



2011 Minerals Yearbook

SOUTH AFRICA

THE MINERAL INDUSTRY OF SOUTH AFRICA

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The Republic of South Africa remained one of the world's leading mining and mineral-processing countries. In 2011, South Africa's estimated share of world platinum production amounted to 72%; kyanite and other materials, 59%; chromium, 46%; vermiculite, 34%; palladium and vanadium, 38% each; zirconium, 27%; manganese, 24%; rutile, 19%; ilmenite, 17%; gold, 7%; fluor spar, 4%; aluminum, antimony, iron ore, lead, and nickel, 2% each; and phosphate rock, 1%. The country's estimated share of world reserves of platinum-group metals (PGMs) amounted to 95%; chromite, 42%; zirconium, 27%; vanadium, 25%; manganese, 24%; rutile, 20%; fluor spar, 17%; gold, 12%; and ilmenite, 10% (Bray, 2012; Carlin, 2012; Corathers, 2012a, b; Gambogi, 2012a, b; George, 2012; Guberman, 2012; Jasinski, 2012; Jorgenson, 2012; Kuck, 2012; Loferski, 2012; Miller, 2012; Papp, 2012; Polyak, 2012; Tanner, 2012a, b).

Minerals in the National Economy

The mineral industry accounted for 8.8% of the gross domestic product (GDP) in 2011 compared with 8.5% in 2010; the direct contribution of the mineral industry to the GDP was \$35.9 billion. Crude and processed mineral products accounted for 45% of the value of total exports. About 76% of crude mineral products and 82% of processed mineral products, by value, were exported in 2011. Employment in the mineral industry amounted to 513,211 workers in 2011 compared with a revised 498,906 in 2010 and 407,154 in 2001. In 2011, PGM mining accounted for 38% of the mineral industry's employment; gold, 28.4%; coal, 15.3%; iron ore, 4.4%; chromite, 3.2%; diamond, 2.3%; and other minerals, 8.4% (Chamber of Mines of South Africa, 2010, p. 12; 2012, p. 4, 6–7, 12; Martin Kohler, Deputy Director of Statistics, Department of Minerals and Energy of the Republic of South Africa, written commun., June 8, 2012).

Government Policies and Programs

The Government's Black Economic Empowerment (BEE) program required that black ownership of mining companies reach 26% by 2014. In September 2010, the Government introduced its new Mining Charter, which allowed companies to use the value of their domestic beneficiation activities as credit for up to 11% of their black ownership requirements. The new Mining Charter required mining companies to purchase 70% of their services, 50% of their consumable goods, and 40% of their capital goods from BEE entities by 2014. Companies were also required to report progress annually on development of near-mine communities, sustainable growth and development, and mineral beneficiation (Creamer, 2010a).

Environment

Acid mine drainage from gold mines in the Witwatersrand Mining Basin reportedly contaminated the Crocodile and the Vaal River systems with increased levels of heavy metals and radioactive particles. The Government planned to spend about \$190 million during 10 years on alleviating acid mine drainage and the other problems that resulted from the 6,000 abandoned mines in South Africa (Prinsloo, 2010; Zeelie, 2010).

Production

In 2011, bentonite production increased by 122%; ferromanganese and fluor spar, an estimated 50% each; fire clay, 42%; talc, 41%; andalusite, an estimated 35%; antimony and silicon, 27% each; direct-reduced iron, 26%; refined gold, 24%; anthracite coal, 23%; manganese ore, 21%; lime, 19%; ilmenite, an estimated 18%; titaniferous slag, an estimated 16%; silicomanganese, 15%; and brick clay, shale, and slate, 11% each. Wollastonite production restarted in 2011. The output of attapulgite decreased by 83%; crude petroleum, 56%; kaolin, 49%; mica, 30%; sulfur, 26%; flint clay, 24%; diamond, 21%; refined zinc, 19%; granite and norite, 17%; pig iron, 15%; vermiculite, 14%; and mined cobalt, 11% (table 1; Martin Kohler, Deputy Director of Statistics, Department of Minerals and Energy of the Republic of South Africa, written commun., June 8, 2012).

Structure of the Mineral Industry

Most of the South African mineral industry was privately owned. Diamond and gold production, which was done mostly by artisanal miners in many African countries, was dominated by large-scale producers in South Africa. The leading producer's share of total output varied sharply by commodity; the leading producer of diamond accounted for 77% of national production; that of iron ore, 71%; manganese, 40%; nickel, 39%; gold, 30%; and coal, 23%.

Reserves and Resources

South Africa accounted for more than 5% of the world's reserves of chromite, fluor spar, gold, ilmenite, manganese, PGM, rutile, vanadium, and zirconium. The country also had substantial reserves of andalusite, antimony, coal, copper, iron ore, lead, nickel, phosphate rock, uranium, vermiculite, and zinc (table 3; Corathers, 2012; Gambogi, 2012a, b; George, 2012; Loferski, 2012; Miller, 2012; Papp, 2012; Polyak, 2012).

Mineral Trade

In 2011, South Africa's exports of gold amounted to \$8.99 billion; iron ore; \$8.05 billion; platinum, \$7.18 billion; coal, \$6.96 billion; palladium, \$1.43 billion; manganese ore, \$1.18 billion; rhodium, \$1.17 billion; nickel, \$561 million;

chromite, \$446 million; iridium, \$210 million; copper, \$206 million; ruthenium, \$101 million; and other crude mineral products, which included diamond, ilmenite, rutile, and zircon, \$2.36 billion. Exports of ferrochromium amounted to \$3.28 billion; manganese metal and alloys, \$1.02 billion; vanadium alloys and other vanadium products, \$315 million; silicon metal and alloys, \$261 million; and other processed mineral products, which included aluminum, \$2.47 billion (Martin Kohler, Deputy Director of Statistics, Department of Minerals and Energy of the Republic of South Africa, written commun., June 8, 2012).

