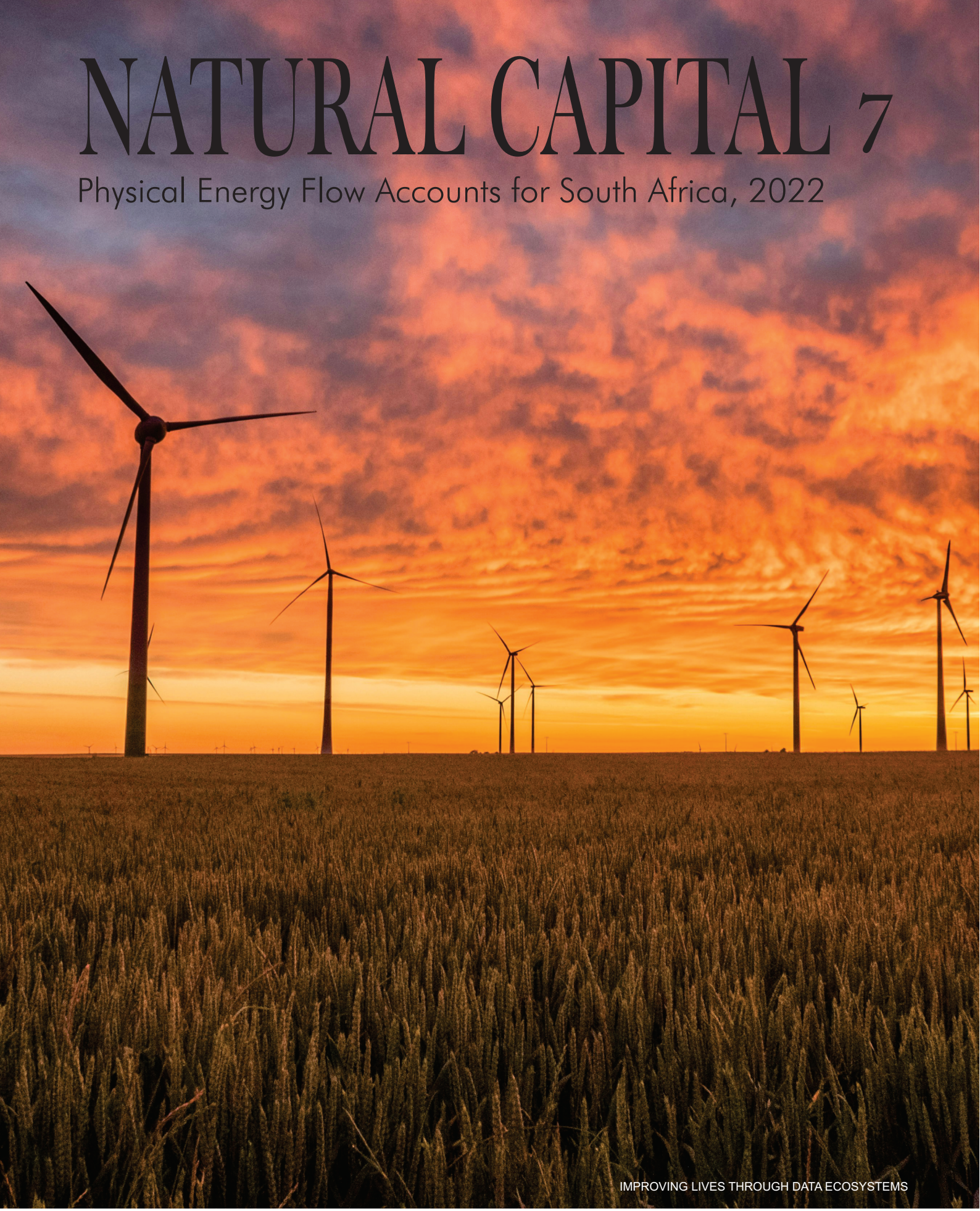
NATURAL CAPITAL 7

Physical Energy Flow Accounts for South Africa, 2022



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NATURAL CAPITAL 7

Physical Energy Flow Accounts for South Africa, 2022

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Joe de Beer
Deputy Director-General: Economic Statistics

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Preface

Natural Capital Accounting (NCA) is a growing field of work globally, in which South Africa is an acknowledged leader. NCA includes accounting for environmental assets such as land, water, minerals and energy, as well as ecosystem assets and ecosystem services, guided by an international standard, the System of Environmental-Economic Accounting (SEEA). This discussion document is part of Statistics South Africa's (Stats SA) *Natural Capital* series and presents the Physical Energy Flow Accounts (PEFA) for South Africa for 2022.

Stats SA is proud to have been involved in the development of the SEEA through, among others, its role in the United Nations Statistical Commission (UNSC), the UN Committee of Experts on Environmental Economic Accounting (UNCEEA) and SEEA-related technical committees. Stats SA, as a custodian and coordinator of national statistics, has embraced working in partnership with other organs of state to produce the statistics needed to make decisions for sustainable national development, including through NCA. Stats SA has partnered with relevant organs of state to develop natural capital accounts, covering environmental resources and ecosystems since the early 2000s.

Stats SA has remained steadfast in applying the SEEA in the development of natural capital accounts for South Africa for over two decades. Using the best available data in South Africa and applying robust, globally endorsed methodologies, NCA can help public and private sector actors to understand more about the interactions between the economy, society and the environment. The information from NCA can be used to monitor and report on progress towards achieving the goals of the National Development Plan (NDP) and the global Sustainable Development Goals (SDGs).

The reliable supply of energy is vital for the growth of South Africa's economy as well as the well-being of its people. Ensuring energy security, now and into the future, requires standardised energy statistics. This document is published as a discussion document in the *Natural Capital* series and extends the time series of the PEFA for South Africa, which was first released in March 2025 for the period 2015 to 2021, to include the reference year 2022. The purpose of a discussion document is to present experimental accounts that are not official statistics, and to invite comments on these accounts. The statistics from the PEFA for South Africa, 2022, add to the richness of evidence available to decision-and policy-makers. It further contributes to the implementation of South Africa's National NCA Strategy, that Stats SA published in June 2021.

Joe de Beer
Deputy Director-General: Economic Statistics
Pretoria

November 2025

Acknowledgement

Statistics South Africa (Stats SA) is acknowledged as the technical lead for the compilation of the Physical Energy Flow Accounts (PEFA) for South Africa for the reference period 2022. This discussion document was written through the collaborative effort of Robert Parry (Stats SA) and Riaan Grobler (Stats SA).

The following institutions are acknowledged for data provided: the Department of Electricity and Energy (DEE) for the South African energy balances data for 2022; and the Stats SA Structural Industry Statistics (SIS) chief directorate for the industry energy use data from the various large sample surveys (LSSs).

Members of the Technical Working Group (TWG) for the compilation of the air emissions accounts (AEA) and energy accounts for South Africa – including representatives from the Department of Forestry, Fisheries and the Environment (DFFE), the DEE, the Department of Planning, Monitoring and Evaluation (DPME), Eskom, National Treasury (NT), the South African Reserve Bank (SARB) and Stats SA are acknowledged for providing valuable feedback and input that influenced additional analysis and contextual information that have been included in this document.

The Statistics Department of the International Monetary Fund (IMF), with support from the Switzerland State Secretariat for Economic Affairs (SECO), through the three-year "Environmental and Climate Change Statistics Capacity Development Program", is acknowledged for the technical support, technical guidance and the training opportunities provided for compilation of the PEFA for South Africa, 2022.

The photograph on the front cover showing the wind turbine in a field was obtained from Unsplash (https://unsplash.com). The photographer is Karsten Würth.

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Abbreviations

AEA	Air Emission Accounts
AEIS	Africa Energy Information System
AFREC	African Energy Commission
ANCA	Advancing Natural Capital Accounting
AU	African Union
BESA	Biodiversity Economy Satellite Accounts
BP	British Petroleum
°C	Degrees Celsius
CO	Carbon Monoxide
CSP	Concentrated Solar Power
CSIR	Council for Scientific and Industrial Research
CWRR	Centre for Water Resources Research
DBSA	Development Bank of Southern Africa
DEE	Department of Electricity and Energy
DGI-3	Data Gaps Initiative 3
DFFE	Department of Forestry, Fisheries and the Environment
DMRE	Department of Mineral Resources and Energy
DPME	Department of Planning, Monitoring and Evaluation
DWS	Department of Water and Sanitation
EDRG	Energy Data Reference Group
EEA	Environmental Economic Accounts
Eurostat	European Statistical Office
FSB	Financial Stability Board
FMCBGs	Finance Ministers and Central Bank Governors
G20	Group of Twenty
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Greenhouse gas
GJ	Gigajoule
H_2	Hydrogen
IAG	Inter-Agency Group on Economic and Financial Statistics
IIP	Indicative Implementation Plan
IRP	Integrated Resource Plan
IMF	International Monetary Fund
IRES	International Recommendations for Energy Statistics
J	Joule
LPG	Liquefied petroleum gases
LSS	Large Sample Survey
NCA	Natural Capital Accounting
NCAVES	NCA and Valuation of Ecosystem Services

NDP	National Development Plan
NEIS	National Energy Information Systems
NERSA	National Energy Regulator of South Africa
NGOs	Non-government organisations
NIST	National Institute of Standards and Technology
NSDS	National Strategy for Development of Statistics
NSO	National Statistical Office
NT	National Treasury
PEFA	Physical Energy Flow Accounts
PetroSA	The Petroleum Oil and Gas Corporation of South Africa
PJ	Petajoule
PV	Photovoltaic
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
SANBI	South African National Biodiversity Institute
SANEDI	South African National Energy Development Institute
SAPREF	South African Petroleum Refineries
SARB	South African Reserve Bank
SAWS	South African Weather Service
SBP	Special Boiling Point
SDGs	Sustainable Development Goals
SECO	Switzerland State Secretariat for Economic Affairs
SEEA	System of Environmental-Economic Accounting
SEEA CF	System of Environmental-Economic Accounting Central Framework
SEEA EA	System of Environmental-Economic Accounting Ecosystem Accounting
SEEA-Energy	System of Environmental-Economic Accounting Energy
SIEC	Standard International Energy Product Classification
SI	International System of Units
SNA	System of National Accounts
Stats SA	Statistics South Africa
SUTs	Supply and Use Tables
SWSAs	Strategic Water Source Areas
TJ	Terajoule
TWG	Technical Working Group
UN	United Nations
UNEP	United Nations Environment Programme
UNDP	United Nations Development Programme
UNSD	United Nations Statistics Division
UNSC	United Nations Statistical Commission
UNSIAP	United Nations Statistical Institute for Asia and the Pacific
WRC	Water Research Commission
WWF	World Wildlife Federation

Chapter 1: Introduction

This discussion document presents South Africa's Physical Energy Flow Accounts (PEFA) for 2022, and it further contributes to the implementation of South Africa's National Natural Capital Accounting (NCA) Strategy, which was published by Statistics South Africa (Stats SA) in June 2021. It expands the time series of the PEFA for South Africa from 2015 to 2022[1].

1.1 What is Natural Capital Accounting?

NCA refers to the use of an accounting framework to provide a systematic way to measure and report on stocks and flows of natural capital, analogous to accounts for other forms of capital. It is a broad term that includes accounting for individual environmental assets or resources, both biotic and abiotic (such as water, minerals, energy, timber and fish), as well as accounting for ecosystem assets and ecosystem services. NCA provides a common framework for measuring and tracking the contribution of ecosystems and natural resources to social and economic goals over time, such as water security, food security and job creation, and provides a wealth of information that can improve planning and decision-making related to the management of natural resources.

Using an accounting framework provides well-accepted and globally consistent information on the nature of humanity's connection to the environment, and how this is changing over time. Regular production of natural capital accounts can therefore provide standardised statistical information (comparable between countries, or between administrative units within a country, and over time) for tracking and reporting on progress towards sustainable development, including goals and targets set out in policies, frameworks and plans at international, continental, national, provincial or local levels. NCA can provide information to inform economic policy and decision-making for sustainable development.

To this end, the System of Environmental-Economic Accounting (SEEA) has been developed by the United Nations (UN) to organise and present statistics on the environment and its relationship with the economy. It is a statistical system that brings together economic and environmental information into a common framework. SEEA contains an internationally agreed set of standard concepts, definitions, classifications, accounting rules and tables to produce internationally comparable statistics and indicators for policy-making, analysis and research. SEEA Central Framework (CF)[2] describes methods to account for changes in land cover, pollution and waste, as well as to account for stocks and use of natural resources (water, minerals, energy, timber, fish, soil) (UN, 2014). To complement this, the SEEA Ecosystem Accounting (EA)[3] describes methods to account for ecosystems and their services, using a spatial approach (UN, 2021). SEEA also provides specific guidance related to energy accounting, with which the accounts presented in this document are aligned.

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[1] *Natural Capital Series 6: Physical Energy Flow Accounts for South Africa, 2015 to 2021*. Discussion document D0401.6 which was published in March 2025 (Stats SA, 2025b) (https://www.statssa.gov.za/?page_id=1854&PPN=D0401.6).

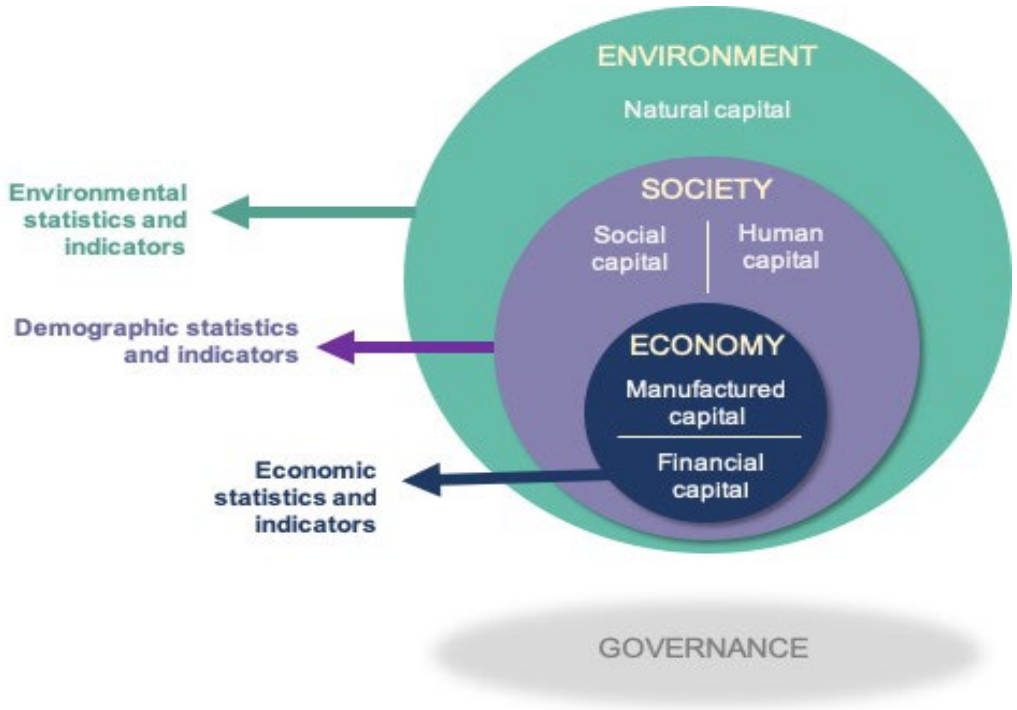
[2] SEEA Central Framework is available at https://seea.un.org/content/seea-central-framework.

[3] SEEA Ecosystem Accounting is available at https://seea.un.org/ecosystem-accounting.

The SEEA-Energy is a subsystem of the SEEA CF and is entirely consistent with the SEEA CF (UN, 2019). SEEA-Energy (UN, 2019) is a multi-purpose conceptual framework for organising energy-related statistics. It supports analysis of the role of energy within the economy, the state of energy inputs and various energy-related transactions of environmental interest. The aim of SEEA-Energy is to serve as a bridge between the statistical and energy communities (UN, 2019). The compilation of the PEFA for South Africa, which are presented in this document, is fully aligned to the SEEA-Energy.

NCA provides a wealth of information that can improve planning and decision-making related to the management of natural resources and sustainable development. NCA aims to better capture in statistics the relationship between the environment, society and the economy, which are presented as a set of nested dependencies in Figure 1. This illustrates that our society and the economy we create are wholly dependent on the environment – the planet we live on and rely on for food, clean water, fresh air, fertile soil and other natural resources.

Figure 1 – The relationship between the environment, society and the economy in a sustainable future



Source: South African National Biodiversity Institute, Natural Capital Accounting & Valuation of Ecosystem Services Project 2018.

South Africa has been actively engaged in the implementation of the SEEA, following the SEEA CF and, more recently, making pioneering strides in adopting the SEEA EA. Stats SA has been producing natural capital accounts in line with the SEEA for many years, generating accounts for water, energy, fisheries and minerals since 2000 (available from the Stats SA website: www.statssa.gov.za). As the national statistical office (NSO), Stats SA is a vital enabler of NCA with a mandate to promote official statistics in policy development, policy monitoring, evaluation and decision-making.

Stats SA plays a crucial role in elevating official statistics across state organs and civil society, providing a framework for the National Strategy for Development of Statistics (NSDS). Additionally, Stats SA coordinates South Africa's reporting on Sustainable Development Goals (SDGs) and maintains a small unit that produces environmental-economic accounts.

Since 2014, several donor-funded projects have supported South Africa piloting experimental ecosystem accounts and contributing to the finalisation and subsequent implementation of the SEEA-Energy. Stats SA has partnered with the South African National Biodiversity Institute (SANBI) to compile ecosystem accounts, in collaboration with the Department of Forestry, Fisheries and the Environment (DFFE), the Department of Water and Sanitation (DWS) and other national and provincial stakeholders. These projects included implementing a country pilot project on ecosystem accounts as part of a global initiative called Advancing Natural Capital Accounting (ANCA)[4] (2014–2015), and the NCA and Valuation of Ecosystem Services (NCAVES) Project[5] that began in 2017 and was completed in 2021. In 2018, SANBI began the implementation of another project – the Ecological Infrastructure for Water Security (EI4WS) Project[6] – that includes an outcome on developing natural capital accounts to enable policy, planning and decision-making in favour of ecological infrastructure. The Water Research Commission (WRC) has also funded research projects related to water accounts, including a project on National Water Accounts (in partnership with Stats SA) and two projects on the development of a methodology for compiling catchment-level water resource accounts (in partnership with the Centre for Water Resources Research (CWRR) at the University of KwaZulu-Natal). More recently, from 2023 the Statistics Department of the International Monetary Fund (IMF), with support from the Switzerland State Secretariat for Economic Affairs (SECO), launched the "Environmental and Climate Change Statistics Capacity Development Program" which assisted selected countries, including South Africa, to design and implement programmes for developing timely and internationally comparable statistics to assist in formulating policies to address the environmental, financial, economic, and social implications of climate change.

In 2021, supported through the NCAVES Project, Stats SA became one of the first countries to release a *National NCA Strategy: A ten-year strategy for advancing NCA in South Africa* (Stats SA, 2021). Historically, South Africa's natural capital accounts had been produced on an ad hoc basis, linked to donor-funded projects.

[4] In the ANCA Project, South Africa was one of seven pilot countries. The project was led by the UNSD in partnership with UN Environment and the Convention on Biodiversity, with funding from the Government of Norway. In this project, Stats SA and SANBI worked in partnership with the CSIR, Ezemvelo KZN Wildlife, DWS and DEA (now DFFE).

