

MINERAL RESOURCES

SOUTH AFRICA
YEARBOOK

2010/11

2010/11

South Africa's mining industry has been and remains the bedrock of Africa's economic powerhouse. The mining sector, together with its related industries, continues to be critical to the country's socio-economic development.

With Citibank estimating in 2010 that South Africa had R2,5 trillion worth of mineral reserves, it is clear that the mining industry is crucial in the war against poverty and underdevelopment in South Africa.

The Mineral Policy and Promotion Branch of the Department of Mineral Resources is responsible for formulating and promoting mineral-related policies that will encourage investment in the mining and minerals industry, making South Africa attractive to investors.

The Mine Health and Safety Inspectorate (MHSI) is responsible for implementing mine-health and -safety legislation.

The Mineral Regulation Branch regulates the mining and minerals industry to achieve transformation and contribute to sustainable development.

Policy and initiatives

Mining and minerals policy is based on the principles of the Freedom Charter, according to which the mineral wealth beneath the soil will be transferred to the ownership of the people as a whole.

The Mineral and Petroleum Resources Development Act (MPRDA), 2002 (Act 28 of 2002), has opened doors for the substantial and meaningful participation of historically disadvantaged South Africans (HDSAs) in the exploration and exploitation of mineral resources. The MPRDA, 2002 enshrines equal access to mineral resources, irrespective of race, gender or creed. Section 100 of the MPRDA, 2002 provides for the development of the Broad-Based Socio-Economic Empowerment Charter, which is popularly known as the Mining Charter. The Mining Charter, as promulgated in 2004, made provision to review the progress against agreed targets five years after its implementation.

The introduction of the Mining Charter in South Africa was aimed at transforming the mining industry to redress historical imbalances engendered by apartheid so that the industry is consistent with the changes in South Africa's overall transformation of its social, political and economic landscape.

The Department of Mineral Resources concluded an assessment of the progress of the industry's transformation against the

Mining Charter objectives as adopted in 2002.

The racial ownership pattern of the country's mining assets has remained largely unchanged, with only 8,9% black ownership attained by 2009 against the target of 15%. The reviewed Mining Charter, launched in September 2010, seeks to correct this, putting emphasis on 26% of South Africa's mining assets being black economic empowerment (BEE)-compliant by 2014.

It also provides for the complete elimination of hostels on South Africa's mines by 2014, and introduces a sustainable element, premised on the understanding that the social licence to operate includes the environment, health and safety performance.

Under the new charter, companies found not complying could face penalties, which could include the revoking of a mining company's licence.

The Mining Industry Growth, Development and Employment Task Team (Migdett), a multistakeholder task team chaired by the Department of Mineral Resources, and comprising government and organised labour, was established in December 2008 to:

- help the industry manage the negative effects of the global economic crisis and to save jobs
- position the industry for growth and transformation in the medium to long term.

The first mandate of Migdett was successfully concluded in September 2009, with job losses contained to less than 40 000, against original projections in excess of 100 000 job losses in the first year of the global economic crisis.

During the course of its second mandate, which started during the latter part of 2009, Migdett identified two major attributes that will position South Africa's mining industry along a sustainable growth path, promoting competitiveness and transformation.

i

In 2010, the unprecedented successful rescue operation of the 33 miners trapped 700 m underground in a San Jose mine in Chile, prompted intense international attention.

After 69 days underground, including two weeks during which they were feared dead, the men were rescued on 14 October. The Cementation Group, through its global footprint and capability, was able to participate in the rescue operation and fly the flag high for Murray & Roberts of South Africa.

One of Murray & Roberts' large diameter raise drilling machines, the Strata 950, was used by Terracem in the rescue operation.

To this extent, Migdett established two working groups, chaired by the Chamber of Mines and South African Mining Development Association, respectively. This process recognised that the department had previously dealt with competitiveness and transformation of the mining industry as mutually exclusive and Migdett was specifically tasked to emphasise the symbiotic relationship and mutually reinforcing nature of these attributes.

The second phase of the Migdett process culminated in the signing of the declaration on the Strategy for Sustainable Growth and Meaningful Transformation of South Africa's Mining Industry on 30 June 2010.

All stakeholders represented in Migdett signed the declaration document. The relevant transformation aspects of the declaration document were effectively migrated to constitute the bulk of the amendments of the Mining Charter.

In essence, the revised Mining Charter is located within the broader context of the Strategy for Sustainable Growth and Meaningful Transformation of South Africa's Mining Industry.

The Codes of Good Practice and the Housing and Living Conditions Standards for the Mineral Industry were gazetted in April 2009.

The promulgation of the MPRDA, 2002 led to an increase in the number of new entrants in the mining space, seen by the increase in BEE companies mining coal, which were then unable to export their goods due to insufficient rail and port facilities. The Department of Mineral Resources established the Coal Industry Task Team to facilitate access to new coal-export facilities for junior coal-mining companies, and by August 2010 stakeholders had collectively secured four million tons (Mt) export capacity dedicated to these companies.

The enabling environment has led to a further increase in the number of new entrants, requiring a significantly larger proportion of access to these facilities. The department continues to engage all stakeholders to seek supplementary solutions.