The percentage of domestic consumption of mineral commodities produced in South Africa varied sharply by commodity. In 2011, gold exports, by volume, amounted to 97% of domestic production; vermiculite, 95%; ferrochromium, 89%; PGMs, 84%; iron ore and vanadium, 83% each; manganese ore, 78%; manganese and silicon alloys, 71% each; nickel, 62%; zinc, 54%; chromite, 30%; coal, 27%; and lime and silica, less than 1% each (Chamber of Mines of South Africa, 2012, p. 15–16, 18–19, 26; Martin Kohler, Deputy Director of Statistics, Department of Minerals and Energy of the Republic of South Africa, written commun., June 8, 2012).

Commodity Review

Metals

Aluminum.—South Africa produced primary aluminum from alumina imported from Guinea. BHP Billiton Ltd. of Australia operated the Bayside and the Hillside primary aluminum smelters at Richards Bay. In 2011, BHP Billiton's production remained nearly unchanged at 809,000 metric tons (t). Aluminum produced by BHP Billiton was consumed by Hulamin Ltd. at its rolling mills (BHP Billiton Ltd., 2011b, p. 4; 2012, p. 4).

Antimony.—The Consolidated Murchison Mine was South Africa's only producer of antimony. Village Main Reef Ltd. purchased the mine from Metorex Ltd. in 2010. In the last 9 months of 2011, Village was producing antimony at the rate of nearly 4,700 metric tons per year (t/yr). Production was constrained by labor disputes (Village Main Reef Ltd., 2011, 2012).

Chromium.—In 2011, chromite production was about 10.72 million metric tons (Mt) compared with 10.87 Mt in 2010 and 5.5 Mt in 2001. From 2001 to 2011, employment in chromite mining increased to 16,389 workers from about 5,000 (Chamber of Mines of South Africa, 2010, p. 15; 2012, p. 12, 15).

Xstrata plc of Switzerland and its joint-venture partner Merafe Resources Ltd. mined 2.29 Mt of chromite compared with 2.13 Mt in 2010. Production at the Thorncliffe Mine was 801,000 t; the Kroondal Mine, 792,000 t; the Helena Mine, 489,000 t; and the Waterval Mine, 210,000 t. In 2011, Xstrata and Merafe were engaged in the construction of the new Magareng Mine within the Thorncliffe Mine complex. The Magareng Mine, which would provide ore to the Lion ferrochromium plant, was likely to have a capacity of 1.2 million metric tons per year (Mt/yr) and to start production in the first quarter of 2013 (Engineering & Mining Journal, 2010; Xstrata plc, 2012, p. 39, 81).

Xstrata and Merafe produced 1.29 Mt of ferrochromium in 2011 compared with 1.47 Mt in 2010. Production at the Wonderkop plant was 368,000 t; the Lion plant, 302,000 t; the Lydenburg plant, 291,000 t; the Rustenburg plant, 183,000 t; and the Boshhoek plant, 141,000 t. In 2011, Xstrata and Merafe started their expansion of the Lion's plant's capacity to 720,000 t/yr from 360,000 t/yr. The project was expected to be completed in 2013 (Xstrata plc, 2012, p. 37, 76, 81).

In April 2011, Xstrata and Merafe started construction on the Tswelopele pelletizing and sintering plant, which was likely to be completed in the second half of 2012. The plant was expected to have a capacity of 600,000 t/yr and to recover chromite from the tailings of Lonmin plc of the United Kingdom's PGM mining operations (Xstrata plc, 2012, p. 37, 39).

Samancor Chrome Ltd. (International Mineral Resources BV of the Netherlands, 70%) produced chromite at the Eastern Chrome Mines in Mpumalanga Province and the Western Chrome Mines in North West Province. The mines had a combined capacity of about 3.5 Mt/yr. The majority of the company's output was consumed in its ferrochromium plants.

Samancor Chrome operated the Ferrometals plant in Witbank, the Middelburg plant in Middelburg, and the Tubatse plant in Steelpoort; the plants had a combined capacity of 1.11 Mt/yr (table 2). In 2011, the company was producing ferrochrome at the rate of about 900,000 t/yr (Tex Report, The, 2011b).

Assmang Ltd. [African Rainbow Minerals Ltd. (ARM), 50%, and Assore Ltd., 50%] operated the Dwarsrivier Mine in Mpumalanga. In 2011, production increased to 922,000 t from 780,000 t in 2010. Output was expected to ramp up to 1.4 Mt/yr in 2012 (African Rainbow Minerals Ltd., 2011a, p. 59, 70; 2011b, p. 59; 2012, p. 58).

Assmang's ferrochromium production at the Machadodorp plant decreased to 228,000 t in 2011 from 250,000 t in 2010. The company converted one of its furnaces with a capacity of 40,000 t/yr from ferrochromium to ferromanganese because ferromanganese is only 65% as power intensive to produce as ferrochromium. In early 2011, Assmang decided to convert an additional 60,000 t/yr of ferrochromium capacity to ferromanganese (African Rainbow Minerals Ltd., 2011a, p. 59, 61, 70; 2011b, p. 59; 2012, p. 58; Ryan's Notes, 2011e).

ARM and its joint-venture partner MMC Norilsk Nickel of Russia operated the Nkomati chromite mine. In 2011, sales decreased to 666,000 t from 743,000 t in 2010 (African Rainbow Minerals Ltd., 2011a, p. 55; 2011b, p. 63; 2012, p. 64).

International Ferro Metals Ltd. (IFM) operated the Lesedi and Sky Chrome Mines and the Buffelsfontein ferrochromium plant in North West Province. In 2011, IFM produced 179,809 t of ferrochromium compared with 206,500 t in 2010. The Lesedi and the Sky Chrome Mines produced run-of-mine ore at the rate of 1.07 Mt/yr in the second half of 2011, of which Lesedi accounted for 64% and Sky Chrome, 36%. By the end of 2014, IFM planned to increase run-of-mine production at the Lesedi Underground Mine to 720,000 t/yr from 324,000 t/yr. The Lesedi Surface Mine was expected to shut down by July 2012. IFM planned to increase run-of-mine production at Sky Chrome to more than 600,000 t/yr by April 2012. In November 2011, the company opened a new waste retreatment plant that was likely

to produce 48,000 t/yr of chromite concentrate for between 2 and 3 years (Mining Journal, 2011c; Ryan's Notes, 2012b, c).