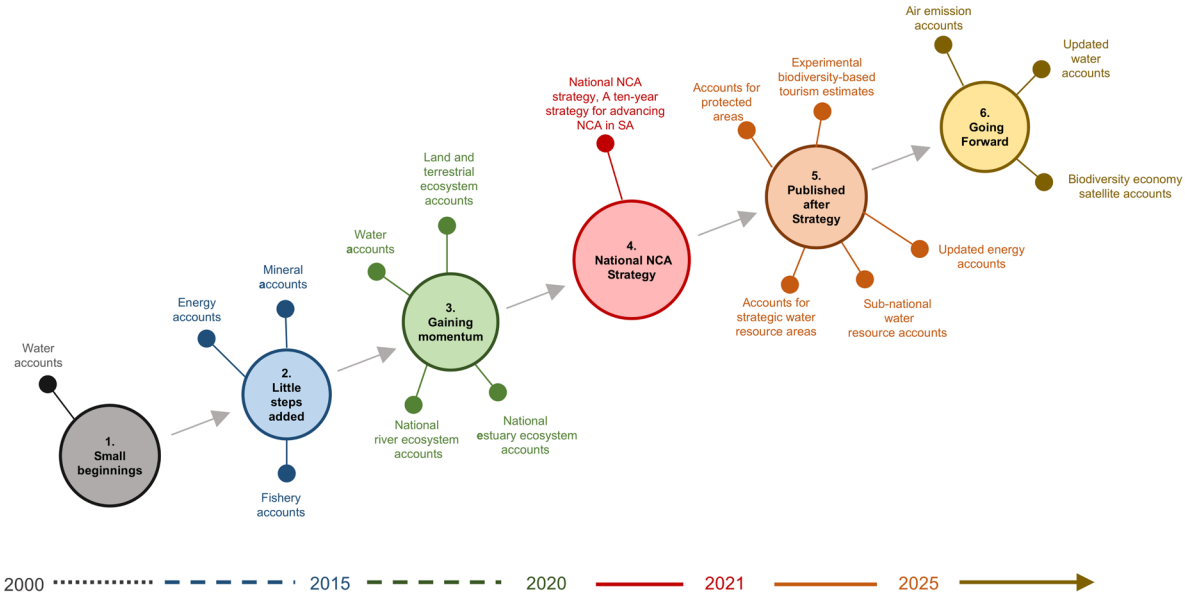
[5] The NCAVES Project is a global project in which South Africa is one of five participating partner countries (Brazil, China, India, Mexico and South Africa). It was funded by the EU and led globally by the United Nations Statistics Division (UNSD) and United Nations Environment Programme (UNEP). The following institutions are represented on the Project Reference Group: The Delegation of the European Union (EU) to South Africa, UNSD, UN Environment, and the Department of Forestry, Fisheries and the Environment (DFFE).

[6] The EI4WS Project is a seven-year project (2018–2025) and is funded by the Global Environment Facility (GEF), implemented by the Development Bank of Southern Africa (DBSA), and executed by SANBI in partnership with others, including DWS, World Wildlife Federation (WWF) and Stats SA. The accounts developed in the EI4WS Project include the Accounts for Strategic Water Source Areas (SWSAs), 1990 to 2020 (Stats SA, 2023), Sub-national Water Resource Accounts, 2015 to 2021 (Stats SA, 2024), and experimental ecosystem accounts of water-related ecological infrastructure assets.

Recognising the need for an integrated and more holistic approach, the National NCA Strategy aims to strengthen the statistical and institutional mechanisms, systems and production processes and focus efforts of Stats SA and other institutions on consistently and regularly producing priority natural capital accounts, aligning with South Africa's development objectives. The National NCA Strategy fosters coordination, standardised statistics, relevant indicators, and collaboration among institutions over a ten-year period with a five-year review, emphasising national-level accounts.

In line with the National NCA Strategy, Stats SA is working in partnership with other entities to further the development of priority national natural capital accounts. Accounts under development using largely existing capacity include the development of South Africa's first experimental Biodiversity Economy Satellite Accounts (BESA), first Air Emission Accounts (AEA), update of the Water Accounts, as well as the PEFA for South Africa, 2022 (which are presented in this discussion document). Figure 2, provides a high-level overview of the natural capital accounts produced in South Africa from 2000 to present.

Figure 2 – A snapshot of Natural Capital Accounts in South Africa since 2000



Source: Statistics South Africa and the South African National Biodiversity Institute, 2025.

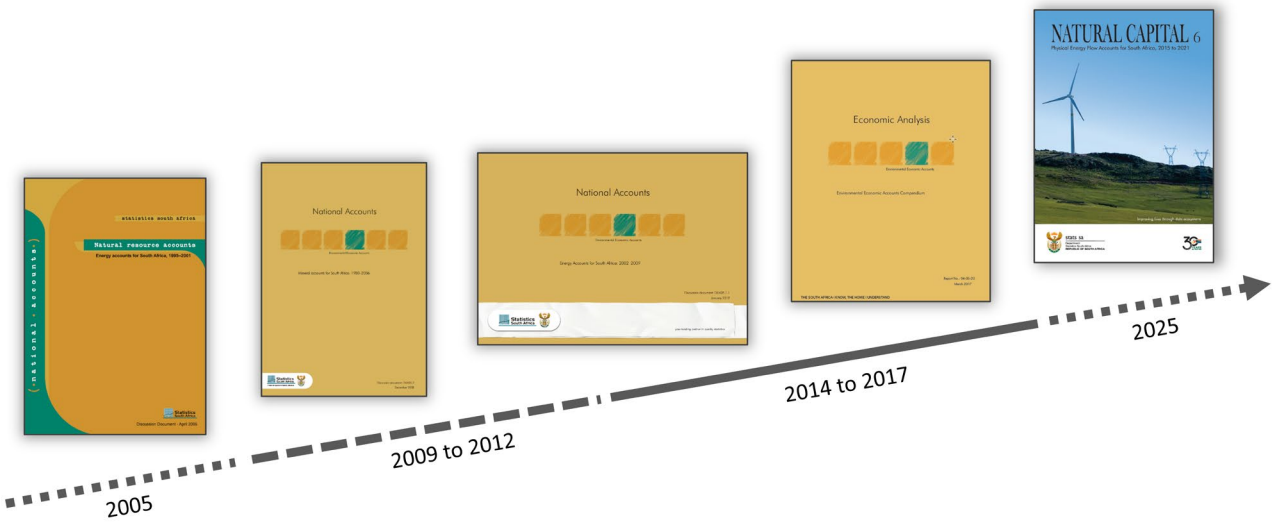
1.2 Why Physical Energy Flow Accounts?

Stats SA has a long history with the development and publication of energy accounts. The first discussion document, *Energy Accounts for South Africa, 1995–2001* (Stats SA, 2005) was published by Stats SA in 2005 with further energy accounts published in 2009 and in 2012[7].

[7] Energy Accounts for South Africa: 2002–2009. Discussion document D0405.1.1. https://www.statssa.gov.za/?page_id=1854&PPN=D04051.1

From 2014 to 2017, the energy accounts were included as a chapter in the Environmental Economic Accounts (EEA) compendium,[8] which also included mineral and fisheries accounts, and indicators for said accounts. The *Physical Energy Flow Accounts for South Africa, 2015 to 2021 (*Discussion Document D0401.6) was published in March 2025[9] as part of the Stats SA *Natural Capital Series* (refer to Figure 3).

Figure 3 – Learning curve of energy accounts at Statistics South Africa



Source: Statistics South Africa.

The Indicative Implementation Plan (IIP) of the National NCA Strategy is structured per goal and strategic objective, and includes a table specifying per output the indicative activities towards arriving at those outputs and information important to implementation (Stats SA, 2021):

- **Funding scenario**: The NCA strategy has been developed so that it can be implemented under two different funding scenarios:
  - **Low-road activities**: can be undertaken with existing human and financial resources.
  - **High-road activities**: are only possible with additional resources.
- **Key role players**: include both lead and support role players.
- **Timeframes**: in the case of low-road activities these may be known, in the case of high-road activities these might be estimated or unknown.
- **Resources**: refer to human or financial resources. There may be existing resources that are known, or resources required may be estimated, i.e. can provide an estimation of the budget required.

Goal 3 '*An integrated suite of natural capital accounts is produced based on best-available methods*' has a high-road activity for the indicative implementation output *3.1.2 'Accounts related to energy'*, specifically for output *3.1.2.1 'Regularly produce national energy supply and use tables*' (refer to Table 1).

[8] Environmental Economic Accounts Compendium. Report No. 04-05-20. https://www.statssa.gov.za/?page_id=1854&PPN=Report-04-05-20.

[9] *Natural Capital Series 6: Physical Energy Flow Accounts for South Africa, 2015 to 2021*. Discussion document D0401.6 which was published in March 2025 (Stats SA, 2025b) (https://www.statssa.gov.za/?page_id=1854&PPN=D0401.6).

Table 1 – National Natural Capital Accounting Strategy – Output 3.1.2: Accounts related to energy

Output	High-level indicative activities		Funding scenario	Key role players	Timeframe	Resources
3.1.2. Accounts related to energy	3.1.2.1	Regularly produce national energy supply and use tables	High road	Stats SA, DEE, Eskom, South African National Energy Development Institute (SANEDI), relevant Non-government organisations (NGOs)		
	3.1.2.2	Explore production of energy supply and use tables at finer spatial resolutions, e.g. district municipality level	High road	Stats SA, DEE, local and district municipalities		

Source: Statistics South Africa, National Natural Capital Accounting Strategy, A ten-year strategy for advancing Natural Capital Accounting in South Africa. Report No. 04-01-00, 2021.

In October 2022, the Group of Twenty (G20) Finance Ministers and Central Bank Governors (FMCBGs) welcomed the work plan on the G20 IMF Data Gaps Initiative 3 (DGI-3) and asked the IMF, the Financial Stability Board (FSB) and the Inter-Agency Group on Economic and Financial Statistics (IAG) to begin work on filling the 14 identified data gaps that impede the ability to develop economic and financial policy to address climate change, financial innovation, and inclusive growth.

The main objective of the G20 IMF DGI-3 is to address the critical data gaps that exist in the face of the climate crisis, increasing economic polarisation, and large-scale digital transformation. Its 14 recommendations are clustered around four statistical areas: (i) climate change; (ii) household distributional information; (iii) fintech and financial inclusion; and (iv) access to private sources of data and administrative data, and data sharing.

Under the G20 IMF DGI-3 statistical theme of climate change, there are seven recommendations:

- Recommendation III.1: Greenhouse Gas Emission Accounts and National Carbon Footprints.
- **Recommendation III.2: Energy Accounts.**
- Recommendation III.3: Carbon Footprint of Foreign Direct Investment.
- Recommendation III.4: Climate Finance (Green Debt and Equity Security Financing).
- Recommendation III.5: Forward Looking Physical and Transition Risk Indicators.
- Recommendation III.6: Government Climate Impacting Subsidies.
- Recommendation III.7: Climate Change Mitigation and Adaptation Current and Capital Expenditures.

The G20 IMF DGI-3 Recommendation 2 focuses on the compilation of energy accounts. With energy accounts as a recommendation of the G20 IMF DGI-3, it was decided that Stats SA would start the process of developing the PEFA for South Africa, towards the eventual publication of the results as a discussion document in the Stats SA Natural Capital series. This would include the supplementary PEFA Excel workbook for the web, even though in the National NCA Strategy IIP, the compilation of national energy supply and use tables (SUTs) is a high-road activity and dependent on Stats SA first receiving additional human and financial resources.

Meanwhile, the Statistics Department of the IMF with support from SECO launched the "Environmental and Climate Change Statistics Capacity Development Program" in 2023. As a first step, a consultation mission by the Statistics Department of the IMF, with support from SECO, was conducted in South Africa. This took place from 17 to 21 July 2023, in Pretoria and was hosted by Stats SA. The IMF mission team consulted with various stakeholders in the country (e.g. Stats SA, National Treasury (NT), DFFE, Department of Planning, Monitoring and Evaluation (DPME) and the South African Reserve Bank (SARB), involving other relevant organisations like the United Nations Development Programme (UNDP) and technical agencies) and conducted detailed discussions for agreeing on and finalising an assessment report that will help in deciding the scope of the programme, in consultation with Stats SA, Department of Electricity and Energy (DEE) and DFFE.

The assessment helped develop a workplan for the activities under the programme. This included training and technical assistance in line with the country's priorities expressed by the national agencies. South Africa is a G20 member country, hence it was recommended that the programme could be utilised to support Stats SA in achieving some of the recommendation targets for the DGI-3, including energy accounts in respect to Recommendation 2.

A joint IMF and United Nations Statistical Institute for Asia and the Pacific (UNSIAP) Course on the Compilation of Energy and Air Emission Accounts was held in Chiba, Japan, from 5 to 15 February 2024. The course covered various aspects related to the accounts, including:

- Concepts, classifications and methods used for the compilation of energy accounts and AEA.
- Type of indicators that can be developed using these accounts to inform policies aimed to mitigate and/or adapt to climate change.
- Development of user-oriented dissemination formats for energy accounts and AEA and the resulting indicators.

Following this joint IMF-UNSIAP training, a technical assistance mission was conducted by the Statistics Department of the IMF, with support from SECO, to support the G20 countries in the compilation of PEFA and AEA, and to develop a work plan for the activities needed to ensure the achievement of the G20 DGI-3 Recommendations 1 and 2. The technical assistance mission by the Statistics Department of the IMF, supported by SECO, for South Africa took place from 10 to 14 June 2024, in Pretoria and was hosted by Stats SA. The objective of the mission was to support Stats SA and other relevant official agencies in the compilation of PEFA and AEA.

The IMF SECO mission team mainly worked with the team of officials from Stats SA, the DFFE and DEE who are directly involved in the compilation of energy accounts and AEA. The mission team also consulted with a broader group of delegates, including the DPME, Eskom, NT, SARB, Sasol, the South African Weather Service (SAWS) and various other divisions within Stats SA to get necessary data sets required for the compilation of the PEFA and AEA and conducted detailed discussions for agreeing on a work plan.

A virtual technical assistance mission was conducted by the Statistics Department of the IMF, with support from SECO, with Stats SA from 13 to 17 February 2025. The mission provided support to Stats SA in finalising the PEFA for South Africa, 2015 to 2021, following the framework outlined by the SEEA-Energy.

The fourth, and final, technical assistance mission for South Africa was conducted by the Statistics Department of the IMF, with support from SECO, and hosted by Stats SA from 6 to 10 October 2025. The objective of the mission was to review and assess the work already done on the compilation of the PEFA for South Africa, 2022, following the framework outlined by the SEEA-Energy, and the development of the first AEA for South Africa. The IMF mission team mainly worked with the team of officers in Stats SA, DFFE and DEE who are directly involved in the compilation of the PEFA and AEA for South Africa.

1.3 Scope of the South African Physical Energy Flow Accounts

The PEFA for South Africa, are presented in physical terms, more specifically in Petajoule (PJ). These accounts are compiled according to the SEEA-Energy, making use of the South African energy balances, as compiled and published by the DEE, along with additional data sets. The PEFA time series includes the addition of 2022, which is fully dependent on the availability of energy balance data from the DEE.

The International System of Units (SI), derived from the French "Système International d'Unités," is the modern metric system of measurement established through international agreement. It provides a logical and interconnected framework for all measurements used in science, industry, and commerce. (UN, 2017).

The measurement units of energy used in this document, that are based on this system, are joules (J) and its multiples, the gigajoule (GJ), terajoule (TJ) and the PJ. Table 2 provides a reference for understanding the relationship between the various units of energy measurement, specifically focusing on the J and its multiples.[10]

- **J:** Is the base unit of energy in the SI, defined as the energy transferred when one newton of force is applied over a distance of one meter (NIST, 2019).
- **GJ:** Equal to 10^9 J suitable for medium to large scale energy discussions, such as for a single large building, an entire home, a specific industrial process, or for comparing national energy consumption per capita.

  Key: 10^9 = 1 000 000 000 (one billion).
- **TJ:** Equal to 10^{12} J suitable for large-scale energy discussions, such as city-wide energy consumption. Key: 10^{12} = 1 000 000 000 000 (one trillion).
- **PJ:** Equal to 10^{15} J commonly employed in national energy balances and large energy systems. Key: 10^{15} = 1 000 000 000 000 000 (one quadrillion).

[10] The South African PEFA is presented in PJ, while the South African energy balances compiled by the DEE are published in TJ.

Table 2 – Hierarchy of units of energy measurement

Unit	Symbol	Number of Joules (J)	Conversion formula
Joule	J	1	1 J=1 J
Gigajoule	GJ	10^9 J	1 GJ=10^9 J
Terajoule	TJ	10^{12} J	1 TJ=10^{12} J
Petajoule	PJ	10^{15} J	1 PJ=10^{15} J

Source: National Institute of Standards and Technology, Special Publication 330, The International System of Units, 2019.

The purpose of the PEFA is to enable consistent monitoring of energy supply and use by physical flow type and industry within the territory of reference[11]. The PEFA, based on a statistical accounting framework, records the flows of energy (in PJ) from the environment to the economy (natural inputs), within the economy (products), and from the economy back to the environment (residuals) (Eurostat, 2025). These flows include energy extraction, transformation, distribution, and consumption across different sectors. The PEFA helps in understanding how energy contributes to economic activities and the environmental impacts associated with energy use (UN, 2019).

Energy products that are covered by the PEFA are coal, peat and peat products, oil shale/oil sands, natural gas, oil, biofuels, waste, electricity, heat and nuclear fuels, and other fuels. Chapter 2 of *Natural Capital Series 6: Physical Energy Flow Accounts for South Africa, 2015 to 2021*[12] *(*Discussion document D0401.6) which was published on March 2025, (Stats SA, 2025b) provides a more detailed description of the methodological foundation for the compilation of the PEFA for South Africa, the data sources that are used for the compilation of the PEFA for South Africa, and the differences between PEFA and energy balances.

[11] According to the United Nations Statistics Division (UNSD) (UN, 2019), the territory of reference is defined as the geographic territory administered by a government within which persons, goods, and capital circulate freely.

[12] The energy products listed here are described in more detail in Chapter 2 of the *Natural Capital Series 6: Physical Energy Flow Accounts for South Africa, 2015 to 2021*. Discussion document D0401.6 which was published in March 2025 (Stats SA, 2025b) as well as the Glossary of the document (https://www.statssa.gov.za/?page_id=1854&PPN=D0401.6).

Some of the key indicators that can be calculated from the PEFA are listed in Table 3.

Table 3 – Key indicators that can be drawn from the Physical Energy Flow Accounts

Sector	Subsector	Indicator	Formula/Source
Energy supply indicators			
Energy	Energy supply	Total energy supply (Total energy available to the economy)	Calculated from the PEFA supply tables
Energy	Energy supply	Energy self-sufficiency ratio (The extent to which domestic production meets total energy supply)	Domestic production / Total energy supply
Energy	Energy supply	Renewable share in total energy supply (The share of renewable energy in the total energy supply)	Renewable energy / Total energy supply
Energy	Energy supply	Energy dependency ratio (The share of imports in total domestic energy consumption)	Energy imports / Total domestic energy consumption (transformation and end-use of energy)
Energy use indicators			
Energy	Energy use	Final energy consumption (The total energy used by end-users (industries, households))	Calculated from the PEFA use tables
Energy	Energy use	Share of energy use by industry (The distribution of energy use across industries)	Industry energy use / Total energy use
Energy	Energy use	Energy intensity by industry (The amount of energy used per unit of economic output)	Energy use (TJ) / Gross value added (R million) (GVA)
Energy	Energy use	Household energy use per capita (Measure of household energy consumption per person)	Household energy use / Population
Energy efficiency indicators			
Energy	Energy efficiency	Energy productivity (The economic output generated per unit of energy used)	GDP / Total energy use
Energy	Energy efficiency	Energy intensity of production (The energy use per unit of output (inverse of energy productivity))	Total energy use / GDP
Energy	Energy efficiency	Transformation efficiency (The efficiency of converting primary to secondary energy)	Secondary energy output / Primary energy input

Source: Statistics South Africa.

