Economic Analysis

Environmental Economic Accounts

Environmental Economic Accounts Compendium

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March 2016

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Abbreviations and acronyms

%	Per cent
CBD	Convention on Biodiversity
cm	Centimetre
CSIR	Council for Scientific and Industrial Research
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DWS	Department of Water and Sanitation
EEA	Experimental Ecosystem Accounting
FAO	Food and Agriculture Organisation
GDP	Gross domestic product
km	Kilometre
KZN	KwaZulu-Natal
LCCS	Land Cover classification system
LCEU	Land Cover ecosystem functional units
m	Metre
MARAM	Marine Resource Assessment and Management
MBAPs	Minerals Beneficiation Action Plans
MCS	Marine Stewardship Council
MTSF	Medium Term Strategic Framework
MW	Megawatt
NDP	National Development Plan
NFEPA	National Freshwater Ecosystem Priority Areas
NLC	National Land Cover
OMP	Operational Management Plan
PGMs	Platinum group metals
SANBI	South African National Biodiversity Institute
SDGs	Sustainable development goals
SEEA	System of Environmental Economic Accounting
SNA	System of National Accounts
Stats SA	Statistics South Africa
TAC	Total allowable catch
TJ	Terajoules
UNEP	United Nations Environment Programme
UNSD	United Nations Statistics Division

Figures, maps and tables

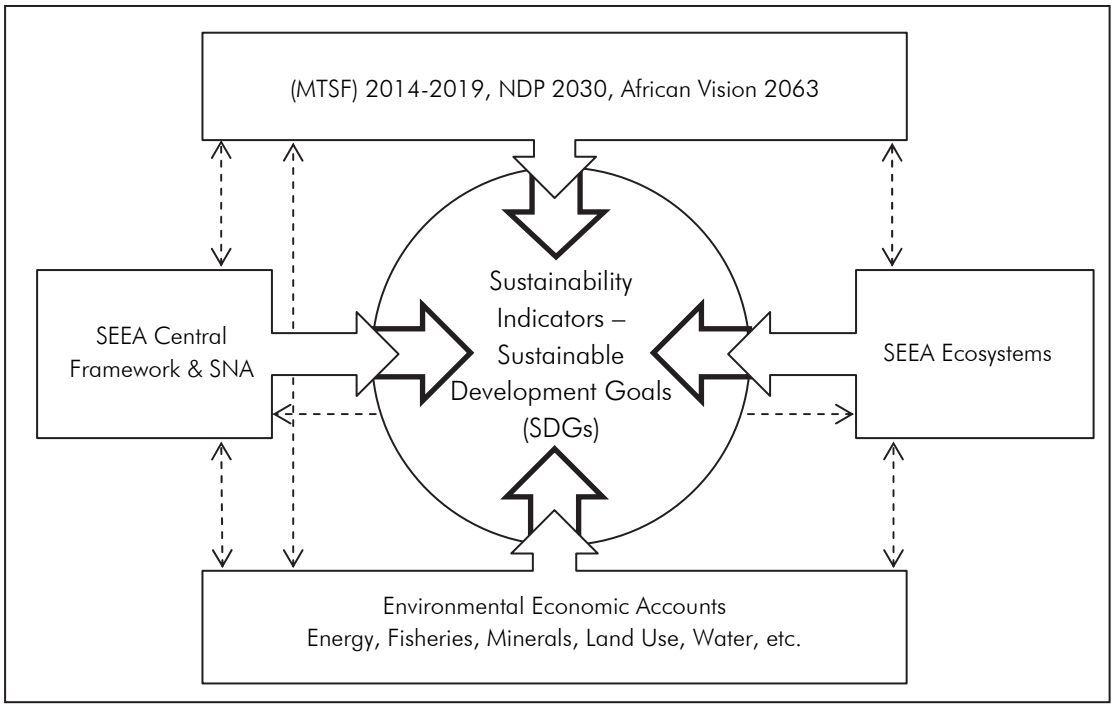
Background

The System of Environmental Economic Accounting (SEEA) is an international statistical standard adopted in 2012. With the adoption of the SEEA Central Framework, the United Nations Statistics Division (UNSD) is developing a programme for implementation of environmental economic accounting and supporting statistics. The SEEA contains three parts, namely the Central Framework, Experimental Ecosystem Accounting (EEA), and Applications and Extensions. The strength of the SEEA is in its approach to integrate statistics for multiple purposes and multiple scales of analyses.[1] Sub-systems of SEEA elaborate on specific resources and sectors.

Statistics South Africa (Stats SA) summarises the key findings of the environmental economic accounts for energy, fisheries and minerals in this report. Indicators from the environmental economic accounts tables are derived in a consistent, comparable and coherent way. The complete tables that include physical stocks and flows for energy, fisheries and minerals, as well as monetary tables for the minerals accounts, are published as a separate Excel online workbook[2] to allow users to manipulate and analyse the information to suit their requirements. The SEEA is compatible with the System of National Accounts (SNA) in terms of its definitions and classifications. An overview of the work pertaining to land use and land cover for ecosystem accounts is presented in the chapter on current developments.

At the United Nations Sustainable Development Summit from 25 to 27 September 2015 in New York, visibility, impetus and political support were brought together to transform the 2030 Agenda for Sustainable Development and its implementation. Member States, Heads of State, government representatives, international organisations, business leaders and civil society participated at the event, with the United Nations Development Programme leading this process. The 2030 Agenda for Sustainable Development includes a set of 17 sustainable development goals (SDGs), with related targets and indicators. The SDGs were recognised as a comprehensive and complex platform for achieving progress internationally and at national level.[3] Figure 1 illustrates the strategies for supporting the sustainable development agenda.

Figure 1: Strategies, systems and frameworks supporting the sustainable development agenda



Source: Statistics South Africa, 2016.

With the United Nations' key focus on sustainable development, it is important for countries to include the SDGs, their targets and a comprehensive list of indicators in strategic plans and budget frameworks. South Africa's Medium Term Strategic Framework (MTSF) 2014–2019 and National Development Plan (NDP) 2030 address issues contained in the SDGs (Figure 1). The African Agenda 2063 is the African continent's alignment to the Sustainable Development Programme.

Chapter 1 – Energy

1. Overview

The key findings for energy are focused on the distribution of energy supply by source and energy use by sector for the reference years 2003 to 2012. The sources of energy are coal, crude oil, gas, hydro, nuclear, petroleum products, and renewables and waste.

According to the MTSF 2014–2019, expansion of electricity supply is a priority. Power from the new Medupi coal-fired plant has already relieved supply constraints. Long-term energy security will continue to be a strategic focus, with the South African Government pursuing options with regard to the energy mix that will include coal, nuclear, shale gas, off-shore gas as well as renewable energy sources. These energy considerations will take environmental, financial, social and other considerations into account.[4] The NDP 2030 states that South Africa should invest in and assist with the exploitation of a broad range of opportunities for low-carbon energy from hydroelectric and other clean energy sources. The NDP 2030 also includes the production of sufficient energy to support industry and households as an enabling milestone. A critical action is the provision of public infrastructure investment focused on energy. An important action is the investment in renewable electricity by 2030 and decommissioning ageing coal-fired power stations. A low-carbon future is the only realistic option, with energy-industrial rejuvenation offering opportunities to shape the future for energy innovation and security, at the same time providing a cleaner and safer environment, while retaining greater biodiversity.[5] These are in alignment with SDGs 7, 9, 12 and 13. SDG 7: Ensure access to affordable, reliable, sustainable and modern energy for all. SDG 9: Build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation. SDG 12: Ensure sustainable consumption and production patterns. SDG 13: Take urgent action to combat climate change and its impacts.[6]

The new Household Electrification Strategy was approved by Cabinet in 2013. The installation of new connections will take the form of renewables, both grid and non-grid connections. The goals for 2020 and beyond are to contract more than 20 000 megawatts (MW) of renewable energy that will include a larger share of regional hydro-electricity. Some of Eskom's older coal-powered stations will be decommissioned with new coal capacity contracted, partially from other southern African countries.[7]

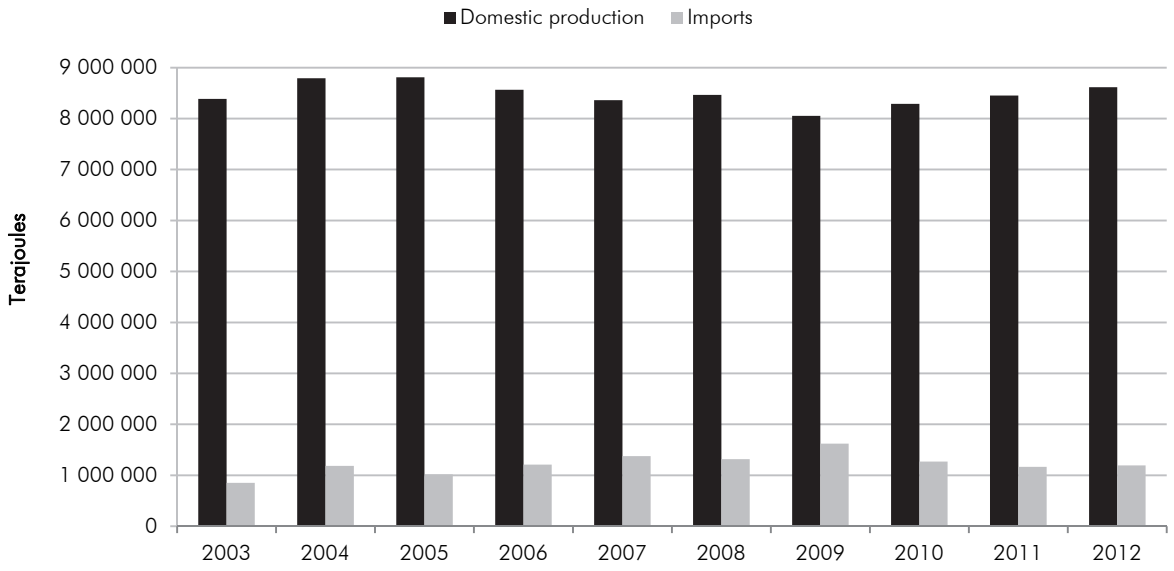
The main sources for production of energy in South Africa are coal, crude oil and refineries. South Africa's oil reserves are limited and the bulk of the country's crude oil requirements are met by imports from the Middle East and Africa. South Africa's indigenous energy-resource base is dominated by coal. In 2013, the estimation was that 118 years of coal supply are left.[2] Production of energy from liquid fuels remains challenging, due to gas stocks for the existing gas-to-liquids plant from offshore gas fields declining. The southern Cape offers the opportunity for investment in gas fields located in close or adjacent proximity. A key feature of liquid-fuels is the production thereof in coastal areas, of which 68 per cent (%) is consumed in Gauteng. A 555-kilometre (km) pipeline runs from Durban to Gauteng, transporting jet fuel, unleaded petrol, and low- and ultra-low sulphur diesel with a carrying capacity of 8,4 billion litres.[7]

South Africa's Cabinet approved the gazetting of technical regulations for petroleum in October 2013. Recommendations to strengthen regulations are proposed to ensure that negative impacts of South African shale-gas exploration and exploitation would be mitigated.[7] The Integrated Resource Plan for Electricity 2010–2030 is a government policy and extends to 2040. Diversification of electricity supply is part of the building plan and includes nuclear and renewables. This has considerations and implications with regard to coal supply and the associated uncertainty with capacity of new mines and exports that could severely impact on electricity supply. Renewables, nuclear and liquid fuels would need to be rapidly phased into the energy mix for a smooth transition to supply sufficient electricity to meet the country's needs.[7, 8, 9]

1.1 Energy supply and use, 2003 to 2012

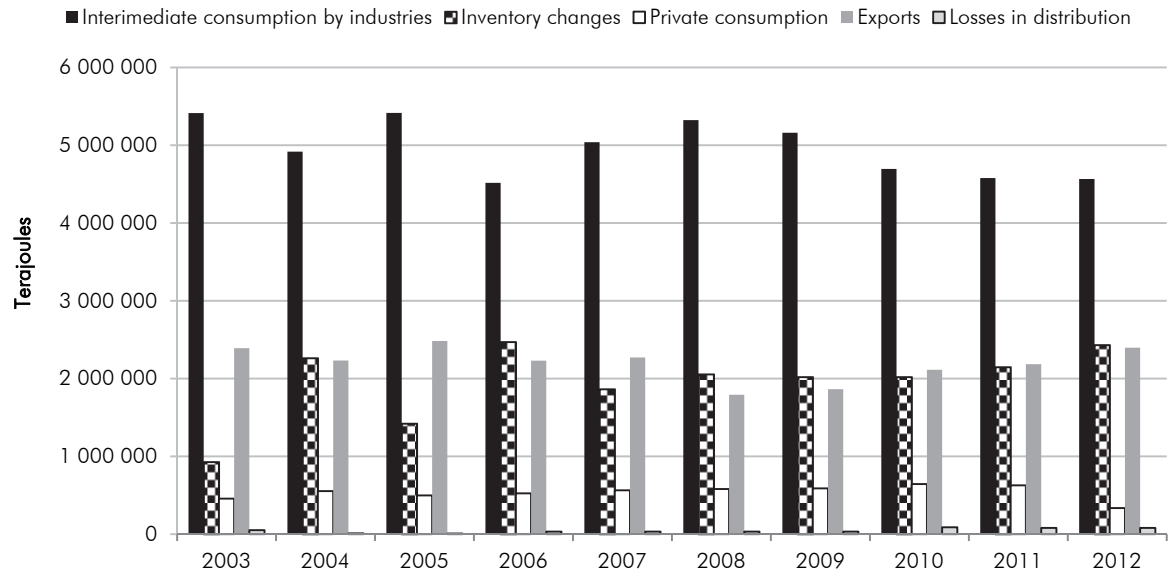
Figure 1.1 and Table 1.1 show energy supply in Terajoules (TJ) for the years 2003 to 2012. Figure 1.2 and Table 1.2 show domestic energy use for the years 2003 to 2012. Domestic production increased by 2,7% from 8 385 313 TJ in 2003 to 8 614 894 TJ in 2012. Imports increased by 40% from 852 397 TJ in 2003 to 1 194 681 TJ in 2012. Intermediate consumption decreased by 15,6% from 5 412 057 TJ in 2003 to 4 565 288 TJ in 2012. Exports increased by 0,2% from 2 391 112 TJ in 2003 to 2 396 092 TJ in 2012.

Figure 1.1: Energy supply, 2003–2012



Sources: Department of Energy, 2015. *Energy Balances, 2003-2012*. Statistics South Africa. Environmental Economic Account Tables.

Figure 1.2: Energy use, 2003–2012



Note: Coal, crude oil, gas, renewables and waste are the main contributors to inventory changes, due to transformation.
Sources: Department of Energy, 2015. *Energy Balances, 2003-2012*. Statistics South Africa. Environmental Economic Account Tables.

Table 1.1: Energy supply, 2003–2012

	2003	2004	2005	2006	2007
			Terajoules		
Domestic production	8 385 313	8 792 339	8 809 280	8 565 319	8 359 646
Imports	852 397	1 183 446	1 017 563	1 209 496	1 376 677
	2008	2009	2010	2011	2012
			Terajoules		
Domestic production	8 464 675	8 053 760	8 287 967	8 451 591	8 614 894
Imports	1 317 166	1 621 099	1 269 680	1 164 323	1 194 681

Note: Figures are rounded.
Sources: Department of Energy, 2015. *Energy Balances, 2003-2012*. Statistics South Africa. Environmental Economic Account Tables.

Table 1.2: Energy use, 2003–2012

	2003	2004	2005	2006	2007
			Terajoules		
Intermediate consumption by industries	5 412 057	4 916 806	5 415 260	4 514 716	5 039 045
Inventory changes	927 832	2 263 865	1 421 982	2 471 680	1 863 492
Private consumption	455 733	552 888	498 256	524 686	563 663
Exports	2 391 112	2 231 611	2 482 535	2 230 088	2 270 123
Losses in distribution	50 976	10 616	8 809	33 646	33 646
	2008	2009	2010	2011	2012
			Terajoules		
Intermediate consumption by industries	5 322 305	5 159 945	4 693 705	4 577 175	4 565 288
Inventory changes	2 054 477	2 029 343	2 020 756	2 147 142	2 432 385
Private consumption	580 124	587 482	643 002	627 261	335 345
Exports	1 791 291	1 864 445	2 112 198	2 185 143	2 396 092
Losses in distribution	33 646	33 646	88 085	79 193	80 464

Note: Figures are rounded.
Sources: Department of Energy, 2015. *Energy Balances, 2003-2012*. Statistics South Africa. Environmental Economic Account Tables.

Chapter 2 – Fisheries

2. Overview

South Africa's coastline spans 3 200 km, linking the east and west coasts of Africa. Its shores are rich in biodiversity, with some 10 000 species of marine plants and animals recorded. The productive waters of the West Coast support a variety of commercially exploited marine life that includes hake, anchovy, sardine, horse mackerel, tuna, snoek, rock lobster and abalone. On the East Coast one finds squid, line fish and a whole range of intertidal resources that provide an important source of food and livelihoods for coastal communities. Marine life that is not harvested, such as whales, dolphins and seabirds, is increasingly recognised as a valuable resource for nature-based tourism.

According to the Department of Agriculture, Forestry and Fisheries (DAFF), the South African fishing industry is managed through scientific research, monitoring, control, surveillance and the use of an ecosystem approach for fisheries management.[10] The coastline provides substantial opportunities for economic and social development. However, it is a resource threatened by inappropriate development, pollution, poaching and over-use. There are two components to the fishing sector: wild capture and aquaculture. Programmes are developed to reduce the degradation of the marine environment through policies that promote conservation and sustainable use of marine-living resources. They also aim to restore and maintain productive capacity and biodiversity of the marine environment and protect human health.

According to the DAFF, the projected increase in demand for high-end fishery products (e.g. abalone and lobster, which are expensive and likely to appeal to the sophisticated market) provides an opportunity for substantial increases in aquaculture production. Total annual fish production from marine fisheries exceeds 600 000 tons. With South Africa's environmental potential for aquaculture and the state of development of its industry, production could grow substantially over the next 10 to 20 years.[10]

As of July 2010, the commercial harvesting of abalone was opened to allow fishing communities to derive a livelihood from the sea. This came with multifaceted conditions to ensure that social, economic and security plans and structures were in place to support communities, especially along the entire South-western and West Coast of South Africa.

The fishing sector comprises large-scale operators as well as small-scale, artisanal or recreational fishermen and women. The Small-Scale Fisheries Policy aims to support investment in community entities to take joint responsibility for sustainable management of the fishery resources and to address the depletion of critical fish stocks.[10]

In order to realise the NDP 2030 Vision for Environmental Sustainability and Resilience, there are a number of constraints that must be urgently addressed. South Africa faces the challenge of deteriorating environmental quality. This is due to pollution and natural resource degradation, destruction and/or depletion rates where the consumption is greater than the production. If the current challenges are not effectively addressed they will worsen the rate of environmental degradation and have the potential to negatively influence many of the positive advances made in meeting South Africa's own development goals and the SDGs as well as the NDP 2030 vision.[5, 6]

According to the NDP 2030, two issues are important with regard to natural resource use, which includes the South African fishing industry:

Inadequately informed decision-making and governance

The information management systems for environmental sustainability in particular are still inadequate. Although South Africa's environmental governance is considered world class, there are capacity constraints at different levels, for example in the areas of compliance monitoring and enforcement. This reinforces many of the problems experienced. Research and information management capacity need to be built to identify, develop and maintain datasets to generate policy-relevant statistics, indicators and indices in collaboration with key contributors within and outside the sector.

Natural resource degradation and depletion of ecological infrastructure

Competing land uses contribute to the over-exploitation and degradation of natural resources. This results in an overall negative impact on ecological infrastructure that undermines the provision of key ecosystem services such as terrestrial and marine assets which underpin the economy and sustainable development.

Production processes that cannot be maintained in the long term result in land and ecosystem degradation and soil erosion, which continue to undermine the productive potential of the marine environment and compromise food security. The size, representativeness and quality of the current conservation status are not sufficient.

The challenge for fishery and marine resources is to maintain the integrity and balance in ecosystems while deriving sustainable economic benefits from these resources. The main constraints to achieve this are the productivity of key resources, which is influenced by the environment and impacted upon by illegal catches, and managing catches in each fishery in a sustainable way. The desired outcomes are to rebuild stocks of threatened species and to reduce illegal catches.

All these necessitate integrated and innovative approaches to natural resource management, which entails a careful balance between essential development and sustainable utilisation. An environmental management framework is required to ensure that developments that have serious environmental or social effects are offset by supportive improvements in related areas. There is also a need to protect estuaries and coastal areas to ensure that a targeted amount of land and oceans are under protection.[5]

This document focuses on hake, West Coast rock lobster, abalone, Cape horse mackerel and South Coast rock lobster as the main marine resources that contribute to the economy. Key findings for these fishery resources are for the closing stocks and total allowable catches (TAC) for the years 2005 to 2014.

2.1 Hake

The South African hake resource comprises two species, namely shallow-water Cape hake (*Merluccius capensis*) and deep-water Cape hake (*M. paradoxus*). The Cape hakes are distributed on the continental shelf and upper slope around the coast of southern Africa. Deep-water hake are distributed from northern Namibia to southern Mozambique, while shallow-water hake are distributed mainly from southern Angola to northern KwaZulu-Natal. As the names suggest, the distributions of the two hake species differ with depth, although there is a substantial overlap in their depth ranges. Shallow-water hake are distributed over a depth range of 30 metres (m) to 500 m with most of the population occurring between 100 m and 300 m. In contrast, deep-water hake are distributed over a depth range of 110 m to deeper than 1 000 m with most of the population occurring in depths of between 200 m and 800 m. As the sizes of both species increase with depth, large shallow-water hake co-exist with (and feed extensively on) smaller deep-water hake. It is difficult to distinguish between the two hake species, so they are generally processed and marketed as a single commodity.[10, 11]

Cape hakes are targeted by four fishery sectors: deep-sea demersal trawl, inshore demersal trawl, hake long line, and hake hand line, with most of the catch being taken by the deep-sea trawl sector. Hakes are also caught as incidental by-catch in the horse mackerel-directed midwater trawl and demersal shark long line fisheries, and to a lesser extent in the line fish sector. The inshore trawl and hand line sectors operate only on the South Coast, whereas the deep-sea trawl and long line fleets operate on both the West and South coasts.

On the West Coast, the continental shelf is fairly narrow, so most trawling is in deep water on the shelf edge and upper slope, and as much as 90% of the hake caught are deep-water hake. In contrast, most trawling on the South Coast is on the wide continental shelf, the Agulhas Bank, and as much as 70% of hake catches on this coast are shallow-water hake. While not the largest fishery in terms of tonnage (the small pelagic purse fishery targeting sardine and anchovy lands the largest amount of fish at present), the hake fishery is the most valuable of South Africa's marine fisheries, providing the basis for some 30 000 jobs and an annual landed value in excess of R5,2 billion.[10]

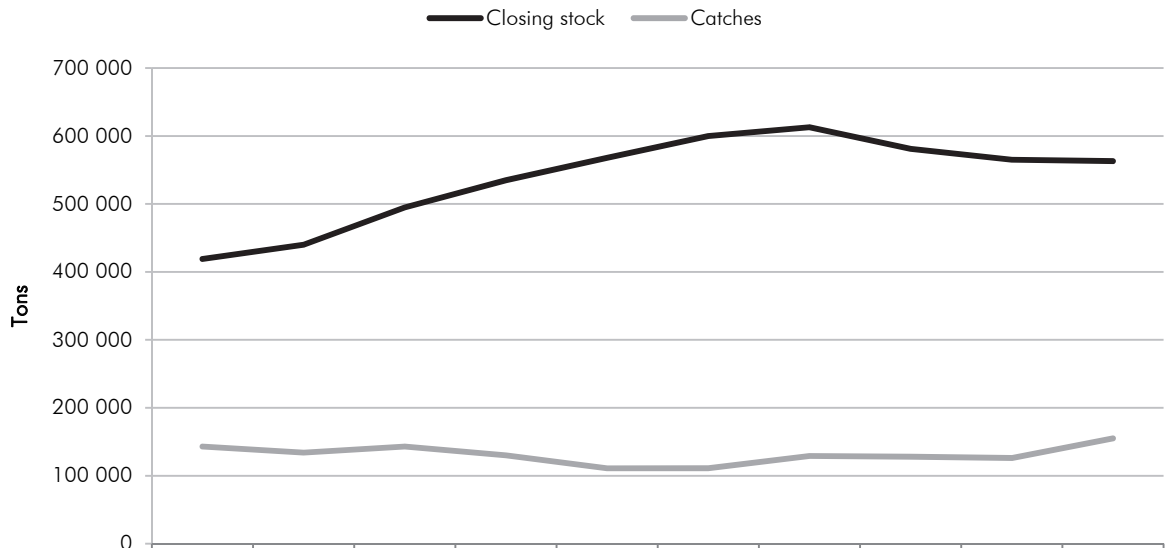
The South African hake fishery has become more inclusive and consultative recently. All fishing rights holders have signed Codes of Conduct, committing them to compliance procedures and accepting the concept of sustainable harvesting. An Operational Management Plan (OMP) is in place to allow the recovery of *M. paradoxus* stocks to sustainable levels within 20 years.[10]

The key findings for the hake commercial fishing industry are focused on total catches and closing stock over the years 2005 to 2014.

Hake closing stock and total catches, 2005 to 2014

The closing stock of hake increased from 419 000 tons in 2005 to 563 000 tons in 2014. This is an increase of 34,4% over ten years. Total catches of hake increased from 143 000 tons in 2005 to 155 000 tons in 2014. This is an increase of 8,4% over ten years.

Figure 2.1: Hake closing stock and total catches, 2005–2014



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Closing stock	419 000	440 000	495 000	535 000	568 000	600 000	613 000	581 000	565 000	563 000
Catches	143 000	134 000	143 000	130 000	111 000	111 000	129 000	128 000	126 000	155 000

Source: Statistics South Africa. Environmental Economic Accounts Tables. Note: Figures are rounded.

Table 2.1: Hake closing stock and total catches, 2005–2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
						Tons				
Closing stock	419 000	440 000	495 000	535 000	568 000	600 000	613 000	581 000	565 000	563 000
Catches	143 000	134 000	143 000	130 000	111 000	111 000	129 000	128 000	126 000	155 000
						% change from previous period				
Closing stock		5,0%	12,5%	8,1%	6,2%	5,6%	2,2%	-5,2%	-2,8%	-0,4%
Catches		-6,3%	6,7%	-9,1%	-14,6%	0,0%	16,2%	-0,8%	-1,6%	23,0%

Note: Closing stock is influenced by other volume changes and not only the catches reflected here. Refer to Excel Online Workbook. Figures are rounded.
Source: Statistics South Africa. Environmental Economic Accounts Tables.

2.2 West Coast rock lobster

The West Coast rock lobster (*Jasus lalandii)* is a species of spiny lobster found off the coast of southern Africa. It occurs in the shallow waters from Cape Cross in Namibia to Algoa Bay in East London in South Africa, where it can usually be found in rocky outcrops in the sea. In South Africa, the commercial fishery operates between the Orange River Mouth and Danger Point. West Coast rock lobsters are slow-growing, long-lived animals listed on the National Environmental Management Biodiversity Act of 2004 as a threatened and protected species, which means that it is a species of high conservation value or national importance that requires national protection.

West Coast rock lobster is caught via a number of methods, mainly using traps or ring-nets. Hand collection is used by recreational fishers. These methods are very selective, and thus the by-catch levels are low or non-existent. These methods are minimally destructive to benthic habitats or benthic species (characteristics of the sea bottom and the plants and animals that live there), but depletion of lobsters will have had adverse effects on the benthos as West Coast rock lobster has important effects as a predator.