ASA Metals (Pty) Ltd. (Sinosteel Corp. of China, 60%, and Limpopo Economic Development Enterprise, 40%) was producing ferrochromium at the rate of about 360,000 t/yr. The company was also engaged in the expansion of the Dilokong Mine. ASA Metals planned to finish sinking two new shafts at Dilokong at the end of 2011 or the beginning of 2012 (International Resource Journal, 2010, p. 128, 130, 135; Ryan's Notes, 2012a).

Hernic Ferrochrome (Pty) Ltd. (a subsidiary of Mitsubishi Corp. of Japan) operated the Bokfontein Mine, which had a capacity of 1.5 Mt/yr, and a ferrochromium plant with a capacity of 420,000 t/yr. In 2011, the plant was producing at the rate of about 350,000 t/yr (Tex Report, The, 2011b).

In December 2011, Tharisa Minerals (Pty) Ltd. had completed 40% of the construction on its new processing plant that would increase chromite concentrate capacity at the Tharisa Mine to 1.7 Mt/yr from 420,000 t/yr. The new plant was likely to be completed in August 2012. Tharisa planned to consume between 1.2 and 1.3 Mt/yr of chromite concentrate at a new ferrochromium plant in China (Markram, 2011).

In 2011, Ruukki Group Oyj of Finland produced 159,455 t of chromite from the Stellite Mine and 86,445 t of ferroalloys from the Mogale plant, which included more than 55,000 t of ferrochromium. Ruukki planned to make a decision on developing the new Mecklenburg Mine in 2012 and to increase its ferroalloys production capacity by 280,000 t/yr (Ruukki Group Oyj, 2012, p. 5, 41).

In 2011, Tata Steel Ltd. of India shut down its ferrochromium plant, which had a capacity of 151,000 t/yr, for 3 months to complete maintenance. Tata announced plans to invest in two new chromite mines (Tex Report, The, 2011a).

PGM producers also mined chromite as a coproduct of PGM mining. Lonmin's sales of chromite were 878,375 t in 2011. Anglo American Platinum Ltd. (Amplats) planned to produce 422,000 t of chromite in 2011 from PGM ore compared with 341,000 t in 2010. In 2012, Amplats planned to produce about 917,000 t of chromite, and in 2013, 2.03 Mt. Eastern Platinum Ltd. (Eastplats) of Canada sold 267,733 t of chromite from its Crocodile River Mine in 2011 (Lonmin plc, 2011, p. 150–151, 2012; Ryan's Notes, 2011d; Eastern Platinum Ltd., 2012).

Most companies that produced chromite from PGM ore exported their production because ferrochromium producers obtained chromite supplies from their own mines. In 2011, chromite exports by volume were 30% of national chromite production compared with 7% in 2006. The increase in exports was partially attributable to higher production from PGM ore. China received most South African chromite exports (Tex Report, The, 2011a; Chamber of Mines of South Africa, 2012, p. 15).

Copper.—Palabora Mining Company Ltd. (Rio Tinto plc of the United Kingdom, 57.7%, and Anglo American plc of the United Kingdom, 16.8%) operated the Palabora Mine, which was South Africa's leading copper producer. Copper was also produced as a coproduct of lead, PGM, and zinc mining. In 2011, the output of copper in concentrate at Palabora decreased to 69,143 t from 74,576 t in 2010. Smelted copper production

increased to 59,438 t from 55,665 t, and refined copper, to 63,787 t from 57,984 t. In September 2011, Anglo American and Rio Tinto announced plans to sell their interest in the mine. Reserves were expected to be depleted in early 2016; Palabora Mining was engaged in a study on extending the life of the mine to 2030 (Engineering & Mining Journal, 2011; Palabora Mining Company Ltd., 2012, p. 135–137).

Gold.—The long-term decline in the country's gold output continued in 2011, with national gold mine production decreasing to 180,184 kilograms (kg) from a revised 188,702 kg in 2010 and about 393,500 kg in 2001. Average ore grades at South Africa's producing mines decreased to about 2.8 grams per metric ton (g/t) in 2011 from 4.1 g/t in 2001. From 2001 to 2011, employment in gold mining declined to 145,561 workers from about 200,000. During the same period, South Africa's share of world gold production decreased to about 7% from 15% (table 1; Chamber of Mines of South Africa, 2010, p. 23–25; 2012, p. 12, 25–26).

Gold Fields Ltd. of South Africa produced gold at the Beatrix Mine, the KDC Mine (formerly the Driefontein and the Kloof Mines), and the South Deep Mine, which were underground mines. In 2011, production at the KDC Mine amounted to about 34,200 kg; the Beatrix Mine, 10,800 kg; and the South Deep Mine, 8,500 kg. In 2012, production at KDC was expected to be between 33,000 and 35,000 kg; Beatrix, between 10,900 and 11,500 kg; and South Deep, between 9,500 and 10,200 kg. Gold Fields planned to increase production at South Deep to nearly 22,000 kilograms per year (kg/yr) of gold by the end of 2015 (Gold Fields Ltd., 2011, 2012, p. 5–6).

AngloGold Ashanti Ltd. operated numerous mines in the Vaal River area near Klerksdorp and the West Wits area near Carletonville. The company's gold production decreased to about 50,900 kg in 2011 from 55,500 kg in 2010. Production at the Mponeng Mine amounted to about 15,500 kg in 2011; the Kopanang Mine, 9,549 kg; the Moab Khotsoang Mine, 8,274 kg; the Tau Tona Mine, 7,589 kg; the surface mining operations, 5,568 kg; the Great Noligwa Mine, 2,924 kg; and the Savuka Mine, 1,524 kg. The Savuka Mine was placed on care-and-maintenance status in 2011 (AngloGold Ashanti Ltd., 2012, p. 27–28).