1.4 Methodological foundation and data sources for Physical Energy Flow Accounts

For a more detailed discussion on the methodological foundation and data sources for the PEFA, please refer to Chapter 2 of the *Natural Capital Series 6: Physical Energy Flow Accounts for South Africa, 2015 to 2021*, Discussion document D0401.6[13], which was published on March 2025 (Stats SA, 2025b).

1.5 Overview of energy supply and use in South Africa for 2022

As outlined in the Integrated Resource Plan (IRP), South Africa remains committed to developing a diversified energy portfolio that ensures a secure energy supply while aligning with its air emissions reduction objectives (DMRE, 2025).

[13] *Natural Capital Series 6: Physical Energy Flow Accounts for South Africa, 2015 to 2021*. Discussion document D0401.6 which was published in March 2025 (Stats SA, 2025b) (https://www.statssa.gov.za/?page_id=1854&PPN=D0401.6).

The IRP is a dynamic framework intended to be periodically updated[14] in response to evolving conditions and emerging developments with the main objective to ensure a reliable electricity supply by aligning generation capacity with demand, while also considering environmental considerations and the overall cost of supply (DMRE, 2024b).

The Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) is a public initiative in South Africa designed to attract private sector investment in renewable energy generation. Its primary objective is to augment the national electricity grid by facilitating the development of projects utilising technologies such as onshore wind, photovoltaic (solar PV), concentrated solar power (CSP), biomass, landfill gas, and small-scale hydroelectric power. The REIPPPP forms a key component of the energy mix outlined in the IRP. In 2022, electricity generation under the REIPPPP was led by onshore wind, which accounted for 55,0% of total output, followed by solar PV at 34,0%. CSP contributed 10,0%, while small-scale hydropower made up the remaining 1,0% (DMRE, 2025).

1.5.1 Energy Supply in South Africa

South Africa's energy supply mix, as in 2022 (DMRE, 2025), was still predominantly made up of coal (consisting of 84,0% of the country's total primary energy supply (electricity) through Eskom's coal-fired power plants), followed by crude oil (6,0% of the total primary energy supply in 2022) and nuclear and natural gas (both contributing 3,0% of the total primary energy supply in 2022). Renewables and electricity each only contributed 2,0% to the total primary energy supply in 2022.

Electricity generation (supply) in South Africa for 2022, again faced major disruptions due to load shedding. According to the Council for Scientific and Industrial Research (CSIR), the year 2022 overtook 2021 as a more intensive load shedding year and for the first time, Stage 4 load shedding occurred more frequently than Stage 2, making it the dominant load shedding stage in 2022 (CSIR, 2023). Eskom operates a diverse portfolio of power stations, including coal-fired, gas-fired, hydroelectric, pumped storage, and a single nuclear facility. In 2022, domestic electricity generation accounted for approximately 91,0% of the total supply, while imports of electricity contributed 3,0% and exports of electricity represented 6,0% of the overall electricity supply (DMRE, 2025).

Coal was still South Africa's primary energy source in 2022, supplying around 84,0% of the country's electricity through Eskom's coal-fired power plants (DMRE, 2025). South Africa exported approximately 25,0% of its domestically mined coal while the imports of coal only constituted 1,0% of energy imports for South Africa in 2022. Domestic coal production contributed 74,0% to the total primary coal supply (DMRE, 2025).

South Africa remained heavily reliant on imports to meet nearly all of its crude oil requirements for 2022. The supply constraints were hampered by three crude oil refineries in South Africa that were non-operational during 2022.

[14] The first IRP was published in 2010, with following updates in 2016, 2018, 2019 and the most recent in 2024.

The Petroleum Oil and Gas Corporation of South Africa's (PetroSA) Mossel Bay refinery ceased operations back in December 2020, due to a lack of feedstock while the Engen Petroleum refinery experienced a major fire on 4 December 2020, that caused extensive damage (DMRE, 2024a). Both PetroSA and Engen Petroleum refineries had still not resumed operations as of 2022. In February 2022, British Petroleum (BP) Southern Africa and Shell Downstream Africa[15] announced that they would pause refinery operations at South African Petroleum Refineries (SAPREF) for an indefinite period and by no later than end March 2022, and this was due to the commencement of a spend freeze. In 2022, South Africa continued to import almost 100,0% of its crude oil requirements, with most of the oil imported from Nigeria (47,0%), closely followed by Saudi Arabia (36,0%), Angola (11,0%), Congo and Ghana (at 2,0% respectively) and Côte d'Ivoire (1,0%). Minor contributions from various other producers, categorised by DEE under 'Others,' accounted for approximately 1,0% of crude oil imports (DMRE, 2025).

Natural gas contributed a very small portion to South Africa's energy mix in 2022. Natural gas made up 3,0% of the total primary energy supply in South Africa in 2022. Of this, about 99,0% was imported by Sasol Gas via an 865 km pipeline from Mozambique's Temane and Pande gas fields and supplies industrial and commercial customers, with the remaining 1,0% was produced locally (DMRE, 2025).

1.5.2 Energy Use in South Africa

For South Africa's energy use mix by sectors in the economy (DMRE, 2025), the top four energy consumers were the 'industrial' sector (consuming 36,0% of the total energy supply available during 2022), the 'commerce and public services' sector (consuming 29,0% of the total energy supply available during 2022) and the 'transport' sector and 'residential' sector (each consuming 14,0% of the total energy supply available during 2022).

South Africa's 'industrial' sector again had the highest energy use amongst all sectors for 2022. Energy use in the 'industrial' sector for 2022 was dominated by the 'mining and quarrying' sub-sector (22,0% of sector energy use in 2022) and the 'iron and steel' sub-sector (19,0% of sector energy use in 2022). According to the DMRE, coal (54,0% of energy products consumed) and electricity (30,0% of energy products consumed) were the most consumed sources of energy products in the 'industrial' sector for 2022. Total energy consumption in the 'mining and quarrying' sub-sector in 2022, consisted mainly of the energy products coal (47,0% of the energy products consumed), followed by electricity (37,0% of the energy products consumed) and oil products (16,0% of the energy products consumed) (DMRE, 2025).

South Africa's 'transport' sector still relied mostly on liquid fuels, like gasoline and diesel in 2022. Oil products constituted 98,0% of the energy consumed in this sector, while electricity accounted for the remaining 2,0% in 2022 (DMRE, 2025).

[15] Press Release, 2022. SAPREF to pause refinery operations. https://www.bp.com/content/dam/bp/country-sites/en_za/south-africa/home/2022/press-release/Press%20statement_SAPREF_operational_pause.pdf.

In South Africa, the 'residential' sector's energy consumption still consists predominantly of biofuels in 2022. The 'residential' sector's energy consumption consisted predominantly of the energy products biofuels and waste (70,0% of the sector's energy consumption), followed by electricity (25,0% of the sector's energy consumption) and coal (5,0% of the sector's energy consumption) in 2022. The 'residential' sector constituted 14,0% of total energy consumption (demand) in the country for 2022 (DMRE, 2025).

1.6 Structure of the discussion document

The discussion document is structured in three chapters as follows:

- Chapter 1: Introduction presents NCA, and the progress of NCA in South Africa, followed by the rationale behind compiling the PEFA for South Africa. It also provides a brief overview of both energy supply and use in South Africa for 2022.
- Chapter 2: Key findings presents the results of the PEFA for South Africa from 2015 to 2022[16] (Stats SA, 2025b). A supplementary PEFA Excel workbook, containing Excel sheets that can be downloaded from the Stats SA website (https://www.statssa.gov.za), accompanies the discussion document.
- Chapter 3: The future development of the PEFA for South Africa makes recommendations for future work on the PEFA for South Africa.

[16] *Natural Capital Series 6: Physical Energy Flow Accounts for South Africa, 2015 to 2021*. Discussion document D0401.6 which was published in March 2025 (Stats SA, 2025b) (https://www.statssa.gov.za/?page_id=1854&PPN=D0401.6).

Chapter 2: Key Findings

This chapter presents the PEFA SUT for South Africa for 2022, as well as some of the high-level results from the PEFA SUTs for South Africa from 2015 to 2022[17]. The analysis of the PEFA for South Africa provides an overview of the energy supply and use in the country from 2015 to 2022. A good understanding of the supply and use of energy is necessary for the improved management of energy natural resource inputs as well as for future planning (UN, 2019). The supplementary PEFA Excel workbook for the web contains detailed PEFA SUTs from 2015 to 2022 and is available on the Stats SA website (https://www.statssa.gov.za).

2.1 Physical Energy Flow Accounts for South Africa

Table 4 and Table 5 present the PEFA SUT for South Africa for 2022. The 'statistical difference' in the DEE energy balances refers to the difference between the energy supply and energy use of an energy commodity. This difference arises because the figures on supply and use come from different sources. An in-depth review of each of the energy commodities by the DEE into the future could help in determining the extent of the difference that should be attributed to either supply or use. Pending this review by the DEE, for the present set of PEFAs in this discussion document, the statistical difference in the DEE energy balances has been assigned to 'accumulation'.

[17] Please note that the results of the PEFA time series from 2015 to 2021 is based on the DEE Energy Balances for 2015 to 2021 as at February 2025 and was already released in *Natural Capital Series 6: Physical Energy Flow Accounts for South Africa, 2015 to 2021*. Discussion document D0401.6 which was published in March 2025 (Stats SA, 2025b). Due to continuous improvements in the energy statistics and information in South Africa, including the DEE Energy Balances, during 2025, the revisions in the DEE Energy Balances from 2015 will be reflected in future updates of the PEFA for South Africa.

Table 4 – Physical energy supply table, 2022 (Petajoule)

PHYSICAL ENERGY SUPPLY TABLE (unit: PJ)	Production (incl. household own account) and generation of residuals								Accumulation	Flows from the rest of the World (Imports)	Flows from the environment	TOTAL
	Industries (by SIC)							Households				
	Agriculture, forestry and fisheries	Mining and quarrying	Manufacturing	Electricity, gas, steam and air conditioning supply	Transportation and storage	Other industries	**Total Industry**					
SIC	*1*	*2*	*3*	*4*	*7*	*Other*		*HH*	*Acc*	*RoW*	*Env*	
1 Energy from natural inputs:												
Natural resource inputs											6 424,1	**6 424,1**
Inputs of energy from renewable sources											94,4	**94,4**
Other natural inputs											0,0	**0,0**
2 Energy products:												
Production of energy products by SIEC class:												
Coal	0,0	5 454,8	54,5	17,1	0,0	0,0	**5 526,4**			35,7		**5 562,1**
Peat and peat products	0,0	0,0	0,0	0,0	0,0	0,0	**0,0**			0,0		**0,0**
Oil shale/oil sands	0,0	0,0	0,0	0,0	0,0	0,0	**0,0**			0,0		**0,0**
Natural gas	0,0	0,7	0,0	0,0	0,0	0,0	**0,7**			126,8		**127,5**
Oil and oil products	0,0	0,0	427,5	0,0	0,0	0,0	**427,5**			1 055,9		**1 483,4**
Biofuels	652,3	0,0	0,0	0,0	0,0	0,0	**652,3**			0,0		**652,3**
Waste	0,0	0,0	0,0	0,0	0,0	0,0	**0,0**			0,0		**0,0**
Electricity	0,0	0,0	0,0	895,7	0,0	0,0	**895,7**			27,0		**922,6**
Heat	0,0	0,0	0,0	0,0	0,0	0,0	**0,0**			0,0		**0,0**
Nuclear fuels and other fuels	0,0	147,7	0,0	0,0	0,0	0,0	**147,7**			0,0		**147,7**
3 Energy residuals:												
Energy residuals from end-use	72,2	246,4	1 593,1	22,1	468,6	262,9	**2 664,4**	727,8				**3 392,2**
Energy residuals from losses	0,0	0,0	155,3	1 760,8	0,0	0,0	**1 916,1**	0,0				**1 916,1**
4 Other residual flows:												
Residuals from end-use for non-energy purposes	0,0	0,0	7,8	0,0	7,4	4,2	**19,4**	0,0				**19,4**
Energy from solid waste									168,8			**168,8**
5 TOTAL SUPPLY	**724,5**	**5 849,5**	**2 238,1**	**2 695,7**	**476,0**	**267,1**	**12 250,0**	**727,8**	**168,8**	**1 245,4**	**6 518,6**	**20 910,6**

Source: Statistics South Africa.

Physical Energy Flow Accounts for South Africa, 2022, Discussion Document D0401.7 (November 2025)

Table 5 – Physical energy use table, 2022 (Petajoule)

PHYSICAL ENERGY USE TABLE (unit: PJ)	Intermediate consumption, use of energy resources, receipt of energy losses							Final Consumption	Accumulation	Flows to the rest of the World (Exports)	Flows to the environment	TOTAL
	Industries (by SIC)							Households				
	Agriculture, forestry and fisheries	Mining and quarrying	Manufacturing	Electricity, gas, steam and air conditioning supply	Transportation and storage	Other industries	**Total Industry**					
SIC	*1*	*2*	*3*	*4*	*7*	*Other*		*HH*	*Acc*	*RoW*	*Env*	
1 Energy from natural inputs:												
Natural resource inputs	652,3	5 603,1	168,8	0,0	0,0	0,0	**6 424,1**					**6 424,1**
Inputs of energy from renewable sources	0,0	0,0	15,9	78,6	0,0	0,0	**94,4**					**94,4**
Other natural inputs	0,0	0,0	0,0	0,0	0,0	0,0	**0,0**					**0,0**
2 Energy products:												
Transformation of energy products by SIEC class:												
Coal	0,0	0,0	94,5	2 370,2	0,0	0,0	**2 464,7**					**2 464,7**
Peat and peat products	0,0	0,0	0,0	0,0	0,0	0,0	**0,0**					**0,0**
Oil shale / oil sands	0,0	0,0	0,0	0,0	0,0	0,0	**0,0**					**0,0**
Natural gas	0,0	0,0	45,7	0,0	0,0	0,0	**45,7**					**45,7**
Oil and oil products	0,0	0,0	259,6	13,3	0,0	0,0	**272,9**					**272,9**
Biofuels	0,0	0,0	221,5	4,3	0,0	0,0	**225,8**					**225,8**
Waste	0,0	0,0	0,0	0,0	0,0	0,0	**0,0**					**0,0**
Electricity	0,0	0,0	0,0	64,0	0,0	0,0	**64,0**					**64,0**
Heat	0,0	0,0	0,0	0,0	0,0	0,0	**0,0**					**0,0**
Nuclear fuels and other fuels	0,0	0,0	0,0	115,6	0,0	0,0	**115,6**					**115,6**

Source: Statistics South Africa.

Table 5 – Physical energy use table, 2022 (Petajoule) (concluded)

PHYSICAL ENERGY USE TABLE (unit: PJ)		Intermediate consumption, use of energy resources, receipt of energy losses							Final Consumption	Accumulation	Flows to the rest of the World (Exports)	Flows to the environment	TOTAL
		Industries (by SIC)							Households				
		Agriculture, forestry and fisheries	Mining and quarrying	Manufacturing	Electricity, gas, steam and air conditioning supply	Transportation and storage	Other industries	Total Industry					
	SIC	*1*	*2*	*3*	*4*	*7*	*Other*		*HH*	*Acc*	*RoW*	*Env*	
	End-use of energy products by SIEC class:												
	Coal	0,3	124,5	712,6	0,8	0,0	25,7	**863,9**	26,2	356,6	1 850,7		**3 097,4**
	Peat and peat products	0,0	0,0	0,0	0,0	0,0	0,0	**0,0**	0,0	0,0	0,0		**0,0**
	Oil shale/oil sands	0,0	0,0	0,0	0,0	0,0	0,0	**0,0**	0,0	0,0	0,0		**0,0**
	Natural gas	0,0	0,0	63,1	16,2	0,0	2,7	**81,0**	0,2	0,0	0,5		**81,8**
	Oil and oil products	50,3	22,2	26,0	0,0	458,3	84,5	**641,3**	220,2	165,4	145,1		**1 172,0**
	Biofuels	0,0	0,0	84,2	0,0	0,0	0,0	**84,2**	338,3	4,0	0,0		**426,5**
	Waste	0,0	0,0	0,0	0,0	0,0	0,0	**0,0**	0,0	0,0	0,0		**0,0**
	Electricity	21,6	99,7	366,6	32,8	7,3	137,1	**665,1**	143,0	0,0	50,5		**858,7**
	Heat	0,0	0,0	0,0	0,0	0,0	0,0	**0,0**	0,0	0,0	0,0		**0,0**
	Nuclear fuels and other fuels	0,0	0,0	0,0	0,0	0,0	0,0	**0,0**	0,0	32,1	0,0		**32,1**
	End-use of energy products for non-energy purposes	0,0	0,0	10,8	0,0	10,4	17,2	**38,4**	0,0	0,0	0,0	0,0	**38,4**
3	**Energy residuals:**												
	Energy residuals from end-use											3 392,2	**3 392,2**
	Energy residuals from losses											1 916,1	**1 916,1**
4	**Other residual flows:**												
	Residuals from end-use for non-energy purposes									19,4			**19,4**
	Energy from solid waste	0,0	0,0	168,8	0,0	0,0	0,0	**168,8**					**168,8**
5	**TOTAL USE**	**724,5**	**5 849,5**	**2 238,1**	**2 695,7**	**476,0**	**267,1**	**12 250,0**	**727,8**	**577,6**	**2 046,9**	**5 308,3**	**20 910,6**

Source: Statistics South Africa.

Individual figures may not add up to stated totals due to rounding.

2.2 The supply of energy in South Africa[18]

This section highlights some of the main findings from the PEFA supply tables for 2022.

Table 6 and Table 7 show the supply of energy from natural inputs in South Africa from 2015 to 2022. The supplier of these flows (natural inputs) is the environment, and natural inputs comprise the flow of energy that results from its removal and capture from the environment by resident economic units. Energy is extracted from the environment either to be used by the economic unit that undertakes the extraction (own use extraction) or to be supplied to other economic units for further processing or direct use (UN, 2019).

Table 6 – Energy from natural inputs, 2015–2022 (Petajoule)

Type of input	2015	2016	2017	2018	2019	2020	2021	2022
	PJ							
Natural resource inputs	7 111,7	7 011,0	7 064,9	7 072,6	7 092,4	6 880,7	6 545,1	6 424,1
Inputs of energy from renewable sources	58,9	36,9	44,3	46,3	46,7	62,4	91,6	94,4
Total: Energy from natural inputs	**7 170,7**	**7 047,9**	**7 109,2**	**7 118,8**	**7 139,0**	**6 943,1**	**6 636,6**	**6 518,6**

Source: Statistics South Africa.

Individual figures may not add up to stated totals due to rounding.