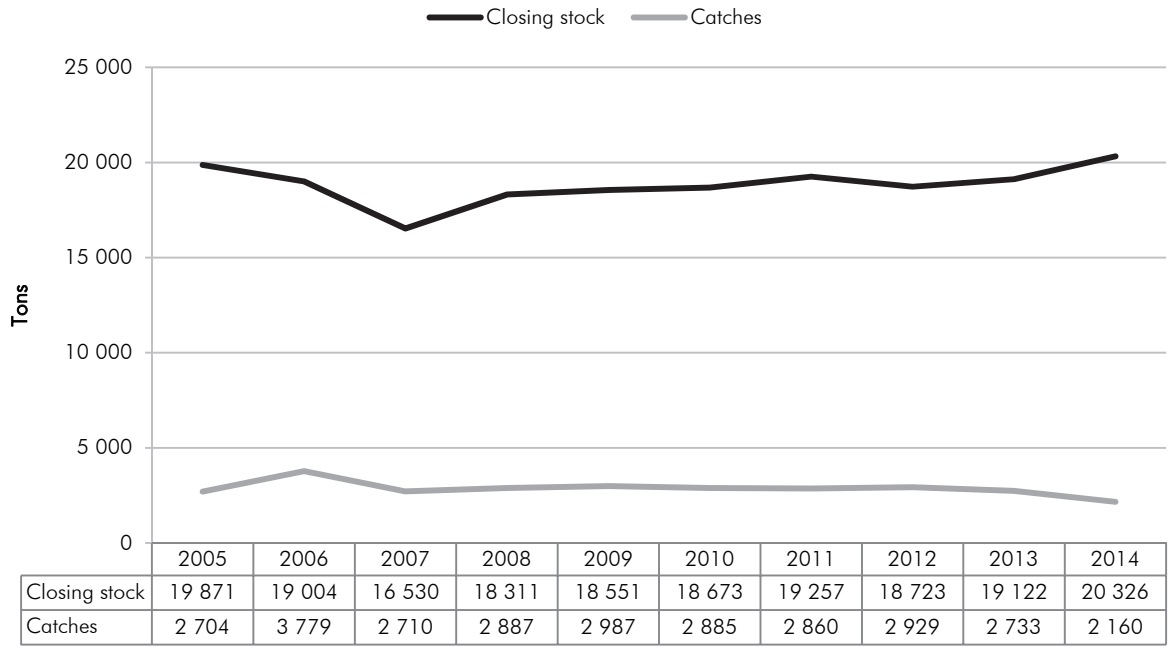
The commercial fishery for West Coast rock lobster is controlled by TAC, which is subdivided across geographical areas. However, there is a considerable amount of poaching from the stock, which adds to the uncertainty of the stock assessment. Other issues of concern are whale entanglements in the gear as well as gear loss, which results in ghost fishing. This concern has been decreased because the netting for the traps is made of biodegradable materials. Ecosystem-based management has been put in place for this fishery. The invasion by West Coast rock lobsters of the traditional abalone fishing zones east of Cape Hangklip marked the onset of the eastward shift in lobster distribution. Commercially viable quantities of lobster in this area resulted in the opening of three new lobster fishing zones. There is a decline in catches, which has a devastating effect on the coastal communities, with economic hardships experienced by most fishers on the West Coast. In the face of resource decline, an OMP was developed which aims to rebuild the stock to sustainable levels.[10]

The key findings for West Coast rock lobster include commercial, recreational, and subsistence catches, as well as poaching estimates. The focus is on total catches and closing stock over the years 2005 to 2014.

West Coast rock lobster closing stock and total catches, 2005 to 2014

The closing stock of West Coast rock lobster increased from 19 871 tons in 2005 to 20 326 tons in 2014. This is an increase of 2,3% over ten years. Total catches of West Coast rock lobster declined from 2 704 tons in 2005 to 2 160 tons in 2014. This is a decline of 20,1% over ten years.

Figure 2.2: West Coast rock lobster closing stock and total catches, 2005–2014



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Closing stock	19 871	19 004	16 530	18 311	18 551	18 673	19 257	18 723	19 122	20 326
Catches	2 704	3 779	2 710	2 887	2 987	2 885	2 860	2 929	2 733	2 160

Source: Statistics South Africa. Environmental Economic Accounts Tables.

Table 2.2: West Coast rock lobster closing stock and total catches, 2005–2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
					Tons					
Closing stock	19 871	19 004	16 530	18 311	18 551	18 673	19 257	18 723	19 122	20 326
Catches	2 704	3 779	2 710	2 887	2 987	2 885	2 860	2 929	2 733	2 160
					% change from previous period					
Closing stock		-4,4%	-13,0%	10,8%	1,3%	0,7%	3,1%	-2,8%	2,1%	6,2%
Catches		39,8%	-28,3%	6,5%	3,5%	-3,4%	-0,9%	2,4%	-6,7%	-21,0%

Note: Closing stock is influenced by other volume changes and not only the catches reflected here. Refer to Excel Online Workbook.
Source: Statistics South Africa. Environmental Economic Accounts Tables.

2.3 Abalone

Abalone (*Haliotis midae*), locally called 'perlemoen', is a large marine snail that is a highly prized seafood delicacy in the Far East. Abalone are slow-growing, reaching sexual maturity at around seven years of age, and take approximately 8 to 9 years to reach the minimum legal size of 11,4 centimetre (cm) shell breadth. Abalone reach a maximum size of 18 cm shell breadth, and are believed to live to an average age of greater than 30 years. They occur in shallow waters of below 20 m in depth, with the highest densities in waters of below 5 m in depth.[10]

Abalone are widely distributed around the South African coastline, from St Helena Bay on the West Coast to just north of Port St Johns along the East Coast. Historically, the resource was most abundant in the region between Cape Columbine and Quoin Point, where it supported a commercial fishery for almost 60 years. Along the East Coast, the resource was considered to be discontinuous and sparsely distributed and as a result no commercial fishery for abalone was implemented there. However, harvesting of abalone along the East Coast was allowed for a number of years through the allocation of experimental permits and subsistence exemptions. The recreational sector also targeted abalone for many years, but due to the decline in the resource, this component of the fishery was suspended in 2003/2004.[10]

Once a lucrative commercial fishery, earning up to approximately R100 million annually at the turn of the century, rampant illegal harvesting and continued declines in the abundance of the resource resulted in a total closure of the fishery in February 2008. The resource has also been heavily impacted by an ecosystem shift that was brought about by the migration of West Coast rock lobster into two of the main, most productive abalone fishing areas.[10]

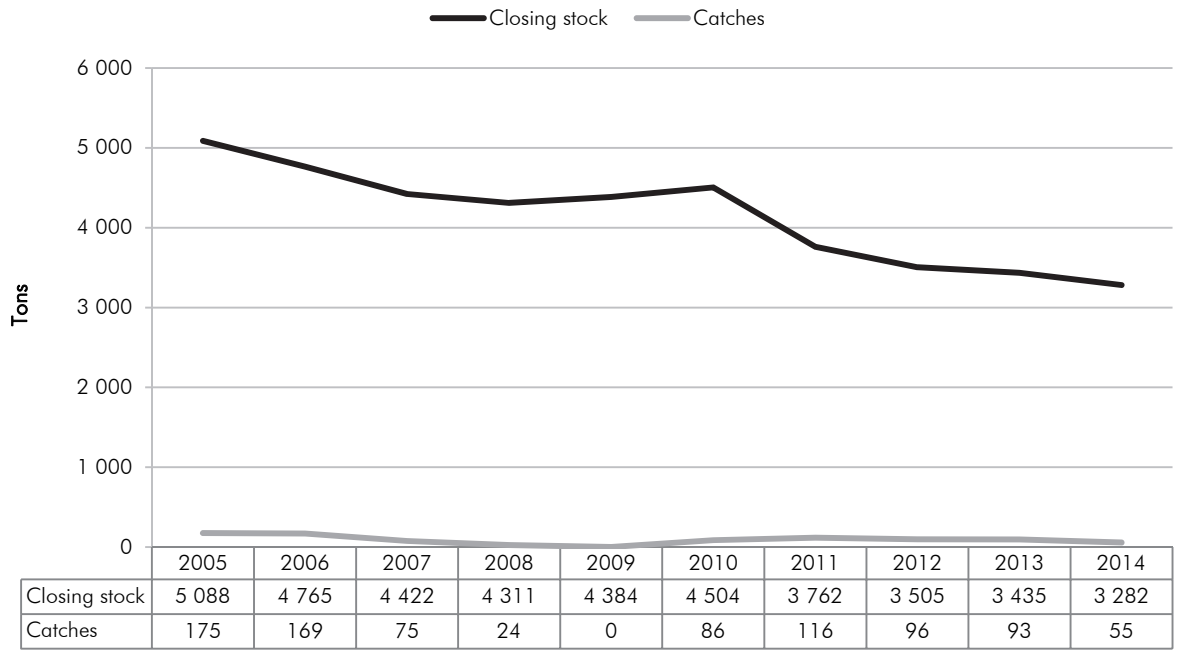
The commercial fishery subsequently re-opened in July 2010. The status of the abalone resource continues to decline in response to extremely high levels of illegal harvesting and over-allocation of TAC.[10]

The key findings for abalone include commercial and experimental sustainable estimates. The focus is on total catches and closing stock over the years 2005 to 2014.

Abalone closing stock and total catches, 2005 to 2014

The closing stock of abalone declined from 5 088 tons in 2005 to 3 282 tons in 2014. This is a decline of 35,5% over ten years. Total catches of abalone declined from 175 tons in 2005 to 55 tons in 2014. This is a decline of 68,6% over ten years.

Figure 2.3: Abalone closing stock and total catches, 2005–2014



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Closing stock	5 088	4 765	4 422	4 311	4 384	4 504	3 762	3 505	3 435	3 282
Catches	175	169	75	24	0	86	116	96	93	55

Source: Statistics South Africa. Environmental Economic Accounts Tables.

Table 2.3: Abalone closing stock and total catches, 2005–2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
					Tons					
Closing stock	5 088	4 765	4 422	4 311	4 384	4 504	3 762	3 505	3 435	3 282
Catches	175	169	75	24	0	86	116	96	93	55
					% change from previous period					
Closing stock		-6,3%	-7,2%	-2,5%	1,7%	2,7%	-16,5%	-6,8%	-2,0%	-4,5%
Catches		-3,4%	-55,6%	-68,0%	-100,0%	---	34,9%	-17,2%	-3,1%	-40,9%

Note: Closing stock is influenced by other volume changes and not only the catches reflected here. Refer to Excel Online Workbook.
Source: Statistics South Africa. Environmental Economic Accounts Tables.

2.4 Cape horse mackerel

Cape horse mackerel (*Trachurus capensis*) is a semi-pelagic shoaling fish that occurs on the continental shelf off southern Africa from southern Angola to the Wild Coast.

Horse mackerel as a group are recognised by a distinct dark spot on the gill cover and a row of spiny scales (scutes) along the lateral line. It is, however, not easy to distinguish between the three species that occur in southern Africa. Cape horse mackerel generally reach 40 cm to 50 cm in length and become sexually mature at around three years of age when they are roughly 20 cm long. They feed primarily on small crustaceans, which they filter from the water using their modified gillrakers. Historically, large surface schools of adult Cape horse mackerel occurred on the West Coast and supported a purse-seine fishery that made substantial catches. These large schools have since disappeared from the South African West Coast, but still occur off Namibia where horse mackerel are the most abundantly harvested fish. Adult horse mackerel currently occur more abundantly on the South Coast than the West Coast of South Africa.

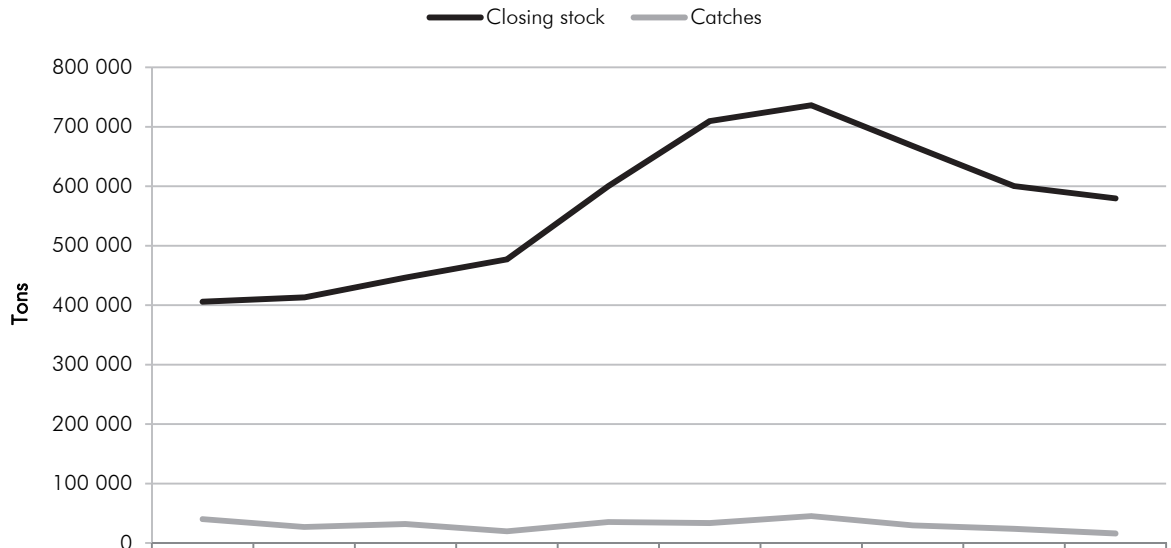
Adult Cape horse mackerel are taken as a by-catch by the demersal trawl fleet and as a targeted catch by the midwater trawl fleet, mainly on the South Coast. In addition, the pelagic purse-seine fleet on the West Coast takes juveniles as a by-catch. Cape horse mackerel yield a low value product and are a cheap source of protein.[10]

The key findings for Cape horse mackerel focus on by-catches by the demersal trawl fleet and as targeted catches by the midwater trawl fleet. The focus is on total catches and closing stock over the years 2005 to 2014.

Cape horse mackerel closing stock and total catches, 2005 to 2014

The closing stock of Cape horse mackerel increased from 405 750 tons in 2005 to 579 474 tons in 2014. This is an increase of 42,8% over ten years. Total catches of Cape horse mackerel declined from 40 195 tons in 2005 to 15 900 tons in 2014. This is a decline of 60,4% over ten years.

Figure 2.4: Cape horse mackerel closing stock and total catches, 2005–2014



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Closing stock	405 750	412 915	446 257	477 012	600 450	709 566	736 284	667 894	600 215	579 474
Catches	40 195	27 014	31 744	19 818	35 213	33 351	45 162	29 719	23 732	15 900

Source: Statistics South Africa. Environmental Economic Accounts Tables.

Table 2.4: Cape horse mackerel closing stock and total catches, 2005–2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
					Tons					
Closing stock	405 750	412 915	446 257	477 012	600 450	709 566	736 284	667 894	600 215	579 474
Catches	40 195	27 014	31 744	19 818	35 213	33 351	45 162	29 719	23 732	15 900
					% change from previous period					
Closing stock		1,8%	8,1%	6,9%	25,9%	18,2%	3,8%	-9,3%	-10,1%	-3,5%
Catches		-32,8%	17,5%	-37,6%	77,7%	-5,3%	35,4%	-34,2%	-20,1%	-33,0%

Note: Closing stock is influenced by other volume changes and not only the catches reflected here. Refer to Excel Online Workbook.
Source: Statistics South Africa. Environmental Economic Accounts Tables.

2.5 South Coast rock lobster

South Coast rock lobster (*Palinurus gilchristi*) is endemic to the southern coast of South Africa, where they occur on rocky substrata at depths of 50 m to 200 m.

The fishery operates between East London and Cape Point and up to 250 km off-shore along the outer edge of the Agulhas Bank. Fishing gear is restricted to long lines with traps. It is the second largest rock lobster fishery in South Africa, and is capital intensive, requiring specialised equipment and large ocean-going vessels. For this reason, it is restricted to the commercial sector.

Products (frozen tails, whole or live lobster) are exported to the United States of America, Europe and the Far East. Sales are affected by seasonal overseas market trends and competition from other lobster-producing countries. High prices on international markets and the rand to dollar exchange rate make the sector lucrative.

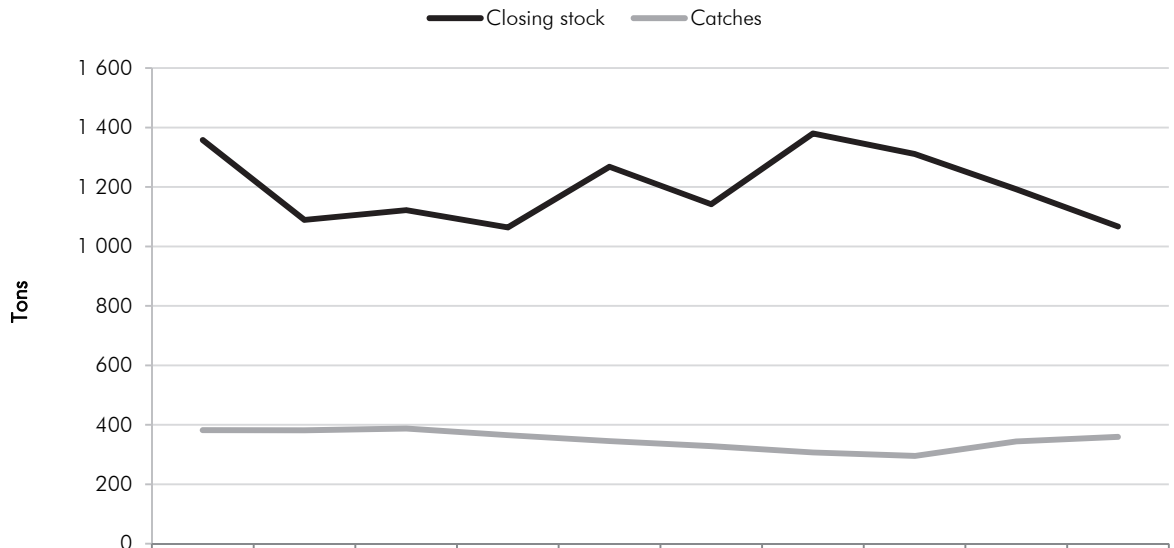
Long line trap-fishing is labour intensive and as such each boat requires approximately 30 officers and crew. The total sea-going complement of the fleet is about 300. The sector employs approximately 100 land-based factory (processing) and administrative staff.[10]

The key findings for South Coast rock lobster focus on specialised commercial harvesting requiring specialised equipment. The focus is on total catches and closing stock over the years 2005 to 2014.

South Coast rock lobster closing stock and total catches, 2005 to 2014

The closing stock of South Coast rock lobster declined from 1 358 tons in 2005 to 1 067 tons in 2014. This is a decline of 21,4% over ten years. Total catches of South Coast rock lobster declined from 382 tons in 2005 to 359 tons in 2014. This is a decline of 6,0% over ten years.

Figure 2.5: South Coast rock lobster closing stock and total catches, 2005–2014



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Closing stock	1 358	1 089	1 122	1 064	1 268	1 142	1 380	1 311	1 192	1 067
Catches	382	381	387	365	345	328	307	295	344	359

Source: Statistics South Africa. Environmental Economic Accounts Tables.

Table 2.5: South Coast rock lobster closing stock and total catches, 2005–2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
					Tons					
Closing stock	1 358	1 089	1 122	1 064	1 268	1 142	1 380	1 311	1 192	1 067
Catches	382	381	387	365	345	328	307	295	344	359
					% change from previous period					
Closing stock		-19,8	3,0	-5,2	19,2	-9,9	20,8	-5,0	-9,1	-10,5
Catches		-0,3	1,6	-5,7	-5,5	-4,9	-6,4	-3,9	16,6	4,4

Note: Closing stock is influenced by other volume changes and not only the catches reflected here. Refer to Excel Online Workbook.
Source: Statistics South Africa. Environmental Economic Accounts Tables.

Chapter 3 – Minerals

3. Overview

South Africa has a wealth of mineral resources. The mineral industry is a significant contributor the country's gross domestic product (GDP), but due to a number of factors, growth in mineral production has been weakened according to the South African Reserve Bank. The Framework Agreement for a Sustainable Mining Industry was signed in July 2013 to restore confidence in the mining sector.[7, 12]

The South African Government's industrialisation policy advocates a conceptual shift in mineral development and strategic investment in assets for the best results in long-term benefits. It also calls for a paradigm shift in enhancing exports values, increasing local content for consumption and sustainable job creation.[7]

In 2013 the Department of Mineral Resources developed a plan to address the long-term sustainability of platinum and gold. The platinum and gold sectors had been negatively affected by persistent weakness in the global economy, which had an adverse bearing on their long-term viability. The department expects to find appropriate government-wide measures for appropriate sector-wide responses. The particular focus is on supply- and demand-side interventions.[7]

In March 2013, a bilateral cooperation agreement was signed by Russia and South Africa in the development of platinum group metals (PGMs), with the intention to stabilise the platinum industry through sustainable expansion of the PGM market.[7]

During October 2013, the first National Jewellery Forum was held in Johannesburg. The forum unites mining and jewellery manufacturing associations and government to establish a global hub of South African entrepreneurs.[7]

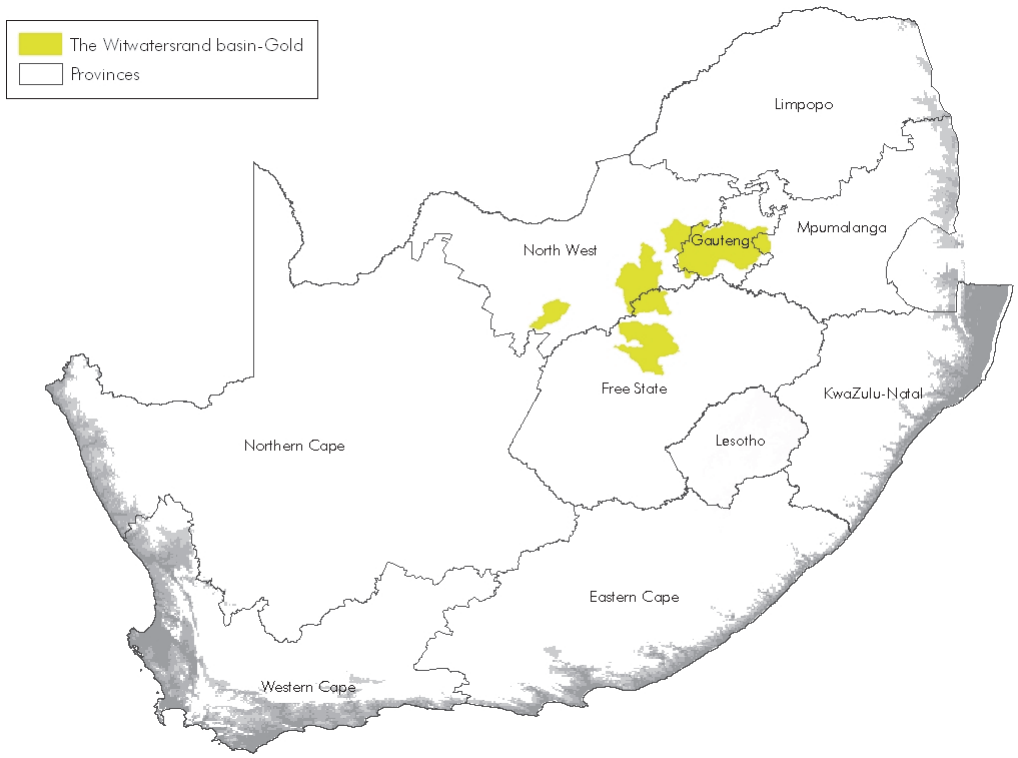
According to the NDP 2030, South Africa has to explore credible ways to improve the energy efficiency of mining and minerals processing, while expanding mineral extraction, beneficiation and exports, and balancing the trade-offs to a low-carbon economy.[5]

South Africa's mineral wealth is found in well-known geological formations and settings, i.e. the Witwatersrand Basin (gold deposits), the Bushveld Complex (PGM deposits) and the Karoo Basin (coal deposits).

The Witwatersrand Basin

The geology and gold mines of the 'Ridge of White Waters' are world famous. Nearly half of all the gold ever mined has come from the extensive Witwatersrand conglomerate reefs that were discovered in 1886, not far from Johannesburg's city centre – seven major goldfields distributed in a crescent-like shape along the 350 km long basin, which produced more than 50 055 tons of gold.[7]

Map 1.1: The Witwatersrand Basin

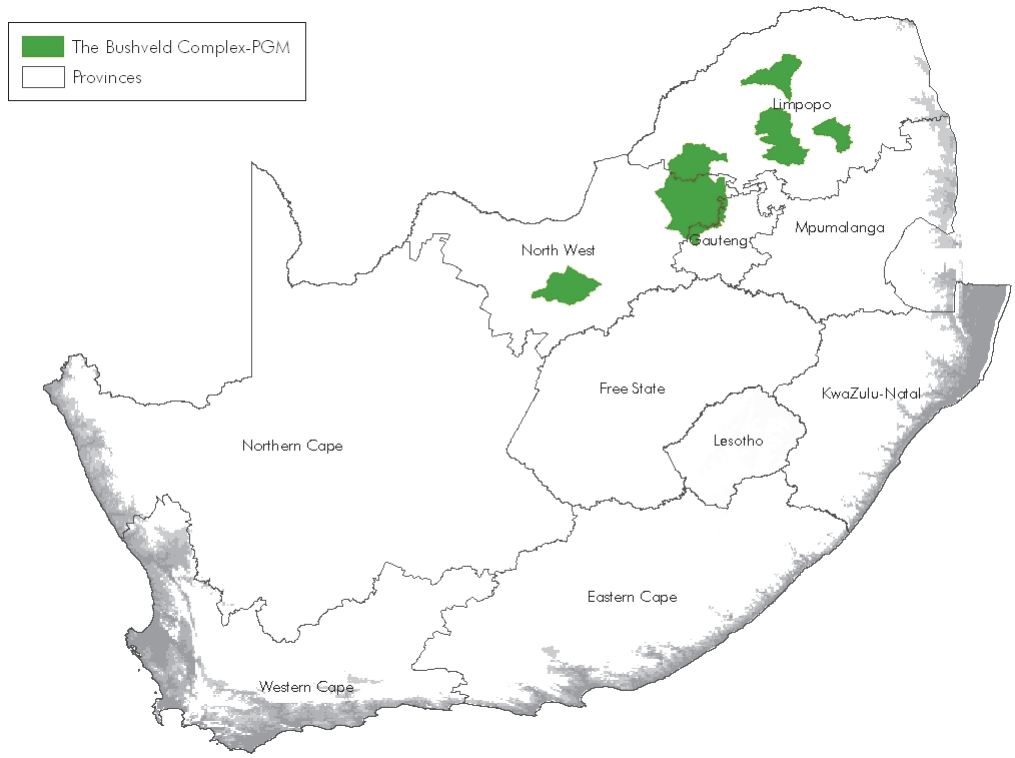


Sources: Statistics South Africa, adapted from Council for Geoscience, 2001. *Digital Metallogenic Map of the Republic of South Africa and the Kingdoms of Lesotho and Swaziland*. Council for Geoscience, Pretoria.

The Bushveld Complex

The Bushveld Complex extends over an area of 65 000 square kilometres and reaches up to 8 km in thickness. It is by far the largest known layered igneous intrusion in the world and contains most of the world resources of chromium, PGMs and vanadium. The impressive igneous geology of the Bushveld Complex can best be viewed in North West, Gauteng and Limpopo in the mountainous terrain around the Steelpoort Valley. The imposing Dwars River chromitite layers, platinum-bearing dunite pipes, the discovery site of the platinum-rich Merensky Reef, and the extensive magnetite-ilmenite layers and pipes near Magnet Heights and Kennedy's Vale are in this area.[7, 13]

Map 1.2: The Bushveld Complex

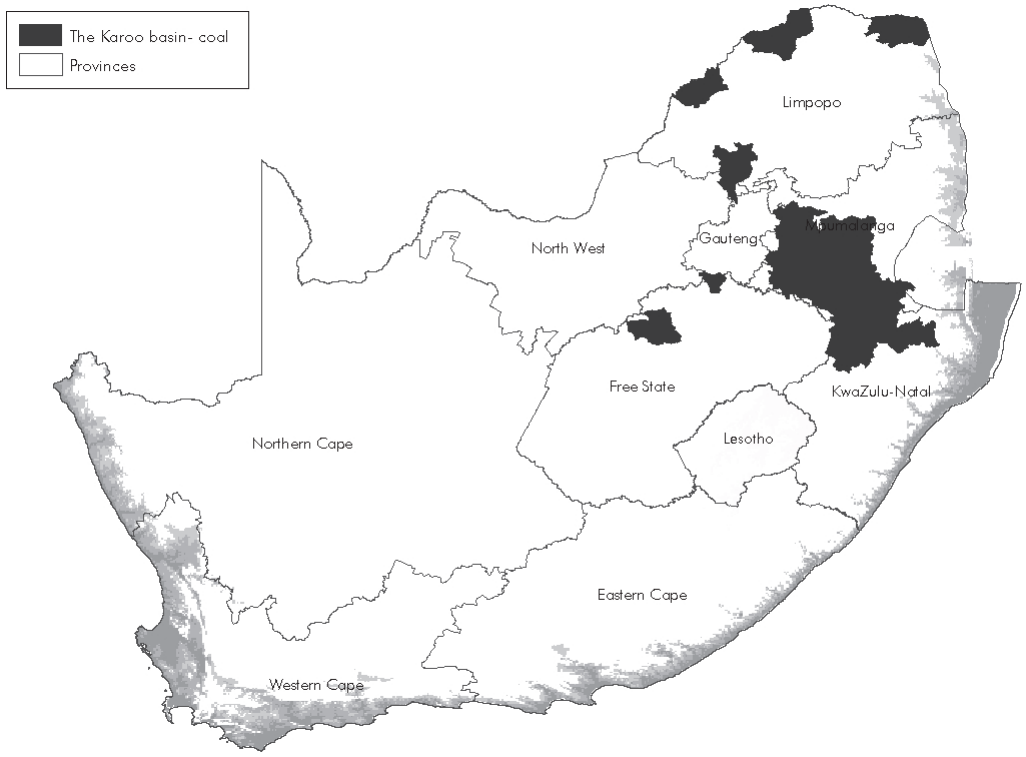


Sources: Statistics South Africa, adapted from Council for Geoscience, 2001. *Digital Metallogenic Map of the Republic of South Africa and the Kingdoms of Lesotho and Swaziland*. Council for Geoscience, Pretoria.