AngloGold Ashanti expected its production to decrease to about 37,000 kg by 2016 without the development of new technology to mechanize its current operations and increase the depths of its mines to as much as 5 kilometers (km). The remaining life of AngloGold Ashanti's mines was estimated to be between 20 and 30 years; the company hoped to increase the life of its mines by between 50 and 100 years and recover an additional 2,200 t of gold (England, 2012).

Harmony Gold Mining Company Ltd. produced gold at numerous mines; the company's output was 37,417 kg in fiscal year 2011 compared with 43,968 kg in fiscal year 2010. Some of the Evander and Virginia operations were placed on care-and-maintenance status. Harmony planned to increase its South African gold production to as much as 57,000 kg/yr by fiscal year 2015. The company planned to increase production at the Doornkop Mine to 6,800 kg/yr by fiscal year 2015 from 2,512 kg in fiscal year 2011. The Phakisa Mine produced 1,762 kg in fiscal year 2011; full output was expected to be 7,800 kg/yr.

At the Kusasalethu Mine, production was likely to increase to 9,600 kg/yr from 5,609 kg in fiscal year 2011. The remaining life of the Kusasalethu Mine was estimated to be about 25 years; Phakisa, between 18 and 21 years; and Doornkop, 15 years (Harmony Gold Mining Company Ltd., 2011a, p. 46, 56–57, 59, 63, 67, 71).

Harmony also planned to increase production at the Target Mine to 6,500 kg/yr from 3,539 kg in fiscal year 2011. The company planned to maintain production at the Masimong Mine at about 5,300 kg/yr; the Bambanani Mine, 3,600 kg/yr; and the Unisel Mine, at about 2,500 kg/yr (Harmony Gold Mining Company Ltd., 2011a, p. 57).

In 2011, DRDGold produced 4,379 kg of gold at the Crown and the Ergo Mines and 3,636 kg at the Blyvooruitzicht Mine. DRDGold agreed to sell Blyvooruitzicht to Village in December 2011. The remaining life of the Crown and Ergo Mines was estimated to be 25 years, and the Blyvooruitzicht Mine, 20 years (Creamer, 2010b; DRDGold Ltd., 2012).

In 2011, Village acquired the Buffelsfontein and the Tau Lekoa Mines from Simmer and Jack Mines Ltd. Village was producing gold at the rate of about 5,400 kg/yr from Buffelsfontein, Consolidated Murchison, and Tau Lekoa in the last 9 months of 2011 (Village Main Reef Ltd., 2011, 2012).

First Uranium Corp. of Canada (a subsidiary of Simmer and Jack) produced gold at the Ezulwini Mine and the Mine Waste Solutions (MWS) project. In the last 6 months of 2011, First Uranium's gold sales from Ezulwini and MWS were at the rate of about 4,900 kg/yr. In fiscal year 2012 (which ran from the end of March in 2011 to the end of March in 2012), the company planned to mine about 3,100 kg at MWS (Odendaal, 2012).

Rand Uranium (Pty) Ltd. was producing gold at the rate of about 4,700 kg/yr from the Cooke Underground and the Randfontein Surface Mines. In late April 2011, Rand Uranium's shareholders accepted Gold One International Ltd.'s offer to purchase 100% of Rand Uranium. In 2012, Gold One planned to produce 3,700 kg at the Cooke Underground Mine and 1,000 kg at the Randfontein Surface Mine (Gold One International Ltd., 2011, 2012).

Gold One produced 3,831 kg of gold in 2011, most of which was attributable to the Modder East underground mine. In 2012, the company planned to increase output at Modder East to about 4,700 kg. Gold One also completed a prefeasibility study on the Ventersburg project in late 2011. The study yielded favorable results for a mine that would produce 4,200 kg/yr of gold during its 17-year life. Gold One planned to complete a feasibility study on Ventersburg by the end of 2012 (Gold One International Ltd., 2012).

Rand Refinery Ltd. (AngloGold Ashanti, 53%; Gold Fields, 33%; DRDGold, 10%; and Avgold Ltd. and Western Areas Ltd., 2% each) refined most of the newly mined gold in South Africa. In fiscal year 2011, Rand Refinery's production increased to 476,229 kg from 385,244 kg in fiscal year 2010 and 390,441 kg in fiscal year 2007 in spite of the 29% decrease in South African gold mine production from 2007 to 2011. The company sourced 58% of its gold from foreign gold producers in 2011 compared with 34% in 2007. Gold was also refined by PGM producers that mined gold as a co-product [Rand Refinery (Pty) Ltd., 2011, p. 43].

Iron Ore and Iron and Steel.—In 2011, iron ore production was about 58.1 Mt compared with 58.7 Mt in 2010 and 34.8 Mt in 2001. From 2001 to 2011, employment in iron ore mining increased to 22,342 workers from about 5,000 (Chamber of Mines of South Africa, 2010, p. 16; 2012, p. 12, 16).

Kumba Iron Ore Ltd.'s iron ore production decreased to 41.4 Mt in 2011 from 43.3 Mt in 2010. In 2011, the Sishen Mine produced 38.9 Mt; the new Kolomela Mine, 1.5 Mt; and the Thabazembi Mine, 0.98 Mt. Mining at Kolomela and Sishen was limited by heavy rains. The remaining life of Kololema was estimated to be 27 years; Sishen, 21 years; and Thabazembi, 6 years (Kumba Iron Ore Ltd., 2012, p. 23, 45, 56).

Production at Kololema was expected to increase to between 4 and 5 Mt in 2012 and to ramp up to the mine's full capacity of 9 Mt/yr in the second half of 2013. By 2014, Kumba planned to complete a feasibility study on an expansion of the mine's capacity to 15 Mt/yr. Depending on the results of the study, production from the Kolomela Expansion project could start in 2017 (Kumba Iron Ore Ltd., 2012, p. 31, 33).

By 2014, Kumba planned to complete a feasibility study on the Phoenix project, which could extend the life of the Thabazembi Mine by 20 years and produce 3.4 Mt/yr of iron ore starting in 2016. By 2013, the company planned to complete a feasibility study on the new Zandriverspoort project, which could produce 2.5 Mt/yr starting in 2015 and 6 Mt/yr starting in 2019. Kumba was also engaged in studies on projects that could increase the Sishen Mine's capacity by between 7.8 and 10.8 Mt/yr by 2019 (Kumba Iron Ore Ltd., 2012, p. 66–67).