Table 7 – Energy from natural inputs, 2015–2022 (percentage)

Type of input	2015	2016	2017	2018	2019	2020	2021	2022
	%							
Natural resource inputs	99,2	99,5	99,4	99,4	99,3	99,1	98,6	98,6
Inputs of energy from renewable sources	0,8	0,5	0,6	0,7	0,7	0,9	1,4	1,4
Total: Energy from natural inputs	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**

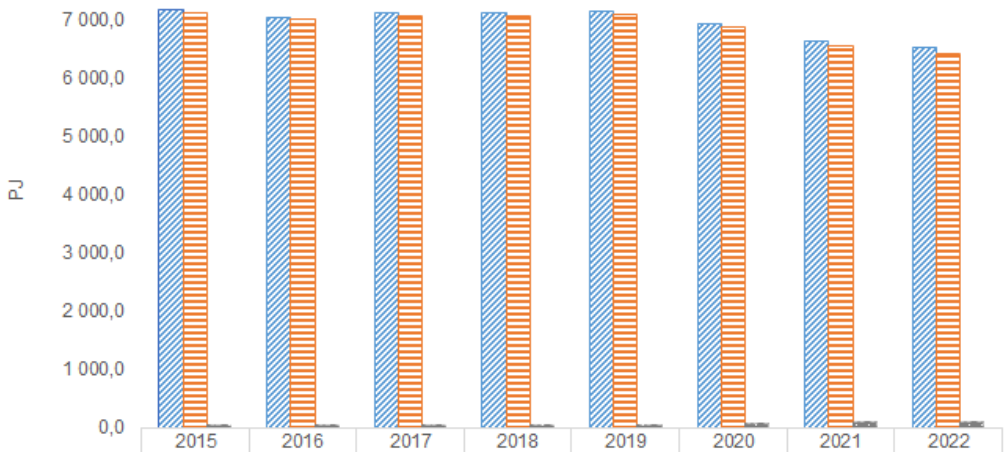
Source: Statistics South Africa.

Individual figures may not add up to stated totals due to rounding.

'Natural resource inputs' for the supply of energy in South Africa decreased by 1,8% from 6 545,1 PJ in 2021 to 6 424,1 PJ in 2022, and 'inputs of energy from renewable sources' increased by 3,1% from 91,6 PJ in 2021 to 94,4 PJ in 2022. Figure 4 and Figure 5 show that the majority of South Africa's energy from natural inputs between 2015 and 2022 was from 'natural resource inputs', slightly decreasing between 2015 (99,2% of all natural inputs) and 2022 (98,6% of all natural inputs).

[18] Please note that the results of the PEFA time series from 2015 to 2021 is based on the DEE Energy Balances for 2015 to 2021 as at February 2025 and was already released in Natural Capital Series 6: Physical Energy Flow Accounts for South Africa, 2015 to 2021. Discussion document D0401.6 which was published in March 2025 (Stats SA, 2025b). Due to continuous improvements in the energy statistics and information in South Africa, including the DEE Energy Balances, during 2025, the revisions in the DEE Energy Balances from 2015 will be reflected in future updates of the PEFA for South Africa.

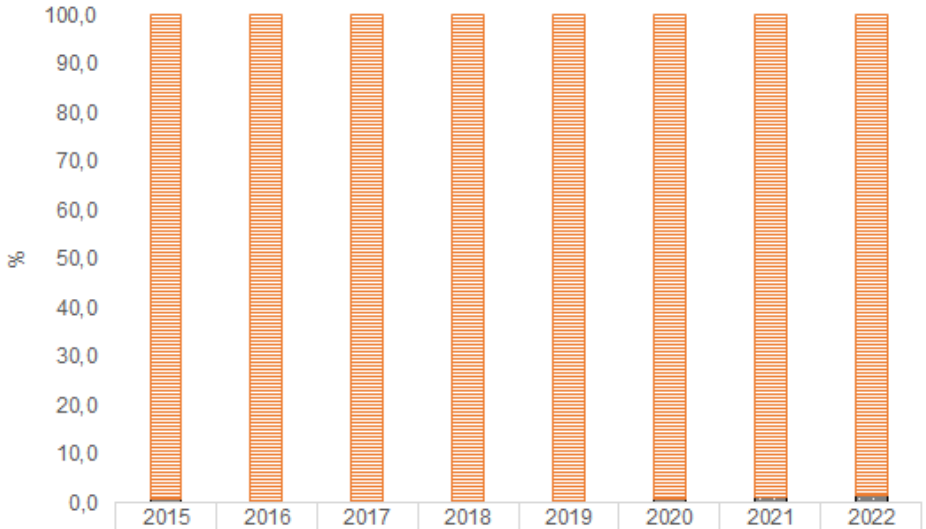
Figure 4 – Energy from natural inputs, 2015–2022 (Petajoule)



	2015	2016	2017	2018	2019	2020	2021	2022
Total energy from natural inputs	7 170,7	7 047,9	7 109,2	7 118,8	7 139,0	6 943,1	6 636,6	6 518,6
Natural resource inputs	7 111,7	7 011,0	7 064,9	7 072,6	7 092,4	6 880,7	6 545,1	6 424,1
Inputs of energy from renewable sources	58,9	36,9	44,3	46,3	46,7	62,4	91,6	94,4

Source: Statistics South Africa.

Figure 5 – Energy from natural inputs, 2015–2022 (percentage)



	2015	2016	2017	2018	2019	2020	2021	2022
Natural resource inputs	99,2	99,5	99,4	99,4	99,3	99,1	98,6	98,6
Inputs of energy from renewable sources	0,8	0,5	0,6	0,7	0,7	0,9	1,4	1,4

Source: Statistics South Africa.

Table 8 and Table 9 show the domestic supply of energy products in South Africa from 2015 to 2022. These are the energy products that were produced by various industries within the South African economy for this period and which are then used by businesses for intermediate consumption (either for direct use or as an input into a transformation process directed towards producing other energy on non-energy products), or by households as part of final consumption or which can be exported to the rest of the world (UN, 2019).

Table 8 – Domestic supply of energy products, 2015–2022 (Petajoule)

Energy product	2015	2016	2017	2018	2019	2020	2021	2022
	PJ							
Coal	6 023,2	6 021,9	6 028,1	6 077,4	6 073,6	5 928,6	5 620,0	5 526,4
Natural gas	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7
Oil and oil products	1 126,1	858,9	886,7	1 032,2	865,2	603,1	477,5	427,5
Biofuels	651,3	651,1	654,7	653,4	652,3	652,1	652,3	652,3
Electricity	918,1	940,7	955,9	861,7	860,4	913,8	888,5	895,7
Nuclear fuels and other fuels	163,5	221,8	219,5	198,1	198,1	169,5	177,6	147,7
Total: Domestic supply of energy products	**8 882,9**	**8 695,2**	**8 745,6**	**8 823,5**	**8 650,2**	**8 267,8**	**7 816,5**	**7 650,1**

Source: Statistics South Africa.
Individual figures may not add up to stated totals due to rounding.

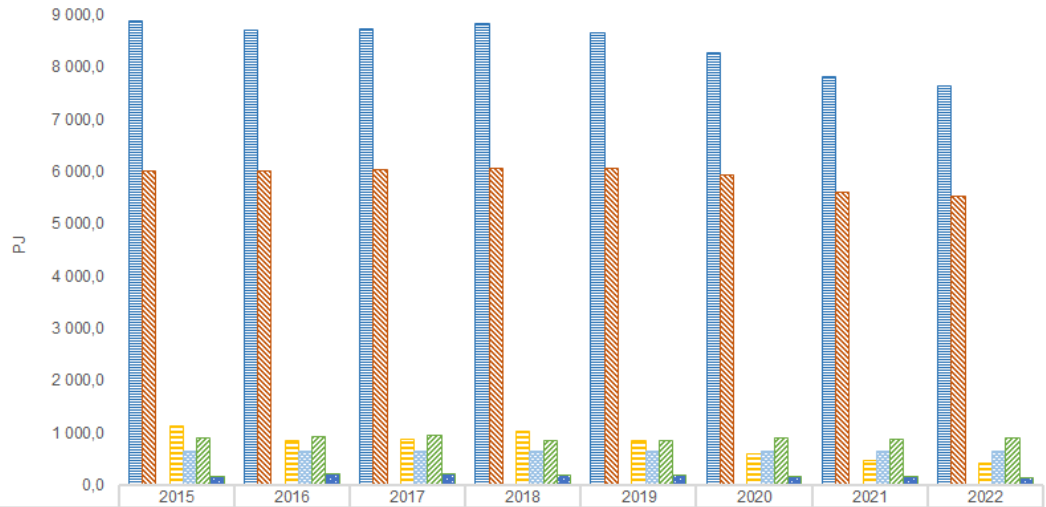
Table 9 – Domestic supply of energy products, 2015–2022 (percentage)

Energy product	2015	2016	2017	2018	2019	2020	2021	2022
	%							
Coal	67,8	69,3	68,9	68,9	70,2	71,7	71,9	72,2
Natural gas	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Oil and oil products	12,7	9,9	10,1	11,7	10,0	7,3	6,1	5,6
Biofuels	7,3	7,5	7,5	7,4	7,5	7,9	8,3	8,5
Electricity	10,3	10,8	10,9	9,8	9,9	11,1	11,4	11,7
Nuclear fuels and other fuels	1,8	2,6	2,5	2,2	2,3	2,1	2,3	1,9
Total: Domestic supply of energy products	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**

Source: Statistics South Africa.
Individual figures may not add up to stated totals due to rounding.

Figure 6 and Figure 7 show that the energy product ‘coal’ was still the largest domestically produced energy product for South Africa in 2022, even though domestic production decreased by 1,7% between 2021 (5 620,0 PJ) and 2022 (5 526,4 PJ). ‘Coal’ contributed 72,2% of the total domestic supply of energy products in South Africa in 2022. ‘Electricity’ was the second largest energy product domestically supplied in South Africa in 2022, increasing by 0,8% between 2021 (888,5 PJ) and 2022 (895,7 PJ). ‘Oil and oil products’ showed a declining trend between 2018 and 2022, decreasing by 58,5% between 2018 (1 032,2PJ) and 2022 (427,5 PJ), due to supply constraints from domestic crude oil refineries.

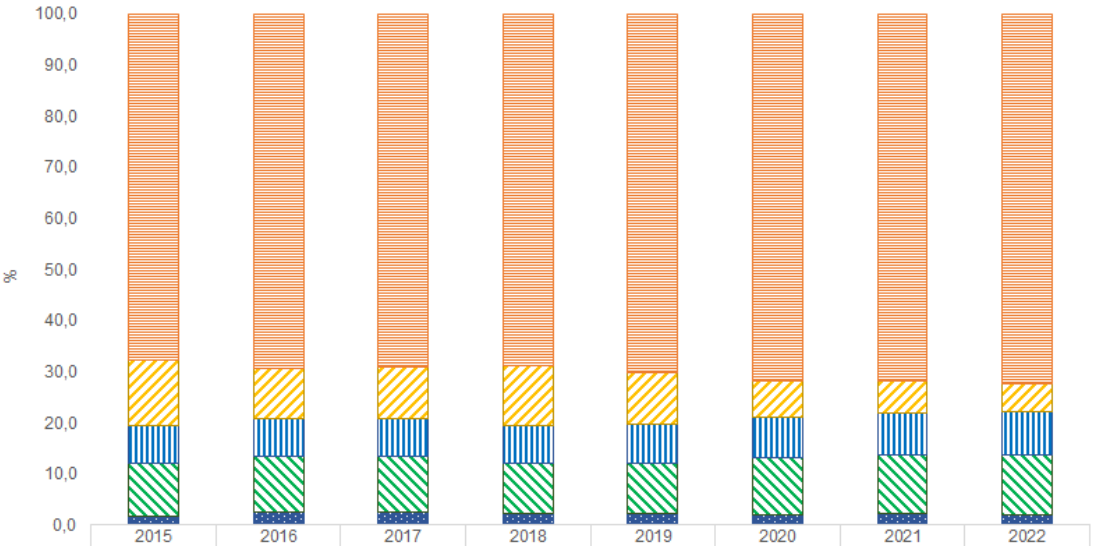
Figure 6 – Domestic supply of energy products, 2015–2022 (Petajoule)



	2015	2016	2017	2018	2019	2020	2021	2022
Total domestic supply of energy products	8 882,9	8 695,2	8 745,6	8 823,5	8 650,2	8 267,8	7 816,5	7 650,1
Coal	6 023,2	6 021,9	6 028,1	6 077,4	6 073,6	5 928,6	5 620,0	5 526,4
Natural gas	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7
Oil and oil products	1 126,1	858,9	886,7	1 032,2	865,2	603,1	477,5	427,5
Biofuels	651,3	651,1	654,7	653,4	652,3	652,1	652,3	652,3
Electricity	918,1	940,7	955,9	861,7	860,4	913,8	888,5	895,7
Nuclear fuels and other fuels	163,5	221,8	219,5	198,1	198,1	169,5	177,6	147,7

Source: Statistics South Africa.

Figure 7 – Domestic supply of energy products, 2015–2022 (percentage)



	2015	2016	2017	2018	2019	2020	2021	2022
Coal	67,8	69,3	68,9	68,9	70,2	71,7	71,9	72,2
Natural gas	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Oil and oil products	12,7	9,9	10,1	11,7	10,0	7,3	6,1	5,6
Biofuels	7,3	7,5	7,5	7,4	7,5	7,9	8,3	8,5
Electricity	10,3	10,8	10,9	9,8	9,9	11,1	11,4	11,7
Nuclear fuels and other fuels	1,8	2,6	2,5	2,2	2,3	2,1	2,3	1,9

Source: Statistics South Africa.

Table 10 and Table 11 show the imports of energy products in South Africa from 2015 to 2022.

Table 10 – Imports of energy products, 2015–2022 (Petajoule)

Energy product	2015	2016	2017	2018	2019	2020	2021	2022
	PJ							
Coal	23,9	17,8	33,1	35,8	35,8	40,3	57,9	35,7
Natural gas	117,1	131,1	111,7	142,7	117,4	136,4	144,2	126,8
Oil and oil products	976,8	1 063,8	1 098,5	1 291,1	1 293,3	1 270,5	901,4	1 055,9
Electricity	47,0	38,0	38,0	27,0	27,0	27,0	27,0	27,0
Total: Imports of energy products	**1 164,8**	**1 250,8**	**1 281,3**	**1 496,5**	**1 473,4**	**1 474,2**	**1 130,5**	**1 245,4**

Source: Statistics South Africa.

Individual figures may not add up to stated totals due to rounding.

Table 11 – Imports of energy products, 2015–2022 (percentage)

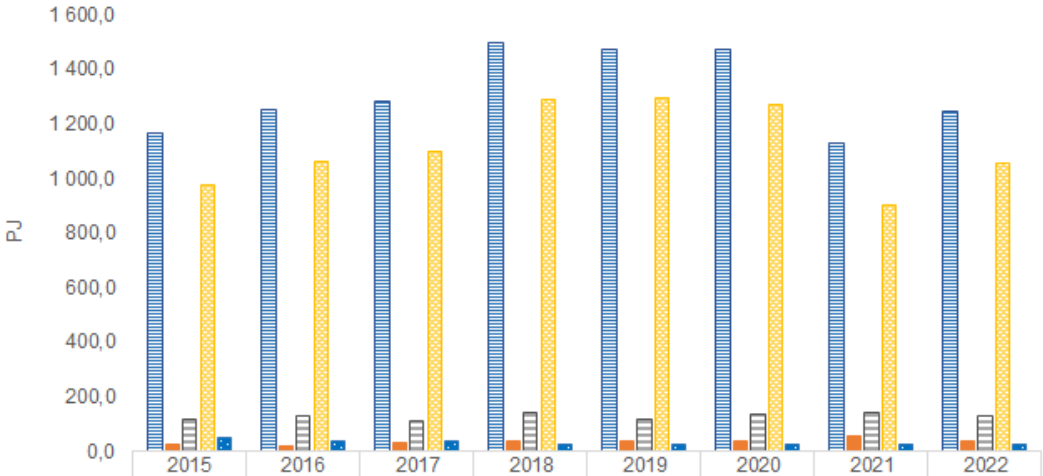
Energy product	2015	2016	2017	2018	2019	2020	2021	2022
	%							
Coal	2,0	1,4	2,6	2,4	2,4	2,7	5,1	2,9
Natural gas	10,1	10,5	8,7	9,5	8,0	9,3	12,8	10,2
Oil and oil products	83,9	85,0	85,7	86,3	87,8	86,2	79,7	84,8
Electricity	4,0	3,0	3,0	1,8	1,8	1,8	2,4	2,2
Total: Imports of energy products	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**

Source: Statistics South Africa.

Individual figures may not add up to stated totals due to rounding.

Figure 8 and Figure 9 show that South Africa mainly imported the energy product ‘oil and oil products’ in 2022, followed ‘natural gas’. South Africa’s imports of ‘oil and oil products’ and ‘natural gas’ are described in more detail in Section 1.5.1 of Chapter 1 in this document. ‘Oil and oil products’ constituted 84,8% of all energy products imported to South Africa in 2022, followed by ‘natural gas’ (10,2%). The imports of ‘oil and oil products’ also increased by 17,1% between 2021 (901,4 PJ) and 2022 (1 055,9 PJ).

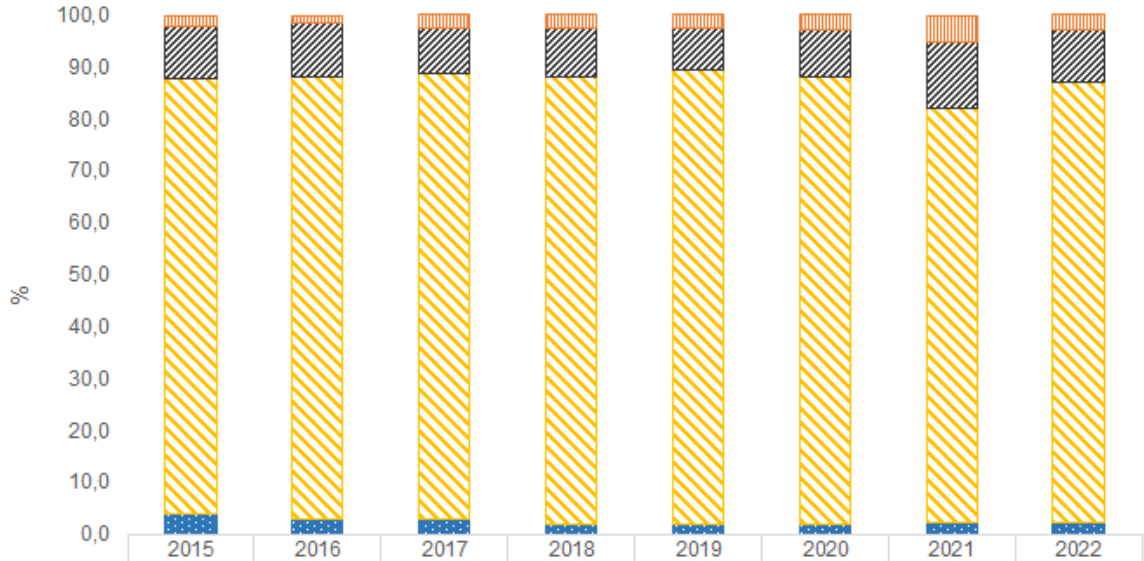
Figure 8 – Imports of energy products, 2015–2022 (Petajoule)



	2015	2016	2017	2018	2019	2020	2021	2022
Total imports of energy products	1 164,8	1 250,8	1 281,3	1 496,5	1 473,4	1 474,2	1 130,5	1 245,4
Coal	23,9	17,8	33,1	35,8	35,8	40,3	57,9	35,7
Natural gas	117,1	131,1	111,7	142,7	117,4	136,4	144,2	126,8
Oil and oil products	976,8	1 063,8	1 098,5	1 291,1	1 293,3	1 270,5	901,4	1 055,9
Electricity	47,0	38,0	38,0	27,0	27,0	27,0	27,0	27,0

Source: Statistics South Africa.

Figure 9 – Imports of energy products, 2015–2022 (percentage)



	2015	2016	2017	2018	2019	2020	2021	2022
Coal	2,0	1,4	2,6	2,4	2,4	2,7	5,1	2,9
Natural gas	10,1	10,5	8,7	9,5	8,0	9,3	12,8	10,2
Oil and oil products	83,9	85,0	85,7	86,3	87,8	86,2	79,7	84,8
Electricity	4,0	3,0	3,0	1,8	1,8	1,8	2,4	2,2

Source: Statistics South Africa.