The Geoscience Amendment Bill, which aims to align the Geoscience Act, 1993 (Act 100 of 1993), with the MPRDA, 2002 and expand the functions of the Council for Geoscience (CGS) has been gazetted and will be reintroduced to Parliament.

The Bill seeks to:

- mandate the CGS to be the custodians and curators of geotechnical informa-

tion, to be a national mandatory advisory authority in respect of geohazards related to infrastructure development, to undertake exploration and prospecting research in the mineral and petroleum sectors and to add to the functions of the council

- put mechanisms in place to address problems associated with infrastructure development on dolomitic land
- empower the CGS to be the custodian of all geotechnical data to compile a complete geotechnical risk profile of the country
- enable the CGS to become the custodian of technical information relating to exploration and mining.

The Department of Mineral Resources, in conjunction with other key departments as well as relevant state-owned enterprises, launched the Beneficiation Strategy in March 2009, after approval was granted by Cabinet for the strategy to be circulated for broader consultation.

Once comments are incorporated into the strategy, it will be sent to Cabinet for approval as a policy position for the country.

The Beneficiation Strategy provides for a framework within which South Africa is able to implement orderly development of the country's mineral value chains to leverage benefit from inherent comparative and competitive advantage, transformation and diversification of the economy as well as incremental gross domestic product (GDP) growth.

The strategy is intended to support national programmes such as the National Industrial Policy Framework.

Mine environmental management

Mine environmental management forms an integral part of the management of mineral resources in South Africa. For the Department of Mineral Resources to effectively manage, it has to undertake research;



Early in 2010, the Department of Mineral Resources embarked on a major re-engineering initiative to streamline its licensing administrative processes.

This exercise sought to improve the turnaround time in issuing licences, achieve more transparency, and root out any potential for maladministration and corruption in the system.

The department has committed to reducing the turnaround time for mining rights applications from 12 to six months, while prospecting-right applications will be reduced from six to three months.

develop mine environmental policies (legislation and strategies); and provide strategic guidance on mine environmental management, mine rehabilitation, water ingress, mine environmental legacies and sustainable development.

The heritage of mining, which extends for over a century, has left a scourge of derelict and ownerless mines, which cause serious environmental and health hazards, particularly for communities living around these areas. The department has prioritised the rehabilitation of these mines.

A Draft Strategy on Regional Mine Closure in the Witwatersrand and Klerksdorp-Orkney-Stilfontein-Hartebeesfontein gold-mining areas has been developed to address cumulative mining-related impact (mine water decant, ingress, pollution, etc.) and to achieve sustainable closure of mines in the areas of concern. The long-term approach is to replicate the concept of regional mine-closure strategies to other areas of cumulative and integrated environmental impacts, such as the coal fields in KwaZulu-Natal and Mpumalanga as well as other mining areas of concern.

The Minister of Mineral Resources, Ms Susan Shabangu, established the Rehabilitation Oversight Committee within the department to drive the implementation of a rehabilitation programme for all mines which were licensed prior to the Minerals Act, 1991 (Act 50 of 1991), and the MPRDA, 2002.

The rehabilitation strategy for these mines was signed off and the implementation plan and costs for the rehabilitation programme were finalised. An amount of R52 million has been set aside for the implementation of this programme in 2010/11.

Sustainable development

The World Summit on Sustainable Development (WSSD) was hosted in Johannesburg in 2002 to reaffirm commitment to sustainable development and, as a follow-up, the then Department of Minerals and Energy initiated a process in 2005 by developing a strategy to address the WSSD outcomes for minerals and mining.

South Africa's Sustainable Development Framework, incorporating all three spheres of sustainable development, namely economic, environmental and social, was finalised and the sustainable development thematic report submitted to the United Nations Commission on Sustainable Development (UNCSD) in preparation for the 18th session of the commission.

This report outlines progress made by the mining industry against the agreed developmental targets of the 2002 Johannesburg Summit of the UNCSD.

African Mining Partnership (AMP)

The AMP was launched in 2004 to further the New Partnership for Africa's Development (Nepad) objectives through mining and mineral initiatives in the quest for economic development on the continent.

Countries were assigned projects to spearhead and ensure that they contributed towards growing Africa's economy through its mineral wealth. African ministers responsible for mining lobbied that the AMP be located under the African Union (AU), meaning that the AMP that took place in February 2010 in Cape Town, South Africa, was the last one taking place under the auspices of Nepad.

Locating the AMP within the AU will improve its standing and should attract more countries to participate. Ghana is the chair of the AMP and South Africa as the secretariat and organiser of the event.

This merger will also give the AMP access to the AU's financial resources and help it achieve its vision of increasing the benefit of Africa's mineral wealth for its own people.

African Diamond Producers' Association (ADPA)

The Department of Mineral Resources received Cabinet approval to participate in the ADPA in 2009.

The ADPA has three organs, namely: the Council of Ministers, Executive Secretariat and the Meeting of Experts. The Council of Ministers is constituted by 18 African countries, 11 of whom are full members, of which South Africa is one, while the remainder enjoy observer status.