Assmang produced iron ore at the Beeshoek and the Khumani Mines. In 2011, production at Beeshoek and Khumani increased to 11.5 Mt from 9.7 Mt in 2010. Assmang was ramping up its capacity at Khumani to 16 Mt/yr from 10 Mt/yr; the expansion was likely to be completed by mid-2013. The existing operations at the Beeshoek Mine were approaching the end of their life; Assmang completed a feasibility study on opening a new mining area at Beeshoek with a capacity of 4 Mt/yr. Production was expected to start at the new operations in late 2012 (African Rainbow Minerals Ltd., 2011a, p. 59, 64, 67–68; 2011b, p. 59; 2012, p. 58).

In 2011, Palabora Mining produced 3.43 Mt of magnetite at Palabora for domestic and international markets compared with 2.99 Mt in 2010. Magnetite sales were limited by damage to the local rail network. Palabora Mining and the Government-owned Industrial Development Corp. (IDC) were engaged in the construction of a pilot pig iron plant at Palabora (Palabora Mining Company Ltd., 2012, p. 39, 135).

Evrax Highveld Steel and Vanadium Corp. Ltd. (Evrax Group S.A. of Luxembourg) mined 1.9 Mt of magnetite from Mapochs in 2011 compared with 2.32 Mt in 2010. Iron ore from Mapochs was consumed in Highveld's steel mill at Witbank; the company's production of crude steel was 659,603 t in 2010 compared with 777,190 t in 2010. Highveld planned to double its steel production by 2015 (Evrax Highveld Steel and Vanadium Ltd., 2012, p. 18, 35).

Lead and Zinc.—The Black Mountain Mine produced copper, lead, and zinc. Lead mine production increased by nearly 8%, and zinc mine production, by about 1%. At the end of 2011, Exxaro shut down the Zincor refinery, which produced

73,000 t of refined zinc in 2011 compared with 90,000 t in 2010 (Exxaro Resources Ltd., 2012, p. 6–7).

Magnesium, Silicon, Titanium, and Zirconium.—Grupo Ferroatlantica produced at its full capacity of 55,000 t/yr of silicon metal at Polokwane in 2011. The company converted one of its ferrosilicon furnaces at its Rand Carbide plant to silicon. Ferrosilicon was also produced by Silicon Technology (Pty) Ltd. (Ryan's Notes, 2011c).

RBM (BHP Billiton Ltd., 37%; Rio Tinto plc, 37%; Blue Horizon Investments, 24%; and RBM permanent employees, 2%) of the United Kingdom was South Africa's leading producer of ilmenite, rutile, and zircon. In 2010, titanium slag production increased to 970,000 t from 840,000 t in 2009, and rutile production decreased to 85,000 t from 90,000 t. Zircon output remained unchanged at 220,000 t (BHP Billiton Ltd., 2011a, p. 41).

In 2011, Exxaro Resources Ltd.'s KZN Sands project produced 377,000 t of ilmenite, 135,000 t of zircon, and 31,000 t of rutile. The Namakwa Sands project produced 168,000 t of ilmenite, 28,000 t of zircon, and 17,000 t of rutile. KZN Sands was likely to shut down at the end of 2012 because of resource depletion at the Hillendale Mine. In 2011, Exxaro approved the development of the Fairbreeze Mine to replace Hillendale. The new mine was expected to start production in the second half of 2014 and to have a capacity of 500,000 t/yr of ilmenite and 60,000 t/yr of zircon (Exxaro Resources Ltd., 2012, p. 4–5; Watts and Lismore, 2012).

Rare Metal Industries, which was a joint venture of the Government-owned companies IDC and National Empowerment Fund, Magnesium & Metals of Russia, and TJTI (Pty) Ltd., was considering the development of a new plant to produce 50,000 t/yr of magnesium, 15,000 t/yr of titanium, 8,000 t/yr of silicon, and 2,000 t/yr of zirconium. Production could start in June 2015; the estimated cost of the project was about \$2 billion (Nedbank Group Economic Unit, 2011).

Manganese.—In 2011, manganese ore production was about 8.65 Mt compared with 7.17 Mt in 2010 and 3.27 Mt in 2001. From 2001 to 2011, employment in manganese mining increased to 7,356 workers from about 2,000 (Chamber of Mines of South Africa, 2010, p. 30; 2012, p. 12, 18).

Assmang produced manganese ore at the Gloria and the Nchwaning Mines. Output at Gloria and Nchwaning increased to about 3.44 Mt in 2011 from 2.36 Mt in 2010 because of the increase in capacity at the Nchwaning Mine's processing plant to 5 Mt/yr from 3 Mt/yr. Assmang planned to increase production at Nchwaning to 4 Mt in 2012 (African Rainbow Minerals Ltd., 2011a, p. 59, 69; 2011b, p. 59; 2012, p. 58).

In 2011, Assmang increased output to 311,000 t of ferromanganese from 229,000 t in 2010. The company increased its ferromanganese capacity by 40,000 t/yr by converting one of its furnaces at Machadodorp from ferrochromium to ferromanganese. Assmang also planned to convert two more furnaces that would increase ferromanganese capacity to 400,000 t/yr from 340,000 t/yr. The conversion was expected to be completed in mid-2012 (African Rainbow Minerals Ltd., 2011a, p. 59, 61, 69; 2011b, p. 59; 2012, p. 58).

Samancor Manganese (Pty) Ltd. (BHP Billiton, 60%, and Anglo American, 40%) operated the Mamatwan open pit mine and the Wessels underground mine near Hotazel in Northern Cape Province. In 2011, Samancor's production of manganese ore decreased to 3.01 Mt from 3.34 Mt in 2010. The company planned to increase ore production at Wessels to 1.5 Mt/yr from 1 Mt/yr in fiscal year 2013 (BHP Billiton Ltd., 2011a, p. 34; 2011b, p. 4; 2012, p. 4).