2.3 The energy dependency ratio for South Africa

A country's energy dependency ratio is the proportion of energy it imports divided by its total domestic energy consumption. Expressed as a percentage, it reflects how much an economy depends on other countries to meet its energy needs. If the energy dependency ratio decreases, then the country is said to be making the transition toward 'energy sovereignty'[19].

A country is considered 'energy dependent' if it imports a substantial portion of its energy resources, such as oil or natural gas, from other nations. The meaning behind addressing energy dependency is deeply rooted in sustainability and resilience. High energy dependency can create numerous challenges[20]:

1. *Economic vulnerability*: Price volatility in global energy markets can significantly impact dependent economies. Sudden spikes in oil or gas prices can lead to inflation, trade deficits, and reduced economic growth. The sense is that energy dependency is a risk factor for economic stability.
2. *Geopolitical risks*: Reliance on energy imports can make nations susceptible to political pressure from supplier countries. Energy can be used as a geopolitical tool, influencing foreign policy decisions and international relations. The designation of energy as a strategic asset highlights its political significance.
3. *Environmental concerns*: For nations dependent on fossil fuels, especially imported ones, reducing dependency is crucial for meeting climate change mitigation goals. Shifting towards renewable energy sources not only decreases import reliance but also reduces greenhouse gas emissions (GHGs). The substance of sustainable energy transitions is intertwined with reducing energy dependency on polluting sources.

Table 12 and Figure 10 show the energy dependency ratio for South Africa from 2015 to 2022, in total, and by the energy products 'coal', 'natural gas', 'oil and oil products' and 'electricity'. The two energy products with the highest energy dependency ratio for South Africa from 2015 to 2022 is 'natural gas' (energy dependency ratio of 99,9% in 2022) and 'oil and oil products' (energy dependency ratio of 93,1% in 2022). Both the energy dependency ratios for the energy products 'natural gas' and 'oil and oil products' have also increased between 2021 and 2022. The energy product with the lowest energy dependency ratio for South Africa from 2015 to 2022 is 'coal' (energy dependency ratio of only 1,1% in 2022), followed by 'electricity' (energy dependency ratio of 3,1% in 2022). South Africa had a total energy dependency ratio in 2022 of 19,9%, which was an increase from the total energy dependency ratio of 18,3% in 2021.

[19] https://www.planete-energies.com/en/media/article/europes-energy-dependency.

[20] https://energy.sustainability-directory.com/term/energy-dependency/.

Table 12 – Energy dependency ratio for South Africa, 2015–2022

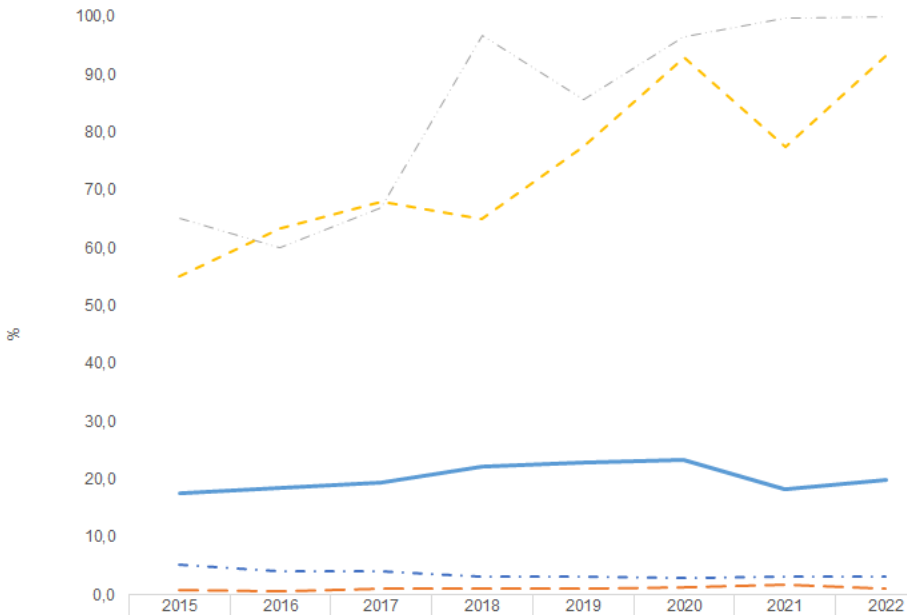
Energy product	2015	2016	2017	2018	2019	2020	2021	2022
Coal								
Imports of coal (PJ)	23,9	17,8	33,1	35,8	35,8	40,3	57,9	35,7
Domestic consumption of coal (PJ)	3 014,8	3 088,8	3 075,1	2 982,9	2 999,2	3 119,6	3 193,4	3 354,8
Energy dependency ratio for coal (%)	***0,8***	***0,6***	***1,1***	***1,2***	***1,2***	***1,3***	***1,8***	**1,1**
Natural gas								
Imports of natural gas (PJ)	117,1	131,1	111,7	142,7	117,4	136,4	144,2	126,8
Domestic consumption of natural gas (PJ)	180,0	218,4	167,0	147,4	137,0	141,3	144,4	126,9
Energy dependency ratio for natural gas (%)	***65,1***	***60,0***	***66,9***	***96,8***	***85,7***	***96,6***	***99,8***	**99,9**
Oil and oil products								
Imports of oil and oil products (PJ)	976,8	1 063,8	1 098,5	1 291,1	1 293,3	1 270,5	901,4	1 055,9
Domestic consumption of oil and oil products (PJ)	1 774,7	1 677,6	1 616,4	1 986,5	1 667,6	1 368,4	1 163,8	1 134,4
Energy dependency ratio for oil and oil products (%)	***55,0***	***63,4***	***68,0***	***65,0***	***77,6***	***92,8***	***77,4***	***93,1***
Electricity								
Imports of electricity (PJ)	47,0	38,0	38,0	27,0	27,0	27,0	27,0	27,0
Domestic consumption of electricity (PJ)	912,6	919,2	934,3	838,2	836,9	890,4	878,7	872,1
Energy dependency ratio for electricity (%)	***5,2***	***4,1***	***4,1***	***3,2***	***3,2***	***3,0***	***3,1***	***3,1***
Total energy products								
Total imports of energy products* (PJ)	1 164,8	1 250,8	1 281,3	1 496,5	1 473,4	1 474,2	1 130,5	1 245,4
Total domestic consumption of energy products** (PJ)	6 658,6	6 728,7	6 616,4	6 761,3	6 447,0	6 303,6	6 171,6	6 252,0
Total energy dependency ratio (%)	**17,5**	**18,6**	**19,4**	**22,1**	**22,9**	**23,4**	**18,3**	**19,9**

Source: Statistics South Africa.

* Please note that the total imports of energy products include the energy products ‘coal’, ‘natural gas’, ‘oil and oil products’ and ‘electricity’.

** Please note that total domestic consumption of energy products includes the domestic consumption of the energy products ‘coal’, ‘natural gas’, ‘oil and oil products’, ‘electricity’, ‘biofuels’ and ‘nuclear fuels and other fuels’.

Figure 10 – Energy dependency ratio for South Africa, 2015–2022 (percentage)



	2015	2016	2017	2018	2019	2020	2021	2022
Total energy dependency ratio (%)	17,5	18,6	19,4	22,1	22,9	23,4	18,3	19,9
Energy dependency ratio for coal (%)	0,8	0,6	1,1	1,2	1,2	1,3	1,8	1,1
Energy dependency ratio for natural gas (%)	65,1	60,0	66,9	96,8	85,7	96,6	99,8	99,9
Energy dependency ratio for oil and oil products (%)	55,0	63,4	68,0	65,0	77,6	92,8	77,4	93,1
Energy dependency ratio for electricity (%)	5,2	4,1	4,1	3,2	3,2	3,0	3,1	3,1

Source: Statistics South Africa.

2.4 The use of energy in South Africa[21]

This section highlights some of the main findings from the PEFA use tables for 2022.

Table 13 and Table 14 show the industrial end-use of energy, by energy product, in South Africa from 2015 to 2022. Energy products that were supplied (produced) by various industries within the South African economy are used by other industries for intermediate consumption and industrial end-use of energy. Industrial end-use of energy focuses on all the energy products directly used (final use) as part of the production process.

Table 13 – Industrial end-use of energy, by energy product, 2015–2022 (Petajoule)

Energy product	2015	2016	2017	2018	2019	2020	2021	2022
	PJ							
Coal*	454,4	469,6	511,6	537,3	557,5	548,0	686,3	863,9
Natural gas	85,7	94,0	87,3	91,6	84,6	81,2	82,4	81,0
Oil and oil products*	568,3	574,0	593,7	588,9	604,5	573,3	607,3	641,3
Biofuels	81,1	81,1	81,1	81,2	81,2	81,2	82,2	84,2
Electricity	747,3	717,4	724,3	625,3	625,4	603,3	657,3	665,1
Total: End-use of energy products by all industries	**1 936,9**	**1 936,2**	**1 998,0**	**1 924,4**	**1 953,1**	**1 887,0**	**2 115,4**	**2 335,5**

Source: Statistics South Africa.

* Note: The industrial end-use of energy, by energy product, for the 'manufacturing' industry and the 'electricity, gas, steam and air conditioning supply' industry excludes energy used for the transformation of energy products.

Individual figures may not add up to stated totals due to rounding.

Table 14 – Industrial end-use of energy, by energy product, 2015–2022 (percentage)

Energy product	2015	2016	2017	2018	2019	2020	2021	2022
	%							
Coal*	23,5	24,3	25,6	27,9	28,5	29,0	32,4	37,0
Natural gas	4,4	4,9	4,4	4,8	4,3	4,3	3,9	3,5
Oil and oil products*	29,3	29,6	29,7	30,6	30,9	30,4	28,7	27,5
Biofuels	4,2	4,2	4,1	4,2	4,2	4,3	3,9	3,6
Electricity	38,6	37,1	36,3	32,5	32,0	32,0	31,1	28,5
Total: End-use of energy products by all industries	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**

Source: Statistics South Africa.

* Note: The industrial end-use of energy, by energy product, for the 'manufacturing' industry and the 'electricity, gas, steam and air conditioning supply' industry excludes energy used for the transformation of energy products.

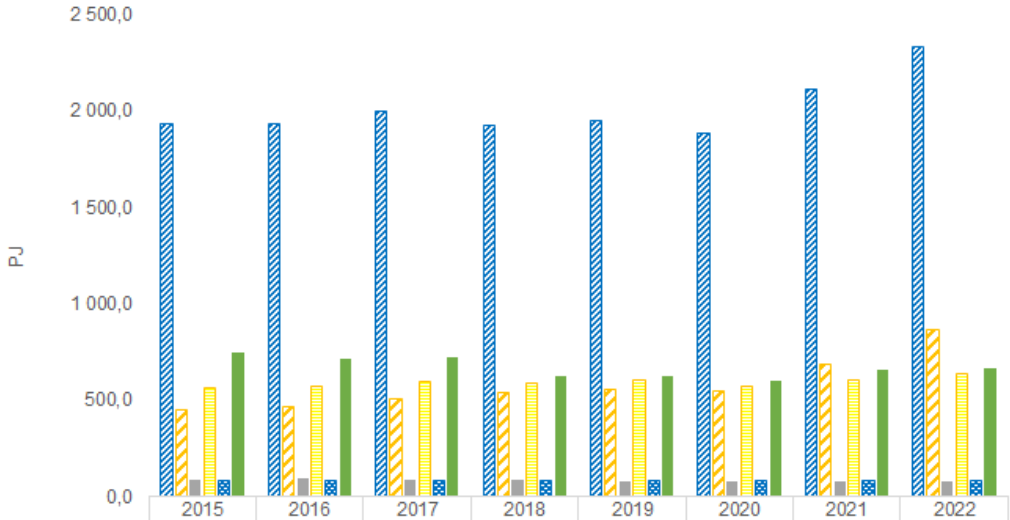
Individual figures may not add up to stated totals due to rounding.

[21] Please note that the results of the PEFA time series from 2015 to 2021 is based on the DEE Energy Balances for 2015 to 2021 as at February 2025 and was already released in Natural Capital Series 6: Physical Energy Flow Accounts for South Africa, 2015 to 2021. Discussion document D0401.6 which was published in March 2025 (Stats SA, 2025b). Due to continuous improvements in the energy statistics and information in South Africa, including the DEE Energy Balances, during 2025, the revisions in the DEE Energy Balances from 2015 will be reflected in future updates of the PEFA for South Africa.

Figure 11 and Figure 12 show that, for all industries in South Africa in 2022, ‘coal’ was the largest energy product directly used as part of the production process (and to produce goods and services that are not energy products), followed by ‘electricity’ and ‘oil and oil products’.

The 25,9% increase in the industrial end-use of the energy product ‘coal’ between 2021 and 2022 was mainly driven by the increased end-use of ‘coal’ in the ‘mining’ industry, where, in 2022, global supply chain issues led to an increased demand for commodities with record high prices. This incentivised the mining industry to increase production, resulting in higher energy use in 2022.

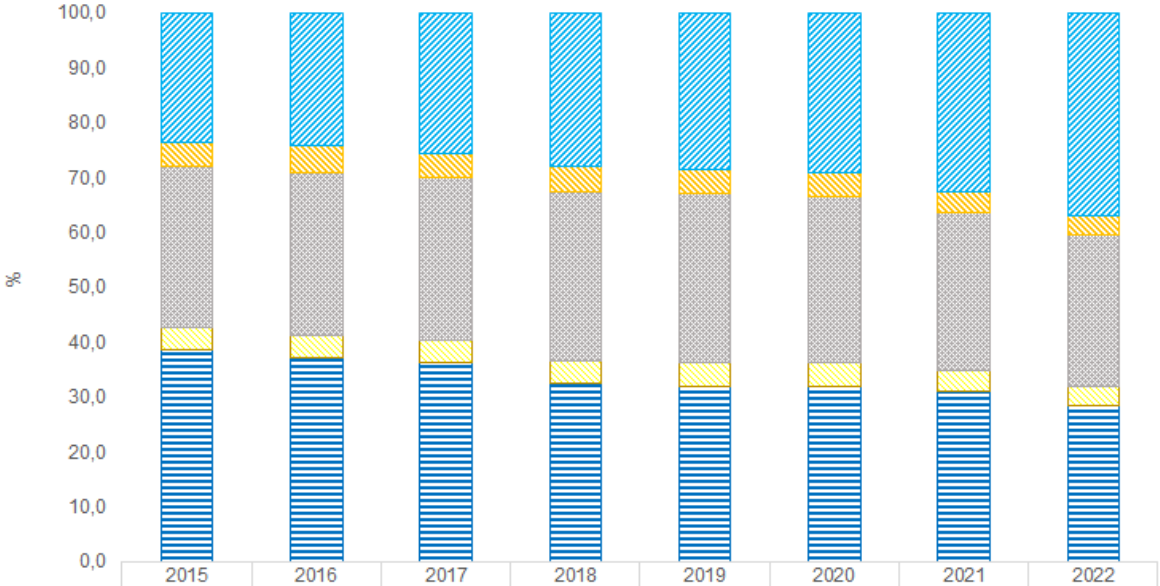
Figure 11 – Industrial end-use of energy, by energy product, 2015–2022 (Petajoule)



	2015	2016	2017	2018	2019	2020	2021	2022
End-use of energy products by industries	1 936,9	1 936,2	1 998,0	1 924,4	1 953,1	1 887,0	2 115,4	2 335,5
Coal	454,4	469,6	511,6	537,3	557,5	548,0	686,3	863,9
Natural gas	85,7	94,0	87,3	91,6	84,6	81,2	82,4	81,0
Oil and oil products	568,3	574,0	593,7	588,9	604,5	573,3	607,3	641,3
Biofuels	81,1	81,1	81,1	81,2	81,2	81,2	82,2	84,2
Electricity	747,3	717,4	724,3	625,3	625,4	603,3	657,3	665,1

Source: Statistics South Africa.

Figure 12 – Industrial end-use of energy, by energy product, 2015–2022 (percentage)



	2015	2016	2017	2018	2019	2020	2021	2022
Coal	23,5	24,3	25,6	27,9	28,5	29,0	32,4	37,0
Natural gas	4,4	4,9	4,4	4,8	4,3	4,3	3,9	3,5
Oil and oil products	29,3	29,6	29,7	30,6	30,9	30,4	28,7	27,5
Biofuels	4,2	4,2	4,1	4,2	4,2	4,3	3,9	3,6
Electricity	38,6	37,1	36,3	32,5	32,0	32,0	31,1	28,5

Source: Statistics South Africa.

Table 15 and Table 16 show the end-use of energy products by industry in South Africa from 2015 to 2022. For a more detailed description of the classification of industries, please refer to Section 2.7.2 in Chapter 2 of the *Natural Capital Series 6: Physical Energy Flow Accounts for South Africa, 2015 to 2021*[22] Discussion document D0401.6, which was published in March 2025 (Stats SA, 2025b). It is important to note that for the end-use of energy products by industry, for the industry 'electricity, gas, steam and air conditioning supply', this does not include the use of coal by Eskom to generate electricity, which is separately recorded in the PEFA use table under 'transformation of energy products by Standard International Energy Product Classification (SIEC) class' (which records the transformation of energy products into other energy products).

[22] *Natural Capital Series 6: Physical Energy Flow Accounts for South Africa, 2015 to 2021*. Discussion document D0401.6 which was published in March 2025 (Stats SA, 2025b) (https://www.statssa.gov.za/?page_id=1854&PPN=D0401.6).

Table 15 – End-use of energy products by industry, 2015–2022 (Petajoule)

Industry	2015	2016	2017	2018	2019	2020	2021	2022
	PJ							
Agriculture, forestry and fisheries	62,4	63,8	64,4	65,3	66,1	63,2	69,9	72,2
Mining and quarrying	163,0	162,6	164,7	174,0	175,7	158,5	198,9	246,4
Manufacturing*	1 038,9	1 017,2	1 044,1	957,3	973,1	950,8	1 118,4	1 252,5
Electricity, gas, steam and air conditioning supply*	47,9	44,0	43,2	47,7	48,3	48,5	47,0	49,8
Transportation and storage	426,7	422,0	445,4	442,2	450,8	429,9	441,5	465,6
Other industries	198,0	226,6	236,2	237,9	239,0	236,2	239,8	250,0
Total: End-use of energy products by industry	**1 936,9**	**1 936,2**	**1 998,0**	**1 924,4**	**1 953,1**	**1 887,0**	**2 115,4**	**2 335,5**

Source: Statistics South Africa.

* Note: The end-use of energy products for the 'manufacturing' industry and the 'electricity, gas, steam and air conditioning supply' industry excludes energy used for the transformation of energy products.

Individual figures may not add up to stated totals due to rounding.