The Executive Secretariat is the administrative organ and comprises a secretariat and two deputies. The Meeting of Experts consists of officials from the member countries and serves as the Working Group.

South Africa was nominated to take over the chairship of the ADPA from Angola during the second ordinary meeting of the Council of Ministers in 2010.

For South Africa, membership of this association presents an opportunity to position itself strategically among diamond-producing countries in Africa. It could add significant impetus to the diamond beneficiation initiatives of South Africa. This will

also boost the country's aim of becoming the beneficiation hub and gateway of Africa.

Mining industry

The discovery of world-class diamond and gold deposits in the latter half of the 19th century laid the foundation for the emergence of South Africa from an essentially agricultural to a modern industrial economy. The mining industry subsequently covered a wide-ranging spectrum of minerals, in which South Africa has an exceptional geological/mineral endowment.

Mining played a vital role as a foundation industry, which stimulated the development of key services, manufacturing and side-stream industries. Mineral production has been a major contributor to foreign exchange earnings and employment in South Africa. In the 1980s, the gold sector accounted dominantly for all mineral-related income.

However, gold has fallen from its eminent position as the main contributor to mineral sales, as a result of which employment in the mining industry has contracted significantly since 1986. Employment in the mining sector decreased cumulatively by 17,1% from 853 116 in 1997 to 438 534 in 2003. Employment figures started to grow since the promulgation of the MPRDA, 2002 in 2004, peaking at 527 000 in 2008 before the implosion of the global financial and economic crisis.

The platinum-group metals (PGM) sector has become the largest employer and contributor to revenue earnings, contributing 36% of total mining employment, followed by the gold and coal sectors respectively. Although the percentage of mining contribution to the national GDP shows a marked declining trend from 1980 (above 22%) to 9,5% in 2008, principally resultant from the introduction and faster growth of other sectors contributory to the GDP, the mining sector has grown significantly in real terms in the same period.

In the period 1986 to 2007, the percentage (relative) decline of mining contribution to the national GDP should be understood in the context of the apparent economic diversification and faster growth pace of other sectors, such as manufacturing, financial and construction, to which the mining industry also contributes significantly.

Despite a mining heritage that extends beyond a century, the South African mining real estate remains attractive for development, with significant resources of gold, uranium, chrome, manganese, PGMs, titanium-minerals, vanadium, coal, limestone, vermiculite and zirconium.

Despite considerable diversification of the country's economy in the recent past, the mining sector remains a key variable in the economic growth equation. For instance, in 2009, the industry contributed 9,5% to gross value added, 9% to total fixed capital formation, more than 30% to the country's total export revenue, and employed 2,9% of the country's economically active population, at just below half a million direct jobs and a further half a million indirect jobs.

The sector contributes 18% to the country's corporate tax receipts. The listed mining companies represent over 30% of the market capitalisation of the Johannesburg Stock Exchange. While mining activities consume 15% of national electricity, the mining industry directly contributes more than 95% towards the country's electricity generation.

South Africa is host to significant known reserves and resources of mineral commodities, with almost 60 minerals being actively mined and prospects for exploitation of an additional two new minerals in the short to medium term. A large number of these known reserves were discovered using conventional exploration methodologies. For this reason, there still lies considerable residual potential for discovery of world-class deposits using modern exploration technology. This is further supported by existing mining infrastructure, which enables investors to leverage maximum value from their investment in South Africa, while at the same time contributing to socio-political improvement.

Mineworkers

According to the Chamber of Mines, the South African mining sector in 2008 employed 518 585 employees compared with 495 474 in 2007, representing an improvement of 4,7%. Mining accounted for 6,1% of total non-agricultural formal



In July 2010, the Minister of Mineral Resources, Ms Susan Shabangu, launched the Matla Diamond Polishing Plant in the Eastern Cape. The plant will enable South Africa to process more of its own diamonds.

The R102-million project is a partnership between Matla Beneficiation Company, the East London Industrial Development Zone, the Industrial Development Corporation and Gold Eastern Holdings of China.

The automated plant is equipped with technology worth R35 million from China, and is expected to be eight times more efficient than a similar-sized manual operation.

It will produce a maximum of 20 000 carats a month, translating into R100 million in monthly revenue.

employment in the economy and 7,8% of total private-sector non-agricultural employment.

If the indirect and induced effects of mining are included, then another 500 000 jobs are estimated to exist in addition to the direct mining jobs.

In 2008, about R60,7 billion was paid in wages and benefits to mine employees. This accounted for about 6% of the total compensation paid to all formally employed people in South Africa.

Mine health and safety

The MHSI of the Department of Mineral Resources, established in terms of the Mine Health and Safety Act (MHSA), 1996 (Act 29 of 1996), is responsible for protecting the health and safety of mineworkers or people affected by mining activities.

The activities of the MHSI focus on achieving a safer and healthier mining industry for all. The MHSI works closely with industry and worker unions to reduce the incidence of mine accidents, with stakeholders committing themselves to continuously reducing fatalities by at least 20% a year. The inspectorate is also pursuing a strategy to eliminate silicosis and noise-induced hearing loss or occupational deafness by 2013.