The Karoo Basin

The Karoo Basin extends through Mpumalanga, KwaZulu-Natal, Free State and Limpopo, hosting considerable bituminous coal and anthracite resources. All of the known coal deposits in South Africa are hosted in sedimentary rocks of the Karoo Basin. The coals range in age from Early Permian (Ecca Group) through to Late Triassic (Molteno Formation) and are predominantly bituminous to anthracite in rank, which is a classification in terms of metamorphism under the influence of temperature and pressure. Based on variations in sedimentation, origin, formation, distribution and quality of the coal seams, coalfields are defined within the Karoo Basin. These variations are in turn attributed to specific conditions of deposition and the local tectonic history characteristic of each area.[7]

Map 1.3: The Karoo Basin



Sources: Statistics South Africa, adapted from Council for Geoscience, 2001. *Digital Metallogenic Map of the Republic of South Africa and the Kingdoms of Lesotho and Swaziland*. Council for Geoscience, Pretoria.

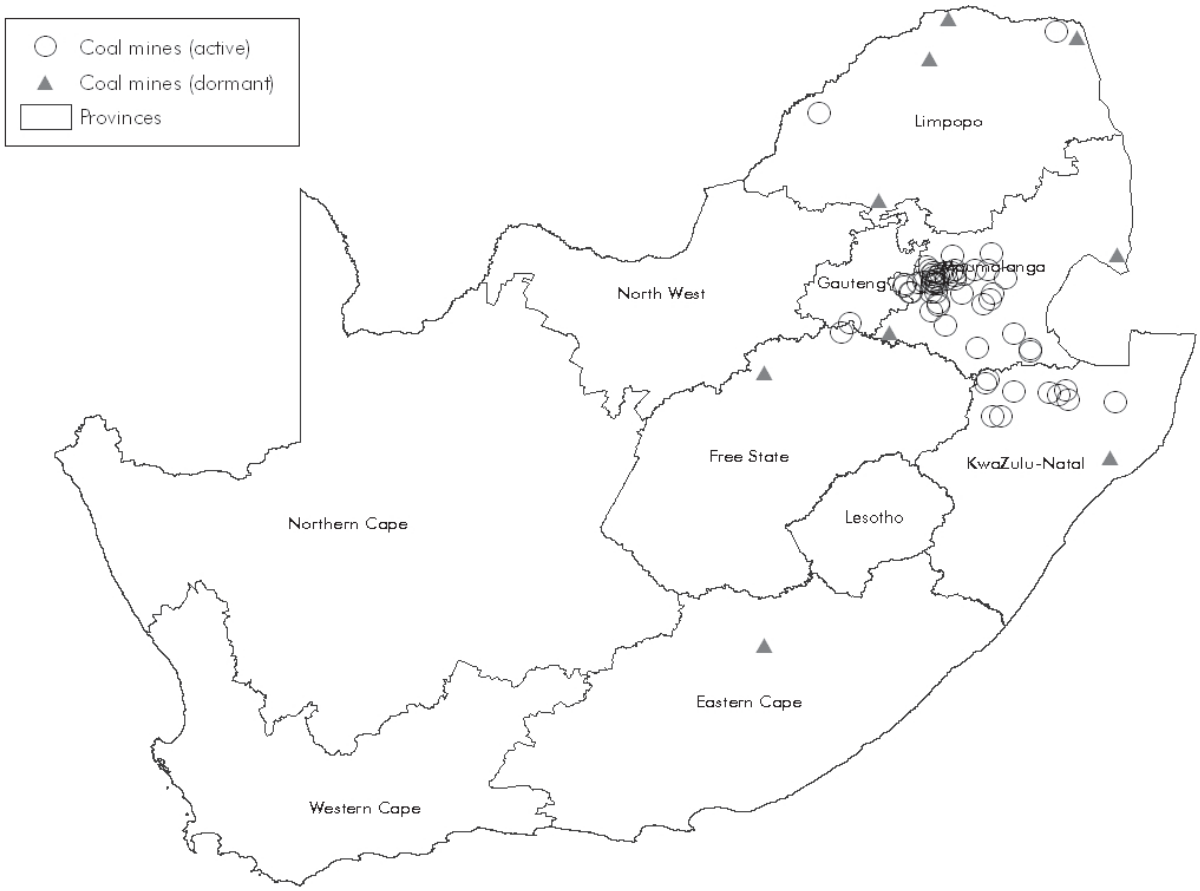
3.1 Coal

For the South African economy, coal remains an important sector in contributing to the country's future energy mix and requirements in the national energy plan.[7]

The NDP vision is that by 2030, South Africa's transition to an environmentally sustainable, climate-change resilient, low-carbon economy and just society will be well under way. The considerations in terms of coal supply rely on available and sufficient coal resources to supply all required grades of coal to power stations in the Central Basin into the mid-2020s. There is uncertainty with regard to the timing, capacity and quality of new mines and the amount of coal resources earmarked for export.[4, 5, 8] The phasing in of renewable energy into the electricity grid is of importance to South Africa and links to SDG 7 with regard to access to affordable, reliable, sustainable and modern energy for all. SDG 12 relates to the production and consumption of coal. According to the MTSF 2014–2019, it is important to expand electricity supply with power from the new Medupi coal-fired plant that has eased constraints from 2015 and long-term energy security.[4] The coal industry provided employment for 87 768 people in 2013, of which 79 020 were male and 8 748 were female.[14] This informs SDG 8 with regard to economic growth and employment.[6] There is a link to the African Agenda 2063 – Aspiration 1: A prosperous Africa based on inclusive growth and sustainable development, and with the means and resources to drive its own development. A drive towards Africa's collective GDP proportionate to the continent's share of the world's population and natural resource endownments.[15]

The key findings for the coal-mining industry are focused on production, years to depletion, volumes sold, value of sales, and resource reserves for the years 2004 to 2013.

Map 1.4: Geographic locations of coal mines

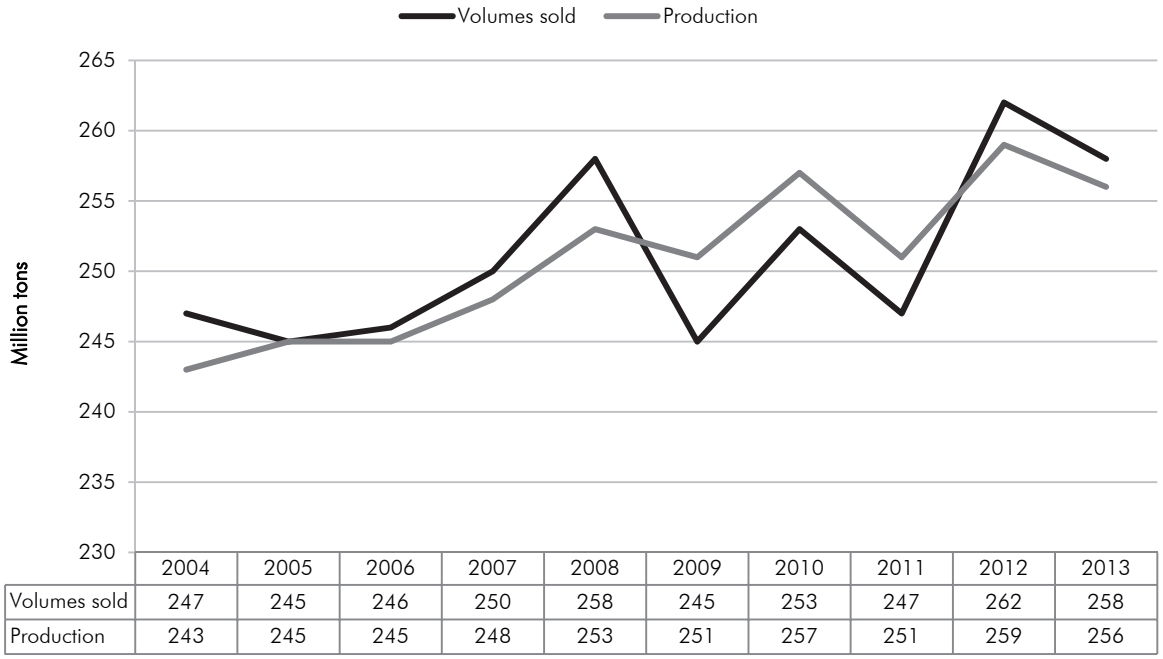


Sources: Statistics South Africa, adapted from Council for Geoscience, 2001. *Digital Metallogenic Map of the Republic of South Africa and the Kingdoms of Lesotho and Swaziland*. Council for Geoscience, Pretoria.

Coal production and volumes sold, 2004 to 2013

Coal production increased from 243 million tons in 2004 to 256 million tons in 2013. This is a 5,3% increase in coal production (extraction) over ten years. The total volume of coal sold increased by 4,5% over ten years from 247 million tons in 2004 to 258 million tons in 2013.

Figure 3.1: Coal production and volumes sold, 2004–2013



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Volumes sold	247	245	246	250	258	245	253	247	262	258
Production	243	245	245	248	253	251	257	251	259	256

Source: Statistics South Africa. Environmental Economic Accounts Tables.

Table 3.1: Coal production and volumes sold, 2004–2013

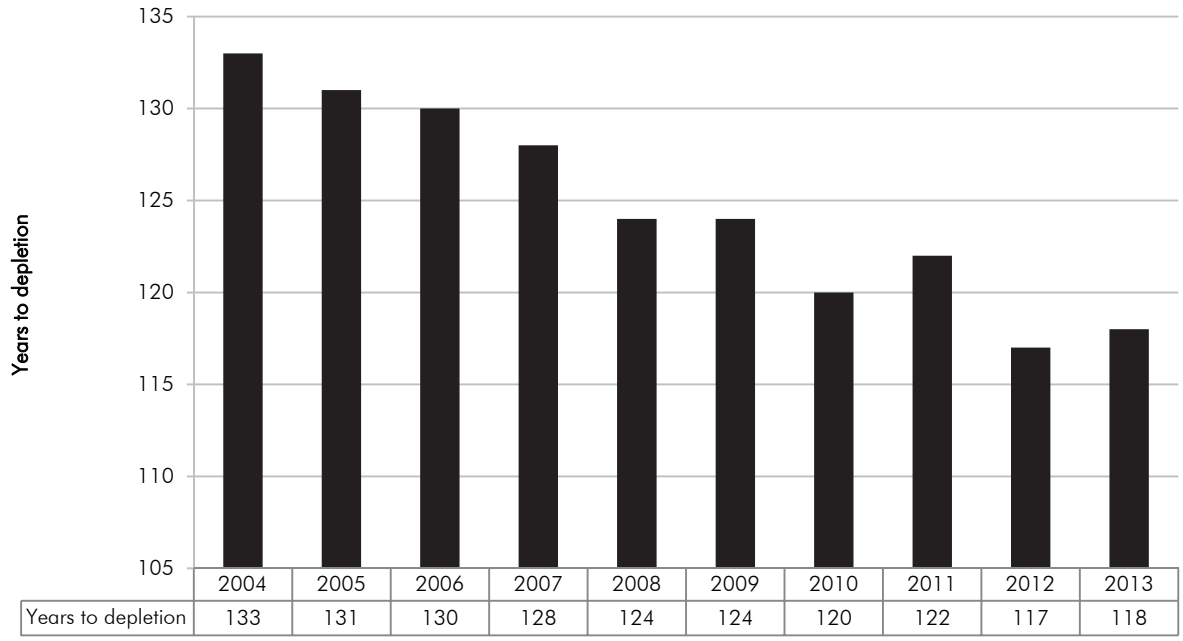
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
					Million tons					
Volumes sold	247	245	246	250	258	245	253	247	262	258
Production	243	245	245	248	253	251	257	251	259	256
					% change from previous period					
Volumes sold		-0,8%	0,4%	1,6%	3,2%	-5,0%	3,3%	-2,4%	6,1%	-1,5%
Production		0,8%	0,0%	1,2%	2,0%	-0,8%	2,4%	-2,3%	3,2%	-1,2%

Source: Statistics South Africa. Environmental Economic Accounts Tables.

Coal years to depletion, 2004 to 2013

The estimated number of years to depletion for proven coal reserves in 2013 was 118 years. In 2004 there were 133 years left to depletion, decreasing to 118 years in 2013, which is an 11,3% decrease over ten years.

Figure 3.2: Coal years to depletion, 2004–2013



Source: Statistics South Africa. Environmental Economic Accounts Tables.

Table 3.2: Coal years to depletion, 2004–2013

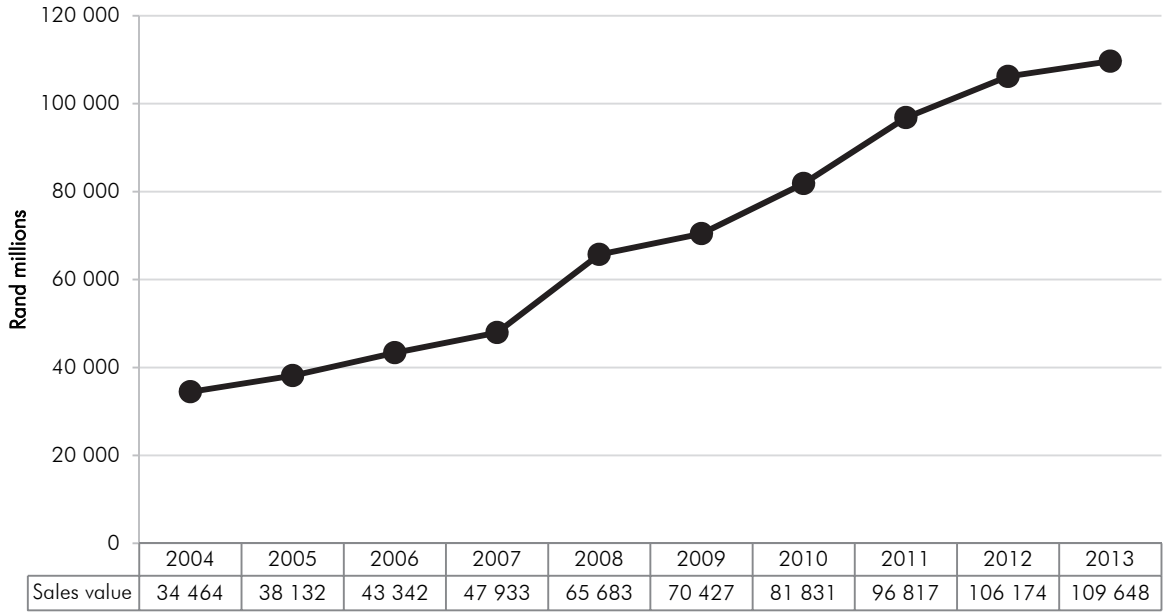
2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Years to depletion									
133	131	130	128	124	124	120	122	117	118
% change from previous period									
	-1,5%	-0,8%	-1,5%	-3,1%	0,0%	-3,2%	1,7%	-4,1%	0,9%

Source: Statistics South Africa. Environmental Economic Accounts Tables.

Coal sales, 2004 to 2013

The total value of coal sales for 2013 amounted to R109 648 million. This is a 218,2% increase from 2004 sales of R34 464 million.

Figure 3.3: Coal sales, 2004–2013



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Sales value	34 464	38 132	43 342	47 933	65 683	70 427	81 831	96 817	106 174	109 648

Source: Statistics South Africa. Environmental Economic Accounts Tables.

Table 3.3: Coal sales, 2004–2013

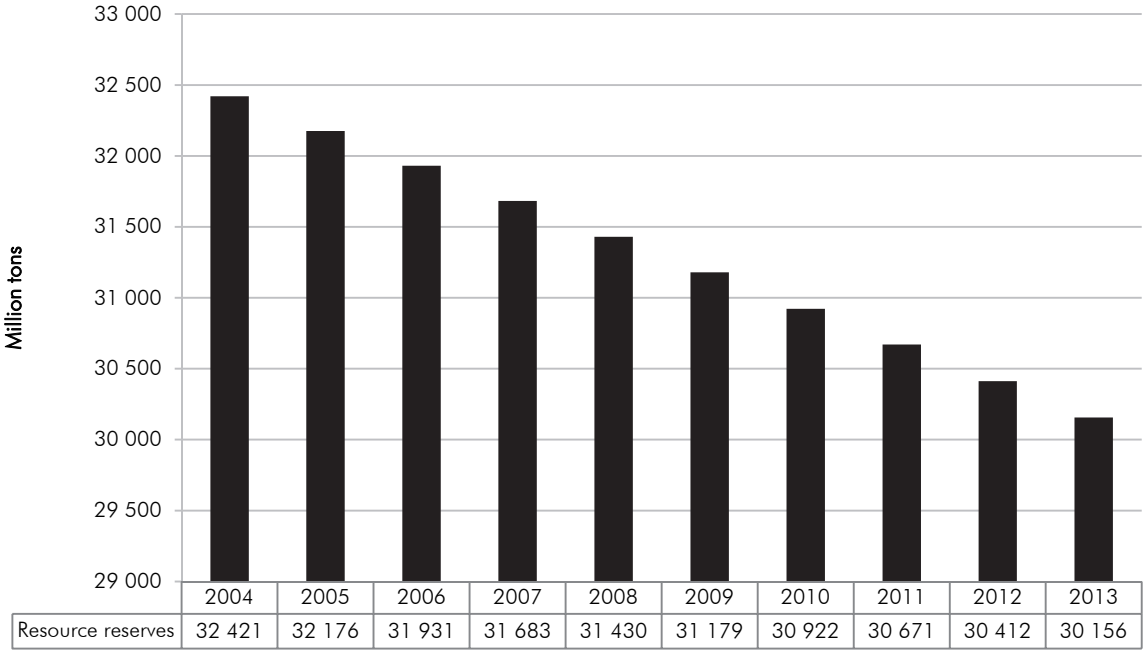
2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Rand millions									
34 464	38 132	43 342	47 933	65 683	70 427	81 831	96 817	106 174	109 648
% change from previous period									
	10,6%	13,7%	10,6%	37,0%	7,2%	16,2%	18,3%	9,7%	3,3%

Source: Statistics South Africa. Environmental Economic Accounts Tables.

Coal resource reserves, 2004 to 2013

Proven coal resource reserves were 30 156 million tons in 2013. The decrease in proven coal reserves over the ten years from 32 421 million tons in 2004 to 30 156 million tons in 2013 is 7,0%.

Figure 3.4: Coal resource reserves, 2004–2013



Source: Statistics South Africa. Environmental Economic Accounts Tables.

Table 3.4: Coal resource reserves, 2004–2013

2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Million tons									
32 421	32 176	31 931	31 683	31 430	31 179	30 922	30 671	30 412	30 156
% change from previous period									
	-0,8%	-0,8%	-0,8%	-0,8%	-0,8%	-0,8%	-0,8%	-0,8%	-0,8%

Source: Statistics South Africa. Environmental Economic Accounts Tables.

3.2 Gold

South Africa was a dominant gold producer in the 20th century globally. Thirty-five large-scale mines are in operation. The deepest mine is the TauTona mine, which extends 3,9 km underground. The name TauTona means 'great lion' in Setswana.[7] The invention of industrial air cooling and air quality control systems facilitated mining at these depths.[16]

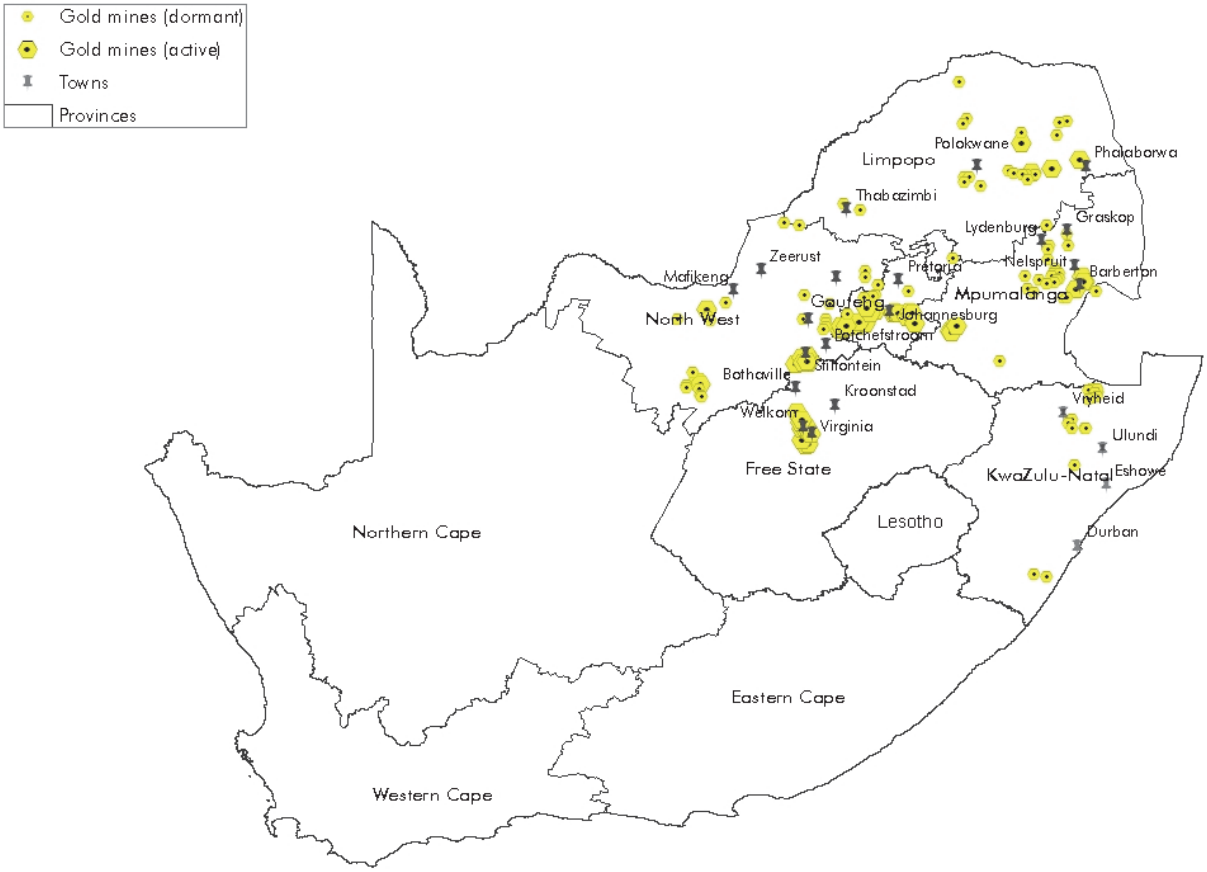
South Africa retreated to number six position in gold production in 2013, contributing 6,0% to global gold production.

Gold mining in South Africa typically involves methods such as panning, sluicing, dredging, hard rock mining, and by-product mining. For most effective gold mining, the method used is hard rock mining, since reserves are typically fully encased in deep underground rock formations. Modern gold beneficiation produces almost 100% pure gold, with the addition of chemicals to rough ore for processing, as well as heat, water, agitation and electro-winning treatments. In terms of the MTSF 2014–2019 and NDP 2030, gold beneficiation is important to the economy in terms of job creation and product transformation prior to export. The production and consumption of gold relate to SDG 12.[4, 5, 6, 16]

Employment created by gold mining in 2013 was a total of 131 591 jobs of which 119 290 were male and 12 301 female.[14] This informs SDG 8 with regard to economic growth and employment.[6]

The key findings for the gold mining industry are focused on production, years to depletion, volumes sold, value of sales, and resource reserves over the years 2004 to 2013.

Map 1.5: Geographic locations of gold mines

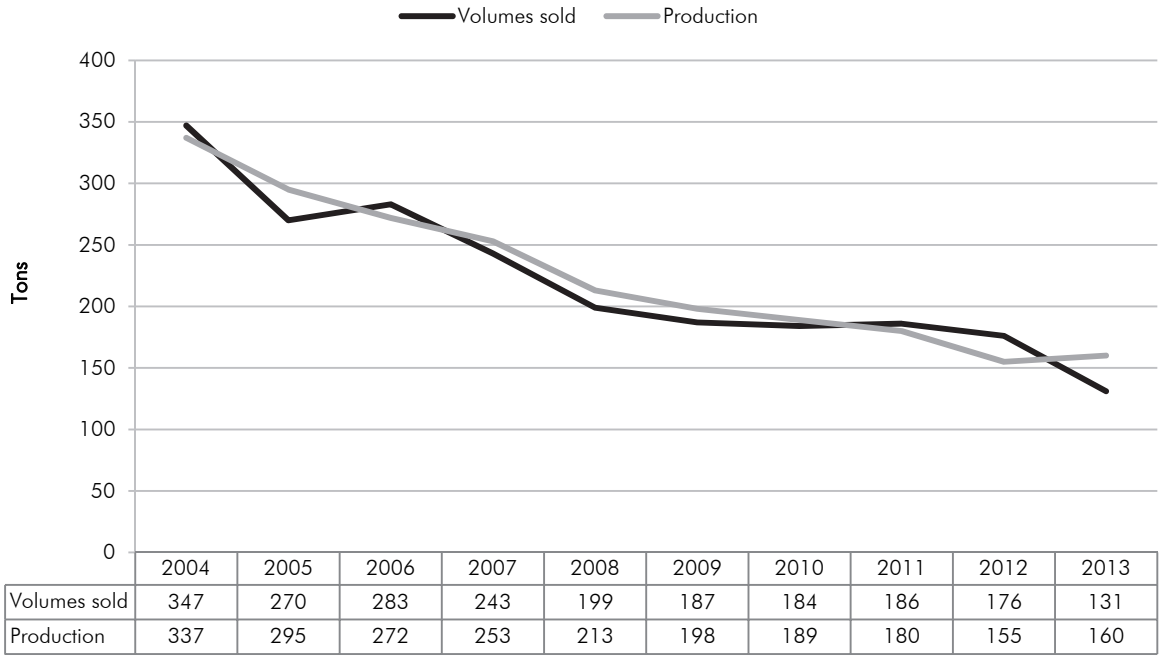


Sources: Statistics South Africa, adapted from Council for Geoscience, 2001. *Digital Metallogenic Map of the Republic of South Africa and the Kingdoms of Lesotho and Swaziland*. Council for Geoscience, Pretoria.

Gold production and volumes sold, 2004 to 2013

Gold production decreased from 337 tons in 2004 to 160 tons in 2013. This is a 52,5% decrease in gold production over ten years. The total volume of gold sold decreased by 62,2% over ten years from 347 tons in 2004 to 131 tons in 2013.

Figure 3.5: Gold production and volumes sold, 2004–2013



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Volumes sold	347	270	283	243	199	187	184	186	176	131
Production	337	295	272	253	213	198	189	180	155	160

Source: Statistics South Africa. Environmental Economic Accounts Tables.

Table 3.5: Gold production and volumes sold, 2004–2013

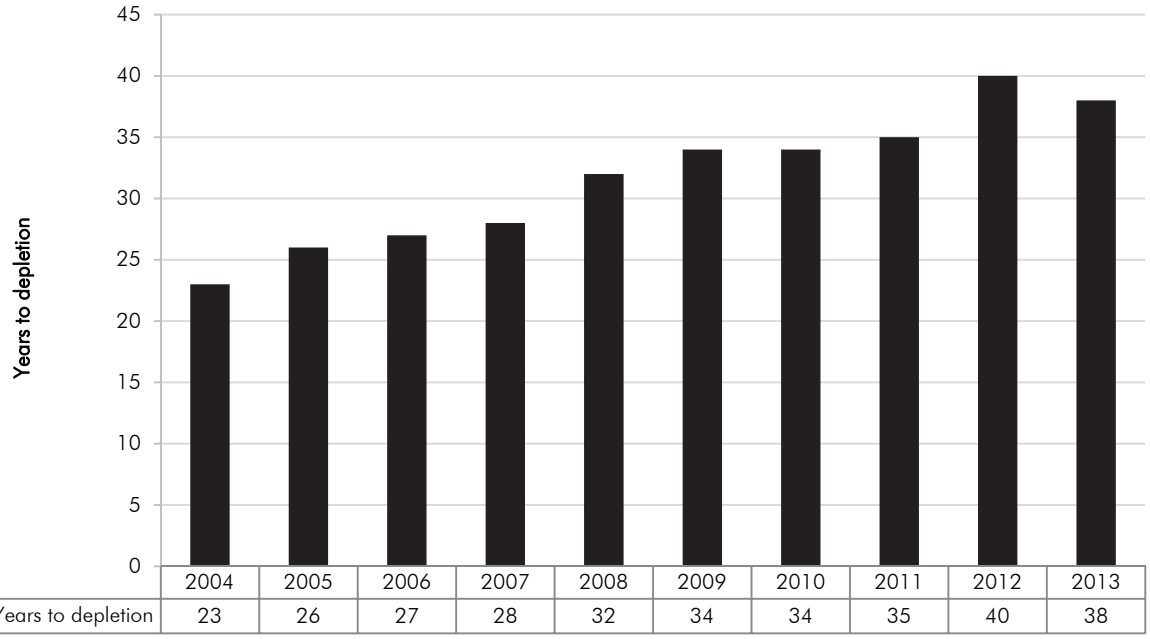
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
					Tons					
Volumes sold	347	270	283	243	199	187	184	186	176	131
Production	337	295	272	253	213	198	189	180	155	160
					% change from previous period					
Volumes sold		-22,2%	4,8%	-14,1%	-18,1%	-6,0%	-1,6%	1,1%	-5,4%	-25,6%
Production		-12,5%	-7,8%	-7,0%	-15,8%	-7,0%	-4,5%	-4,8%	-13,9%	3,2%

Source: Statistics South Africa. Environmental Economic Accounts Tables.