Table 16 – End-use of energy products by industry, 2015–2022 (percentage)

Industry	2015	2016	2017	2018	2019	2020	2021	2022
	%							
Agriculture, forestry and fisheries	3,2	3,3	3,2	3,4	3,4	3,3	3,3	3,1
Mining and quarrying	8,4	8,4	8,2	9,0	9,0	8,4	9,4	10,6
Manufacturing*	53,6	52,5	52,3	49,7	49,8	50,4	52,9	53,6
Electricity, gas, steam and air conditioning supply*	2,5	2,3	2,2	2,5	2,5	2,6	2,2	2,1
Transportation and storage	22,0	21,8	22,3	23,0	23,1	22,8	20,9	19,9
Other industries	10,2	11,7	11,8	12,4	12,2	12,5	11,3	10,7
Total: End-use of energy products by industry	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**

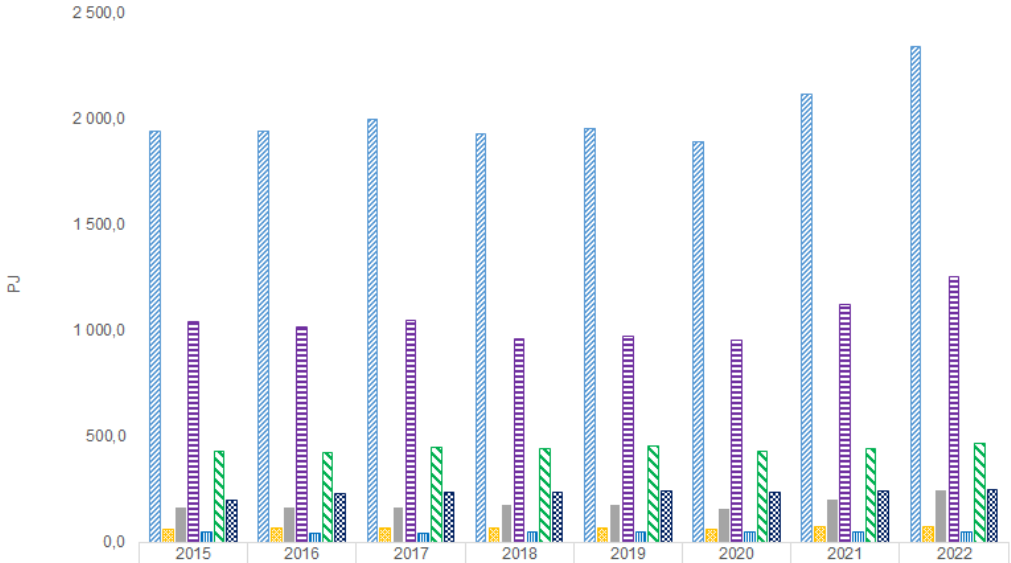
Source: Statistics South Africa.

* Note: The end-use of energy products for the 'manufacturing' industry and the 'electricity, gas, steam and air conditioning supply' industry excludes energy used for the transformation of energy products.

Individual figures may not add up to stated totals due to rounding.

Figure 13 and Figure 14 show that the 'manufacturing' industry was the largest end-user of all energy products, to produce goods and services that are not energy products in 2022 (53,6% of all end-use of energy products by industry). The second largest end-user of energy products in 2022 was the 'transportation and storage' industry. The 'manufacturing' industry increased its end-use of energy products from 1 118,4 PJ in 2021 to 1 252,5 PJ in 2022 (12,0% increase). The largest industry percentage increase in its end-use of energy products between 2021 and 2022 was the 'mining' industry (23,9% increase), and it only contributed 10,6% of total end-use of energy products by all industries in 2022.

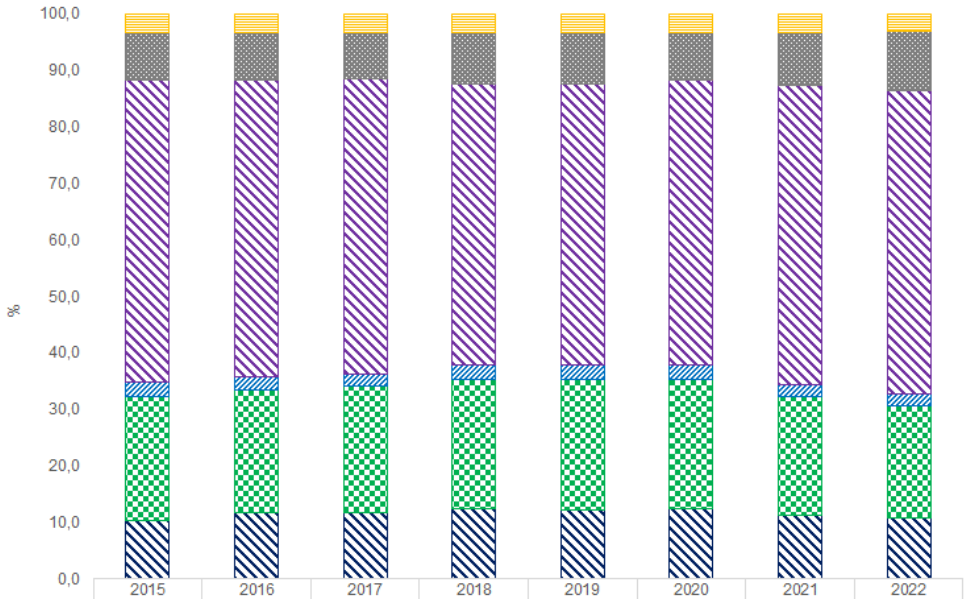
Figure 13 – End-use of energy products by industry, 2015–2022 (Petajoule)



	2015	2016	2017	2018	2019	2020	2021	2022
End-use of energy products by industry	1 936,9	1 936,2	1 998,0	1 924,4	1 953,1	1 887,0	2 115,4	2 335,5
Agriculture, forestry and fisheries	62,4	63,8	64,4	65,3	66,1	63,2	69,9	72,2
Mining and quarrying	163,0	162,6	164,7	174,0	175,7	158,5	198,9	246,4
Manufacturing	1 038,9	1 017,2	1 044,1	957,3	973,1	950,8	1 118,4	1 252,5
Electricity, gas, steam and air conditioning supply	47,9	44,0	43,2	47,7	48,3	48,5	47,0	49,8
Transportation and storage	426,7	422,0	445,4	442,2	450,8	429,9	441,5	465,6
Other industries	198,0	226,6	236,2	237,9	239,0	236,2	239,8	250,0

Source: Statistics South Africa.

Figure 14 – End-use of energy products by industry, 2015–2022 (percentage)



	2015	2016	2017	2018	2019	2020	2021	2022
Agriculture, forestry and fisheries	3,2	3,3	3,2	3,4	3,4	3,3	3,3	3,1
Mining and quarrying	8,4	8,4	8,2	9,0	9,0	8,4	9,4	10,6
Manufacturing	53,6	52,5	52,3	49,7	49,8	50,4	52,9	53,6
Electricity, gas, steam and air conditioning supply	2,5	2,3	2,2	2,5	2,5	2,6	2,2	2,1
Transportation and storage	22,0	21,8	22,3	23,0	23,1	22,8	20,9	19,9
Other industries	10,2	11,7	11,8	12,4	12,2	12,5	11,3	10,7

Source: Statistics South Africa.

Table 17 and Table 18 show the end-use of energy products by households in South Africa from 2015 to 2022. Household consumption entails the consumption by households of energy products purchased or otherwise obtained from energy suppliers (UN, 2019). There were imputations made for energy end-use on household transport, and some of the fuel consumption captured by the DEE energy balances in the 'transportation and storage' industry was moved to the household sector to attribute fuel end-usage associated with private vehicles owned by households. The source of these imputations was the statistical release (P0100) "Income and Expenditure of Households, 2022/2023[23]" that was released by Stats SA in January 2025 (Stats SA, 2025a).

[23] *Income and Expenditure of Households, 2022/2023*. Statistical Release: P0100. Statistics South Africa, Pretoria (Stats SA, 2025a) (https://www.statssa.gov.za/?page_id=1854&PPN=P0100).

Table 17 – End-use of energy products by households, 2015–2022 (Petajoule)

Energy product	2015	2016	2017	2018	2019	2020	2021	2022
	PJ							
Coal	11,1	9,5	16,6	18,2	18,2	21,2	22,3	26,2
Natural gas	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2
Oil and oil products	201,6	204,4	208,7	212,4	218,1	183,2	204,5	220,2
Biofuels	344,4	344,2	344,8	344,2	344,2	344,2	344,3	338,3
Electricity	145,6	174,7	174,7	174,7	174,7	237,1	159,0	143,0
Total: End-use of energy products by households	**702,9**	**733,1**	**745,0**	**749,7**	**755,4**	**786,0**	**730,2**	**727,8**

Source: Statistics South Africa.
Individual figures may not add up to stated totals due to rounding.

Table 18 – End-use of energy products by households, 2015–2022 (percentage)

Energy product	2015	2016	2017	2018	2019	2020	2021	2022
	%							
Coal	1,6	1,3	2,2	2,4	2,4	2,7	3,1	3,6
Natural gas	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Oil and oil products	28,7	27,9	28,0	28,3	28,9	23,3	28,0	30,3
Biofuels	49,0	47,0	46,3	45,9	45,6	43,8	47,1	46,5
Electricity	20,7	23,8	23,4	23,3	23,1	30,2	21,8	19,6
Total: End-use of energy products by households	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**

Source: Statistics South Africa.
Individual figures may not add up to stated totals due to rounding.

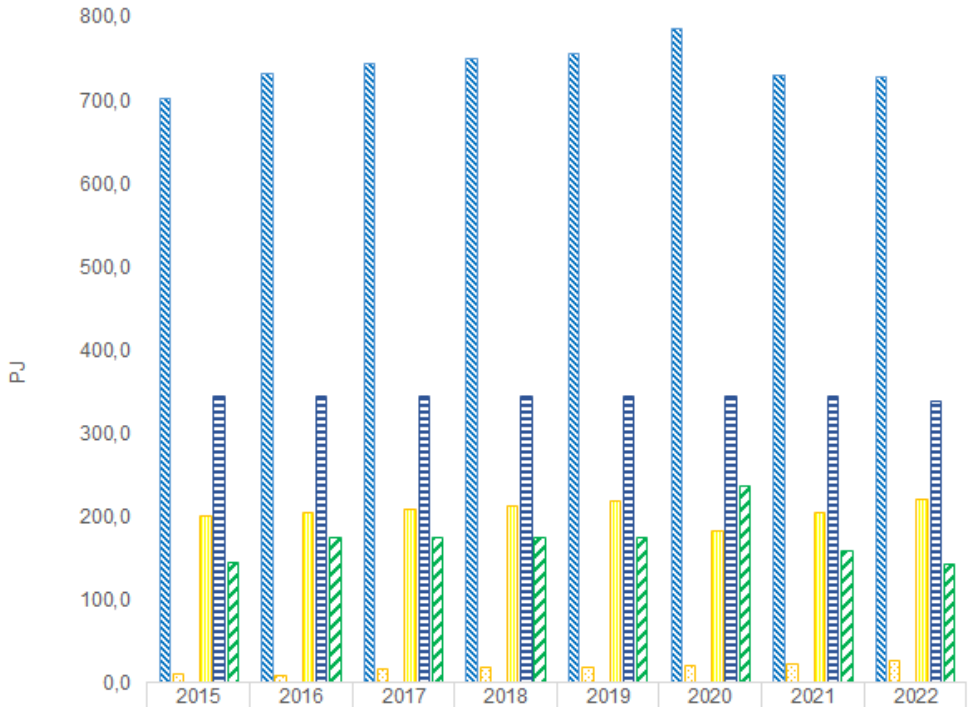
Figure 15 and Figure 16 show that the main energy product used by households for their own end-use in 2022, was ‘biofuels’, followed by ‘oil and oil products’ and ‘electricity’. Solid biofuels are derived from non-fossil, organic materials, including plant biomass, animal waste, and municipal waste, which can be used to produce energy for heating, cooking, or electricity generation.[24] The latest General Household Survey, statistical release P0318 (Stats SA, 2025c),[25] released by Stats SA in May 2025, indicated that the use of wood and coal as a main source of energy for cooking in 2024, was particularly noticeable in the following provinces of South Africa:

- Limpopo (34,3% of the total main sources of energy used for cooking by the households in the province);
- Mpumalanga (19,7%);
- Eastern Cape (8,5%);
- North-West (7,9%); and
- KwaZulu-Natal (7,6%).

[24] https://www.sciencedirect.com/science/article/abs/pii/B9780128192429000178.

[25] *General Household Survey, 2024.* Statistical Release: P0318. Statistics South Africa, Pretoria (Stats SA, 2025c) (https://www.statssa.gov.za/?page_id=1854&PPN=P0318&SCH=74038).

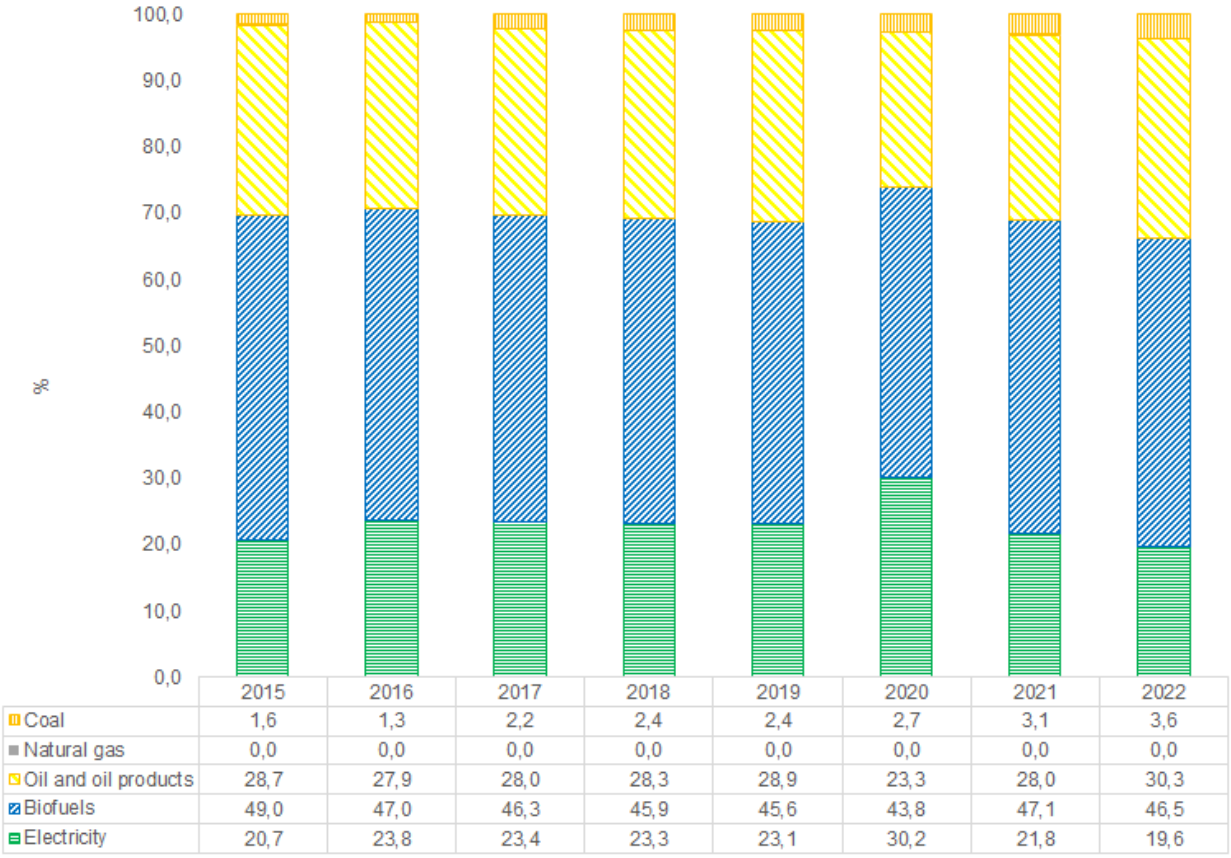
Figure 15 – End-use of energy products by households, 2015–2022 (Petajoule)



	2015	2016	2017	2018	2019	2020	2021	2022
End-use of energy products by households	702,9	733,1	745,0	749,7	755,4	786,0	730,2	727,8
Coal	11,1	9,5	16,6	18,2	18,2	21,2	22,3	26,2
Natural gas	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2
Oil and oil products	201,6	204,4	208,7	212,4	218,1	183,2	204,5	220,2
Biofuels	344,4	344,2	344,8	344,2	344,2	344,2	344,3	338,3
Electricity	145,6	174,7	174,7	174,7	174,7	237,1	159,0	143,0

Source: Statistics South Africa.

Figure 16 – End-use of energy products by households, 2015–2022 (percentage)



	2015	2016	2017	2018	2019	2020	2021	2022
Coal	1,6	1,3	2,2	2,4	2,4	2,7	3,1	3,6
Natural gas	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Oil and oil products	28,7	27,9	28,0	28,3	28,9	23,3	28,0	30,3
Biofuels	49,0	47,0	46,3	45,9	45,6	43,8	47,1	46,5
Electricity	20,7	23,8	23,4	23,3	23,1	30,2	21,8	19,6

Source: Statistics South Africa.

Table 19 and Table 20, show the exports of energy products from South Africa from 2015 to 2022.

Table 19 – Exports of energy products, 2015–2022 (Petajoule)

Energy product	2015	2016	2017	2018	2019	2020	2021	2022
	PJ							
Coal	2 105,2	1 883,6	1 956,6	1 968,7	1 968,7	1 678,1	1 298,4	1 850,7
Natural gas	0,7	0,6	0,4	0,3	0,4	0,4	0,4	0,5
Oil and oil products	109,1	120,1	118,9	122,9	125,0	111,3	82,1	145,1
Electricity	52,6	59,6	59,6	50,5	50,5	50,5	36,8	50,5
Total: Exports of energy products	**2 267,6**	**2 063,8**	**2 135,5**	**2 142,3**	**2 144,5**	**1 840,3**	**1 417,8**	**2 046,9**

Source: Statistics South Africa.

Individual figures may not add up to stated totals due to rounding.

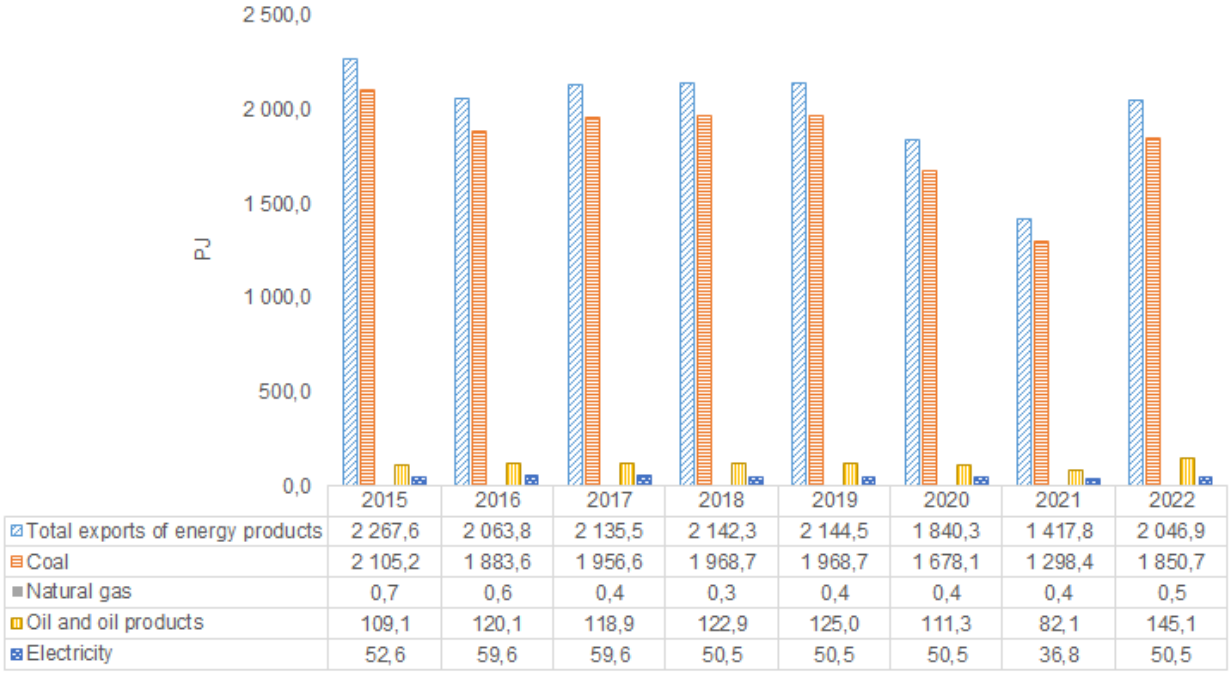
Table 20 – Exports of energy products, 2015–2022 (percentage)

Energy product	2015	2016	2017	2018	2019	2020	2021	2022
	%							
Coal	92,8	91,3	91,6	91,9	91,8	91,2	91,6	90,4
Natural gas	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Oil and oil products	4,8	5,8	5,6	5,7	5,8	6,1	5,8	7,1
Electricity	2,3	2,9	2,8	2,4	2,4	2,7	2,6	2,5
Total: Exports of energy products	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**

Source: Statistics South Africa.
Individual figures may not add up to stated totals due to rounding.

