rate — official vs "real" from 1995 to 2021. Available at: https://mybroadband.co.za.

repeating years, or dropping out of school. Globally, in 2019, 53% of children completed secondary school, up from 46% in 2010.

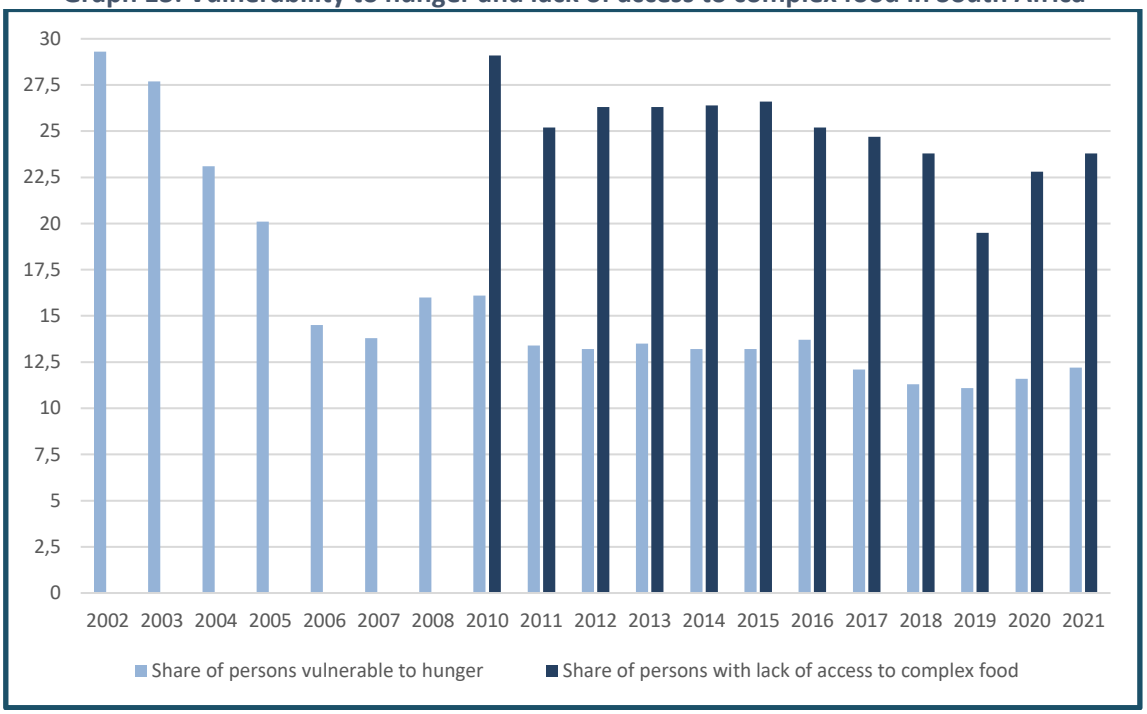
Access to quality education for all needs to be prioritised to ensure that the country's youth are equipped for the future. Education forms one of the pillars of developmental objectives. The 2020 lockdown regulations linked to the fight against COVID-19 highlighted inequalities once more, resulting in school closures and rotational attendance. Close to one million children aged 5-18 were out of school in that year. Readiness for remote learning was also low as most households did not and do not have digital assets, such as laptops and tablets at home.[24]

Food security

Globally (and in South Africa), many adults and children go hungry due to a lack of access to nutritional food. This violates human rights (including the right to food in the South African Constitution), has negative health implications, and limits the ability to learn and participate in the economy.

Food security is measured by household or persons. The share of persons vulnerable to hunger measures the percentage of the population who do not have enough food for an active and healthy life. Access to complex foods per person measures the access of people to a variety of food sources for improved nutrition. A low access to complex foods indicates dependence on a single food or narrow basket of nutritional options. Measuring vulnerability to hunger and access to different sources of food is crucial for targeting food, social and economic assistance, evaluating nutrition, health, and development programmes, and informing government policy across many sectors.

Graph 13: Vulnerability to hunger and lack of access to complex food in South Africa



Source: Authors, calculated from Statistics South Africa, General Household Surveys, downloaded from https://www.statssa.gov.za.

[24] Statistics South Africa. 2022. How COVID-19 changed the way we learn. Pretoria: Statistics South Africa. Available at: http://www.statssa.gov.za.