Gold years to depletion, 2004 to 2013

The estimated number of years to depletion for proven gold reserves in 2013 was 38 years. In 2004 there were 23 years left to depletion and this increased to 38 years in 2013, which is a 65,2% increase over ten years.

Figure 3.6: Gold years to depletion, 2004–2013



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Years to depletion	23	26	27	28	32	34	34	35	40	38

Source: Statistics South Africa. Environmental Economic Accounts Tables.

Table 3.6: Gold years to depletion, 2004–2013

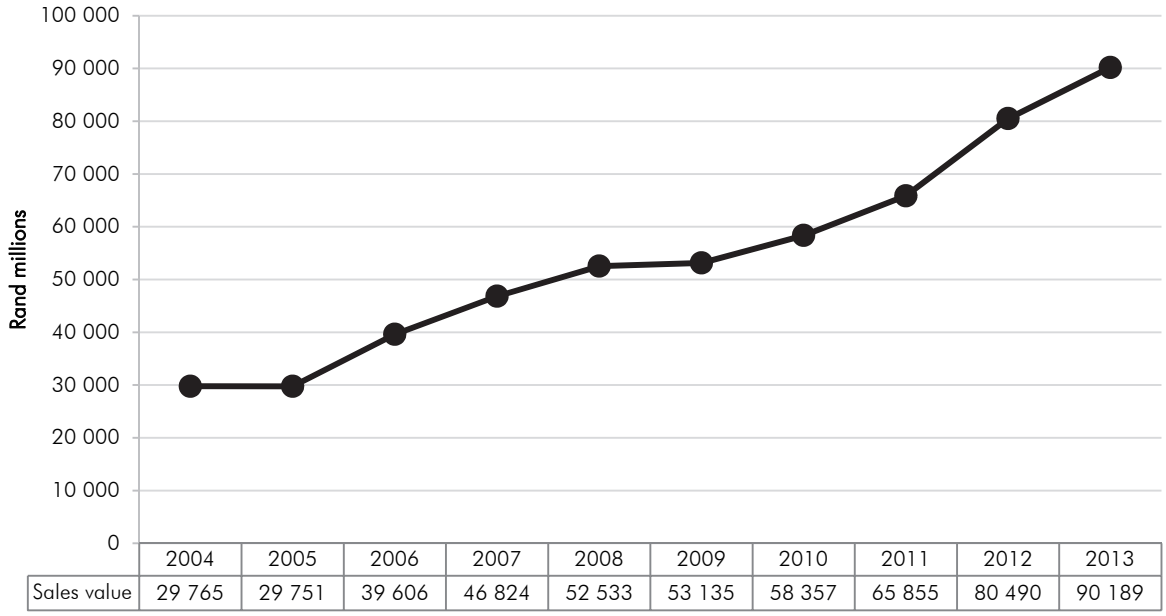
2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Years to depletion									
23	26	27	28	32	34	34	35	40	38
% change from previous period									
	13,0%	3,8%	3,7%	14,3%	6,3%	0,0%	2,9%	14,3%	-5,0%

Source: Statistics South Africa. Environmental Economic Accounts Tables.

Gold sales, 2004 to 2013

The total value of gold sales for 2013 amounted to R90 189 million. This is a 203,0% increase from 2004 sales that amounted to R29 765 million.

Figure 3.7: Gold sales, 2004–2013



Source: Statistics South Africa. Environmental Economic Accounts Tables.

Table 3.7: Gold sales, 2004–2013

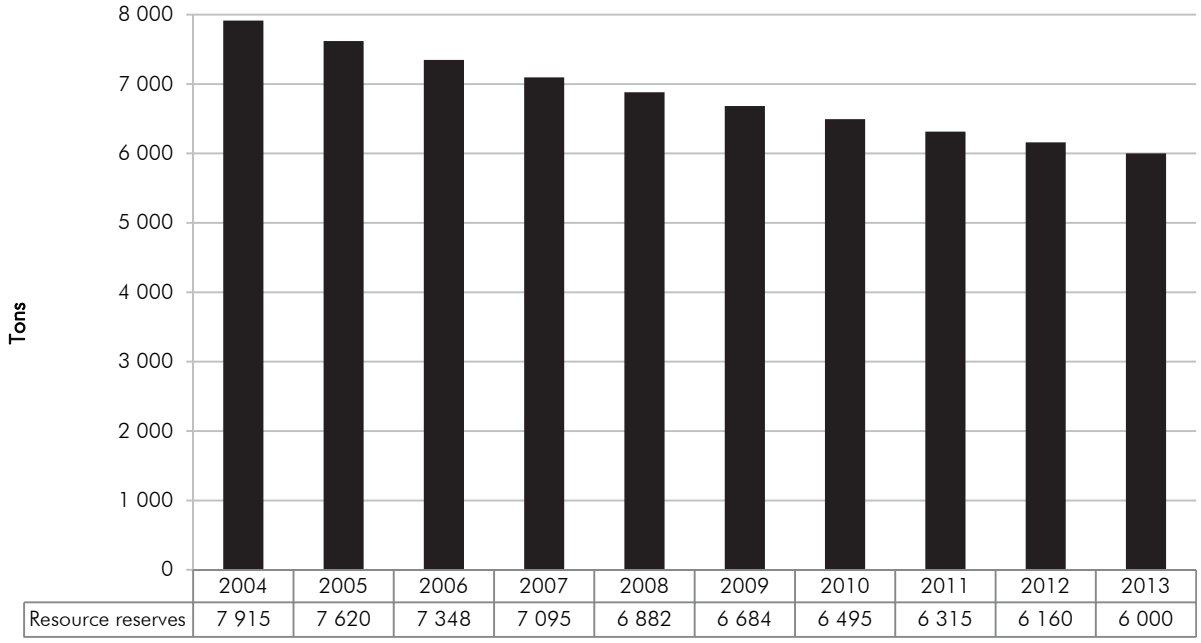
2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Rand millions									
29 765	29 751	39 606	46 824	52 533	53 135	58 357	65 855	80 490	90 189
% change from previous period									
	0,0%	33,1%	18,2%	12,2%	1,1%	9,8%	12,8%	22,2%	12,0%

Source: Statistics South Africa. Environmental Economic Accounts Tables.

Gold resource reserves, 2004 to 2013

Proven gold resource reserves were 6 000 tons in 2013. The decrease in proven gold reserves over ten years from 7 915 tons in 2004 to 6 000 tons in 2013 is 24,2%.

Figure 3.8: Gold resource reserves, 2004–2013



Source: Statistics South Africa. Environmental Economic Accounts Tables.

Table 3.8: Gold resource reserves, 2004–2013

2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Tons									
7 915	7 620	7 348	7 095	6 882	6 684	6 495	6 315	6 160	6 000
% change from previous period									
	-3,7%	-3,6%	-3,4%	-3,0%	-2,9%	-2,8%	-2,8%	-2,5%	-2,6%

Source: Statistics South Africa. Environmental Economic Accounts Tables.

3.3 Platinum Group Metals

South Africa possesses more than 80% of PGM reserves that support the mining of platinum. The Merensky Reef that originates in southern Zimbabwe and extends through to Rustenburg and Pretoria, is the centre of platinum mining in South Africa. A number of mining companies are active in the platinum-mining sector. The platinum-mining industry has established the Twickenham Expansion Project, 100 km south-east of Polokwane.[7]

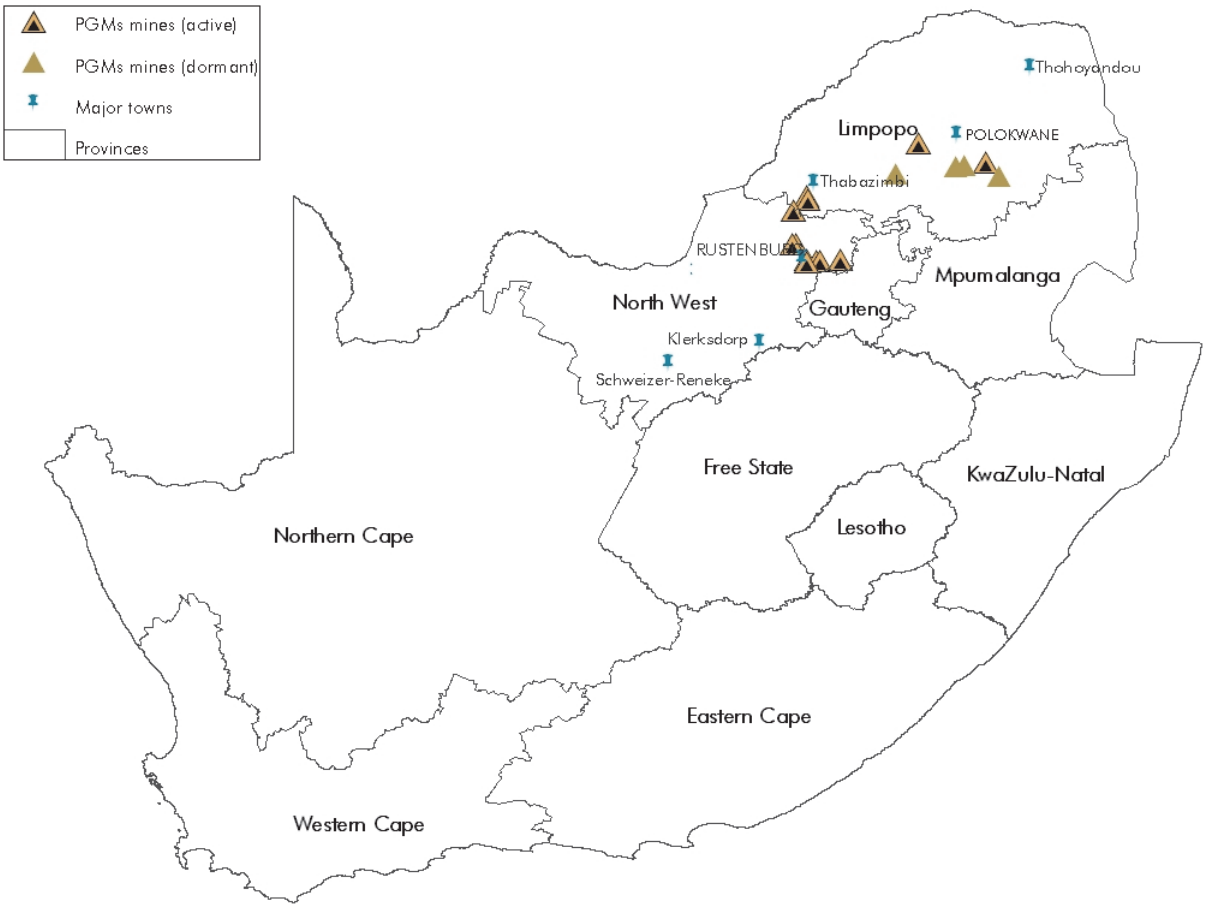
The automotive industry requires the powerful catalytic properties of platinum for use in exhaust systems to pacify harmful gasses. Platinum has a great range of other uses in the chemical, electrical, medical, glass and petroleum industries. With rising concern about environmental and energy costs, there is growing interest in platinum fuel cells as an alternative energy source.[17, 18, 19]

According to the NDP 2030, progress has been made in processing some of the minerals in the country through the PGM cluster and the production of about 25% of the global demand for fuel cells and related technologies.[5]

Platinum mining is a valuable South African industry that creates thousands of jobs (both directly and indirectly) that impact on the quality of life for communities. In 2013, the number of employees in the PGM sector was 191 261, of which 174 036 were male and 17 225 female.[14] The production and consumption of PGMs relates to SDGs 8 and 12 with regard to economic growth and employment, and to production and consumption respectively.[6]

The key findings for the PGM-mining industry are focused on production, years to depletion, volumes sold, value of sales, and resource reserves over the years 2004 to 2013.

Map 1.6: Geographic locations of PGM mines

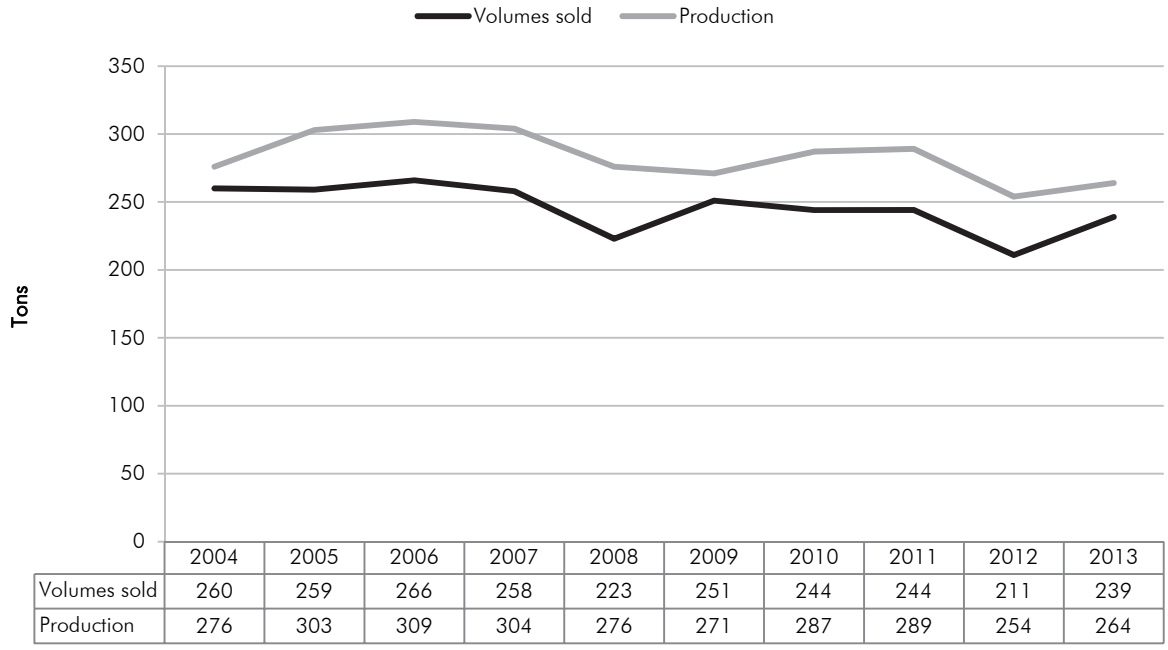


Sources: Statistics South Africa, adapted from Council for Geoscience, 2001. *Digital Metallogenic Map of the Republic of South Africa and the Kingdoms of Lesotho and Swaziland*. Council for Geoscience, Pretoria.

PGM production and volumes sold, 2004 to 2013

PGM production decreased from 276 tons in 2004 to 264 tons in 2013. This is a 4,3% decrease in PGM production over ten years. The total volume of PGMs sold decreased by 8,1% over ten years from 260 tons in 2004 to 239 tons in 2013.

Figure 3.9: PGM production and volumes sold, 2004–2013



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Volumes sold	260	259	266	258	223	251	244	244	211	239
Production	276	303	309	304	276	271	287	289	254	264

Source: Statistics South Africa. Environmental Economic Accounts Tables.

Table 3.9: PGM production and volumes sold, 2004–2013

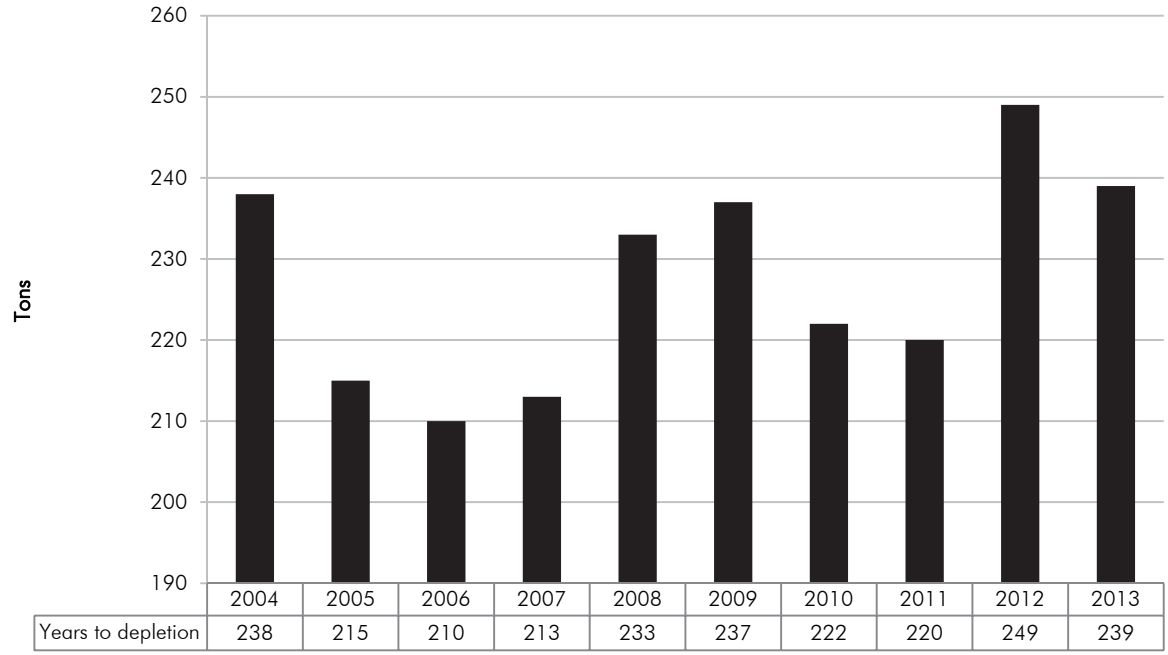
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
					Tons					
Volumes sold	260	259	266	258	223	251	244	244	211	239
Production	276	303	309	304	276	271	287	289	254	264
					% change from previous period					
Volumes sold		-0,4%	2,7%	-3,0%	-13,6%	12,6%	-2,8%	0,0%	-13,5%	13,3%
Production		9,8%	2,0%	-1,6%	-9,2%	-1,8%	5,9%	0,7%	-12,1%	3,9%

Source: Statistics South Africa. Environmental Economic Accounts Tables.

PGM years to depletion, 2004 to 2013

The estimated number of years to depletion for proven PGM reserves in 2013 was 239 years. In 2004 there were 238 years left to depletion, increasing to 239 years in 2013, which is a 0,4% increase over ten years.

Figure 3.10: PGM years to depletion, 2004–2013



Source: Statistics South Africa. Environmental Economic Accounts Tables.

Table 3.10: PGM years to depletion, 2004–2013

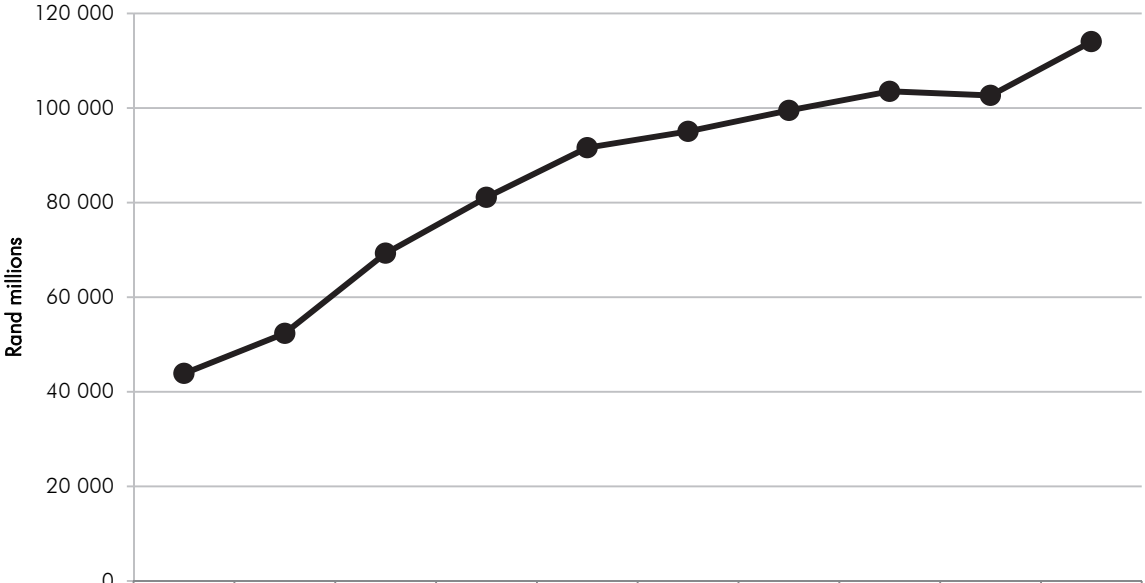
2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Years to depletion									
238	215	210	213	233	237	222	220	249	239
% change from previous period									
	-9,7%	-2,3%	1,4%	9,4%	1,7%	-6,3%	-0,9%	13,2%	-4,0%

Source: Statistics South Africa. Environmental Economic Accounts Tables.

PGM sales, 2004 to 2013

The total value of PGM sales for 2013 amounted to R114 029 million. This is a 159,9% increase from 2004 sales that amounted to R43 871 million.

Figure 3.11: PGM sales, 2004–2013



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Sales value	43 871	52 338	69 286	81 108	91 609	95 050	99 498	103 525	102 650	114 029

Source: Statistics South Africa. Environmental Economic Accounts Tables.

Table 3.11: PGM sales, 2004–2013

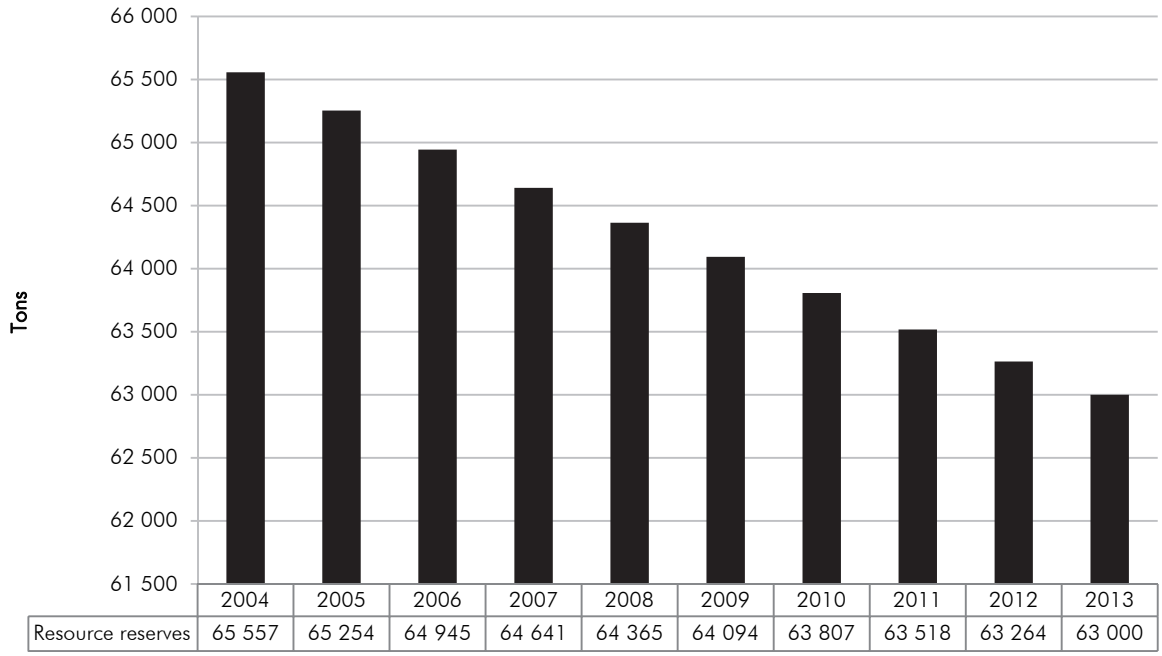
2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Rand millions									
43 871	52 338	69 286	81 108	91 609	95 050	99 498	103 525	102 650	114 029
% change from previous period									
	19,3%	32,4%	17,1%	12,9%	3,8%	4,7%	4,0%	-0,8%	11,1%

Source: Statistics South Africa. Environmental Economic Accounts Tables.

PGM resource reserves, 2004 to 2013

Proven PGM resource reserves were 63 000 tons in 2013. The decrease in proven PGM reserves over ten years from 65 557 tons in 2004 to 63 000 tons in 2013 is 3,9%.

Figure 3.12: PGM resource reserves, 2004–2013



Source: Statistics South Africa. Environmental Economic Accounts Tables.

Table 3.12: PGM resource reserves, 2004–2013

2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Tons									
65 557	65 254	64 945	64 641	64 365	64 094	63 807	63 518	63 264	63 000
% change from previous period									
	-0,5%	-0,5%	-0,5%	-0,4%	-0,4%	-0,4%	-0,5%	-0,4%	-0,4%

Source: Statistics South Africa. Environmental Economic Accounts Tables.

Chapter 4 – Indicators

4. Overview

An indicator is a tool that is used to identify issues or conditions of concern, and that measures the efficiency of a system. When a problem occurs, the selected indicator can assist with determining the directions to take to manage the issue at stake or condition that needs attention. The variety of indicators is as broad as the characteristics of the systems that they monitor.

Although selection criteria can be broad, the following are key characteristics of effective indicators:

- Relevance – does the indicator tell you something that you need to know? The indicator needs to address the purpose of the measurement.

- Ease of understanding – do people who are not experts with regard to the subject matter understand the indicator? The indicator that is selected must inform you about the purpose of the measurement.

- Reliability – is the information contained in the indicator trustworthy? It is important to trust the data and information that are presented by the selected indicator to make informed decisions and plan accordingly.

- Data accessibility – are the data available in time to act? Indicators must provide information in time, otherwise the data are no longer useful.

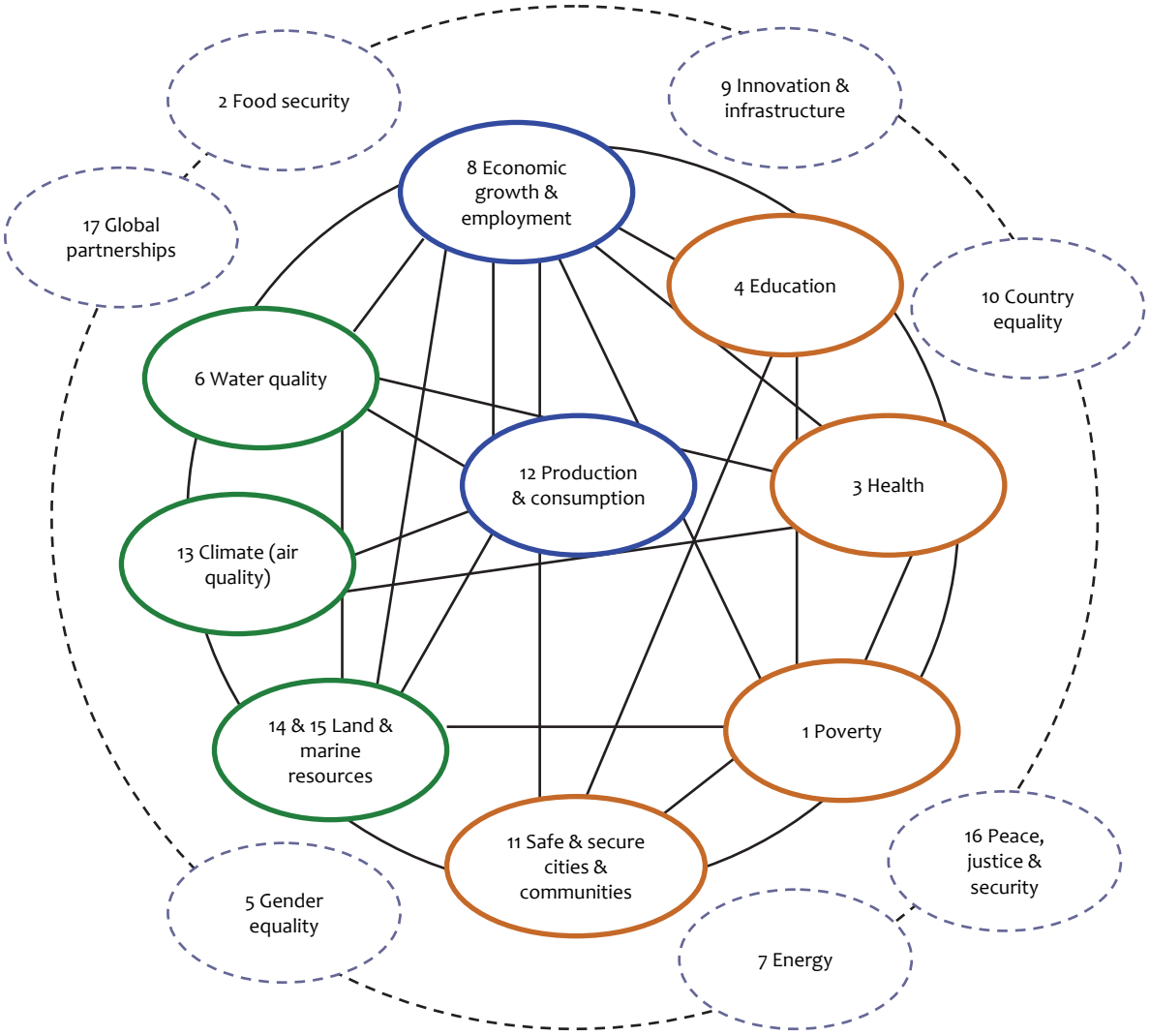
An example is the number of years left to depletion for coal resources. Given that coal is the major energy source for electricity generation in South Africa, it is important for planning ahead with regard to infrastructure, new building developments and alternative sources of energy to ensure continuity in service delivery. It is important to know that indicators are quantifiable; in other words, the measurement is numeric.