Figure 17 and Figure 18 show that South Africa mainly exported the energy product 'coal' to the rest of the world in 2022 (90,4% of total exports of energy products).

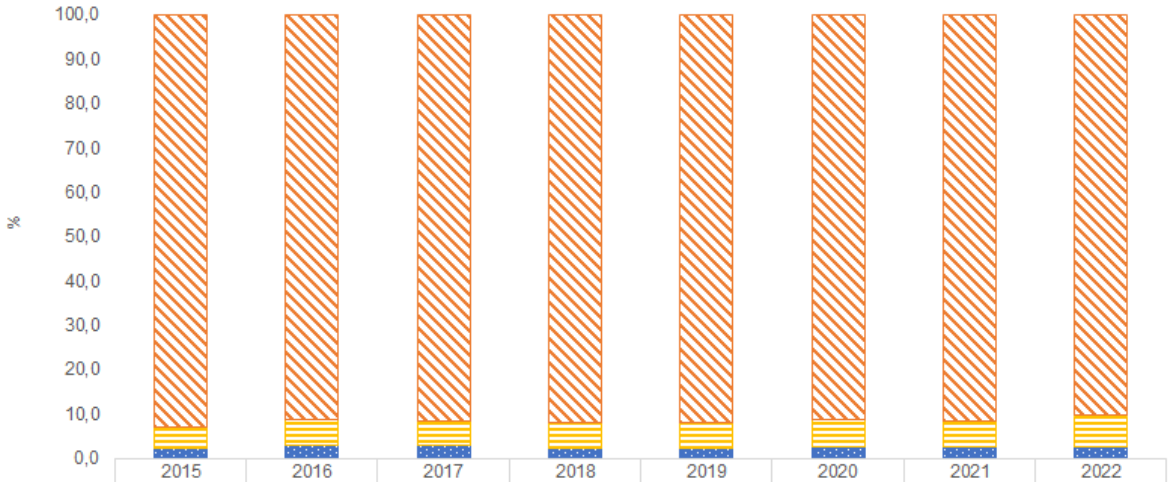
Figure 17 – Exports of energy products, 2015–2022 (Petajoule)



	2015	2016	2017	2018	2019	2020	2021	2022
Total exports of energy products	2 267,6	2 063,8	2 135,5	2 142,3	2 144,5	1 840,3	1 417,8	2 046,9
Coal	2 105,2	1 883,6	1 956,6	1 968,7	1 968,7	1 678,1	1 298,4	1 850,7
Natural gas	0,7	0,6	0,4	0,3	0,4	0,4	0,4	0,5
Oil and oil products	109,1	120,1	118,9	122,9	125,0	111,3	82,1	145,1
Electricity	52,6	59,6	59,6	50,5	50,5	50,5	36,8	50,5

Source: Statistics South Africa.

Figure 18 – Exports of energy products, 2015–2022 (percentage)



	2015	2016	2017	2018	2019	2020	2021	2022
Coal	92,8	91,3	91,6	91,9	91,8	91,2	91,6	90,4
Natural gas	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Oil and oil products	4,8	5,8	5,6	5,7	5,8	6,1	5,8	7,1
Electricity	2,3	2,9	2,8	2,4	2,4	2,7	2,6	2,5

Source: Statistics South Africa.

2.5 The household energy use per capita for South Africa

Table 21 shows the household energy use per capita for South Africa from 2015 to 2022. The household energy use per capita is the total energy use by resident households (total purposes, i.e. heating/cooling, transport, other) divided by the resident population. It measures the use of energy for heating, cooling, transport and other purposes by households. It is calculated as the consumption of energy products by households for all purposes divided by the resident population[26].

Table 21 – Household energy use per capita, 2015–2022 (Gigajoule per person)

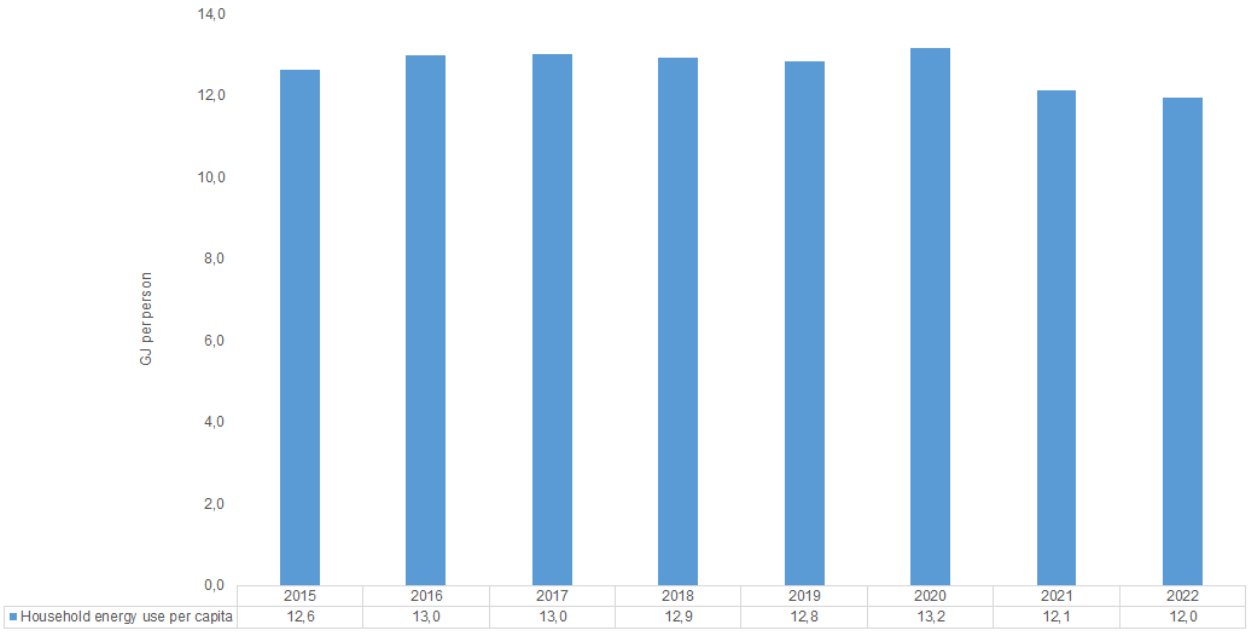
Year	Household energy use	Estimated population of South Africa	Household energy use per capita
	GJ	Number of persons	GJ per person
2015	702 857 154	55 669 436	12,6
2016	733 054 355	56 436 023	13,0
2017	745 029 434	57 210 747	13,0
2018	749 722 640	58 038 876	12,9
2019	755 418 184	58 889 765	12,8
2020	785 981 779	59 694 268	13,2
2021	730 210 170	60 234 725	12,1
2022	727 828 745	60 867 031	12,0

Source: Statistics South Africa.

Figure 19 shows that the household energy use per capita for South Africa was 12,0 GJ per person in 2022, which was a decrease from the 12,1 GJ per person in 2021, and the 13,2 GJ per person in 2020. The household energy use per capita figures for South Africa from 2015 to 2022 would suggest moderate household energy use. If the household energy use per capita is relatively low compared to other countries, this may reflect factors such as a milder climate, fewer appliances, smaller homes, limited access to modern energy services, socio-economic factors or higher energy efficiency. If the household energy use per capita is relatively high, it could indicate higher consumption due to larger homes, high heating/cooling demand, many appliances, or lower energy efficiency.

[26] https://unece.org/sites/default/files/2025-02/G-1.4%20Energy%20use%20by%20resident%20households%20per%20capita.pdf.

Figure 19 – Household energy use per capita, 2015–2022 (Gigajoule per person)



Source: Statistics South Africa.

2.6 The energy intensities for selected industries in South Africa

Table 22 shows the energy intensities for selected industries in South Africa from 2015 to 2022. Increased efficiency in energy use and decreased energy use can contribute to sustainable development. Energy intensity is defined as the ratio of energy used for a given industry to the gross value added (GVA) in constant prices by that industry (UN, 2019). Decreasing energy intensities indicate a tendency over time to use energy more efficiently.

Table 22 – Energy intensities for selected industries, 2015–2022

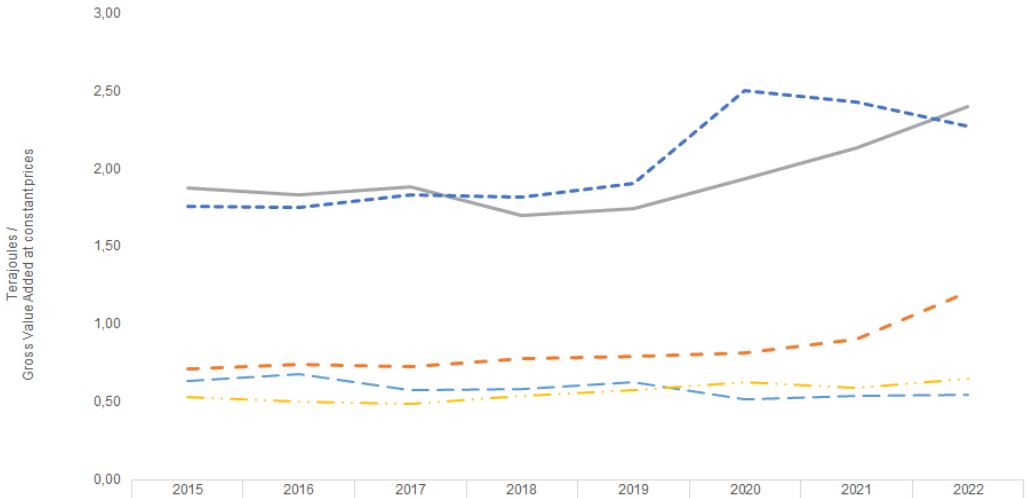
Industry	2015	2016	2017	2018	2019	2020	2021	2022
Agriculture, forestry and fisheries								
Gross Value Added (GVA) at constant prices (R million)	98 759,6	93 672,1	111 545,1	112 094,9	104 785,1	122 870,1	128 983,1	131 770,6
Energy end-use (Terajoule (TJ))	62 377,3	63 798,3	64 440,9	65 257,0	66 134,2	63 165,6	69 933,8	72 240,9
Energy intensity (TJ/GVA)	***0,63***	***0,68***	***0,58***	***0,58***	***0,63***	***0,51***	***0,54***	***0,55***
Mining and quarrying								
Gross Value Added (GVA) at constant prices (R million)	227 875,0	220 141,0	225 419,7	223 613,0	222 100,1	194 984,9	219 636,0	204 452,9
Energy end-use (Terajoule (TJ))	162 972,2	162 579,5	164 722,4	173 994,5	175 714,2	158 518,7	198 930,6	246 419,7
Energy intensity (TJ/GVA)	***0,72***	***0,74***	***0,73***	***0,78***	***0,79***	***0,81***	***0,91***	***1,21***
Manufacturing*								
Gross Value Added (GVA) at constant prices (R million)	553 392,4	555 879,7	554 832,7	563 249,7	559 321,5	491 446,6	524 904,8	523 090,8
Energy end-use (Terajoule (TJ))	1 038 938,5	1 017 206,4	1 044 082,0	957 336,5	973 140,0	950 791,5	1 118 362,7	1 252 482,8
Energy intensity (TJ/GVA)	***1,88***	***1,83***	***1,88***	***1,70***	***1,74***	***1,93***	***2,13***	***2,39***
Electricity, gas, steam and air conditioning supply*								
Gross Value Added (GVA) at constant prices (R million)	89 628,3	87 439,9	87 955,3	87 858,3	83 579,8	77 429,1	79 526,0	76 903,8
Energy end-use (Terajoule (TJ))	47 894,8	43 991,9	43 176,9	47 679,1	48 305,5	48 476,8	46 959,3	49 800,1
Energy intensity (TJ/GVA)	***0,53***	***0,50***	***0,49***	***0,54***	***0,58***	***0,63***	***0,59***	***0,65***
Transportation and storage								
Gross Value Added (GVA) at constant prices (R million)	242 742,2	240 909,6	243 633,0	243 894,7	236 843,0	171 664,4	181 915,4	204 633,9
Energy intensity (TJ/GVA)	426 749,4	421 979,8	445 362,3	442 222,2	450 831,9	429 892,8	441 468,7	465 560,5
Energy intensity (TJ/GVA)	***1,76***	***1,75***	***1,83***	***1,81***	***1,90***	***2,50***	***2,43***	***2,28***

Source: Statistics South Africa.

* Note: The energy intensity for the 'manufacturing' industry and the 'electricity, gas, steam and air conditioning supply' industry excludes energy used for the transformation of energy products.

Figure 20 shows that the 'manufacturing' industry and 'transportation and storage' industry had relatively higher energy intensities compared to the 'agriculture, forestry and fisheries', 'mining and quarrying' and 'electricity, gas, steam and air conditioning supply' industries. The energy intensity for the 'mining and quarrying' industry also noticeably increased between 2021 (0,91) and 2022 (1,21), indicating that this industry was using energy less efficiently over this period. The energy intensity for the 'transportation and storage'' industry decreased between 2021 (2,43) and 2022 (2,28), indicating that this industry made more efficient use of energy over this period. Except for the 'transportation and storage' industry, all the industries had higher energy intensities in 2022 compared with 2021, an indication that the majority of industries used energy less efficiently during the year.

Figure 20 – Energy intensities for selected industries, 2015–2022



	2015	2016	2017	2018	2019	2020	2021	2022
Agriculture, forestry and fisheries	0,63	0,68	0,58	0,58	0,63	0,51	0,54	0,55
Mining and quarrying	0,72	0,74	0,73	0,78	0,79	0,81	0,91	1,21
Manufacturing	1,88	1,83	1,88	1,70	1,74	1,93	2,13	2,39
Electricity, gas, steam and air conditioning supply	0,53	0,50	0,49	0,54	0,58	0,63	0,59	0,65
Transportation and storage	1,76	1,75	1,83	1,81	1,90	2,50	2,43	2,28

Source: Statistics South Africa.

Chapter 3: The future development of the Physical Energy Flow Accounts for South Africa

Chapter 3 discusses the various directions related to future work and improvements to the PEFA for South Africa. As outlined below, these will further enhance and add richness to the work undertaken thus far.

3.1 Continuous improvement of the energy statistics and information in the country

The PEFA for South Africa is reliant on both the quality of energy statistics and information in South Africa, as well as the DEE compiled energy balances[27]. All relevant role-players in the energy data ecosystem for South Africa must work jointly towards the continuous improvement of the energy statistics and information in South Africa, as well as the DEE compiled energy balances, to improve the compilation of the PEFA for South Africa into the future. The improved communication and co-ordination between the role-players in the energy data ecosystem for South Africa, which was strengthened by the G20 IMF DGI-3 processes (as described in more detail in Section 1.2 of Chapter 1 in this document) in South Africa, should be further built upon and expanded going into the future.

Below are some energy statistics and information improvement activities already completed or currently[28] in progress since the release of Natural Capital Series 6: Physical Energy Flow Accounts for South Africa, 2015 to 2021[29] (*Discussion document D0401.6)* in March 2025 (Stats SA, 2025b).

3.1.1 Energy Data Reference Group

Energy data is crucial for the government to make informed decisions, plan for, develop and formulate effective policies and regulations that support the growth and sustainable development of the energy sector in South Africa. Given the interconnected roles of various stakeholders in the energy data ecosystem for South Africa, it is essential to have a centralised energy data body (mechanism) that coordinates the compilation of energy data (energy statistics and information) in South Africa and that also ensures that the energy data is compiled according to internationally agreed to standards and best practice.

To address this need, the formalisation of the establishment of the Energy Data Reference Group (EDRG) for South Africa is in process to enhance coordination and streamline energy data management. The EDRG will be chaired by the DEE, with DFFE acting as vice-chair, and the South African National Energy Development Institute (SANEDI) as the secretariat. Stats SA and the National Energy Regulator of South Africa (NERSA) will be supporting members.

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[27] The 'statistical difference' in the DEE energy balances refers to the difference between the energy supply and energy use of an energy commodity. This difference arises because the figures on supply and use come from different sources. An in-depth review of each of the energy commodities by the DEE into the future could help in determining the extent of the difference that should be attributed to either supply or use. Pending this review by the DEE, for the present set of PEFAs in this discussion document, the statistical difference in the DEE energy balances has been assigned to 'accumulation'.

[28] October 2025.

[29] *Natural Capital Series 6: Physical Energy Flow Accounts for South Africa, 2015 to 2021*. Discussion document D0401.6 which was published in March 2025 (Stats SA, 2025b) (https://www.statssa.gov.za/?page_id=1854&PPN=D0401.6).

The EDRG will aim to:

- Map the landscape of energy data across government and other energy data role-players in the energy data ecosystem for South Africa and identify any existing energy data gaps.
- Oversee the quality of energy data reported by energy data providers.
- Support the monitoring, verification and reporting of energy data required for carbon tax purposes.
- Provide guidance on the compilation of reports for national and international reporting obligations on energy and greenhouse gas (GHG) emissions data.
- Mobilise resources for energy data collection and analysis.
- Identify and address potential duplication in energy data collection efforts across government departments and agencies.
- Facilitate improved inter-departmental flow of energy data.

The EDRG shall be responsible for the periodic review of the methodology and best practices in the compilation of energy data as well as identifying any emerging energy data gaps and to mobilise resources to address these identified energy data gaps.

3.1.2 African Energy Commission Energy Balance training for South Africa

The DEE, DFFE, SANEDI and Stats SA attended the African Energy Commission (AFREC) Energy Balance training for South Africa in Pretoria from 30 July to 1 August 2025. This was aimed at enhancing the country's capacity to compile and manage comprehensive national energy statistics, thereby improving its ability to collect and report energy data accurately for the Africa Energy Information System (AEIS). The training focused on the Energy Balance Questionnaire, one of AFREC's four core data collection tools, along with others on energy efficiency, prices and taxes, and power plant capacity, which are critical for developing accurate national energy balances and feeding into the continental AEIS. The initiative is part of AFREC's broader strategy to support African Union (AU) member states in building and maintaining National Energy Information Systems (NEIS) that inform policy and planning at both national and continental levels[30].

3.1.3 Statistics Amendment Act 29 of 2024

The Statistics Amendment Act 29 of 2024 intends[31] to amend the Statistics Act, 1999, so as:

- to substitute certain definitions and insert new definitions;
- to amend the provisions dealing with the powers and duties of the Statistician-General;
- to make provision for the development and implementation of the National Statistics System and National Strategy for the Development of Statistics by the Statistician-General;
- to strengthen co-ordination and enhance collaboration amongst data producers and data users by creating an enabling environment for the production and consumption of quality statistics within the Republic;

[30] https://au-afrec.org/afrec-empowers-south-africa-strengthen-energy-data-statistics-reporting.