Environmental sustainability

The third key component of a green economy consists of environmental sustainability, from climate change mitigation, to biodiversity preservation and healthy ecosystems. In the GEB, environmental sustainability is measured through an assessment of South Africa's natural capital stocks (the total available capacity South Africa has in its natural system), and whether national use remains within limits that allows such stocks to be sustainable over time (i.e. replenished). Three indicators have been chosen: ecological footprint, GHG emissions and water security.

Ecological footprint and biological capacity

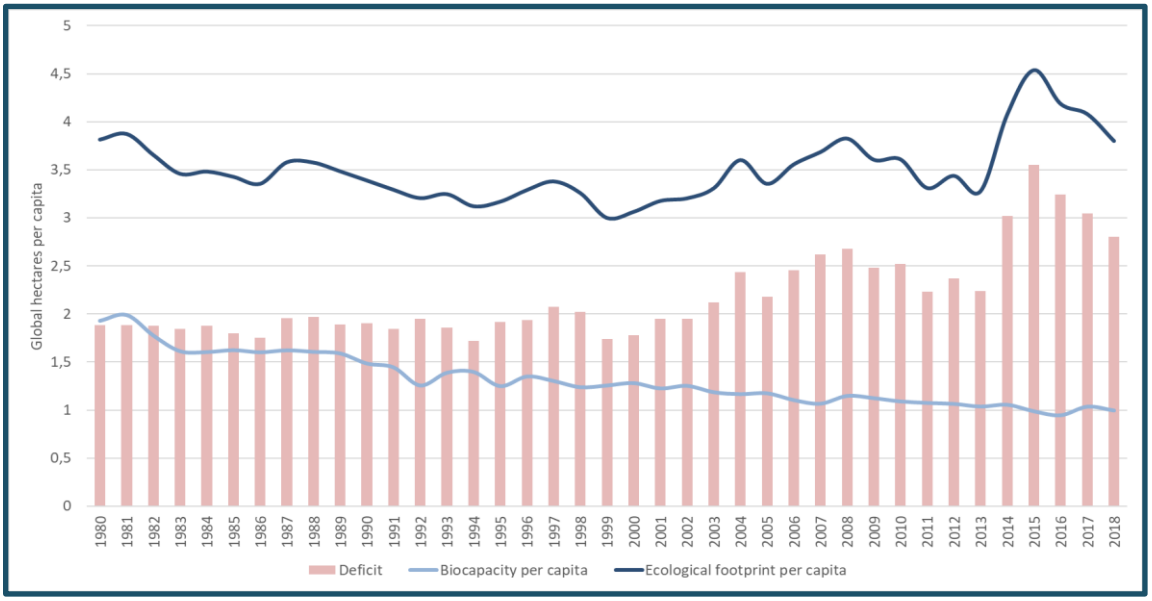
Human consumption exceeds the renewable capacity of the Earth. To better understand this, including at a per capita and country level, the concepts of ecological footprint (EF) and biological capacity (BC) have been developed. An EF measures the area of biologically-productive land and water required to support a given population at its current level of consumption. The BC measures the total amount available of natural stock in a country. The deficit or surplus is the difference between the two. The measurement unit is Global Hectares (GHAs).

Per capita, South Africa's EF consistently overshot the country's BC since 1964. South Africa's EF per capita has increased since the 2000s, reaching a peak in 2015, at 4,5 GHAs. It declined over the 2016-2018 period to 3,8 GHAs per capita. Rising sharply until 2015, South Africa's total EF went down over the 2016-2018. That is, per capita and in total, South Africa has become slightly less resource intensive. But while the country's biocapacity has been largely stable, it has also declined on a per-capita basis due to a growing population. In 1980, South Africa had a biocapacity of 1,8 GHAs per capita. This declined to 1 GHA per capita in 2018, yielding a deficit per capita of 2,8 GHAs in that year. This can be compared to the global average EF of 2,8 GHAs per person and an average biocapacity of 1,6 GHAs, leading to global deficit of 1,2 GHAs per person in 2018.