In 2011, Samancor Manganese produced 479,000 t of manganese alloys at its Meyerton plant compared with 513,000 t in 2010; silicomanganese production was about 120,000 t/yr. Samancor Manganese was building a new ferromanganese furnace at Meyerton with a capacity of about 110,000 t/yr. Silicomanganese is more power intensive to produce than ferromanganese (BHP Billiton Ltd., 2011a, p. 41; 2011b, p. 4; 2012, p. 4; Ryan's Notes, 2011b, 2012e).

Renova was engaged in a joint-venture project with Majestic Silver Trading (which was a BEE company) to mine the Kalahari manganese ore deposit. Manganese from the Kalahari deposit was consumed by Transalloys (Pty) Ltd. (a subsidiary of Renova) in the production of silicomanganese. Renova and its partners produced manganese ore at the rate of about 2.1 Mt/yr in 2011; the companies planned to increase output to 2.7 Mt/yr in 2012 (Ryan's Notes, 2011a).

Transalloys produced 155,000 t of silicomanganese in 2011; the company increased its capacity to 165,000 t/yr from 110,000 t/yr in recent years. In December, Transalloys shut down its plant because silicomanganese prices of \$1,000 per ton were below production costs (Ryan's Notes, 2012d, e).

Ruukki produced silicomanganese at the rate of about 30,000 t/yr at its Mogale plant. The company was operating at about 50% of capacity because of problems with transformers. Manganese Metal Company (MMC) produced 29,000 t of manganese metal in 2011 compared with an estimated 20,000 t in 2010; production capacity was 30,000 t/yr (Ryan's Notes, 2012e; Tex Report, The, 2012b).

ArcelorMittal was engaged in a joint venture with IDC and Kalagadi Manganese (Pty) Ltd. (Kalahari Resources Ltd., 80%) to develop Kalagadi's manganese resources. ArcelorMittal and Kalahari (which was a BEE company) planned to start production at a new underground mine at Hotazel by June 2012. Output was expected to be 3 Mt/yr of manganese ore; the companies planned to beneficiate the mine's output into 2.4 Mt/yr of sintered ore. ArcelorMittal and Kalahari also planned to build a new ferromanganese plant at Coega with a capacity of 320,000 t/yr by 2015; the plant was expected to consume about 700,000 t/yr of the mine's sintered output (Ryan's Notes, 2010, 2011a).

Jupiter Mines Ltd. of Australia purchased a 49.9% share in Tshipi é Ntle Manganese Mining (Pty) Ltd. in August 2010; BEE company Ntsimbitntle Mining held a 50.1% share. Jupiter and Ntsimbitntle planned to develop the Tshipi Borwa project, which was adjacent to the Mamatwan Mine. The companies planned to complete the new Tshipi Borwa Mine in the fourth quarter of 2012; the mine was expected to produce about 2.4 Mt/yr of run-of-mine manganese ore. Production was likely to be about 2 Mt/yr of lumpy ore and 400,000 t/yr of fine ore (Ryan's Notes, 2011a).

Asia Minerals Ltd. (AML) of Hong Kong planned to start large-scale production from a new mine at its Kudumane Manganese project in the fourth quarter of 2012. Production at full capacity was likely to be 2 Mt/yr of ore at a grade of between 37% and 38% manganese and 900,000 t/yr of ore at a grade of 42% manganese. By 2014, AML planned to complete a plant at the minesite that would produce sintered ore at a grade of between 44% and 45% manganese (Tex Report, The, 2012a).

Nickel.—Most of South Africa's nickel mine production was a coproduct of PGM mining. Amplats produced 20,300 t of refined nickel in 2011 compared with 18,500 t in 2010. About 17,000 t was attributable to the company's PGM mining operations compared with 15,700 t in 2010. Amplats expanded its refined nickel capacity to 33,000 t/yr from 21,500 t/yr in 2011. Impala Platinum Holdings Ltd. (Implats) produced 15,600 t of refined nickel in 2011, of which 5,900 t was attributable to the company's PGM mining operations (Impala Platinum Holdings Ltd., 2011, p. 51; 2012; Anglo American Platinum Ltd., 2012, p. 119).

ARM produced 11,452 t of nickel at the Nkomati Mine in 2011 compared with 9,698 t in 2010. The company was engaged in an expansion of its capacity to 20,500 t/yr from 5,000 t/yr. ARM planned to reach full capacity at Nkomati in 2014; the mine was also expected to produce 10,000 t/yr of copper and 300 t/yr of cobalt at full capacity (African Rainbow Minerals Ltd., 2011a, p. 55–56; 2011b, p. 63; 2012, p. 64).

Platinum-Group Metals.—In 2011, platinum-group metal (PGM) mine production was 288,850 kg compared with 287,304 kg in 2010 and about 228,700 kg in 2001. From 2001 to 2011, the share of platinum in PGM production by volume decreased to 51% from 57%. During the same period, employment in PGM mining increased to 194,929 workers from about 100,000 (Chamber of Mines of South Africa, 2010, p. 31–32; 2012, p. 12).

In 2011, Amplats produced 148,800 kg of refined PGM compared with 151,000 kg in 2010. About 131,200 kg was attributable to mining operations of Amplats and its joint-venture partners in 2011, of which platinum accounted for 68,397 kg; palladium, 39,775 kg; rhodium, 9,452 kg; and other PGM, about 13,600 kg (Anglo American Platinum Ltd., 2012, p. 123).

In 2011, PGM production at Amplats' Mogalakwena Mine amounted to 21,038 kg; the Tumela Mine, about 16,900 kg; the Union Mine, 16,031 kg; the Kroondal Mine, 13,869 kg; the Modikwa Mine, 9,698 kg; the Dishaba Mine, 9,054 kg; the Khuseleka Mine, 7,636 kg; the Batholope Mine, 7,564 kg; the Mototolo Mine, 7,306 kg; and the Thembelani Mine, 6,404 kg. From 2007 to 2011, output at Mogalakwena increased by 91% and output at Tumela decreased by 31%. Amplats' production target for 2012 was between 78,000 and 81,000 kg of refined platinum, which included toll refining; output at Modikwa was expected to increase to 10,600 kg (African Rainbow Minerals, 2011a, p. 45; Anglo American Platinum Ltd., 2012, p. 128–145).