The trend is to move from traditional indicators to indicators of sustainability. Traditional indicators measure changes in one area, e.g. water quality, independently of other environmental, social or economic interactions and integration. One of the problems that are encountered is data related. Often the best indicators are those for which there are no data, meaning that the indicator selection reverts back to traditional indicators that have data available and assist with the identification of problem areas. It is possible to combine traditional indicators to create sustainability indicators. The risk with combining traditional indicators is that the solutions may not lead to sustainability and may be an interim measure while developing data sources for better indicators. An example of a traditional indicator may be the cost of fuel, whereas the sustainable version may be total energy used from all sources and the ratio of renewable energy used compared with non-renewable energy.

In Figure 4, the natural resource base provides the materials for production, which creates employment and affects the economy. Employment affects the poverty rate, which is related to safety and security. Air quality, water quality and materials used for production have an effect on health, but may also impact on the economy. If a process requires clean water as an input, cleaning up poor quality water prior to processing is an extra expense that must be recovered from profits, tariffs or taxes. Similarly, health problems, whether as a result of general air quality problems or exposure to toxic materials, have an effect on productivity in the workplace and contribute to the rising costs of health expenditure. Sustainability requires this integrated view of the world, with multidimensional indicators that show the links between a country's economy, environment, and society. For example, the GDP, a regular published traditional indicator, measures the amount of money being spent in a country. It is generally reported as a measure of

the country's economic well-being: the more money being spent, the higher the GDP and the better the overall economic well-being is assumed to be. However, because GDP reflects only the amount of economic activity, regardless of the effect of that activity on the community's social and environmental health, GDP can go up when society health goes down or go down when society well-being goes up. Figure 4 is only one example of a set of interactions related to the 17 SDGs. There are many possible combinations of linkages between the 17 SDGs, showing the complexity of developing indicators to address all the goals and targets, while addressing the NDP 2030 on environmental sustainability. [5, 6, 7, 20, 21]

Figure 4: Web of interactions between the economy, environment and society



Source: Statistics South Africa, 2016.

The selection of indicators presented in this report is based on the environmental economic accounts for South Africa, focusing on energy, fisheries, minerals and rivers, linking the environment and economy or showing rates of depletion to determine if the resource is managed sustainably. Where possible, reference is made to census and population data.

4.1 Hake: Sustainability of hake (*Merluccius paradoxus* and *M. capensis*) stocks, 1993 to 2014

Description

Closing stock for hake (*Merluccius paradoxus* and *M. capensis*) and total allowable catch (TAC) for fish and fish farming pertaining to hake.

Linkages

This indicator links to the MTSF 2014–2019, the NDP 2030, SDGs and African Agenda 2063 as follows:

- MTSF Outcome 10: Protect and enhance environmental assets and natural resources. The challenge for South Africa's marine fisheries is to maintain the integrity of and balance in marine ecosystems while deriving sustainable economic benefits from living marine resources. The main constraints to achieve this are the productivity of key resources, which is influenced by the environment and impacted upon by illegal catches, and managing catches in each fishery in a sustainable way. The desired outcomes are to rebuild stocks of threatened species and to reduce illegal catches.
- NDP: Implementation of a long-term vision through to 2030 towards addressing unemployment, inequality and creating a more inclusive society through the protection of South Africa's natural resources and a transition to an environmentally sustainable, climate-change resilient, low-carbon economy.
- SDG 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all. The fishing sector in South Africa plays an important role in small- and large-scale fishing enterprises.
- SDG 12: Ensure sustainable consumption and production patterns, curbing food and post-harvest losses.
- SDG 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development by regulating harvesting, overfishing, illegal, unreported, unregulated and destructive fishing practices.
- Agenda 2063 – Aspiration 1: A prosperous Africa based on inclusive growth and sustainable development. Africa by 2063 aspires to be a prosperous continent, with the means and resources to drive its own development. Africa's blue economy, which is three times the size of its landmass, shall be a major contributor to continental transformation and growth; advancing knowledge on marine and aquatic biotechnology; the growth of an Africa-wide shipping industry; the development of sea, river and lake transport and fishing; and the exploitation and beneficiation of deep-sea mineral and other resources.

Selection criteria

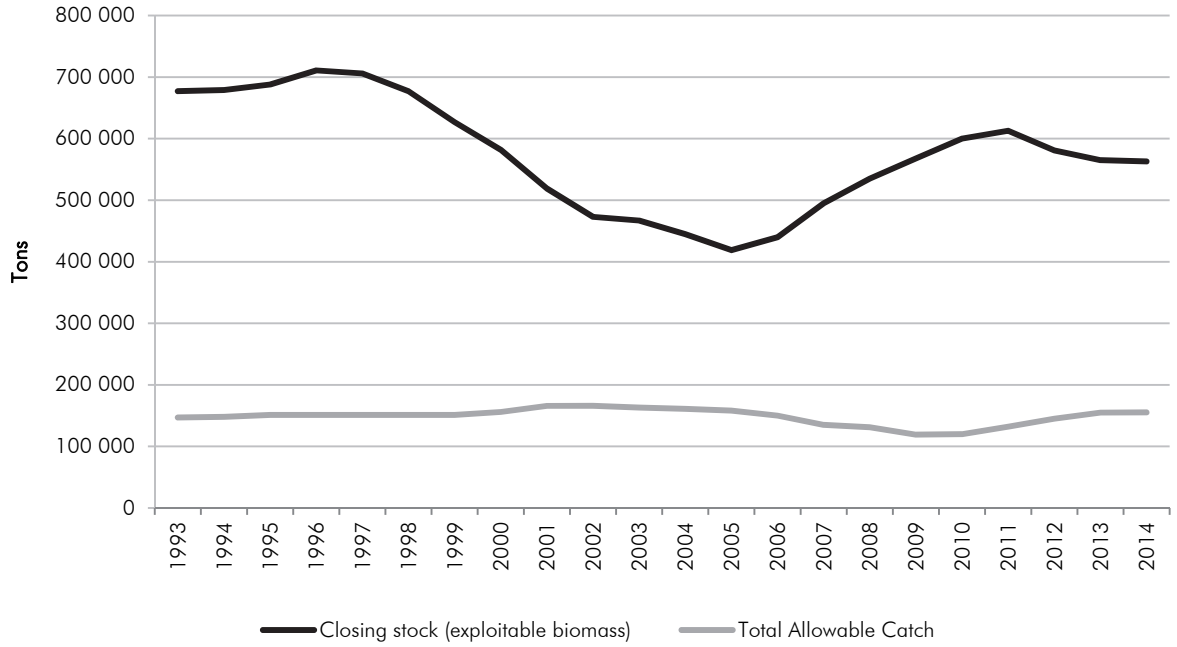
- Relevant – the indicator provides information that is useful to decision-making with regard to employment, economic growth and meeting sustainable development goals.
- Easy to understand – for both technical and non-expert audiences in tables and graphics with simplified content and subject matter.
- Reliable – the quality of measurement is consistent and can be repeated over time-based data series.
- Accessible – the data are available on an annual basis, keeping the trends up to date.

Measurement

Units	Spatial scale	Frequency
Tons	National	Annually

Figure 4.1 shows the correlation between the closing stock (exploitable biomass) and the set TAC level. From 1993, the TAC level was gradually set at higher levels until 2002 (166 000 tons). At first, the closing stock (exploitable biomass) showed a steady trend (1993 to 1996). In 1997, the closing stock (exploitable biomass) began to decline and maintained this decreasing trend until reaching 419 000 tons in 2005. From 2006, the closing stock (exploitable biomass) recovered through to 2011 (613 000 tons), and started declining again through to 2014 (563 000 tons). There is about a 3-year lag time before there are positive responses in the closing stock (exploitable biomass) due to the dropping of the TAC levels.

Figure 4.1: Hake: Closing stock and total allowable catch, 1993–2014



Source: Statistics South Africa. Environmental Economic Accounts Tables.

Table 4.1: Hake: Closing stock and total allowable catch, 1993–2014

1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Closing stock (exploitable biomass) (tons)										
677 000	679 000	688 000	711 000	706 000	677 000	627 000	582 000	519 000	473 000	467 000
Total allowable catch (tons)										
147 000	148 000	151 000	151 000	151 000	151 000	151 000	156 000	166 000	166 000	163 000
2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Closing stock (exploitable biomass) (tons)										
445 000	419 000	440 000	495 000	535 000	568 000	600 000	613 000	581 000	565 000	563 000
Total allowable catch (tons)										
161 000	158 000	150 000	135 000	131 000	119 000	120 000	132 000	145 000	155 000	155 280

Source: Statistics South Africa. Environmental Economic Accounts Tables.

Data sources and references

- Statistics South Africa. Environmental Economic Accounts Tables.
- Department of Agriculture, Forestry and Fisheries (DAFF), Marine Resource Assessment and Management (MARAM), and the University of Cape Town, Department of Mathematics and Applied Mathematics.
- Marine Stewardship Council (MSC), 2009. *MSC Fishery Fact Sheet: South Africa hake trawl fishery, 2009*. Website: www.msc.org
- The Presidency, Republic of South Africa, 2014. *Medium Term Strategic Framework (MTSF) 2014-2019*. Department: Planning, Monitoring and Evaluation.
- The Presidency, Republic of South Africa, 2012. *National Development Plan 2030. Our Future-make it work*. National Planning Commission.
- United Nations, 2015. Open Working Group proposal for Sustainable Development Goals. http://undocs.org/A/68/970.
- United Nations, 2015. *Sustainable Development Goals, Transforming Our World – the 2030 Agenda for Sustainable Development*. https://sustainabledevelopment.un.org/topics
- United Nations, 2015. *Agenda 2063. The Africa We Want*. http://www.un.org/en/africa/osaa/pdf/au/agenda2063.pdf

4.2 West Coast rock lobster: Sustainability of West Coast rock lobster (*Jasus lalandii*) stocks, 1993 to 2014

Description

Closing stock for West Coast rock lobster (*J lalandii)* and TAC for fish and fish farming pertaining to West Coast rock lobster.

Linkages

This indicator links to the MTSF 2014–2019, the NDP 2030, SDGs and African Agenda 2063 as follows:

- MTSF Outcome 10: Protect and enhance environmental assets and natural resources. The challenge for South Africa's marine fisheries is to maintain the integrity of and balance in marine ecosystems while deriving sustainable economic benefits from living marine resources. The main constraints to achieve this are the productivity of key resources, which is influenced by the environment and impacted upon by illegal catches, and managing catches in each fishery in a sustainable way. The desired outcomes are to rebuild stocks of threatened species and to reduce illegal catches.
- NDP: Implementation of a long-term vision through to 2030 towards addressing unemployment, inequality and creating a more inclusive society through the protection of South Africa's natural resources and a transition to an environmentally sustainable, climate-change resilient, low-carbon economy.
- SDG 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all. The fishing sector in South Africa plays an important role in small- and large-scale fishing enterprises.
- SDG 12: Ensure sustainable consumption and production patterns, curbing food and post-harvest losses.
- SDG 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development by regulating harvesting, overfishing, illegal, unreported, unregulated and destructive fishing practices.
- Agenda 2063 – Aspiration 1: A prosperous Africa based on inclusive growth and sustainable development. Africa by 2063 aspires to be a prosperous continent, with the means and resources to drive its own development. Africa's blue economy, which is three times the size of its landmass, shall be a major contributor to continental transformation and growth; advancing knowledge on marine and aquatic biotechnology; the growth of an Africa-wide shipping industry; the development of sea, river and lake transport and fishing; and the exploitation and beneficiation of deep-sea mineral and other resources.

Selection criteria

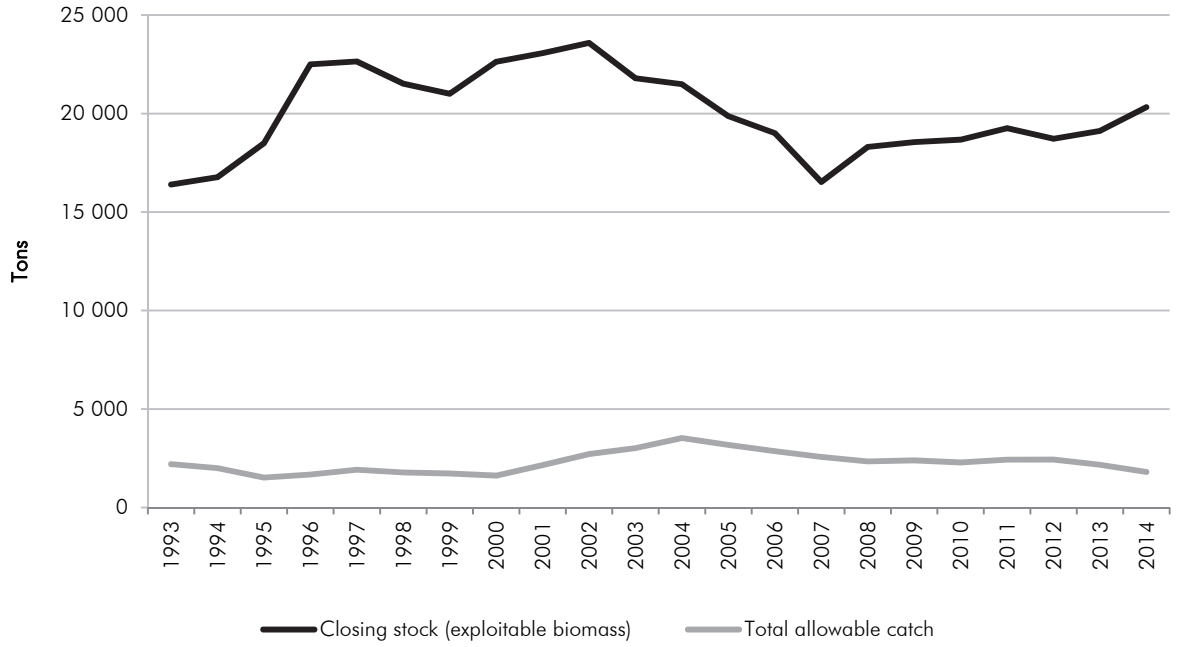
- Relevant – the indicator provides information that is useful to decision-making with regard to employment, economic growth and meeting sustainable development goals.
- Easy to understand – for both technical and non-expert audiences in tables and graphics with simplified content and subject matter.
- Reliable – the quality of measurement is consistent and can be repeated over time-based data series.
- Accessible – the data are available on an annual basis, keeping the trends up to date.

Measurement

Units	Spatial scale	Frequency
Tons	National	Annually

Figure 4.2 shows the correlation between the closing stock (exploitable biomass) and the set TAC level. From 1993 through to 2014, the TAC level has been increased and decreased over the ten years. From 2001, the TAC level was gradually set at higher levels each year until 2004 (when it peaked at 3 527 tons). The closing stock (exploitable biomass) followed a recovery trend from 1993 to 2002. In 2003, the closing stock (exploitable biomass) began to decline, maintaining this decreasing trend until reaching 16 530 tons in 2007, and showed some fluctuations reaching 20 326 tons in 2014.

Figure 4.2: West Coast rock lobster: Closing stock and total allowable catch, 1993–2014



Source: Statistics South Africa. Environmental Economic Accounts Tables.

Table 4.2: West Coast rock lobster: Closing stock and total allowable catch, 1993–2014

1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Closing stock (exploitable biomass) (tons)										
16 395	16 770	18 491	22 496	22 649	21 513	21 008	22 629	23 066	23 588	21 794
Total allowable catch (tons)										
2 220	2 000	1 520	1 675	1 920	1 780	1 720	1 614	2 151	2 713	3 016
2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Closing stock (exploitable biomass) (tons)										
21 495	19 871	19 004	16 530	18 311	18 551	18 673	19 257	18 723	19 122	20 326
Total allowable catch (tons)										
3 527	3 174	2 857	2 571	2 340	2 393	2 286	2 426	2 426	2 167	1 801

Source: Statistics South Africa. Environmental Economic Accounts Tables.

Data sources and references

- Statistics South Africa. Environmental Economic Accounts Tables.
- Department of Agriculture, Forestry and Fisheries (DAFF), Marine Resource Assessment and Management (MARAM), and the University of Cape Town, Department of Mathematics and Applied Mathematics.
- Marine Stewardship Council (MSC), 2009. *MSC Fishery Fact Sheet: South Africa hake trawl fishery, 2009*. Website: www.msc.org
- The Presidency, Republic of South Africa, 2014. *Medium Term Strategic Framework (MTSF) 2014-2019*. Department: Planning, Monitoring and Evaluation.
- The Presidency, Republic of South Africa, 2012. *National Development Plan 2030. Our Future-make it work*. National Planning Commission.
- United Nations, 2015. Open Working Group proposal for Sustainable Development Goals. http://undocs.org/A/68/970.
- United Nations, 2015. *Sustainable Development Goals, Transforming Our World – the 2030 Agenda for Sustainable Development*. https://sustainabledevelopment.un.org/topics
- United Nations, 2015. *Agenda 2063. The Africa We Want*. http://www.un.org/en/africa/osaa/pdf/au/agenda2063.pdf

4.3 Abalone: Sustainability of Abalone (*Haliotis midae*) stocks, 1993 to 2014

Description

Closing stock for abalone (*Haliotis midae*) and TAC for fish and fish farming pertaining to abalone.

Linkages

This indicator links to the MTSF 2014–2019, the NDP 2030, SDGs and African Agenda 2063 as follows:

- MTSF Outcome 10: Protect and enhance environmental assets and natural resources. The challenge for South Africa's marine fisheries is to maintain the integrity of and balance in marine ecosystems while deriving sustainable economic benefits from living marine resources. The main constraints to achieve this are the productivity of key resources, which is influenced by the environment and impacted upon by illegal catches, and managing catches in each fishery in a sustainable way. The desired outcomes are to rebuild stocks of threatened species and to reduce illegal catches.
- NDP: Implementation of a long-term vision through to 2030 towards addressing unemployment, inequality and creating a more inclusive society through the protection of South Africa's natural resources and a transition to an environmentally sustainable, climate-change resilient, low-carbon economy.
- SDG 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all. The fishing sector in South Africa plays an important role in small- and large-scale fishing enterprises.
- SDG 12: Ensure sustainable consumption and production patterns, curbing food and post-harvest losses.
- SDG 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development by regulating harvesting, overfishing, illegal, unreported, unregulated and destructive fishing practices.
- Agenda 2063 – Aspiration 1: A prosperous Africa based on inclusive growth and sustainable development. Africa by 2063 aspires to be a prosperous continent, with the means and resources to drive its own development. Africa's blue economy, which is three times the size of its landmass, shall be a major contributor to continental transformation and growth; advancing knowledge on marine and aquatic biotechnology: the growth of an Africa-wide shipping industry: the development of sea, river and lake transport and fishing; and the exploitation and beneficiation of deep-sea mineral and other resources.

Selection criteria

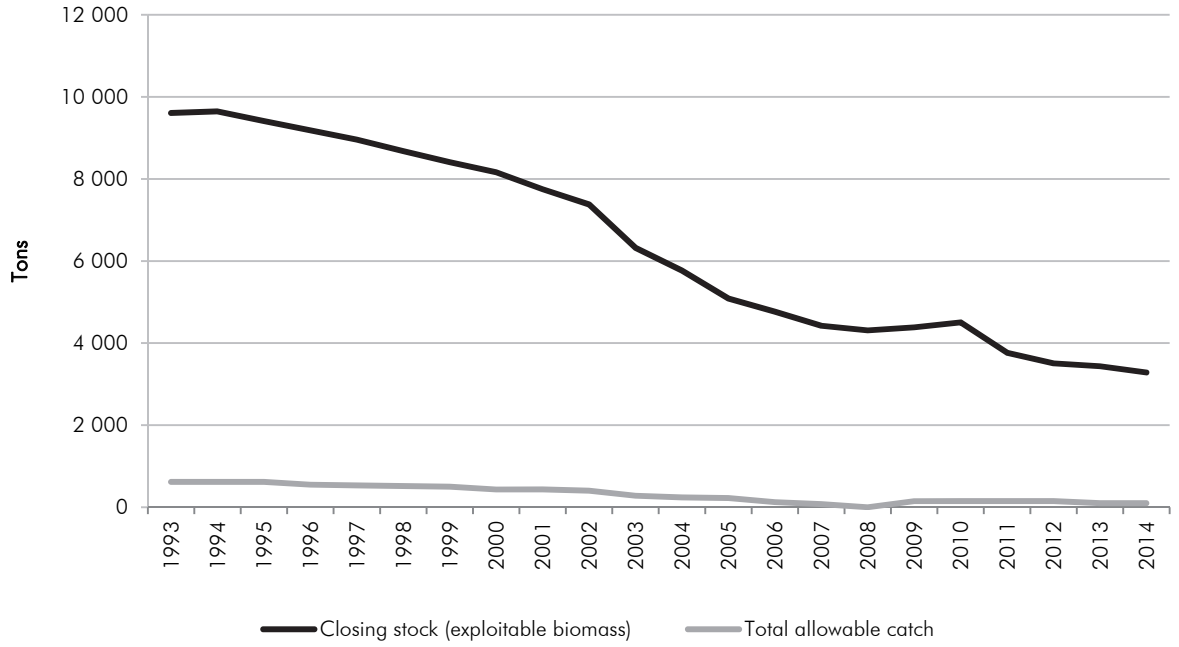
- Relevant – the indicator provides information that is useful to decision-making with regard to employment, economic growth and meeting sustainable development goals.
- Easy to understand – for both technical and non-expert audiences in tables and graphics with simplified content and subject matter.
- Reliable – the quality of measurement is consistent and can be repeated over time-based data series.
- Accessible – the data are available on an annual basis, keeping the trends up to date.

Measurement

Units	Spatial scale	Frequency
Tons	National	Annually

Figure 4.3 shows the correlation between the closing stock (exploitable biomass) and the set TAC level. From 1993, the TAC level was gradually lowered, with a steep decline between 2002 (400 tons) and 2008, where the TAC level was set to 0 tons. The TAC level is still set low at only 96 tons for the year 2014. The steep decline in the TAC levels was in response to the continuous decline in the closing stock (exploitable biomass), which fell from 9 606 tons in 1993 to 3 282 tons in 2014.

Figure 4.3: Abalone: Closing stock and total allowable catch, 1993–2014



Source: Statistics South Africa. Environmental Economic Accounts Tables.

Table 4.3: Abalone: Closing stock and total allowable catch, 1993–2014

1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Closing stock (exploitable biomass) (tons)										
9 606	9 647	9 412	9 184	8 960	8 680	8 407	8 163	7 750	7 378	6 324
Total allowable catch (tons)										
615	615	615	550	530	515	500	433	432	400	282
2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Closing stock (exploitable biomass) (tons)										
5 768	5 088	4 765	4 422	4 311	4 384	4 504	3 762	3 505	3 435	3 282
Total allowable catch (tons)										
237	223	125	75	0	150	150	150	150	96	96

Source: Statistics South Africa. Environmental Economic Accounts Tables.

Data sources and references

- Statistics South Africa. Environmental Economic Accounts Tables.
- Department of Agriculture, Forestry and Fisheries (DAFF), Marine Resource Assessment and Management (MARAM), and the University of Cape Town, Department of Mathematics and Applied Mathematics.
- Marine Stewardship Council (MSC), 2009. *MSC Fishery Fact Sheet: South Africa hake trawl fishery, 2009*. Website: www.msc.org
- The Presidency, Republic of South Africa, 2014. *Medium Term Strategic Framework (MTSF) 2014-2019*. Department: Planning, Monitoring and Evaluation.
- The Presidency, Republic of South Africa, 2012. *National Development Plan 2030. Our Future-make it work*. National Planning Commission.
- United Nations, 2015. Open Working Group proposal for Sustainable Development Goals. http://undocs.org/A/68/970.
- United Nations, 2015. *Sustainable Development Goals, Transforming Our World – the 2030 Agenda for Sustainable Development*. https://sustainabledevelopment.un.org/topics
- United Nations, 2015. *Agenda 2063. The Africa We Want*. http://www.un.org/en/africa/osaa/pdf/au/agenda2063.pdf

4.4 Cape horse mackerel: Sustainability of Cape horse mackerel (*Trachurus capensis*) stocks, 1993 to 2014

Description

Closing stock for Cape horse mackerel (*Trachurus capensis*) and TAC for fish and fish farming pertaining to Cape horse mackerel.

Linkages

This indicator links to the MTSF 2014–2019, the NDP 2030, SDGs and African Agenda 2063 as follows:

- MTSF Outcome 10: Protect and enhance environmental assets and natural resources. The challenge for South Africa's marine fisheries is to maintain the integrity of and balance in marine ecosystems while deriving sustainable economic benefits from living marine resources. The main constraints to achieve this are the productivity of key resources, which is influenced by the environment and impacted upon by illegal catches, and managing catches in each fishery in a sustainable way. The desired outcomes are to rebuild stocks of threatened species and to reduce illegal catches.
- NDP: Implementation of a long-term vision through to 2030 towards addressing unemployment, inequality and creating a more inclusive society through the protection of South Africa's natural resources and a transition to an environmentally sustainable, climate-change resilient, low-carbon economy.
- SDG 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all. The fishing sector in South Africa plays an important role in small- and large-scale fishing enterprises.
- SDG 12: Ensure sustainable consumption and production patterns, curbing food and post-harvest losses.
- SDG 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development by regulating harvesting, overfishing, illegal, unreported, unregulated and destructive fishing practices.
- Agenda 2063 – Aspiration 1: A prosperous Africa based on inclusive growth and sustainable development. Africa by 2063 aspires to be a prosperous continent, with the means and resources to drive its own development. Africa's blue economy, which is three times the size of its landmass, shall be a major contributor to continental transformation and growth; advancing knowledge on marine and aquatic biotechnology; the growth of an Africa-wide shipping industry: the development of sea, river and lake transport and fishing; and the exploitation and beneficiation of deep-sea mineral and other resources.