Most middle- and high-income countries have higher footprints than low-income countries as their populations consume more. For certain countries, like South Africa, more fossil fuels are used, increasing the EF. Fossil fuels are often the primary contributor to the ecological footprint. Other factors determining the biocapacity of a country include land area (a small space or area means less biocapacity) and population size (large populations increase consumption). In 2017, China had the largest deficit of all countries followed by the United States and then India. Suriname, Guyana and Gabon had the highest biocapacity reserves. Brazil was the tenth best in biocapacity reserve.

South Africa's high EF is due to the carbon intensity of the economy. Close to 80% of the country's footprint is from the carbon produced. Making strides in reducing GHG emissions would decrease the deficit but would not remove it altogether, highlighting the need to reduce the EF in other areas too. This could include the adoption of more sustainable agricultural methods on crop lands, which are the second largest contributor to the EF in South Africa.

Graph 14: South Africa's ecological footprint and biocapacity per capita



Source: Authors, based on data from Global Footprint Network, downloaded from www.data.footprintnetwork.org.

In addition, moving towards a circular economy would promote more sustainable levels of consumption and production in South Africa. The country's socio-economic cycling rate, which refers to the ratio between the sum of recycled and reused materials to domestically processed materials, is very low, at just under 2%. Ecological cycling, which refers to biological nutrients designed to re-enter the biosphere, is also low, at about 5%. In sum, South Africa's economy is very far from circular (outside of a few pockets of domestic recycling loops in metals, paper and glass).

Looking ahead, a combination of interventions across green industrial, agricultural and energy policy (among others) is necessary to lower South Africa's ecological deficit and improve the sustainability of the economy and society.

Climate change mitigation

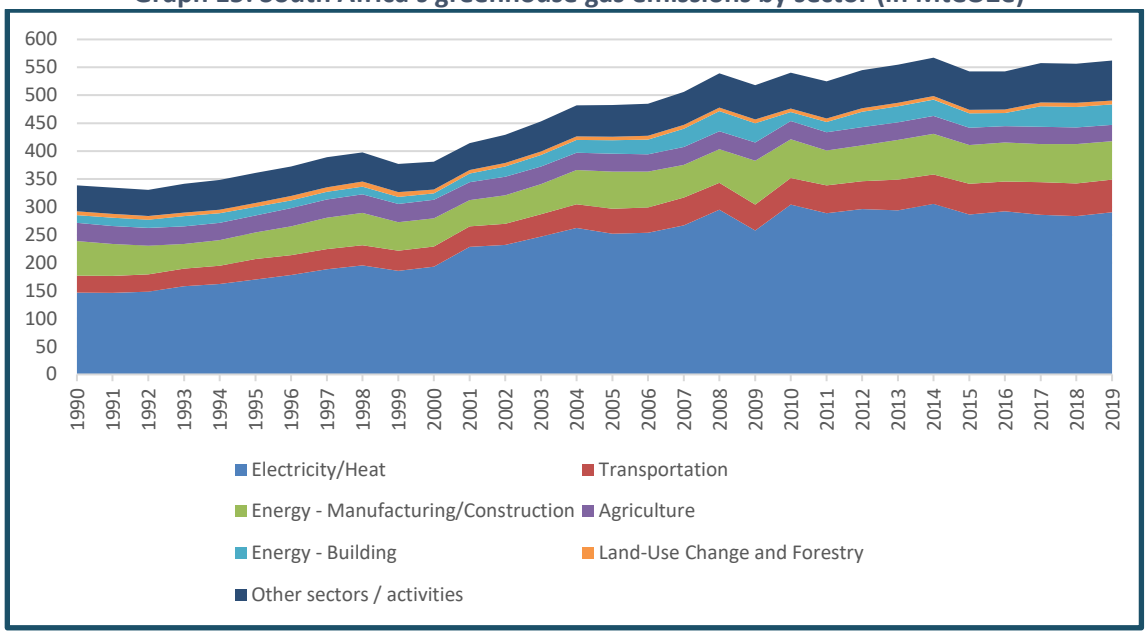
South Africa is ranked the 12th largest emitter of GHGs and the 15th largest in terms of emissions per capita. As a result of an economy underpinned by coal-fired electricity and energy-intensive industries, as well as large inequalities, South Africa's contribution to global GHG emissions is far greater than its economic weight and level of socio-economic development.