The levels of death, ill health and injuries at mines remain a serious concern for the Department of Mineral Resources. During 2009, the mining industry managed to record a 3% improvement in fatalities due to mine accidents when compared with the previous year, 2008, when 171 miners lost their lives, followed by 165 miners in 2009.

To deal with the pressing occupational health and safety challenges facing the industry, the Department of Mineral

Resources embarked on a number of interventions, which include:

- implementing the amendments to the MHSA, 1996 to improve enforcement and prosecutions
- the work that is being done to improve seismic network coverage and systems integration to assess actions taken by mines in dealing with high-risk areas, which are prone to seismic events
- improving the health capacity of the inspectorate by establishing a new chief directorate for occupational health and appointing additional health inspectors in the regional offices.

An amount of R145 million has been allocated toward the health and safety programmes.

In 2010, the department experienced problems between mines and surrounding communities due to blasting operations that caused damage to houses, as well as dust and noise.

In addressing these challenges, the department is developing a comprehensive strategy with an emphasis on blasting, vibration, noise and dust control.

The legislation of compensation matters in the mining industry needs an urgent overhaul to address issues relating to access to services and information, turnaround times on payments and compensation amounts.

The Mine Health and Safety Council budgeted R29,5 million to support the achievement of zero harm to mineworkers through a comprehensive research programme. The council continues to drive the implementation of outcomes of the Tripartite Leadership Summit and the recommendations of the Presidential Audit.

The department introduced the Mine Health and Safety Amendment Act, 2008 (Act 74 of 2008), which aims to enhance the State's ability to address the mine-health and -safety challenges of a high injury rate, ill health and deaths.

The amendment introduces stricter sanctions for non-compliance with health and safety standards by individuals and corporate bodies, as well as prosecution.

The Act establishes the MHSI as a juristic person. This amendment is significant as it provides a platform upon which the critical question of capacity to effectively enforce health and safety regulatory requirements can be addressed.

The department continues to work with security forces to develop a strategy to combat illegal mining, which is one of the

i

In August 2010, Gold Fields announced three Black Economic Empowerment (BEE) deals that would see an employee-share scheme and a broad-based BEE consortium buying discounted shares in the South African gold mine, thereby enabling it to meet its 2014 empowerment targets.

The company announced the empowerment deals after disclosing that the Department of Mineral Resources had executed the new order mining rights for its South Deep Gold Mine.

The cumulative effect of the execution, together with the previous conversions for Driefontein, Kloof and Beatrix granted in 2006, is that all of Gold Fields' South African operations had been granted their new order mining rights.

The South Deep licence was also extended by the department to include a contiguous property, called Uncle Harry's, which contains a mineral resource of about 14,5 million ounces of gold.

biggest threats to mineworkers' health and safety.

South Africa is committed to combating HIV and AIDS in the mining industry.

Mining Qualifications Authority (MQA)

The MQA was established as a sector education and training authority and aims to facilitate the development of appropriate knowledge and skills in the mining, minerals and jewellery sectors to:

- enable the development and transformation of the sector
- contribute to the health, safety and competitiveness of the sector
- improve access to quality education and training for all
- redress past inequalities in education and training.

The MQA is responsible for:

- developing and monitoring the implementation of a sector skills plan
- registering skills-development facilitators at workplaces within the sector
- approving work-skills plans and annual training reports of companies in the sector
- developing unit standards and qualifications
- maintaining the quality of standards, qualifications and learning provision in the sector
- establishing, registering, administering and promoting learnerships
- administering existing apprenticeship systems
- administering and disbursing skills-development levies.

The MQA allocated almost R280 million to support the mining and minerals industry with skills development. Partnerships with further education and training colleges in areas where there is significant growth in mining is needed.

Work experience is important for graduates in Mining Engineering, Geology and Metallurgy. The MQA is supporting this initiative through the allocation of bursaries to about 500 learners who are studying mining-related qualifications at different universities.

Chamber of Mines

The Chamber of Mines of South Africa is a prominent industry employers' organisation, which exists to serve its members and promote their interests in the South African mining industry. It does this through a variety of activities and programmes undertaken

in areas where it is deemed desirable for members to consult with one another on matters of common concern or to cooperate in specific industry-level policy responses and joint initiatives.

With this scope defining its role, the chamber exists as an important strategic partner to its member mines. In recent years, the chamber's role and functions have undergone substantial change in view of developments unfolding in the external environment. This redirection of the organisation has been undertaken with a view to:

- refocus the chamber to position it as the principal advocate to government of major policy positions endorsed by mining employers
- end the chamber's direct involvement in and financial subsidisation of various industry services
- expand the membership base of the organisation.

The chamber facilitates interaction among mine employers to examine policy issues and other matters of mutual concern to define desirable industry-level stances. Consultation and cooperation within the chamber system occur on a voluntary basis and do not encroach on the managerial powers or prerogatives of individual member mines and mining groups.

A range of professional resources is maintained to support the chamber's policy review and advocacy functions and to equip it to render advice to its members, including mining health and safety, education and training, communication, environmental management, economics and industrial relations.