Selection criteria

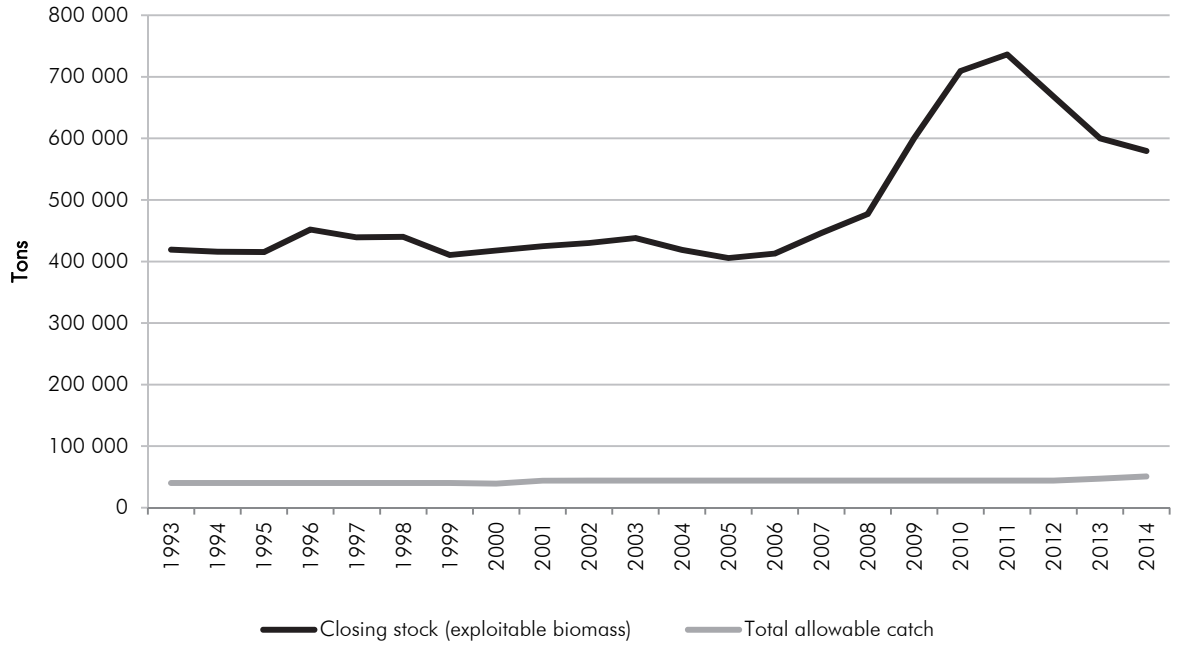
- Relevant – the indicator provides information that is useful to decision-making with regard to employment, economic growth and meeting sustainable development goals.
- Easy to understand – for both technical and non-expert audiences in tables and graphics with simplified content and subject matter.
- Reliable – the quality of measurement is consistent and can be repeated over time-based data series.
- Accessible – the data are available on an annual basis, keeping the trends up to date.

Measurement

Units	Spatial scale	Frequency
Tons	National	Annually

Figure 4.4 shows the correlation between the closing stock (exploitable biomass) and the set TAC level. From 1993 the TAC level remained unchanged at 40 000 tons until 1999. It was lowered to 39 000 tons in 2000 and increased to 44 000 tons in 2001. The TAC level remained unchanged at 44 000 tons until 2012. The closing stock (exploitable biomass) showed a fluctuating trend between 1993 and 2008. In 2009, the closing stock (exploitable biomass) began to recover and maintained this increasing trend until reaching 736 284 tons in 2011. From 2012, the closing stock (exploitable biomass) started a declining trend through to 2014 (579 474 tons).

Figure 4.4: Cape horse mackerel: Closing stock and total allowable catch, 1993–2014



Source: Statistics South Africa. Environmental Economic Accounts Tables.

Table 4.4: Cape horse mackerel: Closing stock and total allowable catch, 1993–2014

1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Closing stock (exploitable biomass) (tons)										
419 161	415 686	415 145	451 959	439 298	440 087	410 694	417 945	424 874	430 110	438 109
Total allowable catch (tons)										
40 000	40 000	40 000	40 000	40 000	40 000	40 000	39 000	44 000	44 000	44 000
2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Closing stock (exploitable biomass) (tons)										
418 883	405 750	412 915	446 257	477 012	600 450	709 566	736 284	667 894	600 215	579 474
Total allowable catch (tons)										
44 000	44 000	44 000	44 000	44 000	44 000	44 000	44 000	44 000	47 150	50 615

Source: Statistics South Africa. Environmental Economic Accounts Tables.

Data sources and references

- Statistics South Africa. Environmental Economic Accounts Tables.
- Department of Agriculture, Forestry and Fisheries (DAFF), Marine Resource Assessment and Management (MARAM), and the University of Cape Town, Department of Mathematics and Applied Mathematics.
- Marine Stewardship Council (MSC), 2009. *MSC Fishery Fact Sheet: South Africa hake trawl fishery, 2009*. Website: www.msc.org
- The Presidency, Republic of South Africa, 2014. *Medium Term Strategic Framework (MTSF) 2014-2019*. Department: Planning, Monitoring and Evaluation.
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- United Nations, 2015. Open Working Group proposal for Sustainable Development Goals. http://undocs.org/A/68/970.
- United Nations, 2015. *Sustainable Development Goals, Transforming Our World – the 2030 Agenda for Sustainable Development*. https://sustainabledevelopment.un.org/topics
- United Nations, 2015. *Agenda 2063. The Africa We Want*. http://www.un.org/en/africa/osaa/pdf/au/agenda2063.pdf

4.5 South Coast rock lobster: Sustainability of South Coast rock lobster (*Palinurus gilchristi*) stocks, 1993 to 2014

Description

Closing stock for South Coast rock lobster (*Palinurus gilchristi*) and TAC for fish and fish farming pertaining to South Coast rock lobster.

Linkages

This indicator links to the MTSF 2014–2019, the NDP 2030, SDGs and African Agenda 2063 as follows:

- MTSF Outcome 10: Protect and enhance environmental assets and natural resources. The challenge for South Africa's marine fisheries is to maintain the integrity of and balance in marine ecosystems while deriving sustainable economic benefits from living marine resources. The main constraints to achieve this are the productivity of key resources, which is influenced by the environment and impacted upon by illegal catches, and managing catches in each fishery in a sustainable way. The desired outcomes are to rebuild stocks of threatened species and to reduce illegal catches.
- NDP: Implementation of a long-term vision through to 2030 towards addressing unemployment, inequality and creating a more inclusive society through the protection of South Africa's natural resources and a transition to an environmentally sustainable, climate-change resilient, low-carbon economy.
- SDG 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all. The fishing sector in South Africa plays an important role in small- and large-scale fishing enterprises.
- SDG 12: Ensure sustainable consumption and production patterns, curbing food and post-harvest losses.
- SDG 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development by regulating harvesting, overfishing, illegal, unreported, unregulated and destructive fishing practices.
- Agenda 2063 – Aspiration 1: A prosperous Africa based on inclusive growth and sustainable development. Africa by 2063 aspires to be a prosperous continent, with the means and resources to drive its own development. Africa's blue economy, which is three times the size of its landmass, shall be a major contributor to continental transformation and growth: advancing knowledge on marine and aquatic biotechnology: the growth of an Africa-wide shipping industry: the development of sea, river and lake transport and fishing; and the exploitation and beneficiation of deep-sea mineral and other resources.

Selection criteria

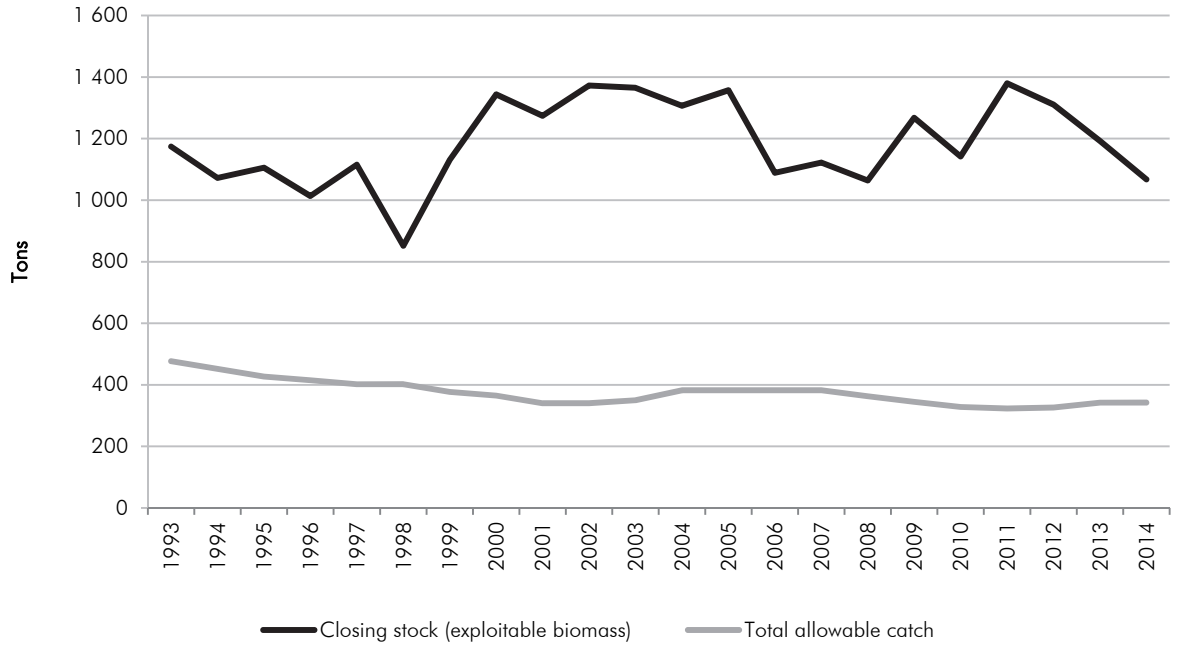
- Relevant – the indicator provides information that is useful to decision-making with regard to employment, economic growth and meeting sustainable development goals.
- Easy to understand – for both technical and non-expert audiences in tables and graphics with simplified content and subject matter.
- Reliable – the quality of measurement is consistent and can be repeated over time-based data series.
- Accessible – the data are available on an annual basis, keeping the trends up to date.

Measurement

Units	Spatial scale	Frequency
Tons	National	Annually

Figure 4.5 shows the correlation between the closing stock (exploitable biomass) and the set TAC level. From 1993, the TAC level was gradually set to lower levels until 2001 (340 tons). Thereafter the TAC ranged between 340 and 382 tons. The closing stock (exploitable biomass) showed a fluctuating trend from 1993 (1 174 tons) through to 2014 (1 067 tons), reaching a peak of 1 380 tons in 2011.

Figure 4.5: South Coast rock lobster: Closing stock and total allowable catch, 1993–2014



Source: Statistics South Africa. Environmental Economic Accounts Tables.

Table 4.5: South Coast rock lobster: Closing stock and total allowable catch, 1993–2014

1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Closing stock (exploitable biomass) (tons)										
1 174	1 072	1 106	1 013	1 116	852	1 131	1 344	1 274	1 372	1 365
Total allowable catch (tons)										
477	452	427	415	402	402	377	365	340	340	350
2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Closing stock (exploitable biomass) (tons)										
1 307	1 358	1 089	1 122	1 064	1 268	1 142	1 380	1 311	1 192	1 067
Total allowable catch (tons)										
382	382	382	382	363	345	328	323	326	342	342

Source: Statistics South Africa. Environmental Economic Accounts Tables.

Data sources and references

- Statistics South Africa. Environmental Economic Accounts Tables.
- Department of Agriculture, Forestry and Fisheries (DAFF), Marine Resource Assessment and Management (MARAM), and the University of Cape Town, Department of Mathematics and Applied Mathematics.
- Marine Stewardship Council (MSC), 2009. *MSC Fishery Fact Sheet: South Africa hake trawl fishery, 2009*. Website: www.msc.org
- The Presidency, Republic of South Africa, 2014. *Medium Term Strategic Framework (MTSF) 2014-2019*. Department: Planning, Monitoring and Evaluation.
- The Presidency, Republic of South Africa, 2012. *National Development Plan 2030. Our Future-make it work*. National Planning Commission.
- United Nations, 2015. Open Working Group proposal for Sustainable Development Goals. http://undocs.org/A/68/970.
- United Nations, 2015. *Sustainable Development Goals, Transforming Our World – the 2030 Agenda for Sustainable Development*. https://sustainabledevelopment.un.org/topics
- United Nations, 2015. *Agenda 2063. The Africa We Want*. http://www.un.org/en/africa/osaa/pdf/au/agenda2063.pdf

4.6 Coal: Employment compared with production and output sales in the coal-mining sector, 1995 to 2013

Description

Production of coal, number of workers employed and output sales in the coal-mining sector.

Linkages

This indicator links to the MTSF 2014–2019, the NDP 2030, SDGs and African Agenda 2063 as follows:

- MTSF Outcome 4: Decent employment through economic growth – building a sustainable mining sector will ensure employment. The development and implementation of Minerals Beneficiation Action Plans (MBAPs) in terms of growth, employment, rural incomes, investment, output and African regional development.
- MTSF Outcome 10: Protect and enhance environmental assets and natural resources. South Africa's indigenous energy resource base is dominantly coal. The transition to a low-carbon economy is crucial.
- NDP: Implementation of a long-term vision through to 2030 towards addressing unemployment, inequality and creating a more inclusive society through the protection of South Africa's natural resources and a transition to an environmentally sustainable, climate-change resilient, low-carbon economy.
- SDG 7: Ensure access to affordable, reliable, sustainable and modern energy for all. The phasing in of renewable energy into the electricity grid is of importance in South Africa.
- SDG 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all. South Africa's mining sector remains a key sector in terms of this goal.
- Agenda 2063 – Aspiration 1: A prosperous Africa based on inclusive growth and sustainable development. Africa by 2063 aspires to be a prosperous continent, with the means and resources to drive its own development. Africa's collective GDP will be proportionate to the continent's share of the world's population and natural resource endowments. Implementation of the African Industrial Development Action Plan, the African Mining Vision at country and continental level, in particular fast-tracking the establishment of the Centre for African Mineral Development.

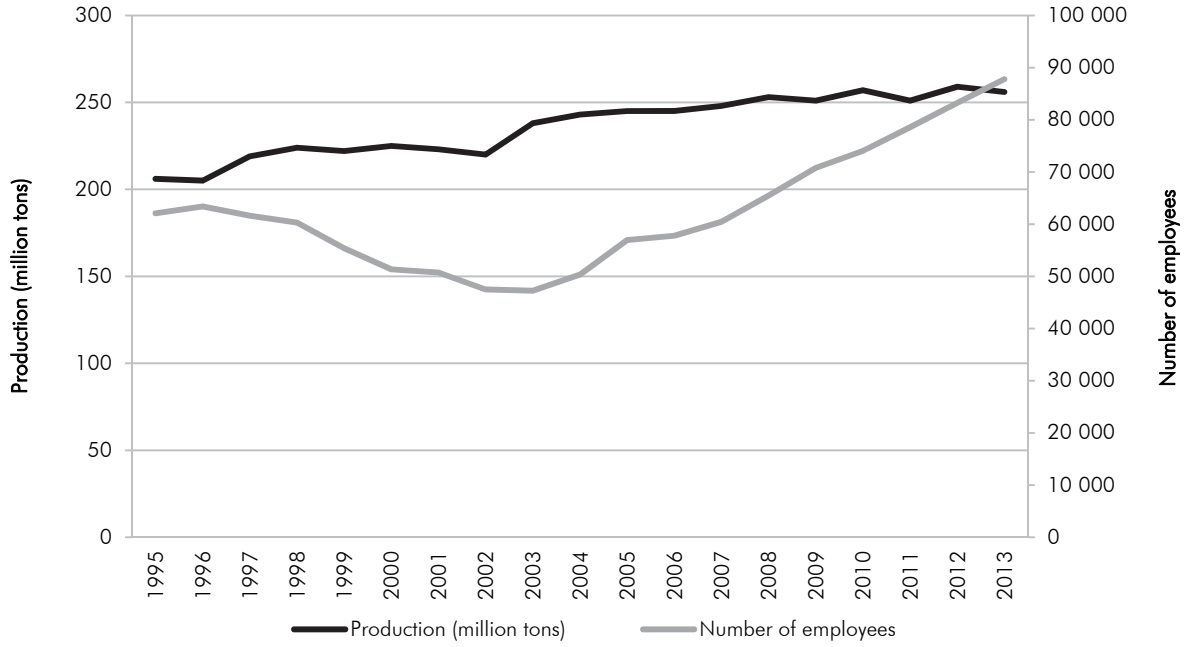
Selection criteria

- Relevant – the indicator provides information that is useful to decision-making with regard to employment, economic growth and meeting sustainable development goals.
- Easy to understand – for both technical and non-expert audiences in tables and graphics with simplified content and subject matter.
- Reliable – the quality of measurement is consistent and can be repeated over time-based data series.
- Accessible – the data are available on an annual basis, keeping the trends up to date.

Measurement

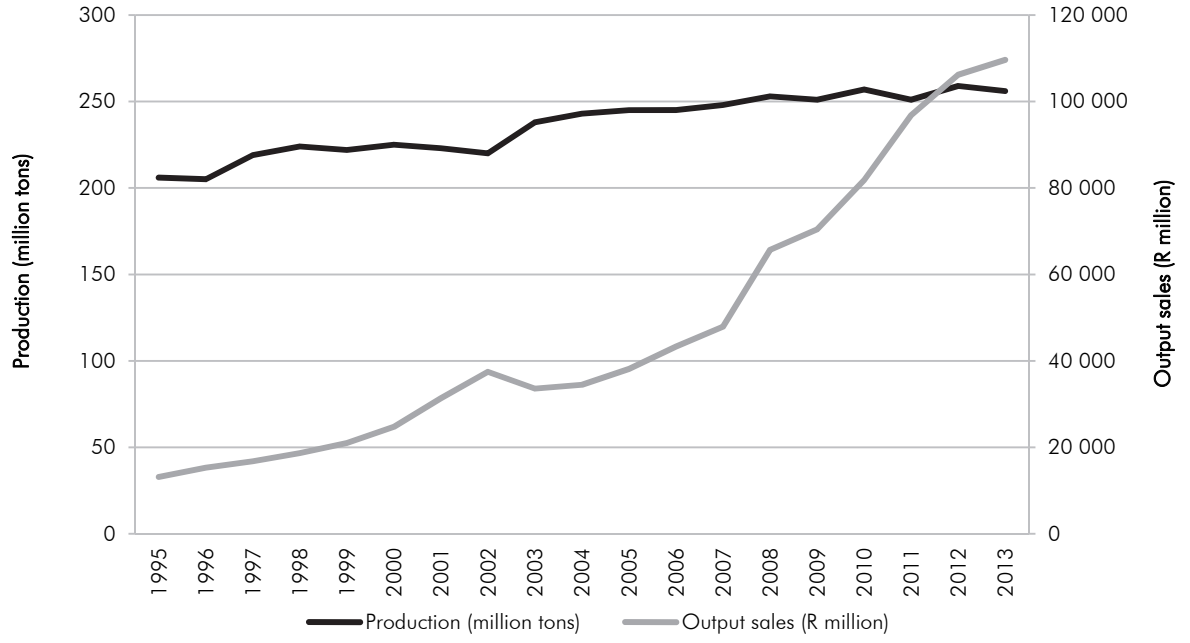
Units	Spatial scale	Frequency
Number of employees Production (Million tons) Output sales (Rand millions)	National	Annually

Figure 4.6a: Production of coal and employment in the coal-mining industry, 1995–2013



Source: Statistics South Africa. Environmental Economic Accounts Tables.

Figure 4.6b: Production of coal and output sales in the coal-mining industry, 1995–2013



Source: Statistics South Africa. Environmental Economic Accounts Tables.

Table 4.6: Production of coal, employment and output sales in the coal-mining industry, 1995–2013

1995	1996	1997	1998	1999	2000	2001	2002	2003
Production (million tons)								
206	205	219	224	222	225	223	220	238
Number of employees								
62 064	63 397	61 607	60 309	55 378	51 346	50 740	47 469	47 239
Output sales (Rand millions)								
13 138	15 285	16 765	18 680	20 993	24 728	31 370	37 459	33 588

2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Production (million tons)									
243	245	245	248	253	251	257	251	259	256
Number of employees									
50 327	56 971	57 778	60 439	65 484	70 791	74 025	78 579	83 244	87 768
Output sales (Rand millions)									
34 464	38 132	43 342	47 933	65 683	70 427	81 831	96 817	106 174	109 648

Source: Statistics South Africa. Environmental Economic Accounts Tables.

Table 4.6 and Figure 4.6a show the production of coal and the number of employees in the coal-mining industry from 1995 to 2013. Figure 4.6b shows the production of coal and output sales in the coal-mining industry from 1995 to 2013. From 1995 to 2013, coal production increased by 24,3% from 206 million tons to 256 million tons. Employment in the coal-mining industry increased by 41,4% from 62 064 employees in 1995 to 87 768 in 2013. Output sales increased by 734,6% from R13 138 million in 1995 to R109 648 million in 2013.

Data sources and references

- Statistics South Africa. Environmental Economic Accounts Tables.
- Department of Mineral Resources, 2012/2013. *South African Minerals Industry*. Department of Mineral Resources, Pretoria.
- The Presidency, Republic of South Africa, 2014. *Medium Term Strategic Framework (MTSF) 2014-2019*. Department: Planning, Monitoring and Evaluation.
- The Presidency, Republic of South Africa, 2012. *National Development Plan 2030. Our Future-make it work*. National Planning Commission.
- Chamber of Mines of South Africa, 2013. *Facts & Figures 2013/2014*. Johannesburg, South Africa.
- Department of Internal Relations and Cooperation, 2014. *African Agenda 2063*. Republic of South Africa.
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- United Nations, 2015. *Agenda 2063. The Africa We Want*. http://www.un.org/en/africa/osaa/pdf/au/agenda2063.pdf

4.7 Gold: Employment compared with production and output sales in the gold-mining sector, 1995 to 2013

Description

Production of gold, number of workers employed and output sales in the gold-mining sector.

Linkages

This indicator links to the MTSF 2014–2019, the NDP 2030, SDGs and African Vision Agenda 2063 as follows:

- MTSF Outcome 4: Decent employment through economic growth – building a sustainable mining sector will ensure employment. The development and implementation of MBAPs in terms of growth, employment, rural incomes, investment, output and African regional development.
- MTSF Outcome 10: Protect and enhance environmental assets and natural resources, including gold.
- NDP: Implementation of a long-term vision through to 2030 towards addressing unemployment, inequality and creating a more inclusive society through the protection of South Africa's natural resources and a transition to an environmentally sustainable, climate-change resilient, low-carbon economy.
- SDG 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.
- Agenda 2063 – Aspiration 1: A prosperous Africa based on inclusive growth and sustainable development. Africa by 2063 aspires to be a prosperous continent, with the means and resources to drive its own development. Africa's collective GDP will be proportionate to the continent's share of the world's population and natural resource endowments. Implementation of the African Industrial Development Action Plan, the African Mining Vision at country and continental level, in particular fast-tracking the establishment of the Centre for African Mineral Development.

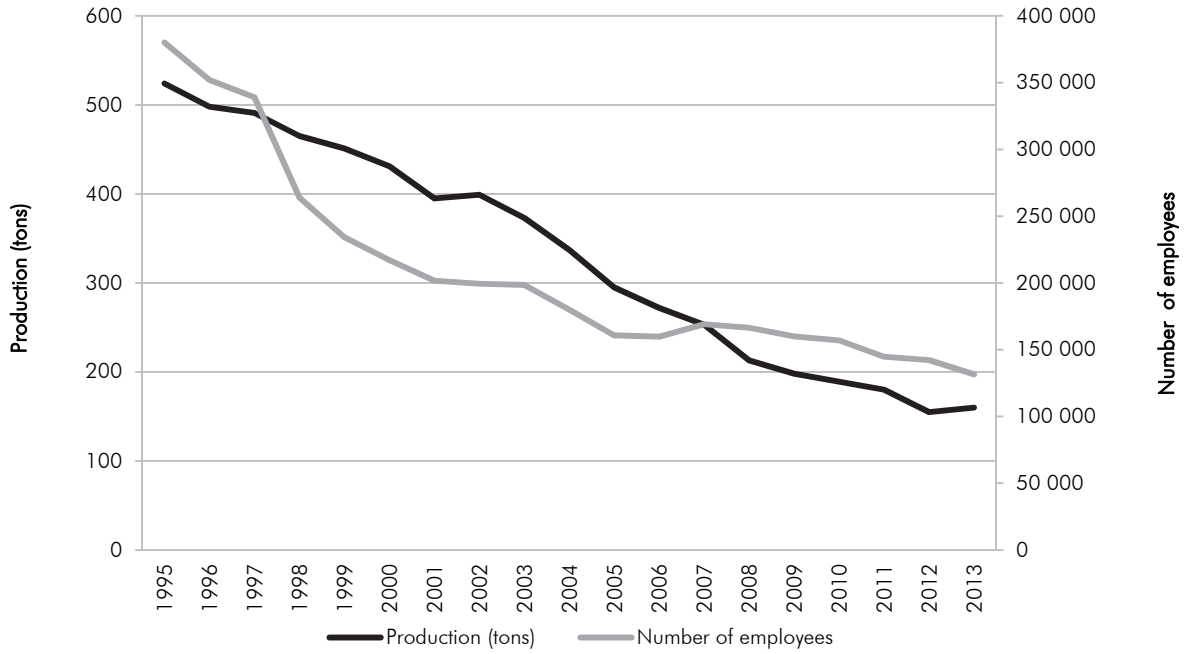
Selection criteria

- Relevant – the indicator provides information that is useful to decision-making with regard to employment, economic growth and meeting sustainable development goals.
- Easy to understand – for both technical and non-expert audiences in tables and graphics with simplified content and subject matter.
- Reliable – the quality of measurement is consistent and can be repeated over time-based data series.
- Accessible – the data are available on an annual basis, keeping the trends up to date.

Measurement

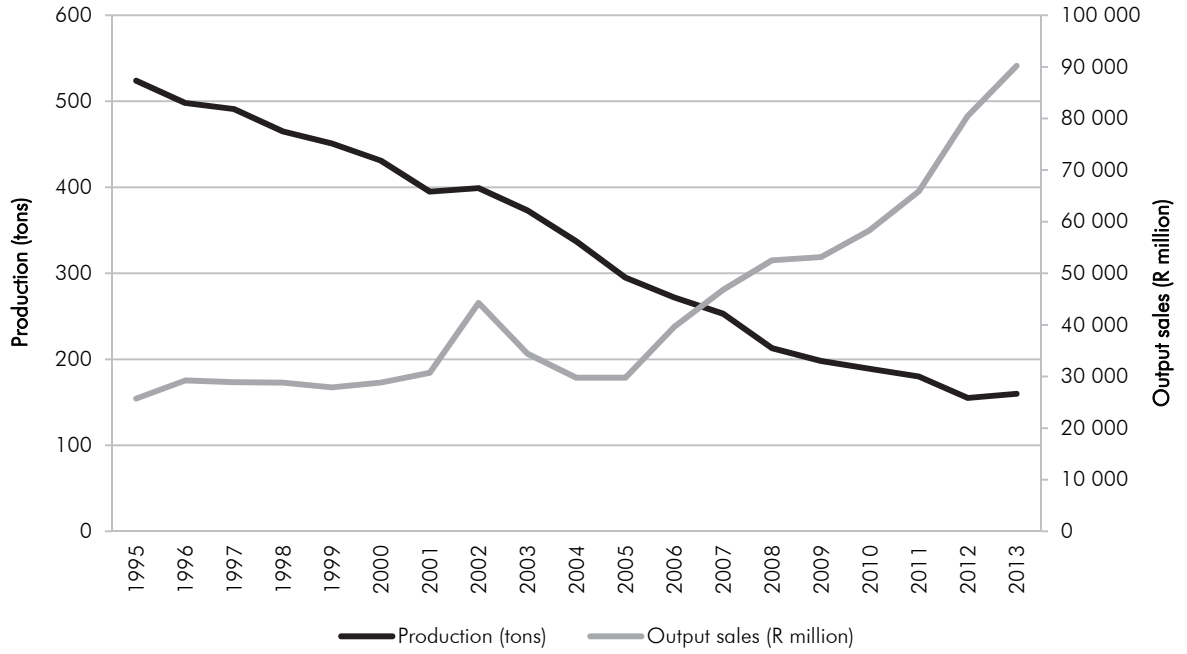
Units	Spatial scale	Frequency
Number of employees Production (tons) Output Sales (Rand millions)	National	Annually

Figure 4.7a: Production of gold and employment in the gold-mining industry, 1995–2013



Source: Statistics South Africa. Environmental Economic Accounts Tables.

Figure 4.7b: Production of gold and output sales in the gold-mining industry, 1995–2013



Source: Statistics South Africa. Environmental Economic Accounts Tables.

Table 4.7: Production of gold, employment and output sales in the gold-mining industry, 1995–2013

1995	1996	1997	1998	1999	2000	2001	2002	2003
Production (tons)								
524	498	491	465	451	431	395	399	373
Number of employees								
380 086	352 039	339 078	263 869	234 206	216 982	201 673	199 378	198 465
Output sales (Rand millions)								
25 714	29 238	28 881	28 788	27 893	28 825	30 704	44 271	34 395

2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Production (tons)									
337	295	272	253	213	198	189	180	155	160
Number of employees									
179 964	160 634	159 782	169 057	166 424	159 925	157 019	144 799	142 201	131 591
Output sales (Rand millions)									
29 765	29 751	39 606	46 824	52 533	53 135	58 357	65 855	80 490	90 189

Source: Statistics South Africa. Environmental Economic Accounts Tables.

Table 4.7, Figure 4.7a and Figure 4.7b show the production of gold, the number of employees in the gold-mining industry and output sales from 1995 to 2013. Gold production shows a decrease over the period from 1995 to 2013. In 1995, gold production was 524 tons and it decreased to 160 tons in 2013, which is a decrease of 69,5%. Employment in the gold-mining industry decreased by 65,4%, from 380 086 employees in 1995 to 131 591 employees in 2013. Output sales increased by 250,7% from R25 714 million in 1995 to R90 189 million in 2013.