South Africa's climate change mitigation target, i.e. its updated Nationally Determined Contribution (NDC) for 2025 is in the range of 398-510 MtCO2e. The 2030 target range from 398 to 440 MtCO2e. The updated NDC reflects increased mitigation commitments but only the lower limit for 2030 is in line with the +1.5°C target and consistent with South Africa's fair share, as calculated by the Climate Equity Reference Project.[25]

South Africa's total GHG emissions increased by 4% between 2010 and 2019, when they reached 562 MtCO2e. Electricity/heat was the main contributor, accounting for 52% of emissions. This was followed by manufacturing and construction (12%), and transport (10%). Overall, the share of energy in South Africa's GHG emissions stood at 85% in 2019.

[25] See memo from the Climate Equity Reference Project here: https://cer.org.za.

Graph 15: South Africa's greenhouse gas emissions by sector (in MtCO2e)



Source: Authors, based on data from the Climate Watch's CAIT Climate Data Explorer, downloaded from https://www.climatewatchdata.org.

South Africa, like the rest of the African continent, is extremely vulnerable to climate change impacts. South Africa is already experiencing hotter average temperatures as a result of global climate change patterns: the annual average temperature in South Africa in 2020 was in the region of 0,5 degree higher than the average from 1981 to 2010. The long-term trend, irrespective of which emissions scenario materialises, should see South Africa become hotter and drier, more so than the global average. Rainfall trends are already highly variable and are predicted to remain that way with droughts and floods likely as a result.[26]

Urgent attention needs to be given to develop climate-compatibility strategies that can decarbonise and climate proof socio-economic activities, including aligning energy and transport policies as well as industrial master plans with GHG emission reduction targets that are in line with a peak of emissions by 2030 and 2050 net-zero carbon emission targets.

Water security

Water, much like electricity, underpins economic development and social progress. In turn, the inability to ensure water security has dramatic consequences on businesses and households. In addition, the lack of access to modern water and sanitation services entrenches poverty and inequality.

Already 98% of South Africa's available water is allocated to users at a high assurance of supply, leaving little room to manoeuvre. Furthermore, water demand is forecast to keep growing, leading to severe gaps in core industrial areas (Gauteng, KwaZulu-Natal, Mpumalanga and Western Cape) and an overall 17% gap by 2030. In South Africa, water security and scarcity are affected by variable rainfall (with regular droughts and floods), water pollution, deteriorating water distribution services and a relatively high water consumption per capita (albeit unequally

[26] See South African Weather Service. 2022. Annual State of the Climate of South Africa 2021. Pretoria: South African Weather Service. Available at: https://www.weathersa.co.za; World Bank. 2021. Climate Risk Country Profile. Washington, D.C. Available at https://climateknowledgeportal.worldbank.org.

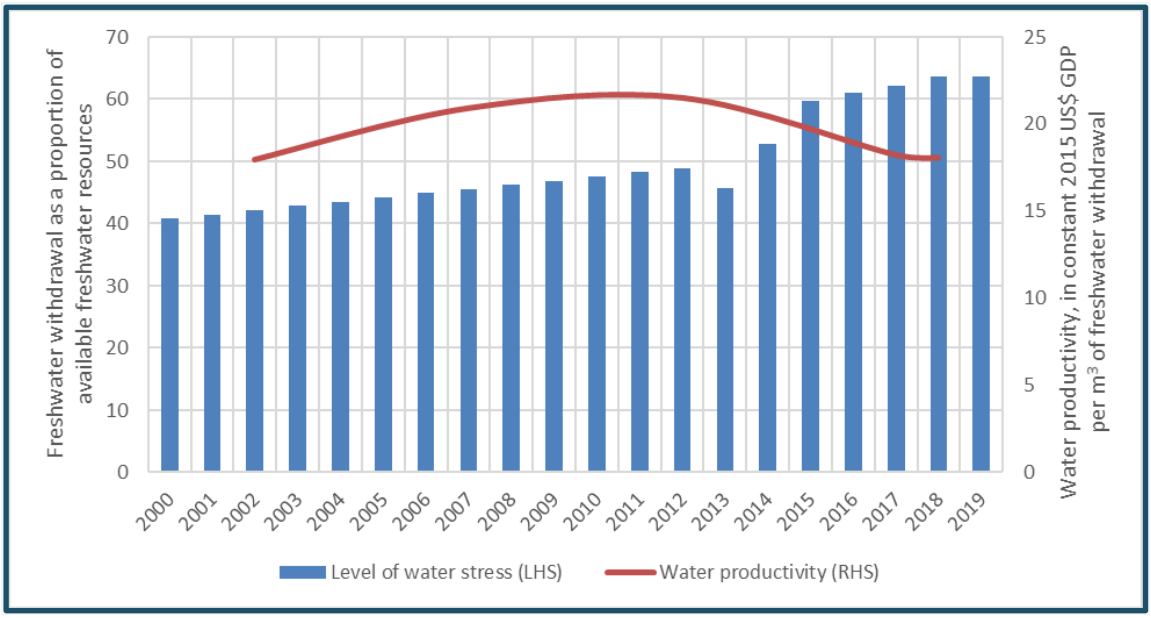
distributed). In addition, climate change will likely increasingly impact on water security, notably through a heightened occurrence of droughts and floods.