Small-scale mining in South Africa

The Department of Mineral Resources deems the role of small-scale mining in community upliftment, job creation and poverty alleviation as critical. The previous model of implementation of the small-scale mining programme was piloted with varying levels of success being attained.

The department is developing a new approach to maximise the impact of small-scale mining, with particular focus on poverty nodal points with mining potential, intended to contribute meaningfully towards the livelihood of these communities. The small-scale mining sector is faced with many challenges such as lack of access to finance and markets, shortage of skills and inadequate or non-compliance with regulatory requirements, all of which the

Department of Mineral Resources is working towards addressing.

The small-scale mining sector has historically comprised mainly alluvial diamond and in-land salt mining, but lately the bulk of the demand for small-scale mining ventures has been associated with industrial commodities, such as slate, sand, clay, sandstone, dolerite and granites for the production of infrastructural development products such as tiles, clay and cement bricks, aggregates and dimension stone for cladding.

The Directorate: Small-Scale Mining in the Department of Mineral Resources develops and addresses the challenges faced by the small-scale mining sector.

It is essential that small-scale miners in South Africa become integrated into the greater South African mining community and the mainstream economy. Government has taken active measures to promote the development of this sector. The small-scale mining sector includes:

- artisanal or subsistence mining operations (new entrants)
- suboptimal formal mining operations
- entrepreneurs with upfront capital.

The department is working to legalise small-scale mining operations, and find ways to help make them economically viable in a way that is relevant and affordable to small-scale miners.

The directorate assists aspiring small-scale miners in:

- establishing legal entities
- guiding towards the identification of mineral deposits
- doing environmental impact assessment, feasibility and market studies
- legal and contractual arrangements and mineral rights
- developing mining equipment.

The Small-Scale Mining Board has been set up as a point of delivery for the services required by the small-scale mining sector. It coordinates a substantial amount of expert capacity and experience and specialises in planning and developing a viable mining project through pre-feasibility stages.

Mineral wealth

South Africa's mineral wealth is typically found in the following well-known geological formations and settings:

- the Witwatersrand Basin yields some 93% of South Africa's gold output and contains considerable resources of uranium, silver, pyrite and osmiridium
- the Bushveld Complex is known for PGMs (with associated copper, nickel and cobalt

mineralisation), chromium and vanadium-bearing titanium-iron ore formations as well as large deposits of industrial minerals, including fluorspar and andalusite

- the Transvaal Supergroup contains enormous resources of manganese and iron ore
- the Karoo Basin extends through Mpumalanga, KwaZulu-Natal, the Free State as well as Limpopo, hosting considerable bituminous coal and anthracite resources
- the Phalaborwa Igneous Complex hosts extensive deposits of copper, phosphate, titanium, vermiculite, feldspar and zirconium ores
- kimberlite pipes host diamonds that also occur in alluvial, fluvial and marine settings
- heavy mineral sands contain ilmenite, rutile and zircon
- significant deposits of lead-zinc ores associated with copper and silver are found in the Northern Cape near Aggeneys.

The bulk of the known mineral resources and reserves were discovered using conventional exploration methods, but the country still has significant potential for additional discoveries of world-class deposits, using modern exploration technologies.

South Africa has the world's largest resources of PGMs (87,7% of world total), manganese (80%), chromium (72,4%), gold (29,7%) and alumino-silicates. South Africa also accounts for over 40% of the global production of the following mineral commodities: ferrochromium, PGMs and vanadium.

It is also the world's leading producer of chrome ore, vermiculite and alumino-silicates, and is among the top three producers of gold, manganese ore, titanium minerals and fluorspar.

The South African mining industry contributes 51,7% of world ferrochromium exports and 54% of alumino-silicates, and is one of the world's largest exporters of PGMs, gold and vanadium, and a significant exporter of manganese ore. Other important export commodities include ferro-manganese and fluorspar.

Although South Africa is probably the largest exporter of vanadium, gold and PGMs, it is not possible to rank it because of the unavailability of export data from other producing countries.

The Directorate: Mineral Economics of the Department of Mineral Resources monitors and analyses the global supply and demand of minerals that affect the South African economy.

Gold

South Africa's gold production decreased by 15,8% from 252,6 t in 2007 to 212,7 t in 2008, resulting in the country dropping in production ranking from second-largest producer to fourth-largest, mainly as a result of mining of lower-grade ore, influenced by higher rand gold prices, temporary closure of shafts to maintain infrastructure, as well as new safety procedures, which involved the temporary closure of a shaft where a fatal incident had occurred to facilitate a safety audit.

About 4,1% of South Africa's gold production was beneficiated to coins and jewellery locally during 2008, generating revenue of R2 billion.

Silver

South Africa does not have a primary silver mine and the metal is produced only as a by-product of other minerals. Silver was produced as a by-product from 13 gold operations, one uranium mine, two copper mines and two platinum mines in 2008. Despite the vagaries of the global economy, production increased by 8,1% to 2,7 million ounces of silver in 2008, mainly due to a modest increase from one to two silver-producing platinum mines.