Data sources and references

- Statistics South Africa. Environmental Economic Accounts Tables.
- Department of Mineral Resources, 2012/2013. *South African Minerals Industry*. Department of Mineral Resources.
- The Presidency, Republic of South Africa, 2014. *Medium Term Strategic Framework (MTSF) 2014-2019*. Department: Planning, Monitoring and Evaluation.
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- Department of Internal Relations and Cooperation, 2014. *African Agenda 2063*. Republic of South Africa.
- United Nations, 2015. Open Working Group proposal for Sustainable Development Goals. http://undocs.org/A/68/970.
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- United Nations, 2015. *Agenda 2063. The Africa We Want*. http://www.un.org/en/africa/osaa/pdf/au/agenda2063.pdf

4.8 PGMs: Employment compared with PGM production and output sales in the platinum-mining sector, 1995 to 2013

Description

Production of PGMs, number of workers employed and output sales in the platinum-mining sector.

Linkages

This indicator links to the MTSF 2014–2019, the NDP 2030, SDGs and African Vision Agenda 2063 as follows:

- MTSF Outcome 4: Decent employment through economic growth – building a sustainable mining sector will ensure employment. The development and implementation of MBAPs in terms of growth, employment, rural incomes, investment, output and African regional development.
- MTSF Outcome 10: Protect and enhance environmental assets and natural resources, including PGMs.
- NDP: Implementation of a long-term vision through to 2030 towards addressing unemployment, inequality and creating a more inclusive society through the protection of South Africa's natural resources and a transition to an environmentally sustainable, climate-change resilient, low-carbon economy.
- SDG 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.
- Agenda 2063 – Aspiration 1: A prosperous Africa based on inclusive growth and sustainable development. Africa by 2063 aspires to be a prosperous continent, with the means and resources to drive its own development. Africa's collective GDP will be proportionate to the continent's share of the world's population and natural resource endowments. Implementation of the African Industrial Development Action Plan, the African Mining Vision at country and continental level, in particular fast-tracking the establishment of the Centre for African Mineral Development.

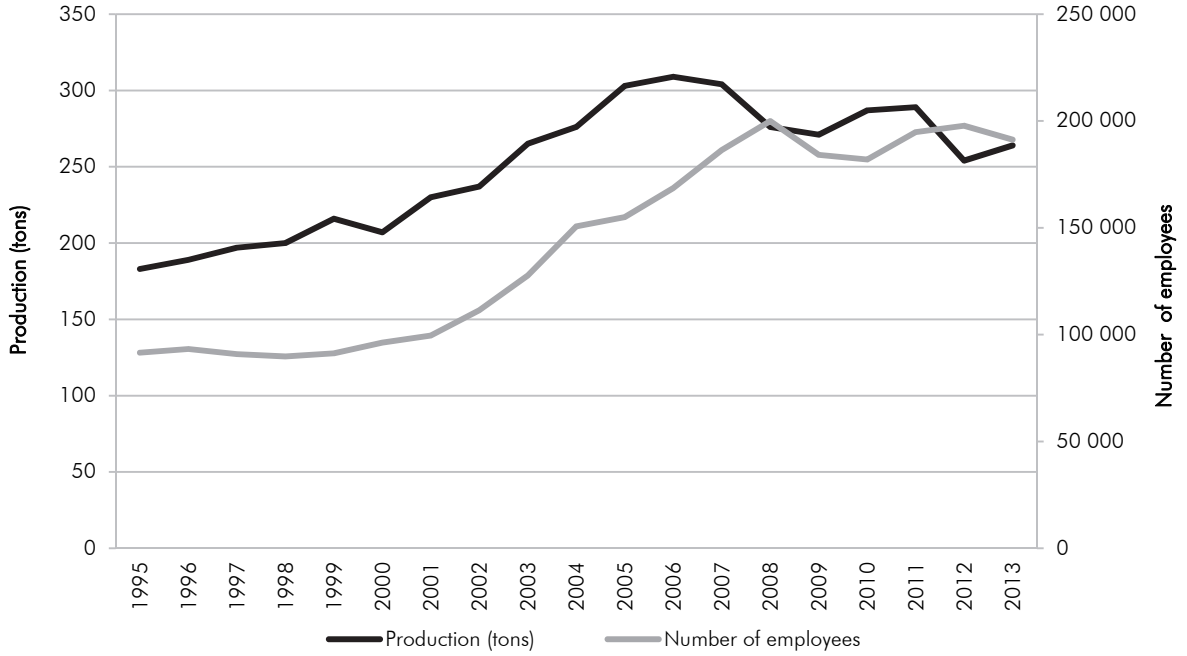
Selection criteria

- Relevant – the indicator provides information that is useful to decision-making with regard to employment, economic growth and meeting sustainable development goals.
- Easy to understand – for both technical and non-expert audiences in tables and graphics with simplified content and subject matter.
- Reliable – the quality of measurement is consistent and can be repeated over time-based data series.
- Accessible – the data are available on an annual basis, keeping the trends up to date.

Measurement

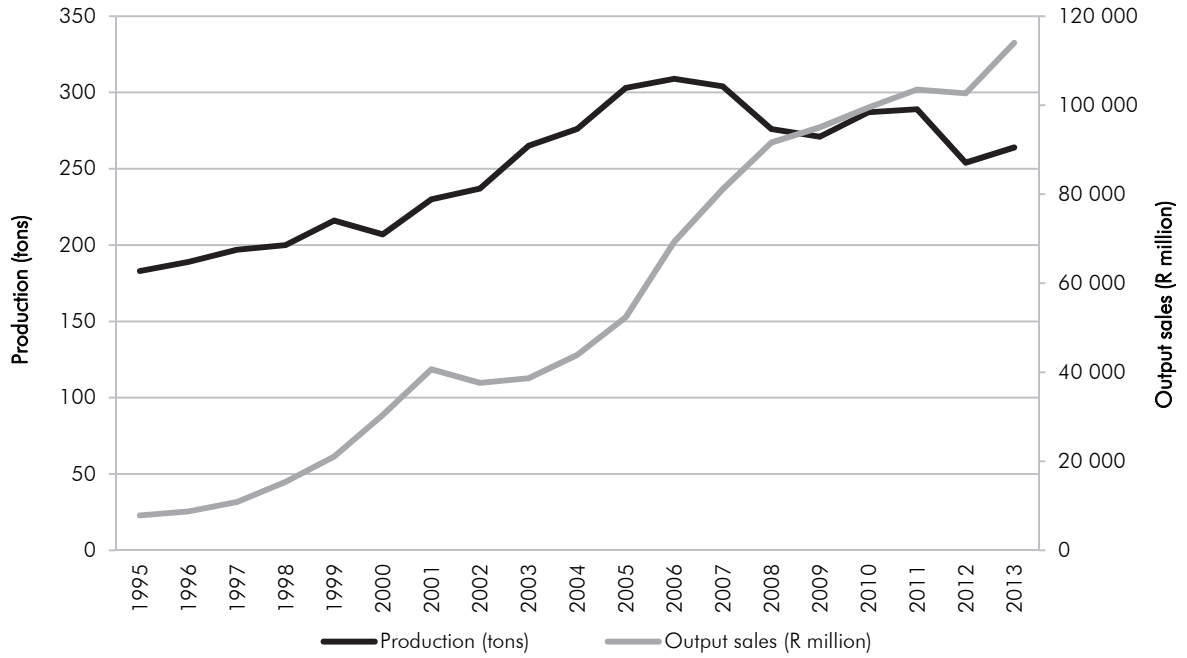
Units	Spatial scale	Frequency
Number of employees Production (tons) Output Sales (Rand millions)	National	Annually

Figure 4.8a: Production of PGMs and employment in the PGM-mining industry, 1995–2013



Source: Statistics South Africa. Environmental Economic Accounts Tables.

Figure 4.8b: Production of PGMs and output sales in the PGM-mining industry, 1995–2013



Source: Statistics South Africa. Environmental Economic Accounts Tables.

Table 4.8: Production of PGMs, employment and output sales in the PGM-mining industry, 1995–2013

1995	1996	1997	1998	1999	2000	2001	2002	2003
Production (tons)								
183	189	197	200	216	207	230	237	265
Number of employees								
91 528	93 304	90 876	89 781	91 269	96 273	99 575	111 419	127 672
Output sales (Rand millions)								
7 839	8 727	10 867	15 392	21 083	30 383	40 652	37 612	38 657

2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Production (tons)									
276	303	309	304	276	271	287	289	254	264
Number of employees									
150 630	155 034	168 530	186 411	199 948	184 163	181 969	194 745	197 752	191 261
Output sales (Rand millions)									
43 871	52 338	69 286	81 108	91 609	95 050	99 498	103 525	102 650	114 029

Source: Statistics South Africa. Environmental Economic Accounts Tables.

Table 4.8, Figure 4.8a and Figure 4.8b show the production of platinum, the number of employees in the platinum-mining industry and output sales from 1995 to 2013. From 1995 to 2013, platinum production increased by 44,3% from 183 tons in 1995 to 264 tons in 2013. Employment increased by 108,9% from 91 528 employees in 1995 to 191 216 employees in 2013. Output sales increased from R7 839 million in 1995 to R114 029 million in 2013.

Data sources and references

- Statistics South Africa. Environmental Economic Accounts Tables.
- Department of Mineral Resources, 2012/2013. *South African Minerals Industry*. Department of Mineral Resources.
- The Presidency, Republic of South Africa, 2014. *Medium Term Strategic Framework (MTSF) 2014-2019*. Department: Planning, Monitoring and Evaluation.
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- United Nations, 2015. *Agenda 2063. The Africa We Want*. http://www.un.org/en/africa/osaa/pdf/au/agenda2063.pdf

4.9 Access to water sources, population density NFEPA rivers

Description

The indicator shows different types of water sources that are accessible to people in each province, the population density and National Freshwater Ecosystem Priority Areas (NFEPA) rivers. The municipality is the major water service provider in all the provinces, with Gauteng having the largest municipal supplier. Boreholes are used in all provinces. Rivers are the main source of supply in provinces like Eastern Cape and KwaZulu-Natal. Northern Cape has a smaller population with less modified and clean natural river conditions. Gauteng province has a high population density and the river condition is C, i.e. largely modified. Other water sources such as dams, springs, rain water, tankers as well as water-vendors are used in all the provinces. Water sources like boreholes, rivers and dams are mostly used by farmers for irrigation purposes. The sources of water serve as alternatives to tap water, which is mainly inside dwelling units or in yards.

Linkages

This indicator links to the MTSF 2014–2019, the NDP 2030, SDGs and African Vision Agenda 2063 as follows:

- MTSF Outcome 10: Protect and enhance environmental assets and natural resources.
- NDP: Implementation of a long-term vision through to 2030 towards addressing unemployment, inequality and creating a more inclusive society through the protection of South Africa's natural resources and a transition to an environmentally sustainable, climate-change resilient, low-carbon economy.
- SDG 6: Ensure availability and sustainable management of water for all.
- Agenda 2063 – Aspiration 1: A prosperous Africa based on inclusive growth and sustainable development. Africa by 2063 aspires to be a prosperous continent, with the means and resources to drive its own development.

Selection criteria

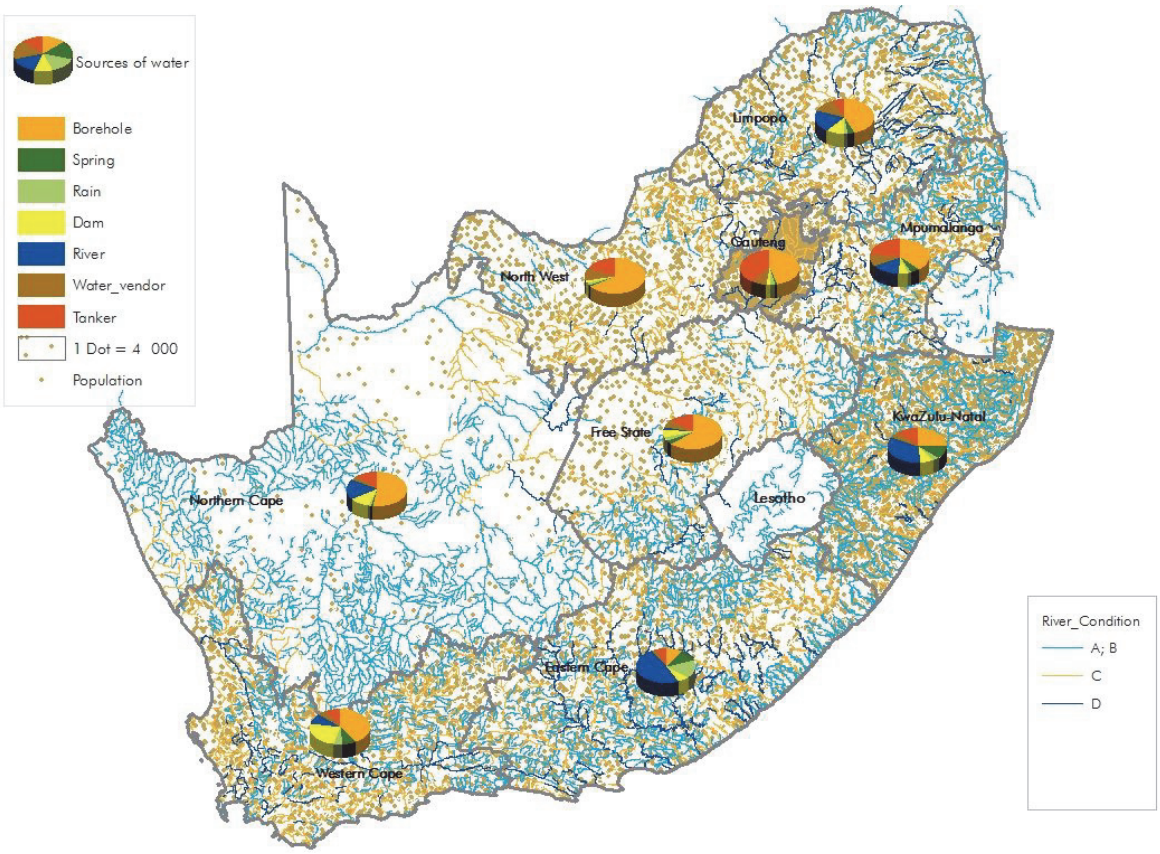
The indicator met the following criteria:

- Relevant – the indicator provides information that is useful to decision-making with regard to employment, economic growth and meeting sustainable development goals.
- Easy to understand – for both technical and non-expert audiences in tables and graphics with simplified content and subject matter.
- Reliable – the quality of measurement is consistent and can be repeated over time-based data series.
- Accessible – the data are available on a regular basis, keeping the trends up to date.

Measurement

Units	Spatial scale	Frequency
Million m^3	National	Annually/5-year period

Map 1.7: Access to water sources, population density and NFEPA rivers



Source: Census 2011 and National Freshwater Ecosystem Priority Areas

Data sources and references

- Statistics South Africa, 2012. *Census 2011, P0301*. Pretoria.
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- United Nations, 2015. *Agenda 2063. The Africa We Want*. http://www.un.org/en/africa/osaa/pdf/au/agenda2063.pdf

4.10 Total population with access to piped (tap) water

Description

The indicator shows the total population with access to piped water and no access to piped water at all in each province, and the NFEPA rivers. Gauteng has the largest population within the country, followed by KwaZulu-Natal, with Northern Cape having the smallest population. In all provinces there are a very small number of people with no access to piped water, which indicates that there has been improvement in water service delivery and a reduction in the backlog. Although Gauteng and other provinces experience modified river ecosystem conditions, people still have access to tap water that is clean and drinkable since the water goes through purification processes.

Linkages

This indicator links to the MTSF 2014–2019, the NDP 2030, SDGs and African Vision Agenda 2063 as follows:

- MTSF Outcome 10: Protect and enhance environmental assets and natural resources.
- NDP: Implementation of a long-term vision through to 2030 towards addressing unemployment, inequality and creating a more inclusive society through the protection of South Africa's natural resources and a transition to an environmentally sustainable, climate-change resilient, low-carbon economy.
- SDG 6: Ensure availability and sustainable management of water for all.
- Agenda 2063 – Aspiration 1: A prosperous Africa based on inclusive growth and sustainable development. Africa by 2063 aspires to be a prosperous continent, with the means and resources to drive its own development. Africa's collective GDP will be proportionate to the continent's share of the world's population and natural resource endowments.

Selection criteria

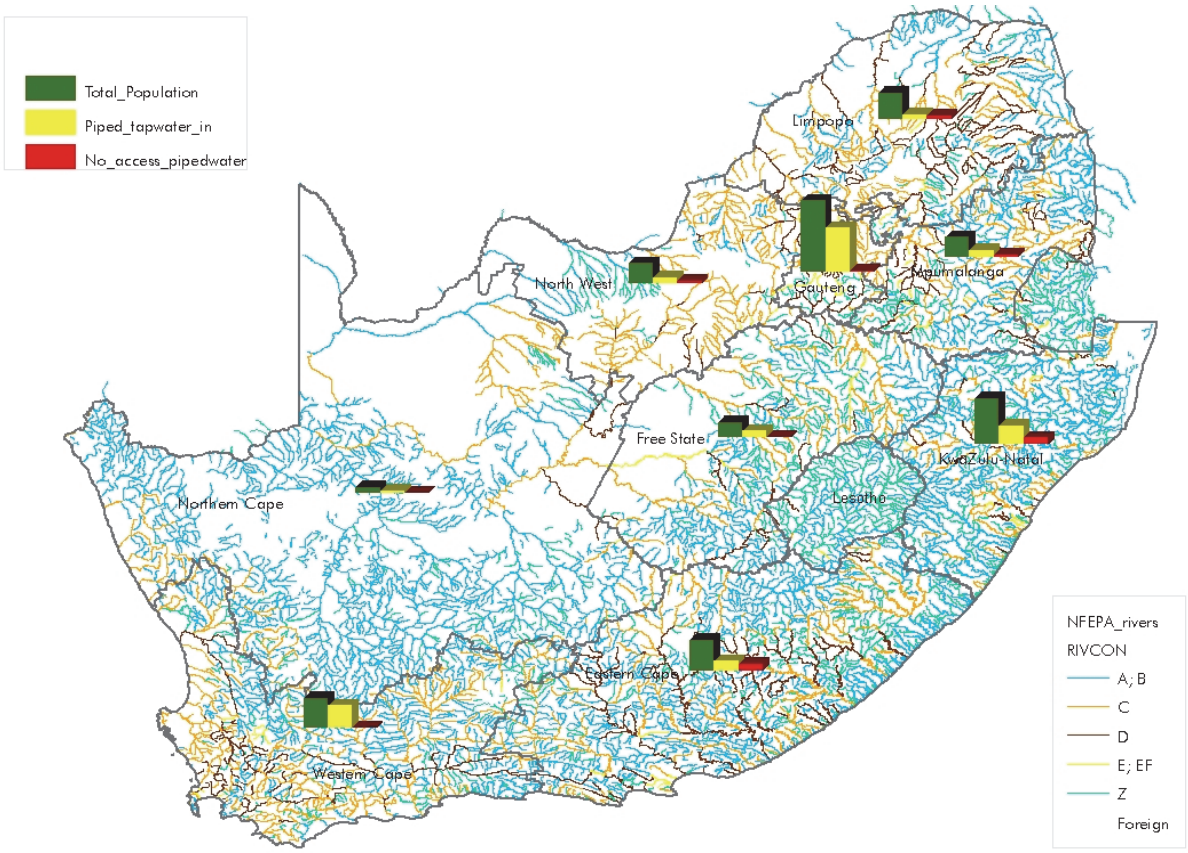
The indicator met the following criteria:

- Relevant – the indicator provides information that is useful to decision-making with regard to employment, economic growth and meeting sustainable development goals.
- Easy to understand – for both technical and non-expert audiences in tables and graphics with simplified content and subject matter.
- Reliable – the quality of measurement is consistent and can be repeated over time-based data series.
- Accessible – the data are available on a regular basis, keeping the trends up to date.

Measurement

Units	Spatial scale	Frequency
Million/ Million m^3	National	Annually/5-year period

Map 1.8: Total population with access to piped (tap) water



Source: Census 2011 and National Freshwater Ecosystem Priority Areas

Data sources and references

- Statistics South Africa, 2012. *Census 2011, P0301*. Pretoria.
- Nel, J., *et al*, 2011. *Atlas of Freshwater Ecosystem Priority Areas in South Africa: Maps to support sustainable development of water resources*. WRC Report No. TT 500/11, Water Research Commission, Pretoria, South Africa.
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- United Nations, 2015. *Agenda 2063. The Africa We Want*. http://www.un.org/en/africa/osaa/pdf/au/agenda2063.pdf

4.11 Piped (tap) water services and NFEPA rivers

Description

The indicator shows piped (tap) water services within provincial boundaries, and the NFEPA rivers. The NFEPA rivers indicate that Northern Cape is the only province with unmodified river conditions, with other provinces having moderate to largely modified river conditions. Gauteng and Western Cape are the two provinces with large numbers of the population with access to piped water within dwelling units. Limpopo, Mpumalanga, Free State, North West as well as Northern Cape are provinces that have large populations with access to piped water within their yards, and this is characteristic of rural areas in these provinces. Eastern Cape has the largest number of people without access to piped water, followed by KwaZulu-Natal, Mpumalanga, Limpopo and North West. Most people in these provinces are likely to fetch their water from rivers, dams, reservoirs, springs, water tankers and other sources shown in Map 1.9.

Linkages

This indicator links to the MTSF 2014–2019, the NDP 2030, SDGs and African Vision Agenda 2063 as follows:

- MTSF Outcome 6: A competitive and responsive economic infrastructure network. Maintenance and supply availability of our bulk water resources infrastructure ensured: dams and inter-basin transfers, bulk water and wastewater.
- NDP: Implementation of a long-term vision through to 2030 towards addressing unemployment, inequality and creating a more inclusive society through the protection of South Africa's natural resources and a transition to an environmentally sustainable, climate-change resilient, low-carbon economy.
- SDG 6: Ensure availability and sustainable management of water for all.
- SDG 9: Build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation.
- Agenda 2063 – Aspiration 1: A prosperous Africa based on inclusive growth and sustainable development. Africa by 2063 aspires to be a prosperous continent, with the means and resources to drive its own development. Africa's collective GDP will be proportionate to the continent's share of the world's population and natural resource endowments.

Selection criteria

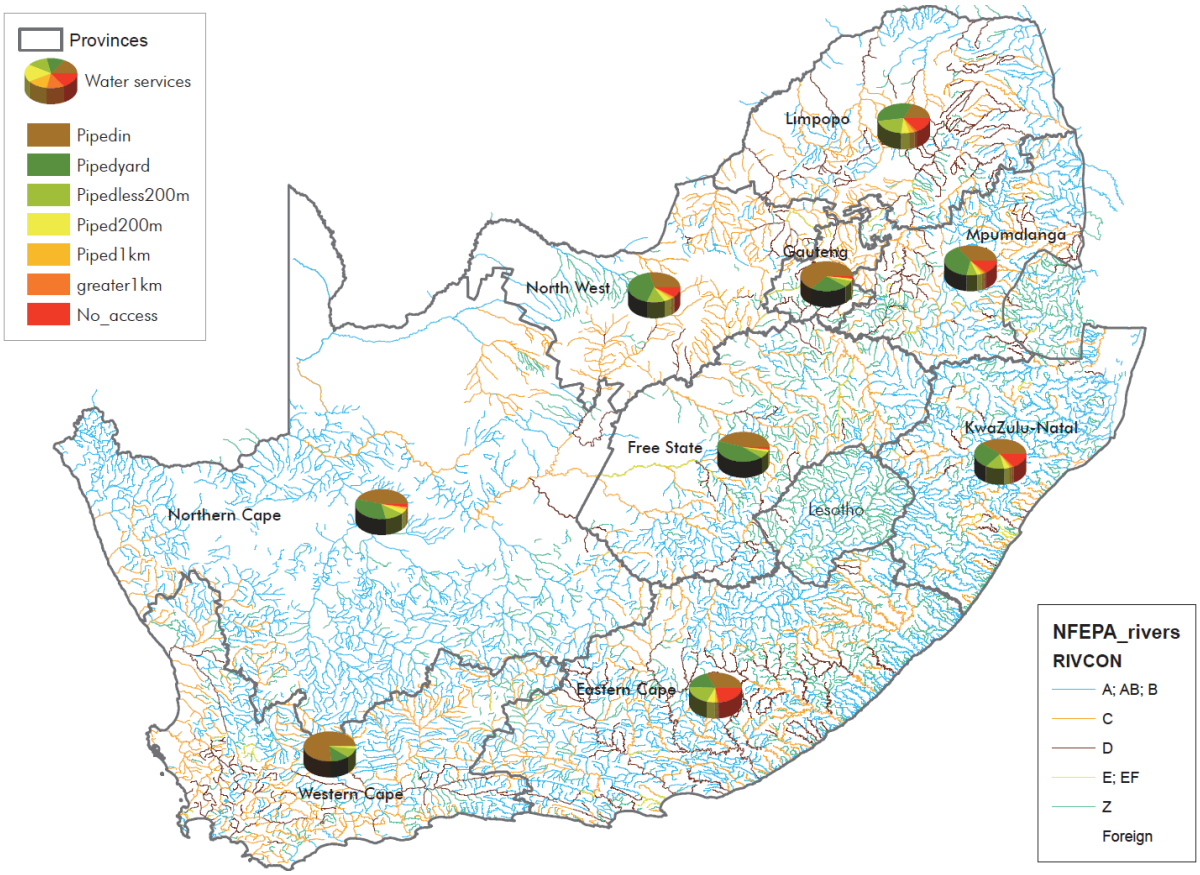
The indicator met the following criteria:

- Relevant – the indicator provides information that is useful to decision-making with regard to employment, economic growth and meeting sustainable development goals.
- Easy to understand – for both technical and non-expert audiences in tables and graphics with simplified content and subject matter.
- Reliable – the quality of measurement is consistent and can be repeated over time-based data series.
- Accessible – the data are available on a regular basis, keeping the trends up to date.

Measurement

	Spatial scale	Frequency
Million m^3	National	Annually/5-year period

Map 1.9: Piped (tap) water services and NFEPA rivers



Data sources and references

- Statistics South Africa, 2012. *Census 2011, P0301*. Pretoria.
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- United Nations, 2015. *Agenda 2063. The Africa We Want*. http://www.un.org/en/africa/osaa/pdf/au/agenda2063.pdf

4.12 Mining, energy power plants and NFEPA rivers

Description

The indicator shows the location of mining industries, energy power plants as well as NFEPA rivers. These mines mainly extract minerals such as coal, gold and PGMs from both open-cast and underground mines. The minerals are measured in TJ for international comparison. Most of the provinces with mining sectors show river condition C (i.e. moderately modified), which is not good for drinking unless some sort of purification is used. Northern Cape has river condition A-B (i.e. unmodified and largely natural) with no mining actitivties in operation and no power plants to affect the river ecosystem condition.

Linkages

This indicator links to the MTSF 2014–2019, the NDP 2030, SDGs and African Vision Agenda 2063 as follows:

- MTSF Outcome 10: Protect and enhance environmental assets and natural resources.
- NDP: Implementation of a long-term vision through to 2030 towards addressing unemployment, inequality and creating a more inclusive society through the protection of South Africa's natural resources and a transition to an environmentally sustainable, climate-change resilient, low-carbon economy.
- SDG 7: Ensure access to affordable, reliable, sustainable and modern energy for all.
- SDG 9: Build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation.
- Agenda 2063 – Aspiration 1: A prosperous Africa based on inclusive growth and sustainable development. Africa by 2063 aspires to be a prosperous continent, with the means and resources to drive its own development. Africa's collective GDP will be proportionate to the continent's share of the world's population and natural resource endowments.