Multiple measures exist to assess water security and scarcity. One measure of the level of water stress is the share of freshwater withdrawals as a proportion of available freshwater resources. This is the total volume of groundwater and surface water withdrawn from their sources for human use (in the agricultural, municipal and industrial sectors), expressed as a percentage of the total actual renewable water resources of the country. Another key performance indicator is water productivity or efficiency. This is the measure of GDP generated (in US$ terms) for each cubic metre of water used.

In South Africa, freshwater withdrawals increased steeply between 2013 and 2019, to 63.6%. This is far above the 25% threshold used by the United Nations to indicate the initial stages of physical water stress and places South Africa within the category of "medium water-stressed countries", alongside India, for example. Highly and critically water-stressed countries are typically located in North Africa and the Middle East.

Water efficiency has recently declined in South Africa, after a sustained period of efficiency gains. In 2018, the GDP value of South Africa's water use stood at US$18 per cubic litre (worse than the world average of US$21 per cubic litre, but better than the middle-income average of US$10 per cubic litre for that year). This was down from US$22 of GDP per cubic metre in 2012. Data from 2019 onwards is not yet available but will reveal the extent to which such trends persisted as South Africa has experienced La Niña-induced higher levels of rainfall and flooding since 2020.

Graph 16: Freshwater withdrawals and water productivity in South Africa



Source: Authors, based on data from World Bank, World Development Indicators, downloaded from https://data.worldbank.org.

South Africa already experiences considerable stress in water access and availability as well as water quality. Better management of water resources, investments in water supply and distribution infrastructure, better data and improved integrated planning will be critical for water security in the future. The further development and commercialisation of next-generation water and sanitation technologies (for agriculture, industry as well as residential purposes) that reduce, recycle and reuse water and associated waste products would also support an inclusive green economy.

Conclusion

South Africa has a long way to go to realise its green economy ambitions. On the economic development side, the sustainable mobility and renewable energy industries will likely experience growth (albeit off a low base) in the short term. Further investments in water technologies are needed for water security. At a time when South Africa has the potential to generate significantly more industrialisation in these (and other) green industries, and where domestic and export markets are looking for such green goods and services, it is critical that private and public investment in R&D and innovation improves.

Over time, South Africans have experienced improved access to basic services, education and food (although the COVID-19 period resulted in some deterioration). But, in many instances, the quality of access remains inadequate. Persistently high levels of child stunting, low levels of "reading for meaning", continued inadequate access to dignified sanitation for many households, all demonstrate the remaining challenges. Without a decent quality of life, including improved access to education and employment opportunities, the country's green development path will not be inclusive, and entrenched inequality, including along racial and gender lines, will remain. Furthermore, a just transition requires the effective implementation of plans that assist communities, employees, suppliers and regions most affected by the move away from fossil fuel industries. The extent to which South Africa is able to realise such a just transition will impact on the economic and social development dimensions of this GEB.

South Africa's biocapacity deficit and its electricity generation are tied to coal. A rapid move away from this feedstock will improve the country's performance on environmental indicators – particularly GHG emissions and ecological footprint. Many actions are also required to improve water security in the country and put in place adaptation measures to improve resilience to extreme climate events.

South Africa needs progress on all three dimensions of the GEB to drive the transition to an inclusive green economy. Such an economy must work to the benefit of all who live in the country as well as operate within natural resource thresholds. There is much work to be done to decarbonise, and do so inclusively. The annually updated GEB will track the country's progress (or lack thereof).

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