In 2010, Royal Bafokeng Platinum Ltd. (RBPlat) increased its share in the Bafokeng-Rasimone Platinum Mine (BRPM) to 67% from 50%. RBPlat and its joint-venture partner Amplats produced 8,759 kg of PGM in 2011, which was a decrease of 2.2% compared with 2010. By late 2014, RBPlat planned to start production at the Styldrift project. The project was

expected to increase RBPlat's PGM production to 19,000 kg/yr by 2017 (Lakimidas, 2012).

In 2011, Implats produced 109,900 kg of refined PGM compared with 119,300 kg in 2010. About 63,000 kg was attributable to Implats' mining operations, of which platinum accounted for about 31,000 kg; palladium, 18,300 kg; rhodium, 4,300 kg; and other PGMs, about 9,400 kg. The remainder was attributable to the Two Rivers joint venture with ARM, company operations in Zimbabwe, recycling, and toll refining (Impala Platinum Holdings Ltd., 2011, p. 4, 51, 63, 71; 2012).

The Impala Mines near Rustenburg in North West Province produced 57,622 kg of PGM in 2011, of which 28,938 kg was platinum and 18,323 kg was palladium. Production was constrained by safety stoppages and delays in completing new mine shafts. Implats planned to increase platinum production to about 29,500 kg/yr by 2014 (Impala Platinum Holdings Ltd., 2011, p. 51, 62–63; 2012; Butler, 2011, p. 18).

In 2011, platinum output at Marula was more than 2,000 kg, and palladium, about 2,100 kg. Implats had planned to increase platinum output at Marula to 3,100 kg/yr in 2013; the company reduced its production target to 2,200 kg/yr (Impala Platinum Holdings Ltd., 2011, p. 63; 2012).

ARM and Implats operated the Two Rivers Mine; output increased to 9,874 kg of PGM in 2011 from 9,311 kg in 2010. Production was expected to be maintained at about 9,700 kg/yr of PGM (African Rainbow Minerals Ltd., 2011a, p. 45, 53; 2011b, p. 62; 2012, p. 63).

In 2011, Lonmin produced 44,542 kg of refined PGM compared with 40,263 kg in 2010. Lonmin's mining operations produced 41,683 kg of PGM in 2011, of which platinum accounted for 22,574 kg; palladium, 10,469 kg; ruthenium, 4,676 kg; rhodium, 2,962 kg; and iridium, 1,001 kg. About 96% of the mine production was attributable to the Marikana Mine. Lonmin planned to produce more than 23,000 kg of platinum in 2012 and subsequently to ramp up production to about 29,500 kg/yr; the company planned to mine from new shafts at Marikana and to build new tailings retreatment plants (Lonmin plc, 2011, p. 150–151; 2012; Butler, 2012, p. 16).

Northam Platinum Ltd. operated the Zondereinde Mine; PGM production at Zondereinde increased to about 8,600 kg in 2011 from 8,200 kg in 2010. Production was expected to increase in 2012. Northam was engaged in a deepening project at Zondereinde to maintain output at about 9,300 kg/yr for the remaining 18 years of the mine's life. The company was also developing the Booyseindal project; mining was expected to start in the first half of 2013. Northam planned to produce about 5,000 kg/yr of PGM at full capacity (Butler, 2011, p. 18–19; 2012, p. 16).

Aquarius Platinum Ltd. operated the Everest Mine and had joint-venture agreements with Amplats for the Kroondal and the Marikana Mines. In 2011, platinum output at Everest increased to more than 1,700 kg from 1,000 kg in 2010. Mining was constrained by mechanical problems, safety stoppages, and strikes. Aquarius planned to produce PGM at Everest at the rate of 3,700 kg/yr in 2012 and the first half of 2013, of which about 2,200 kg/yr would be platinum. The company was engaged in a review of Everest because of difficult geologic conditions and low ore grades (Butler, 2012, p. 18).

Aquarius shut down the Blue Ridge Mine for redevelopment in September 2010. The company planned to reopen Blue Ridge in July 2011 and ramp up production to its full capacity of between 4,000 and 4,400 kg/yr of PGM by 2014. In June 2011, Aquarius cancelled plans to reopen Blue Ridge (Butler, 2011, p. 19; 2012, p. 18).

Eastplats mined about 2,900 kg of PGM at the Crocodile River Mine in 2011, of which nearly 1,500 kg was platinum. From 2010 to 2011, platinum production decreased by 30% because of labor disputes and safety stoppages. Eastplats planned to increase output to about 3,900 kg of PGM in 2012; the company put the expansion of Crocodile River's capacity on hold in December 2011 because of low PGM prices. Eastplats planned to open the new Mareesburg Mine in the fourth quarter of 2012. Production at Mareesburg was expected to ramp up to the mine's full capacity of 3,100 kg/yr in 2013 (Eastern Platinum Ltd., 2011, 2012; Butler, 2012, p. 18).

By 2014, ARM and Norilsk planned to produce 3,400 kg/yr of PGM at the Nkomati nickel mine as capacity increased. Output increased to 2,135 kg in 2011 from 1,958 kg in 2010; the platinum-to-palladium ratio was about 1:2.7 (African Rainbow Minerals Ltd., 2011a, p. 56; 2011b, p. 62; 2012, p. 63).

Platmin Ltd. of Canada planned to produce between 3,100 and 3,700 kg of PGM at its Pilanesburg Mine in 2011. The company produced 1,949 kg of PGM in 2011 compared with 1,923 kg in 2010. Mining was constrained by low ore grades and recovery rates and a labor dispute that led to serious damage to mining equipment (Butler, 2011, p. 20; 2012, p. 16).

In 2011, Xstrata produced about 1,800 kg of PGM at the Eland Mine compared with about 3,100 kg in 2010. Open pit mining was suspended because of low ore grades. Xstrata delayed plans to increase PGM production to about 9,300 kg/yr until 2016. The life of the Eland Mine was estimated to be about 21 years (Butler, 2011, p. 18–19; 2012, p. 16).