Selection criteria

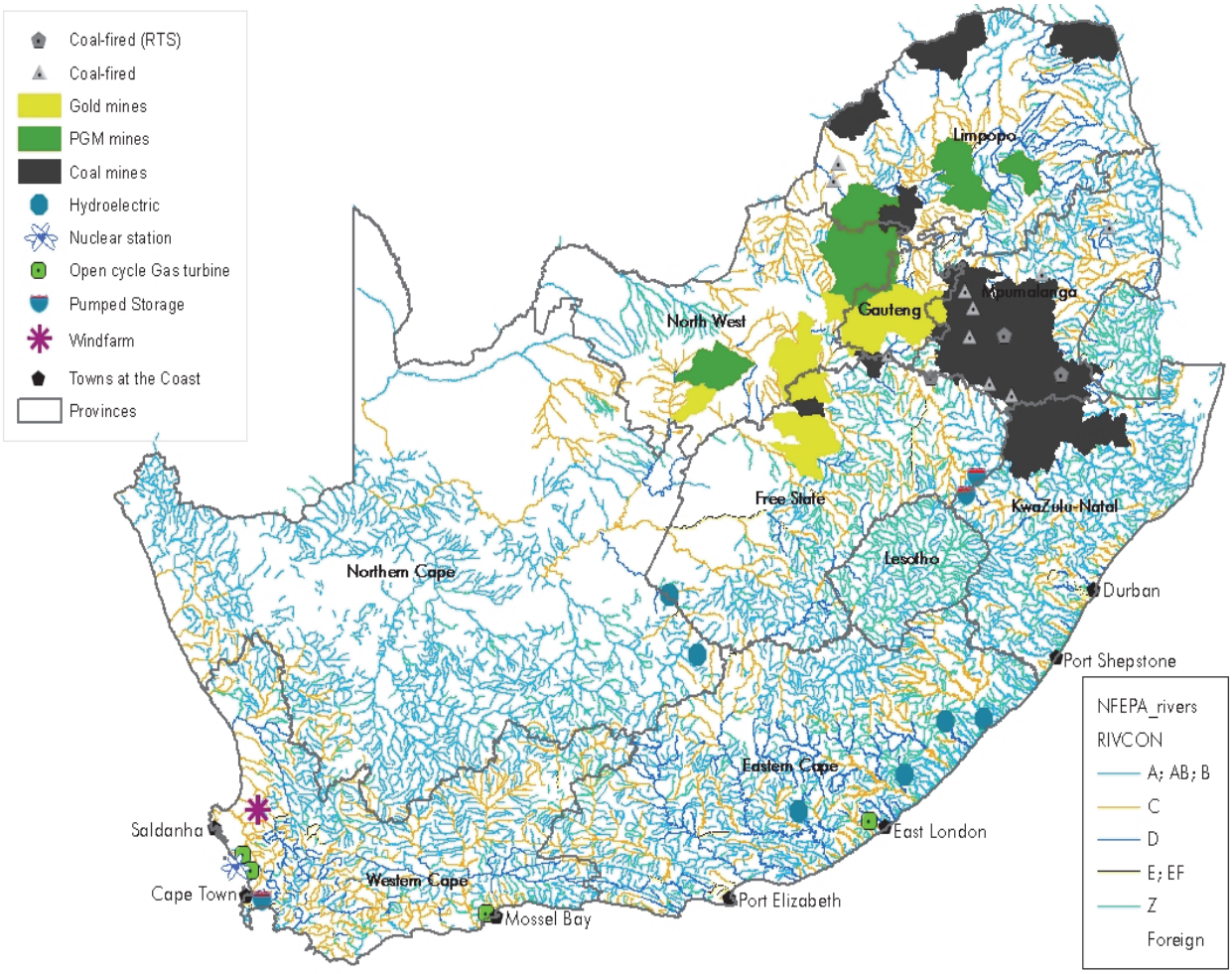
The indicator met the following criteria:

- Relevant – the indicator provides information that is useful to decision-making with regard to employment, economic growth and meeting sustainable development goals.
- Easy to understand – for both technical and non-expert audiences in tables and graphics with simplified content and subject matter.
- Reliable – the quality of measurement is consistent and can be repeated over time-based data series.
- Accessible – the data are available on a regular basis, keeping the trends up to date.

Measurement

Units	Spatial scale	Frequency
Terajoules/Million m^3	National	Annually

Map 1.10: Mining, Energy power plants and NFEPA rives



Source: Census 2011, National Freshwater Ecosystem Priority Areas and Council for Geoscience

Data sources and references

- Statistics South Africa, 2012. *Census 2011, P0301*. Pretoria.
- Nel, J., *et al*, 2011. *Atlas of Freshwater Ecosystem Priority Areas in South Africa: Maps to support sustainable development of water resources*. WRC Report No. TT 500/11, Water Research Commission, Pretoria, South Africa.
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- United Nations, 2015. Open Working Group proposal for Sustainable Development Goals. http://undocs.org/A/68/970.
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4.13 Energy: Primary *versus* renewable energy sources, 2002 to 2012

Description

Production and supply of primary resources, including coal, crude oil and gas (primary). Production and supply of renewable energy resources, including hydro, solar, geothermal and waste.

Linkages

This indicator links to the MTSF 2014–2019, the NDP 2030, SDGs and African Vision Agenda 2063 as follows:

- MTSF Outcome 10: Protect and enhance environmental assets and natural resources. South Africa's indigenous energy resource base is dominantly coal. The transition to a climate-change resilient, low-carbon economy is vital.
- NDP: Implementation of a long-term vision through to 2030 towards addressing unemployment, inequality and creating a more inclusive society through the protection of South Africa's natural resources and a transition to an environmentally sustainable, climate-change resilient, low-carbon economy.
- SDG 7: Ensure access to affordable, reliable, sustainable and modern energy for all. The phasing in of renewable energy into the electricity grid is of importance in South Africa.
- African Vision 2063 – Aspiration 1: Cities and other settlements are hubs of cultural and economic activities, with modernized infrastructure, and people have access to all the basic necessities of life including energy. Energy: harnessing all African energy resources to ensure modern, efficient, reliable, cost-effective and environmentally friendly energy to all African households, businesses, industries and institutions, through building the national and regional energy pools and grids, and the Programme for Infrastructure Development in Africa energy projects.

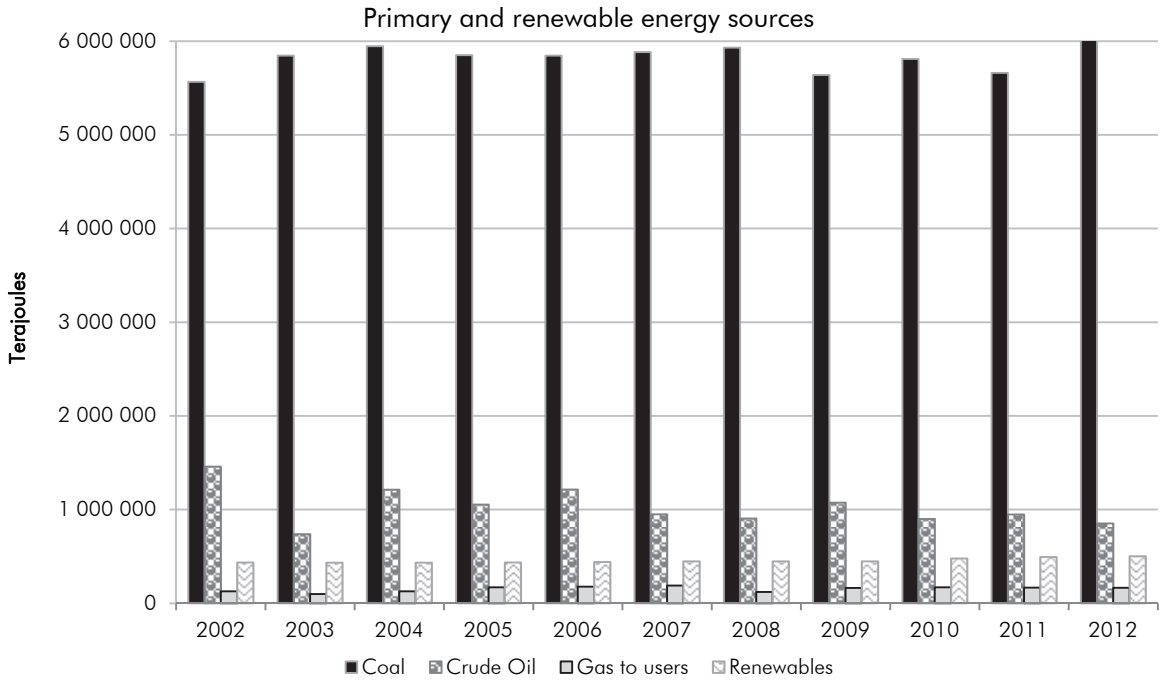
Selection criteria

- Relevant – the indicator provides information that is useful to decision-making with regard to employment, economic growth and meeting sustainable development goals.
- Easy to understand – for both technical and non-expert audiences in tables and graphics with simplified content and subject matter.
- Reliable – the quality of measurement is consistent and can be repeated over time-based data series.
- Accessible – the data are available on an annual basis, keeping the trends up to date.

Measurement

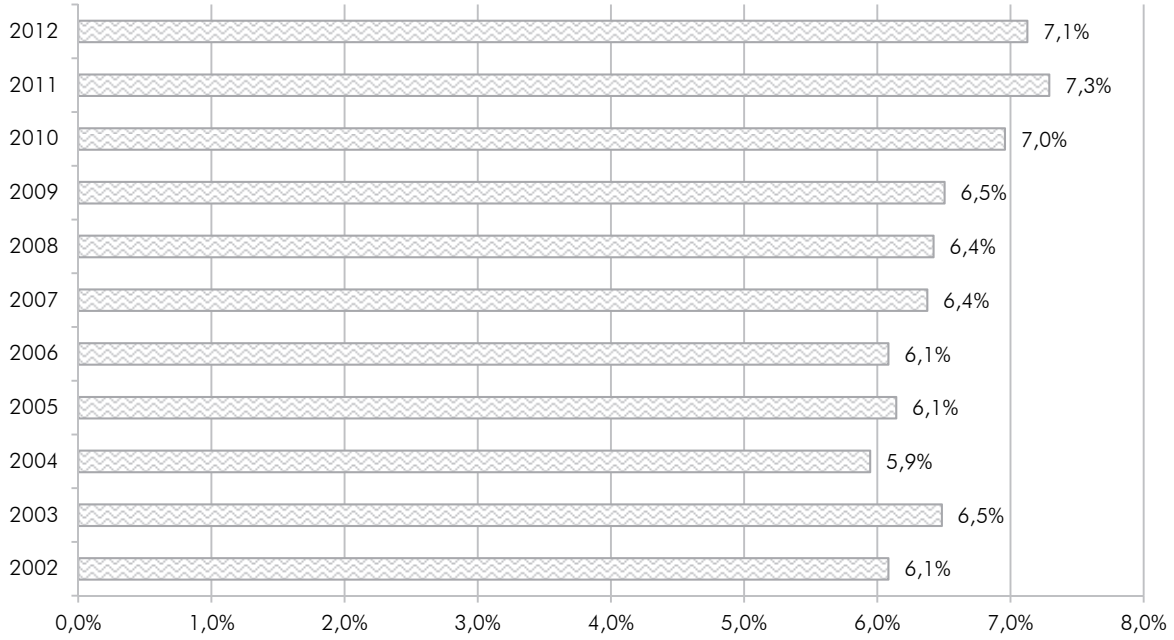
Units	Spatial scale	Frequency
Production (Terajoules)		
Ratio of primary to renewable (%)	National	Annually

Figure 4.9a: Production of primary and renewable energy, 2002–2012



Source: Statistics South Africa. Environmental Economic Accounts Tables.

Figure 4.9b: Renewable energy as a percentage of primary energy, 2002–2012



Source: Statistics South Africa. Environmental Economic Accounts Tables.

Table 4.9a: Production of primary and renewable energy supply by source, 2002–2012

	2002	2003	2004	2005	2006
			Terajoules		
Coal	5 564 663	5 845 989	5 946 220	5 851 419	5 845 839
Crude oil	1 458 054	737 474	1 212 633	1 054 539	1 214 122
Gas to users	127 137	99 062	127 842	169 888	177 998
Renewable energy	434 952	433 317	433 317	434 627	440 322

	2007	2008	2009	2010	2011	2012
			Terajoules			
Coal	5 882 959	5 930 254	5 638 460	5 809 318	5 661 176	6 029 072
Crude oil	950 040	905 344	1 074 807	900 491	948 621	852 226
Gas to users	189 162	121 430	164 046	169 703	167 801	166 055
Renewable energy	447 713	446 781	447 364	478 721	494 156	502 205

Note: Figures are rounded.
Source: Statistics South Africa. Environmental Economic Accounts Tables.

Table 4.9b: Percentage distribution of primary and renewable energy supply by source, 2002–2012

	2002	2003	2004	2005	2006
			Terajoules		
Primary	7 149 854	6 682 525	7 286 695	7 075 845	7 237 959
Renewable energy	434 952	433 317	433 317	434 627	440 322
			% Percentage		
Renewable energy	6,1%	6,5%	5,9%	6,1%	6,1%

	2007	2008	2009	2010	2011	2012
			Terajoules			
Primary	7 022 160	6 957 028	6 877 313	6 879 512	6 777 598	7 047 353
Renewable energy	447 713	446 781	447 364	478 721	494 156	502 205
			% Percentage			
Renewable energy	6,4%	6,4%	6,5%	7,0%	7,3%	7,1%

Note: Figures are rounded.
Source: Statistics South Africa. Environmental Economic Accounts Tables.

The main primary energy sources in the country include coal, crude oil and gas, with coal providing the bulk of energy generation. Renewable energy sources included in the energy grid are hydro, wastes, geothermal and solar power. Table 4.9a shows the production of primary and renewable energy supply by source, from 2002 to 2012, while Table 4.9b shows the proportion contributed by renewable energy compared with primary energy supply from 2002 to 2012. Figure 4.9a indicates that coal was the highest energy supply source from 2002 to 2012, followed by crude oil, with gas remaining fairly low. Figure 4.9b shows that the renewable energy supply has been slow in showing an upward trend from 2002 to 2012.

Data sources and references

- Statistics South Africa. Environmental Economic Accounts Tables.
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Chapter 5 – Current Development: Ecosystem Accounts

5. Introduction and background

Ecosystem accounting is a relatively new field of research and practice, falling within the broader field of environmental accounting. The UNSD has led the establishment of the SEEA to guide national environmental accounting, and is now taking forward the further development of SEEA-EEA within the context of the SEEA Central Framework. Stats SA as the implementation agency for environmental economic accounts formed a partnership with the South African National Biodiversity Institute (SANBI) in 2013/2014 to embark on a first attempt to develop experimental ecosystem accounting for South Africa. The Council for Scientific and Industrial Research (CSIR), the Department of Water and Sanitation (DWS) and the Department of Environmental Affairs (DEA) provided support to the project. A decision was made to focus firstly on river ecosystem assets, with most data sourced from DWS and the NFEPA[22] project. The document on national river ecosystem accounts will be published as a separate discussion document by SANBI and Stats SA in 2016 as part of a set of related deliverables with regard to advancing ecosystem accounting within South Africa. South Africa is one of seven pilot countries selected to participate in a project led by the UNSD in partnership with the United Nations Environment Programme (UNEP), and the Secretariat of the Convention on Biodiversity (CBD) to showcase the SEEA-EEA, with funding from the Norwegian Government. The first phase commenced in August 2014 and is scheduled to be completed in May 2016, with the South African partners SANBI, Stats SA, CSIR, Ezemvelo KZN Wildlife and the DEA to take this project forward into phase two. The focus of phase one included integrated land and ecosystem accounting for KwaZulu-Natal in addition to river ecosystem accounts. A final discussion document on land and ecosystem accounts for KwaZulu-Natal will be published in 2016, along with the discussion document on the national river ecosystem accounts. A short discussion on land and ecosystem accounting is presented here, drawing directly on the draft discussion document.[23]

5.1 Land accounts

Land accounts form part of the SEEA and are consistent with the SNA. The SNA focuses on how much is produced, consumed and invested in a country's economy, providing a range of information and indicators to inform macroeconomic policy. The SEEA focuses on interactions between the environment and the economy. The SEEA Central Framework focuses on accounting for individual environmental assets, such as timber, water, minerals and fish, while SEEA-EEA focuses on accounting for ecosystem assets and ecosystem services. Land is included as a non-produced asset in the SNA, as an environmental asset in the SEEA Central Framework, and also forms a core element of ecosystem accounting in SEEA-EEA. Land accounts provide a link between the SEEA Central Framework and SEEA-EEA.

Land accounts are a tool to quantify and track changes over time in land cover, land use or land ownership, or a combination of these. Land is the physical space where social and economic activities take place, and forms a component of ecosystems. The use of land and the impact and location of different types of socio-economic activities are key factors in sustainable development decisions. Land and ecosystem accounts can be used as a system or tool to support strategic decisions related to the use and management of land and natural resources. The accounts give important information with regard to trade-offs in a policy context and provide a basis for the development of indicators for measuring and reporting on sustainable development.

An accounting framework such as the SNA or the SEEA provides concepts that are consistently and coherently defined. This allows the integration of different data sources and methods to develop accounting tables to estimate trends over time. The accounting approach provides a systematic way of gathering and synthesising large amounts of data that can be used in multiple applications

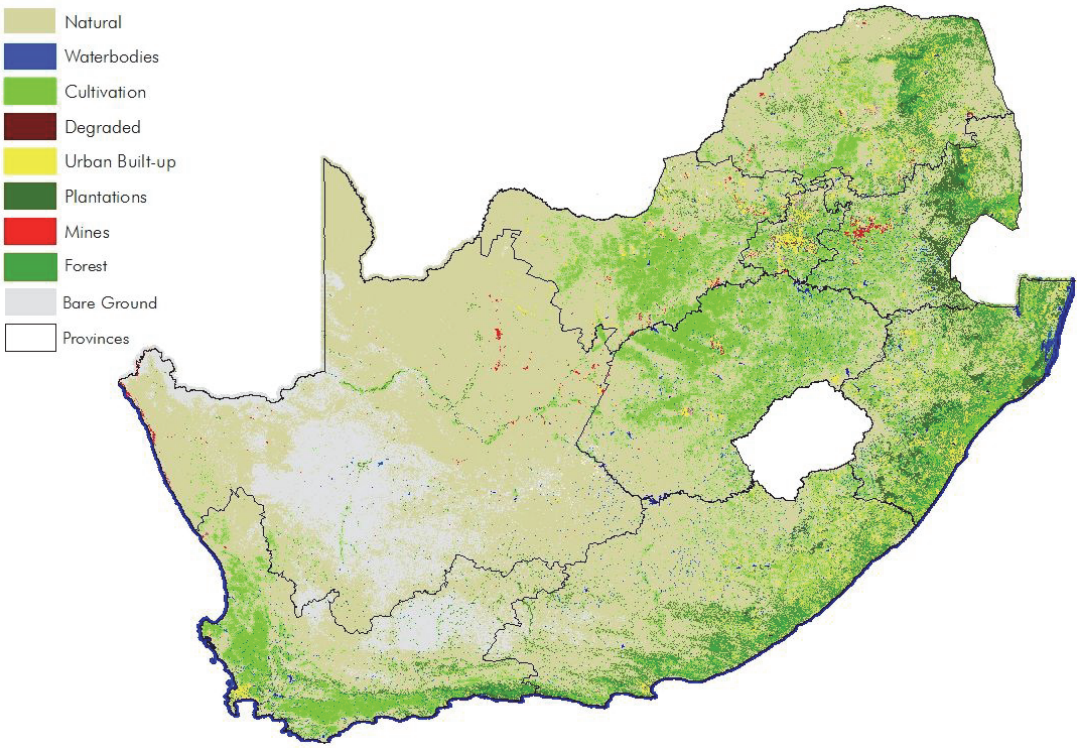
by a variety of sectors that can compare a broad national view globally. In the SEEA Central Framework and SEEA-EEA, the starting point is to describe a series of stocks and flows in physical terms, and how these change over time.[24]

5.2 Land cover data in South Africa

Land cover data are spatial data depicting the different types of physical and biological cover (natural or modified) found on the earth's surface, organised into land cover classes. Land cover datasets are essential for land accounts and a wider range of applications, such as urban planning and development or the use and management of natural resources from municipal level to national level management. The format and scale of the data can vary, and could be between 10 m pixels to 1 km pixels. Land cover datasets are usually produced based on remotely sensed images, such as satellite images, that are processed and interpreted in various ways. The difference between land cover and land use is that the latter is often more difficult to observe spatially, partly because several land uses can occur in a single place, making mapping of land use more difficult than land cover. In practice, some land cover datasets include some elements of land use.[23]

South Africa launched the 2013/2014 National Land Cover (NLC) in 2015, as well as a retrospective 1990 NLC, to provide two reference points on a national scale. This makes it possible to undertake national land accounts for the period 1990 to 2014. The NLC 2013/2014 dataset provides 72 land cover/land use classes at a 1:75 000–1:100 000 data application scale, with classes such as agriculture, forestry, vegetation, wetlands, mining and built-up areas, to name a few classes. The resolution is relatively fine (30 m), and the land cover data has been enhanced by incorporating ancillary data and multiple seasonal images that add value to the interpretation of land and ecosystems.[25]

Map 1.11: National Land Cover 2013/2014 for South Africa



Source: GeoTerraImage (Pty) Ltd, 2015. *National Land Cover 2013/2014*. Pretoria, South Africa.

5.3 Land accounts in the SEEA Central Framework

The SEEA Central Framework deals with accounts for the various environmental assets, including a section on asset accounts for land. Land accounts require the use of spatial data. High-level classifications for land use and land cover are suggested in the SEEA Central Framework, noting that land use and land cover are interrelated but not equivalent. The suggested classifications are interim rather than final, based on the Food and Agriculture Organisation (FAO) Land Cover classification system (LCCS), and are summarised in 14 categories as listed in Annexure A1.

The SEEA Central Framework provides an example of a physical account for land cover (Annexure A2). Managed expansions or regressions are increases or decreases in the area of a land cover class that result from human activity, while natural expansions or regressions are the result of natural processes. Re-appraisals are changes that result from improved information. Asset accounts are accounts of changes in the stock of an asset over a period of time. They are generally structured as balance sheets, with an opening balance, additions to and reductions in stock, and a closing balance. The SEEA Central Framework notes that the structure of land use accounts would be similar to those for land cover accounts. Land ownership accounts would be structured according to the institutional units in the SNA, i.e. government, households, corporations, non-profit institutions, etc.[24]

5.4 Ecosystem extent accounts in SEEA-EEA

The SEEA-EEA sets out a framework for ecosystem accounting that includes ecosystem asset accounts and ecosystem services accounts. Ecosystem asset accounts have three main elements: ecosystem extent accounts, ecosystem condition accounts, and the expected future flow of ecosystem services, which relates to the capacity of ecosystems to provide services. South Africa has started with ecosystem extent and condition accounts, as data availability is best suited to these accounts. Ecosystem accounts are spatial, and the SEEA-EEA sets out three types of spatial units:

- Basic spatial units – a grid of pixels, for example 100 m by 100 m.
- Land Cover ecosystem functional units (LCEU) – to represent ecosystem assets.
- Ecosystem accounting units – reporting units that aggregate results (i.e. administrative – municipalities, or biophysical – catchments or biomes).[26]

5.5 Mapping ecosystem units for ecosystem accounting

In South Africa, national ecosystem types are mapped and classified as part of the National Ecosystem Classification System.[27] National ecosystems are mapped across terrestrial and aquatic realms and include vegetation, river, wetland, coastal, inshore and offshore ecosystem types. This is different from the SEEA-EEA, which suggests that land cover is the starting point for delineating LCEUs. South Africa's view is that ecosystem types, mapped and classified on the basis of biophysical factors, are a better starting point for ecosystem units, which should not be based in the first instance on land cover classes. Land cover data may be useful in mapping ecosystem units, and ecosystem units and land cover classes may align in some instances, but they should not be conflated.[26]

5.6 Recommendations for integrated land and ecosystem accounting

The following recommendations are made based on lessons from South Africa's initial ecosystem accounting work, and will be discussed more fully in the discussion documents to be published in 2016. For fully integrated land, ecosystem asset and ecosystem services accounts, several elements are required:

- Land cover classes that link to socio-economic drivers of change and to ecological impacts.
- Ecosystem units based on characteristics related to the composition, structure and function of ecosystems.
- An understanding of how these ecosystem units link to ecosystem services (*via* their functional characteristics).
- An understanding of how conversion of each ecosystem unit (or groups of similar ecosystem units) from natural to various semi-natural or substantially modified land cover classes impacts on its ability to provide ecosystem services.

Having these elements in place would allow for the construction of an integrated set of accounts for land cover, ecosystem extent, ecosystem condition and ecosystem services generation. All of these elements are closely related and interlinked; it is nevertheless useful to keep each of them distinct. Keeping spatial information on land cover classes, ecosystem extent, ecological condition and ecosystem services supply distinct will ultimately support better integration of the accounts. A further recommendation is that percentage turnover in land cover and percentage land cover unchanged could provide useful headline indicators that could be extracted from land accounts and compared across different reporting units (at a range of spatial scales) and across time periods. For ecosystem extent accounts, percentage decline in natural area relative to original extent could be a useful headline indicator, especially when evaluated against critical ecological thresholds. These will be developed through the upcoming work on national land and ecosystem accounts, as outlined below.[23]

5.7 Priorities for national ecosystem accounting work

At the national level in South Africa, the priorities for national ecosystem accounting work were discussed during the Third Mission by the UNSD in October 2015 at SANBI in Pretoria at the Advisory Committee for SEEA-EEA. It is suggested that the following priorities be considered to expand on the current work in KwaZulu-Natal:

- Developing national land accounts, including land accounts for ecosystems based on current mapping and classification of national ecosystem types.
- Working towards an integrated map of ecosystem types across terrestrial and aquatic realms, to enable a single integrated set of ecosystem extent accounts nationally.
- Developing ecosystem condition accounts and integrating them with ecosystem extent accounts (as done for river ecosystems as part of this project).
- Developing land accounts for key ecological infrastructure features, such as strategic water source areas.
- Developing measures for ecosystem services that link ecosystem types in different ecological condition classes (e.g. natural, semi-natural, substantially modified) to the provision of ecosystem services, which can then be used in ecosystem service accounts.
- Integrating ecological indicators with socio-economic indicators to monitor the implementation of SDGs in South Africa.[23]

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Annexures

A1: Food and Agriculture Organisation (FAO) Land Cover classification system (LCCS) summarised in 14 Categories

Category		Basic rule
01	Artificial surfaces (including urban and associated areas)	The category is composed of any type of artificial surfaces
02	Herbaceous crops	The category is composed of a main layer of cultivated herbaceous plants
03	Woody crops	The category is composed of a main layer of cultivated tree or shrub plants
04	Multiple or layered crops	The category is composed of at least two layers of cultivated woody and herbaceous plants or different layers of cultivated plants combined with natural vegetation
05	Grassland	The category is composed of a main layer of natural herbaceous vegetation with a cover from 10 to 100 per cent
06	Tree-covered areas	The category is composed of a main layer of natural trees with a cover from 10 to 100 per cent
07	Mangroves	The category is composed of natural trees with a cover from 10 to 100 per cent in aquatic or regularly flooded areas in salt and brackish water
08	Shrub-covered areas	The category is composed of a main layer of natural shrubs with a cover 10 to 100 per cent
09	Shrubs and/or herbaceous vegetation, aquatic or regularly flooded	The category is composed of natural shrubs or herbs with a cover from 10 to 100 per cent in aquatic or regularly flooded areas with water persistence from 2 to 12 months per year
10	Sparsely natural vegetated areas	The category is composed of any type of natural vegetation (all growth forms) with a cover from 2 to 10 per cent
11	Terrestrial barren land	The category is composed of abiotic natural surfaces
12	Permanent snow and glaciers	The category is composed of any type of glacier and perennial snow with persistence of 12 months per year
13	Inland water bodies	The category is composed of any type of inland water body with a water persistence of 12 months per year
14	Coastal water bodies and intertidal areas	The category is composed of geographical features in relation to the sea (lagoons and estuaries) and abiotic surfaces subject to water persistence (intertidal variations)

Source: United Nations (UN), European Union, Food and Agriculture Organization of the United Nations, International Monetary Fund, Organisation for Economic Co-operation and Development, World Bank. 2014a. System of Environmental-Economic Accounting 2012: Central Framework. United Nations, New York City.

A2: Physical account for land cover

	Artificial reservoirs	Crops	Grassland	Tree-covered areas	Mangroves	Shrub-covered land	Regularly flooded areas	Sparse natural vegetation areas	Terrestrial barren land	Permanent snow, glaciers and inland water bodies	Coastal water and inter-tidal areas
	hectares										
Opening stock of resources	12 292,5	445 431,0	106 180,5	338 514,0	214,5	66 475,5	73,5	1 966,5		12 949,5	19 351,5
Additions to stock											
Managed expansion	183,0	9 357,0									
Natural expansion			645,0								1,5
Upward reappraisals			4,5								
Total additions to stock	*183,0*	*9 357,0*	*69,0*								*1,5*
Reductions in stock											
Managed regression		147,0	4 704,0	3 118,5	9,0	1 560,0	1,5				
Natural regression					1,5	64,5					
Downward reappraisals						4,5					
Total reductions in stock		*147,0*	*4 704,0*	*3 118,5*	*10,5*	*1 629,0*	*1,5*				
Closing stock	12 475,5	454 641,0	101 545,5	335 395,5	204,0	64 846,5	72,0	1 966,5		12 949,5	19 353,0

Source: United Nations, 2014. *System of Environmental-Economic Accounting 2012 – Central Framework*. United Nations Statistics Division, New York.