[31] https://www.gov.za/documents/acts/statistics-amendment-act-29-2024-english-afrikaans-20-dec-2024.

- to make provision for the establishment of statistics units by organs of state, the submission of annual statistics plans and annual reports by organs of state and the establishment of the Statistical Clearing House in order to promote the functions and objectives of the National Statistics System;
- to empower the Minister to make regulations, and
- to provide for matters connected therewith.

Having joined the statute books in December 2024, the Statistics Amendment Act came into effect on 1 October 2025. This is according to a presidential proclamation published in the Government Gazette[32] [33].

3.2 Further investigate the compilation of the bridging table for energy

When a country implements SEEA-Energy accounts, energy statistics and energy balances typically serve as the primary data sources. In this context, the most efficient approach to compiling energy accounts is by modifying existing energy statistics and balances. In practice, this involves making necessary adjustments and additions to the data provided by these sources (UN, 2019). To illustrate the connections between key concepts and aggregates in energy accounts and the underlying energy statistics and balances, countries may opt to create bridge tables. These tables outline the necessary adjustments, including additions and subtractions, to align the data used in energy accounts with that in energy balances (UN, 2019). Stats SA will further investigate the compilation of the bridging table for energy. Stats SA has already started further investigating the feasibility of compiling the bridging tables for energy as an improvement activity for future PEFA releases (since the release of *Natural Capital Series 6: Physical Energy Flow Accounts for South Africa, 2015 to 2021*[34] (Discussion document D0401.6) in March 2025 (Stats SA, 2025b)). The compilation of the bridging tables for energy is also very closely linked to the improvement activities already mentioned in 3.1.1, 3.1.2 and 3.1.3 above.

3.3 Monetary flow accounts for energy-related transactions

The next step in expanding the PEFA for South Africa could be introducing monetary flow accounts for energy-related transactions. According to the SEEA-Energy, many physical energy flows are accompanied by corresponding monetary flows, representing transactions between economic units such as industries, households, and governments. For instance, household consumption of refined petroleum products can be quantified not only in PJ but also in terms of household expenditure on these products.

All such transactions between economic units are documented in the SNA (UN, 2019). This would entail the investigation of available monetary data from the published South African SUTs by Stats SA, as well as other possible monetary data sources like energy surveys that collect monetary energy-related data.

[32] https://legalacademy.co.za/news/read/statistics-amendment-act-in-force-soon.

[33] https://businesstech.co.za/news/government/839323/ramaphosa-puts-new-law-into-effect-in-south-africa/.

[34] *Natural Capital Series 6: Physical Energy Flow Accounts for South Africa, 2015 to 2021*. Discussion document D0401.6 which was published in March 2025 (Stats SA, 2025b) (https://www.statssa.gov.za/?page_id=1854&PPN=D0401.6).

3.4 Asset accounts in physical and monetary terms

An assessment of mineral and energy resource quantities, along with tracking changes over time, is a key aspect of SEEA-Energy. The preparation of asset accounts in physical terms offers essential insights into the availability of mineral and energy resources. A key aspect of SEEA-Energy asset accounts is the estimation of resource depletion in physical terms (UN, 2019). This would need the investigation of available stock in physical terms of mineral and energy resources as published by the DEE and other possible physical stock data sources like resource stock surveys. Stats SA previously developed and published mineral asset accounts, with the last account published in March 2017 as a chapter in the Environmental Economics Account Compendium report (Stats SA, 2017). Stats SA could build on the previous mineral accounts and broaden the energy-related resources that are included in the asset accounts.

3.5 Combining energy information in physical and monetary terms

With the development of both the PEFA and the monetary flow accounts (as a suggested way forward already discussed earlier), the next step would be to present the physical and monetary flow accounts in a combined format. A key strength of SEEA-Energy lies in its structured approach to organising information in both physical and monetary terms, ensuring consistency in scope, definitions and classifications. This is particularly evident in the development of accounts and tables that integrate physical and monetary data, providing a comprehensive framework for analysis (UN, 2019).

The PEFA for South Africa are released as a discussion document and not as official statistics. Stats SA hereby invites all interested parties to engage with the PEFA for South Africa and submit feedback to Stats SA by 29 May 2026, on any aspect of the PEFA. These submissions will be used to improve the methodology used for the PEFA, contributing to a future update and potential release as official statistics in Stats SA's Natural Capital series. Stats SA encourages organisations, stakeholders, government departments and individuals to make written submissions in either PDF or Microsoft Word format. Email submissions are preferred and should be sent to RiaanG@statssa.gov.za.

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Glossary

Anthracite	High-rank coal typically utilised for industrial and residential applications. It is characterised by having less than 10,0% volatile matter and a high carbon content, approximately 90,0% fixed carbon. Its gross calorific value is equal to or greater than 24 000 kJ/kg (5 732 kcal/kg) on an ash-free but moist basis.
Biofuels	Produced from renewable organic sources or 'feedstocks', biofuels include ethanol and biodiesel, commonly used as fuels in transportation, as well as landfill and sludge biogas captured for combustion to generate heat and/or electricity.
Biogasoline	Liquid fuels derived from biomass and used in spark-ignition internal combustion engines. Common examples are: bioethanol (including both hydrous and anhydrous ethanol); biomethanol; biobutanol; bio ETBE (ethyl-tertio-butyl-ether); and bio MTBE (methyltertio-butyl-ether). Biogasoline may be blended with petroleum gasoline or used directly in engines. The blending may take place in refineries or at or near the point of sale.
Bio jet kerosene	Liquid biofuels derived from biomass and blended with or replacing jet kerosene. Bio jet kerosene can be produced by a range of thermal processes, including gasification followed by Fischer-Tropsch synthesis, pyrolysis followed by hydrogenation, or conversion of sugar to hydrocarbons using microorganisms (e.g. yeast). A wide range of biomass feedstocks, including cellulosic materials and algal biomass, could be used in such processes.
Black coal	A sedimentary organic rock consisting of anthracite, bituminous and sub-bituminous rank coals. Black coal includes thermal black coal, which is primarily used as a solid fuel to raise steam to generate electricity, and metallurgical black coal, used to produce coke for steel making.
Briquettes	Made from brown coal through a process of crushing, drying and the addition of a binding agent, to produce a compact, high-energy fuel easily transported and commonly used for industrial and domestic heating. These have been aggregated into coal products.
Brown coal	Also known as lignite, brown coal is a low rank, brownish-black coal with a high moisture content of around 60,0%.
Butane	A gaseous hydrocarbon and the fourth member of the paraffin series (following methane, ethane and propane). If exposed to higher pressures or lower temperatures, it can be converted to liquid form and is a major component of Liquefied petroleum gases (LPG).
Coal products	Includes products made from coal such as metallurgical coke, coal tar and briquettes. Blast furnace gas and coke oven gas, previously included as coal by-products, have been excluded from the scope of this account. Benzene/toluene/xylene feedstock, previously included as a coal by-product, has been reclassified as other petroleum products.

Coking coal	Has a high carbon content and is typically used as the source of carbon and heat in steel making. It is transformed into coal coke, which then feeds into the blast furnace during steel production. In these accounts it is aggregated with thermal black coal and reported as black coal totals.
Condensate	A liquid mixture of pentanes and heavier hydrocarbons that form part of the vapour phase of natural gas in the reservoir and become liquid under standard field separation conditions.
Conversion loss	Energy lost in the transformation of a primary fuel to a derived (secondary) energy product.
Crude oil	A mixture of hydrocarbons, existing in the liquid state; both in natural underground reservoirs and at atmospheric pressure after passing through surface separating facilities.
Degree of energy self-sufficiency	Measures the dependence on energy imports to sustain current energy activity. This measure is closely connected with the pattern of extraction of energy resources presented in the energy asset tables. An energy self-sufficiency number greater than 100 indicates net exports of energy, a number less than 100 indicates net imports.
Electricity	The flow of electrical power or charge. It is a secondary energy source, meaning it is derived from the conversion of primary sources of energy such as coal, natural gas, oil, nuclear power, and renewables.
End-use	The use of energy products to produce goods and services that are not energy products. These energy products may be used for intermediate consumption, for household final consumption, as a change in inventories of energy products, or for export.
Energy from natural input	Energy from natural inputs encompasses flows of energy resulting from the extraction and capture of energy from the environment by resident economic units.
Energy residuals	Energy residuals in physical terms comprise energy losses and other energy residuals. Examples of energy losses include flaring and venting of natural gas and losses during transformation in the production of primary energy products from natural inputs and in the production of secondary energy products. Energy losses during distribution may arise from the evaporation and leakages of liquid fuels, loss of heat during transport of steam, and losses during gas distribution, electricity transmission and pipeline transport. Energy residuals also include other energy residuals, particularly heat generated when end-users (either households or enterprises) use energy products for energy purposes (e.g. household lighting).
Energy product	Includes forms of energy suitable for direct use (e.g. electricity and heat) and energy products that release energy while undergoing some chemical or other process (including combustion). By convention, energy products also include peat, biomass and waste when and only when they are used for energy purposes.
Environmental account	An information system and framework that links the economic activities and uses of a resource to changes in the natural resource base, therefore linking resource use with the System of National Accounts. See also SEEA.

Ethane	A naturally gaseous straight-chain hydrocarbon (C_2H_6). Ethane is obtained at gas separation plants or from the refining of crude oil. It is a valuable feedstock for petrochemical manufacture.
Exports	Goods exported (exports) represent the quantity of goods sent to other countries or for which ownership changes from residents to non-residents.
Feedstock	A feedstock is defined as "raw material supplied to a machine or processing plant". In industrial contexts, feedstocks are materials used directly in manufacturing processes and transformed into intermediate or finished products. For example, crude oil serves as a feedstock in refineries, where it is processed into various fuels and chemicals.
Final use	Use that finally consumes a product, as opposed to an intermediate use. Final use includes household final consumption; government final consumption; exports; and changes in inventories.
Fischer-Tropsch synthesis	A chemical process that converts carbon monoxide (CO) and hydrogen (H_2) into liquid hydrocarbons using a catalyst, typically iron or cobalt. It is used to produce synthetic fuels, lubricants, and other hydrocarbon-based products from feedstocks like coal, natural gas, or biomass.
Flow accounts	General term used for a framework that presents information on the physical flows of resources throughout the economy. Flow accounts published for energy include SUTs.
Fossil fuel	Any natural fuel derived from decomposed or partly decomposed organic matter.
Fuel oils	Fuel oils include petroleum-based oils used as fuel, e.g. for transport, heating oil or other petroleum-based oils. Fuel oils were previously aggregated into other refined products.
Fractions	Fractions are the components of crude oil that are separated out during the oil refining process. The process used to separate these fractions is called fractional distillation.
Gross energy	Total energy including that derived from primary as well as secondary energy sources. See also net energy.
Gross energy input	Gross energy input reflects the total energy captured from the environment, energy products that are imported, and energy from residuals within the economy.
Gross energy supply and use	Total energy, including that derived from primary as well as secondary energy sources. See also net energy.

Household final consumption expenditure	Net expenditure on goods and services by persons and expenditure of a current nature by private non-profit institutions serving households. This item excludes expenditure by unincorporated businesses and expenditure on assets by non-profit institutions (included in gross fixed capital formation). Also excluded is expenditure on maintenance of dwellings (treated as intermediate expenses of private enterprises), but personal expenditure on motor vehicles and other durable goods and the imputed rent of owner-occupied dwellings are included. The value of 'backyard' production (including food produced and consumed on farms) is included in household final consumption expenditure and the payment of wages and salaries in kind (e.g. food and lodging supplied free to employees) is counted in both household income and household final consumption expenditure.
Hydrogen	Hydrogen (H_2) is a lightweight gas found in water and hydrocarbons. It is not freely available in its pure form but is transformed using other energy sources. In the past, hydrogen has been made from fossil fuels such as natural gas and coal but can also be generated from water using renewable electricity and an electrolyser. Hydrogen can be burnt directly, like natural gas. It can also be stored as a gas or liquid and used in fuel cells to generate electricity for remote communities or mining sites, and to power fuel cell vehicles including cars, trucks, buses and trains.
Hydropower	A process in which flowing water is used to spin a turbine connected to a generator.
Imports	Goods imported (imports) represent the quantity of goods received from other countries or for which ownership changes from non-residents to residents.
Intermediate use	Intermediate use consists of goods and services consumed as inputs by a process of production, excluding fixed assets whose consumption is recorded as consumption of fixed capital. The goods or services may be either transformed or used up by the production process.
Liquefied natural gas	Natural gas that has been processed and then refrigerated to the very low temperatures needed to reach the liquid state.
Liquefied petroleum gas	Consists of propane, butane and isobutane and is derived by processing the natural gas produced from either gas or oil reservoirs through a low-pressure gas separation plant.
Load shedding	Involves the intentional interruption of electricity supply to certain areas to protect the power grid and prevent a nationwide blackout. It is typically a last resort when other measures to balance electricity demand and supply have been exhausted. The primary purpose of load shedding is to lower electricity consumption, maintain grid stability, and avert a complete system failure.
Naphtha	Light or medium oils distilling between 30 degrees celsius (°C) and 210°C that do not meet the specification for motor gasoline. Different naphthas are distinguished by their density and the content of paraffins, isoparaffins, olefins, naphthenes and aromatics. The main uses for naphthas are as feedstock for high-octane gasolines and the manufacture of olefins in the petrochemical industry.
National accounts	Systematic summary of national economic activity. At a detailed level it shows a statistical picture of the performance and structure of the economy.

Natural gas	A combustible mixture of hydrocarbon gases. While natural gas is formed primarily of methane, its composition can vary widely, commonly including ethane, propane, butane and pentane.
Net domestic energy use	Measures all uses of energy by residents of a country. It is equal to the total net use of energy less exports of energy.
Net energy/Net energy supply and use	Total net energy accounts for the transformation process of a primary energy product to a secondary energy product and related conversion losses. In this way, estimates for total net energy avoid double counting the amount of converted primary energy. See also gross energy.
Oil and oil products	Made up of liquid hydrocarbons of fossil fuel origin comprising (a) crude oil, (b) liquids extracted from natural gas, (c) fully or partly processed products derived from the refining of crude oil, and (d) hydrocarbons and organic chemicals of vegetal or animal origin that are functionally similar to liquid hydrocarbons of fossil fuel origin.
Oil shale/Oil sand	A sedimentary rock that contains organic matter in the form of kerogen. Kerogen is a waxy hydrocarbon-rich material regarded as a precursor of petroleum.
Other petroleum products	Other petroleum products include petroleum coke, petroleum-based solvents and chemical feedstocks, and liquefied aromatic hydrocarbons (e.g. benzene/toluene/xylene). Other refined products referred to in the previous account have been disaggregated. Aviation turbine fuel and kerosene are now included under kerosene, aviation gasoline has been reallocated to petrol, and fuel and heating oils have been grouped as fuel oils.
Other volume changes	Other volume changes quantify changes in resources that occur between one period and another.
Output	Consists of goods and services produced within a business that become available for use outside that business, plus any goods and services produced for own final use.
Petajoule	One petajoule is 10^{15} J, or 278 giga-watt hours. The joule is the standard unit of energy in general scientific applications. One joule is the equivalent of one watt of power radiated or dissipated for one second.
Peat	A solid formed from the partial decomposition of dead vegetation under conditions of high humidity and limited air access (initial stage of coalification). It is available in two forms for use as a fuel: sod peat and milled peat.
Petrol	Refinery product made from crude oil. In this account, it includes automotive gasoline and aviation gasoline (which was previously included as other refined products).
Petroleum	Naturally occurring hydrocarbon or mixture of hydrocarbons as oil or gas, or in solution found in sedimentary rocks.
Physical energy flow accounts	PEFA are a statistical accounting framework that record the flows of energy (in TJ) from the environment to the economy (natural inputs), within the economy (products), and from the economy back to the environment (residuals).

Primary energy source	Those forms of energy obtained directly from nature. They include both non-renewable and renewable energy. Primary energy sources include firewood, coal, crude oil, natural gas, liquefied natural petroleum gases, uranium, bagasse, hydro, wind and solar energy.
Propane	A gaseous hydrocarbon and the third member of the paraffin series (following methane and ethane). If exposed to higher pressures or lower temperatures, it can be converted to liquid form and is a major component of LPG.
Refined products	A petroleum product which has been derived from processes such as catalytic cracking and fractional distillation. Refined products include: automotive gasoline and diesel, aviation gasoline and turbine fuel, kerosene and heating oil, industrial diesel and fuel oil, and others such as naphtha and petroleum coke used as fuel.
Renewable energy	Renewable energy is defined as those energy resources that are naturally replenishing. They are virtually inexhaustible in duration but may be limited in the amount of energy available at a given time. Renewable energy resources include biomass, hydro, geothermal, solar, wind, ocean thermal, wave action, and tidal action.
Resource	A concentration of naturally occurring solid, liquid, or gaseous materials in or on the earth's crust and in such form that its economic extraction is feasible now or in the future. The definition does not intend to imply that exploitation of any such material will take place in that time span, but only that its possibility might reasonably be considered.
Secondary energy source	A product that has been derived from a primary energy source. Secondary energy resources include refined petroleum products, coal by-products, coke and electricity.
Solar power	PV conversion generates electric power directly from the light of the sun in a photovoltaic (solar) cell. Solar thermal electric generators use the radiant energy from the sun to produce steam to drive turbines.
Supply-use framework	An accounting framework with the basic principle that the total supply of a product is equal to its total use.
System of Environmental-Economic Accounting	The SEEA is a framework used to develop environmental accounts by integrating environmental information into an accounting framework. The SEEA handbook provides the conceptual basis for developing a framework to describe the relationship between the natural environment and the economy. See also Environmental account.
System of National Accounts	The SNA is an international framework which can be used to develop a comprehensive, consistent and flexible set of macro-economic accounts.
Thermal black coal	Thermal black coal is primarily used in power generation to create electricity. In these accounts, it is aggregated with metallurgical black coal and reported as black coal totals.
Total domestic energy use	A measure of total resident energy use, including losses due to conversion or transformation into other energy products. Total domestic energy use is calculated from total net energy use minus exports of energy products.

Total energy use per capita	Defined as the total net energy use per capita. Energy use per capita is calculated by dividing total net energy use by estimated resident population.
Total supply	Production plus imports.
Transformative use	The transformation of energy products into other energy products, for example the conversion of thermal black coal to produce electricity, or the refining of crude oil to produce petroleum products.
Uranium	Radioactive grey heavy metallic element, used as a source of nuclear energy.
White spirit and special boiling point	White spirit and special boiling point (SBP) industrial spirits are refined distillate intermediates with a distillation in the naphtha/kerosene range. They are mainly used for non-fuel purposes and sub-divided as: (a) white spirit – an industrial spirit with a flash point above 30°C and a distillation range of 135°C to 200°C; and (b) industrial spirit (SBP) – light oils distilling between 30°C and 200°C.
Wind power	The conversion of wind energy into electricity using wind turbines.
Wood and wood waste	Includes wood and wood waste used to produce energy, usually through burning.

Previous publications in the Natural Capital Series

Statistics South Africa (Stats SA), 2020. *Natural Capital Series 1: Land and Terrestrial Ecosystem Accounts, 1990 to 2014*. Discussion document D0401.1. Produced in collaboration with the South African National Biodiversity Institute and the Department of Forestry, Fisheries and the Environment. Statistics South Africa, Pretoria.

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Statistics South Africa, 2024. *Natural Capital Series 5: Experimental Biodiversity-Based Tourism Estimates for South Africa, 2013 to 2019.* Discussion document D0401.5. Produced in collaboration with the South African National Biodiversity Institute and the Department of Forestry, Fisheries and the Environment. Statistics South Africa, Pretoria.

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