Coal

South Africa's saleable coal production increased by 1,8% to reach 252,2 Mt in 2008

compared with 2007. Local sales increased by 7,8% to 197,1 Mt while export sales declined by 14,5% to 57,9 Mt. The value of local sales rose by 57,4% to R30,1 billion while revenue from export sales increased by 73,7% to R42,4 billion.

Platinum-group metals

South African PGM production decreased by 9,3% to 275,8 t in 2008 from 304 t in 2007. The production of platinum and palladium fell by 9,2% to 146,1 t and by 9,7% to 75,5 t respectively, while production of rhodium dropped by 8,1% to 19,3 t. PGM export sales revenue increased by 23,1% to R66 billion, due to a higher average rand basket price for 2007.

Non-ferrous minerals

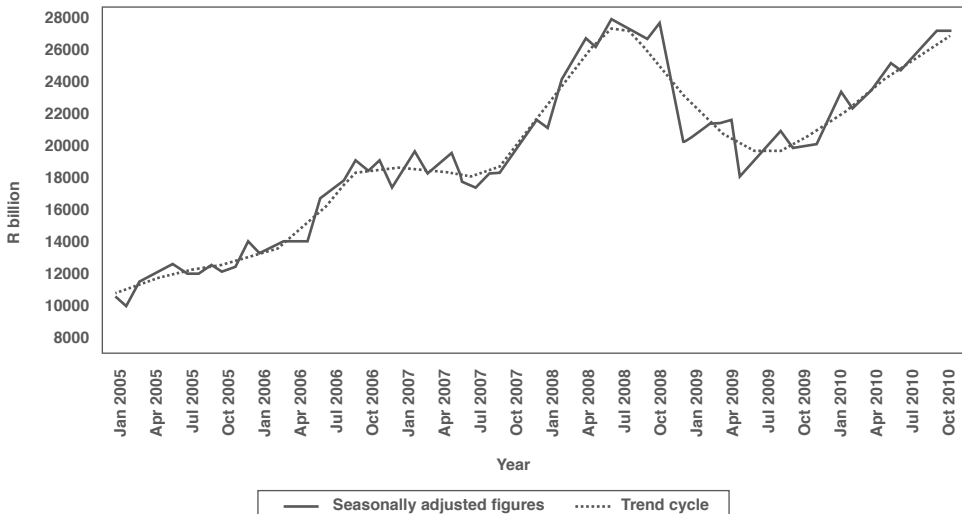
The production of primary non-ferrous metals and minerals, with the exclusion of titanium and zircon, increased by 3,2% to 238,8 kt in 2008, compared with 2007, while sales decreased by 22% to R 12,5 billion.

Domestic sales revenue decreased by 18% to R5,9 billion and exports revenue decreased by 25,3% to R6,5 billion in 2008. The total sales of non-ferrous metals and minerals (primary and processed), excluding titanium slag and aluminium, decreased by 23,8% to R14,1 billion in 2008.

Ferrous minerals

South Africa is an important source of fer-

Total value of mineral sales



Source: Statistics South Africa, October 2010

rous minerals, being the largest producer of chromium and vanadium ores and a leading supplier of their alloys. It is also a significant producer of iron and manganese ores and a significant supplier of manganese alloys, ferrosilicon and silicon metal.

Sales of primary ferrous minerals contributed R44,9 billion (11,6%) to total South African mineral sales, including primary plus processed minerals. Sales of processed and primary ferrous minerals contributed R82,2 billion (28,5%) to total mineral exports in 2008 and the combined sales revenue of primary and processed ferrous minerals in 2008 amounted to R97,1 billion (\$11,7 billion), representing 25,1% of the total value of all primary and processed minerals sold. The significantly higher contributions of both export and total ferrous mineral sales revenue in 2008 compared with 2007 is testimony to the growing importance of ferrous metals in South Africa's mineral industry.

Industrial minerals

There are some 674 producers of industrial minerals in South Africa, of which almost half are in the sand and aggregate sector. There are some 149 producers of clays (brick-making and special), 40 limestone and dolomite, 61 dimension stone, 27 salt and 16 silica producers. Sales of primary industrial minerals in South Africa grew steadily at an annualised compound growth rate of 18% from 2004 to 2008.

The industrial minerals sector is driven by economic growth. Although economic growth slowed to 3,1% in 2008 as a result of the global economic crisis, whose impact became apparent at the beginning of the last quarter of 2008, revenue increased from R6,2 billion in 2004 to R13,6 billion in 2008.

Some 88% of total earnings from the sale of industrial minerals are realised in the local market.

Aggregate, sand, limestone and lime, which are critical raw materials for construction, contributed almost 50% to the value of local sales of primary industrial minerals in 2007 and 2008. The local sales value of industrial minerals increased from R5,2 billion in 2004 to R11,9 billion in 2008. Industrial minerals contributed almost 15% to total local mineral sales in 2008.

Processed minerals

Total sales revenue of processed minerals increased by 57,1% from R54,8 billion in 2007 to R86,1 billion in 2008, and export sales accounted for 80% of total sales.

The value of local sales of processed mineral products increased by 32,8% from R13,1 billion in 2007 to R17,4 billion in 2008.

The largest contributors to total sales were classified commodities at 44% as well as chromium alloys at 36,9%. Total production of processed minerals decreased by 7,9% to 8,1 Mt in 2008.

Geology

South Africa has a long and complex geological history dating back more than 3 700 billion years. Significant fragments of this geology have been preserved and along with them, mineral deposits.

The preservation of so much Archaean geology, dating back more than 2 500 million years, has resulted in the Archaean Witwatersrand Basin, as well as several greenstone belts, being preserved. Ten of the more significant geological formations in South Africa are discussed below.

Barberton mountain land

This beautiful and rugged tract of country with some of the oldest rocks on Earth is found south of Nelspruit, Mpumalanga. The renowned Barberton Greenstone Belt, the largest of its kind in South Africa, contains remnants of original crust, dated at around 3,5 billion years old.

The greenstone formations represent the remains of some of the earliest clearly decipherable geological events on the Earth's surface. Silica-rich layers within the greenstone have revealed traces of a very early life form – minute blue-green algae. Granites surround the formations and gneisses that are more than 3 000 million years old. Gold, iron ore, magnesite, talc, barite, chrysotile asbestos and verdite are mined in the area.

Witwatersrand

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. The Witwatersrand is the greatest goldfield known to mankind. More than 50 055 t of gold have been produced from seven major goldfields distributed in a crescent-like shape along the 350-km long basin, from Welkom in the Free State in the south-west, to Evander in the east.

The geology of the region can be seen at many outcrops in the suburbs of Johannes-

burg. The sequence is divided into a lower shale-rich group and an upper sandstone-rich group. The latter contains the important gold-bearing quartz-pebble conglomerates. These “gold reefs” were formed from gravels transported into the basin and reworked 2,75 billion years ago. The gold and uranium originated from a rich source in the hinterland.

Bushveld Complex and escarpment

The Bushveld Complex extends over an area of 65 000 km² 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’s resources of chromium, PGMs and vanadium.

This mega-complex was emplaced in a molten state about 2 060 billion years ago into pre-existing sedimentary rocks, through several deep feeder zones.

The impressive igneous geology of the Bushveld Complex can best be viewed in Mpumalanga, 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 extensive magnetite-ilmenite layers and pipes near Magnet Heights and Kennedy’s Vale are in this area.

The Great Escarpment of Mpumalanga is one of South Africa’s most scenic landscapes. This area features potholes at Bourke’s Luck, the Blyde River Canyon and the dolomite formation in which giant stromatolites bear witness to the 2,5-billion-year-old fossilised remains of vast oxygen-producing algae growth.

Drakensberg Escarpment and Golden Gate Highlands National Park

The main ramparts of the Drakensberg range, reaching heights of more than 3 000 m, lie in KwaZulu-Natal and on the Lesotho border. These precipitous mountains are the highest in southern Africa and provide the most dramatic scenery.

They were formed by the partial erosion of a high plateau of basaltic lava, which is more than 1 500 m thick, and covers the Clarens sandstones. Prior to its erosion, the continental basalt field covered significantly more of the continent.

The northern area of the Drakensberg has been declared a world heritage site. More than 40% of all known San cave paintings in southern Africa are found here.

The scenic Golden Gate Highlands National Park in the Free State features spectacular sandstone bluffs and cliffs. The sandstone reflects a sandy desert environment that existed around 200 million years ago. Dinosaur fossils are still found in the area.

Karoo

Rocks of the Karoo Supergroup cover about two thirds of South Africa and reach a thickness of several thousand metres. The sedimentary portion of this rock sequence reveals an almost continuous record of deposition and life, from the end of the Carboniferous into the mid-Jurassic periods, between 300 million and 180 million years ago.

Karoo rocks are internationally renowned for their wealth of continental fossils, and particularly for the fossils of mammal-like reptiles that show the transition from reptiles to early mammals, and for their early dinosaur evolution.

During this long period of the Earth’s history, southern Africa was a lowland area in the centre of the Gondwana supercontinent.

Initially, the prehistoric Karoo was a place of vast glaciation. It then became a shallow inland sea, before this was replaced by huge rivers, with lush flood plains and swampy deltas, which dried out to form a sandy desert. Finally, vast outpourings of continental basaltic lava accompanied by the break-up of Gondwana occurred.

Diamond fields

Kimberlite is the primary host-rock of diamonds and was first mined as weathered “yellow ground” from the Kimberley mines, starting in 1871 at Colesberg koppie, now the site of the Big Hole of Kimberley. At increasing depths, less-weathered “blue ground” that continued to yield diamonds was encountered.

The discovery of kimberlite-hosted diamonds was a key event in South Africa’s economic and social development, and paved the way for the later development of the Witwatersrand goldfields.

Kimberlite originates as magma from very deep below the surface, and typically occurs as small volcanic pipes and craters at the surface. Included within solidified kimberlites are fragments of deep-seated rocks and minerals, including rare diamonds of various sizes.

The Orange and Vaal rivers’ alluvial diamond fields and the rich West Coast marine

diamond deposits all originated by erosion from primary kimberlite pipes.

Meteorite impact sites

Impacts by large meteoritic projectiles played a major role in shaping the surface of the Earth.

One such site is the Vredefort Dome, the oldest and largest visible impact structure known on Earth.

Declared a world heritage site in 2005, it lies some 110 km south-west of Johannesburg, in the vicinity of Parys and Vredefort in the Free State and North West.

This spectacular and complex geological feature, measuring 70 km across, was caused by the impact of a 10 km-wide asteroid some two billion years ago. Only a partial ring of hills remains of the dome, created by the rebound of rock below the asteroid's impact site. The original crater – now eroded – is estimated to have been between 250 km and 300 km in diameter.

The Vredefort structure comprises a core zone of granitic rocks, surrounded by a ring-like collar zone of younger bedded formations. Only the north-western portion of the structure remains visible. The south-eastern half was flooded by sediments of the Karoo Supergroup, which cover the Free State.

About 40 km north of Pretoria is a small bowl-shaped meteorite-impact crater, termed Tswaing. Just one kilometre in diameter, this is one of the best-preserved and accessible impact craters of its kind on Earth. It was created about 220 000 years ago when a meteorite of about 50 m wide slammed into the Earth, and is one of the few impact craters containing a crater lake.

Pilanesberg

The Pilanesberg Complex and National Park, located some 120 km north-west of Johannesburg in North West, is a major scientific attraction which includes a number of unique geological sites.

The complex consists of an almost perfectly circular, dissected mountain massif some 25 km in diameter, making it the third-largest alkaline ring complex in the world.

The geology reflects the roots of an ancient volcano that erupted some 1,5 billion years ago. The remains of ancient lava flows and volcanic breccias can be seen.

The dominant feature of the complex is the concentric cone sheets formed by resurgent magma that intruded ring fractures, created during the collapse of the volcano.

There are old mining sites for fluorite and dimension stone, and a non-diamond-bearing kimberlite pipe in the region.

Cradle of Humankind

This world heritage site extends from the Witwatersrand in the south to the Magaliesberg in the north, and is considered to be of universal value because of the outstanding richness of its fossil hominid cave sites.

The Sterkfontein area near Krugersdorp is the most prolific and accessible fossil hominid site on Earth. It comprises several scientifically important cave locations, including Sterkfontein, Swartkrans, Drimolen, Kromdraai, Gladysvale and Plover's Lake, all of which have produced a wealth of material crucial to palaeoanthropological research material.

Table Mountain and the Cape Peninsula

Table Mountain is, arguably, South Africa's best known and most spectacular geological feature, comprising a number of major rock formations.

The earliest of these are the deformed slates of the Malmesbury Group, which formed between 560 million and 700 million years ago.

Coarse-grained Cape granite intruded around 540 million years ago. The Table Mountain Group, which started forming about 450 million years ago, consists of basalt, reddish mudstone and sandstone that is well exposed along Chapman's Peak. Overlying this is the light-coloured sandstone that makes up the higher mountains and major cliff faces of the Cape Peninsula, as far south as Cape Point.

Much younger sandy formations make up the Cape Flats and other low-lying areas adjacent to Table Mountain. The Table Mountain Group continues further inland across False Bay in the strongly deformed Cape Fold Belt.

i

In October 2010, Sasol sold a 20% stake in its mining subsidiary to Ixia Coal, a new mining firm that benefits women, as part of a Black Economic Empowerment deal worth some R1,8 billion.

The transaction forms part of the company's empowerment strategy and its commitment to comply with the objectives of South Africa's Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002), and the Mining Charter.

Acknowledgements

Council for Geoscience
Department of Mineral Resources
Eskom
Mining Weekly
South Africa's Mineral Industry, 2007/08

www.bullion.org.za
www.cef.org.za
www.globaldialogue.info
www.gov.za
www.hartrao.ac.za
www.miningweekly.co.za

www.murrob.com
www.sabcnews.com
www.sagoodnews.co.za
www.sasol.co.za
www.southafrica.info

Suggested reading

- Bond, P, Dada, R & Erion, G (eds). 2009. *Climate change, carbon trading and civil society: negative returns on South African investments*. Scottsville: University of KwaZulu-Natal Press.
- Machens, EW. 2009. *Platinum, gold and diamonds: the adventure of Hans Merensky's discoveries*. Pretoria: Protea Book House.
- Masilo, P & Rautenbach, G. 2008. *Commentary on the Mine Health and Safety Act and regulations*. Cape Town: Juta.
- Mazema, HK *et al.* 2008. *A pilot study into available upstream cleaner production technologies for the petroleum refining industry to meet the requirements of the waste discharge charge system*. Gezina: Water Research Commission.
- Rainmakers & potstirrers*. 2008. Sandton: Miningmx.
- The South African mining industry's sustainability and transformation report 2007*. 2008. Marshalltown: Chamber of Mines of South Africa.
- Winkler, H. 2009. *Cleaner energy, cooler climate: developing sustainable energy solutions for South Africa*. Cape Town: HSRC Press.