Platinum Australia Pty Ltd. (PLA) of Australia produced about 1,000 kg of PGM at the Smokey Hills Mine compared with 960 kg in 2010. Production was limited by labor disputes and safety stoppages (Butler, 2012, p. 18).

In 2011, PLA and joint-venture partner ARM put the development of the new open pit Kalplats Mine on hold because power for the project would be unavailable until 2014. PLA and joint-venture partner Alta Mining Resource Ltd. (which was a BEE company) were engaged in a feasibility study on a new mine at the Rooderand project in 2011. Depending on the results of the study, mining could start in early 2013. Rooderand was expected to produce about 3,600 kg/yr of PGM during its estimated 16-year life (Piper, 2011a, b).

The expansion of Tharisa's chromite processing plant was expected to increase its PGM capacity to about 5,000 kg/yr from 1,200 kg/yr in August 2012. In 2011, Sylvania Platinum Ltd. produced nearly 1,500 kg of PGM from its five chromite tailings retreatment plants compared with about 1,000 kg in 2010 (Markram, 2011; Butler, 2012, p. 18).

In December 2010, Platinum Group Metals Ltd. of Canada announced plans to spend \$100 million on the development of the Western Bushveld joint-venture project. The company and its joint-venture partner Wesizwe Platinum Ltd. planned to produce nearly 8,600 kg/yr of PGM at a new mine; initial

production was expected to be in late 2013. Capital costs were estimated to be about \$433 million (Platinum Group Metals Ltd., 2011).

In July 2011, Wesizwe Platinum started development of the Frischgewaagd-Ledig project, which was expected to produce about 10,900 kg/yr of PGM. Production was likely to start in 2018. Jinchuan Group Ltd. of China and the China-Africa Development Fund (CADF), which held a 51% interest in Wesizwe, planned to secure \$650 million in financing for the project (Butler, 2012, p. 18).

Lesego Platinum Mining Ltd. (Village, 78%, and IDC, 22%) was engaged in a prefeasibility study on the Lesego project. The company planned to start a feasibility study in the first half of 2012 and to complete it in early 2013. Depending on the results of the studies and securing financing for the project, Lesego Platinum could produce 15,600 kg/yr of PGM. The estimated capital costs of the project were about \$1 billion (Mining Review Africa, 2011).

Vanadium.—Evrax Group S.A. produced vanadium from titaniferous magnetite at the Mapochs and the Vametco Vanadium Mines, which were operated by Highveld and Vametco Minerals Corp., respectively. Highveld produced vanadium slag from the lumpy ore at Mapochs; the slag was sold to Germany for processing into ferrovanadium and to Vametco for processing into other products. In 2011, the content of V_2O_5 in vanadium slag was 13,878 t at Mapochs. Highveld planned to increase production to about 16,600 t of V_2O_5 in 2012 and to double output of vanadium slag by 2015 (Evrax Highveld Steel and Vanadium Ltd., 2012, p. 12–13, 18, 35).

Vanchem Vanadium Products (Pty) Ltd. (a subsidiary of Duferco of Switzerland) purchased fine ore from the Mapochs Mine for processing into ferrovanadium and other products. From the beginning of October 2010 to the end of September 2011, Vanchem's output of contained vanadium was 4,150 t.

Xstrata produced V_2O_5 at the Rhovan Mine in Brits; output decreased to 9,543 t of V_2O_5 in 2010 from 9,922 t in 2010. Ferrovanadium production at Rhovan decreased to 3,953 t in 2011 from 4,311 t in 2010. Decreased production at Rhovan was attributable to shutdowns for scheduled maintenance (Xstrata plc, 2012, p. 76, 81).

Industrial Minerals

Cement.—South Africa had four cement producers with a total capacity of 14.8 Mt/yr. Pretoria Portland Cement Co. (Pty) Ltd. (PPC) was South Africa's leading cement producer. Domestic sales of cementitious products increased to 11.2 Mt in 2011 from 10.9 Mt in 2010.

By mid-2013, Sephaku Cement (Pty) Ltd. (Dangote Industries Ltd. of Nigeria, 64%) planned to complete its new Aganang and Delmas cement plants in North West and Mpumalanga Provinces, respectively. Sephaku Cement also planned to quarry limestone for use as raw material at Aganang. The company planned to start construction on another clinker and cement plant in Limpopo Province with a capacity of about 1.1 Mt/yr in 2013 after the completion of the Aganang and the Delmas plants (Smit, 2011).

Diamond.—In 2011, diamond production was 7.05 million carats compared with 8.87 million carats in 2010 and 11.24 million carats in 2001. From 2001 to 2011, employment in diamond mining decreased to 12,030 workers from about 16,000 (Chamber of Mines of South Africa, 2010, p. 21; 2012, p. 12, 24).

De Beers Group accounted for most of South Africa's rough diamond production. In 2011, the company's output decreased to 5.44 million carats from 7.56 million carats in 2010. The Venetia Mine produced nearly 3.15 million carats in 2011; the Finsch Mine, 938,000 carats; the Kimberley Surface Mining Operations, 778,000 carats; and Voorspoed, 580,000 carats. De Beers sold the Finsch Mine to Petra in September 2011. The remaining life of the Venetia Mine was estimated to be 35 years; the Voorspoed Mine, 14 years; and the Kimberley Surface Mining Operations, 12 years. Anglo American planned to purchase most of CHL Holdings Ltd.'s 40% share in De Beers in 2012 (Mining Journal, 2011c; De Beers Group, 2012, p. 11, 22).

In 2011, diamond production at the Cullinan Mine by Petra Diamonds Ltd. amounted to 871,422 carats; the Finsch Mine, 414,563 carats; the Helam, the Sedibeng, and the Star Mines combined, 79,853 carats; the Kimberley Underground Mine, 67,165 carats; and the Koffiefontein Mine, 34,994 carats. Petra planned to ramp up production at Cullinan to 2.4 million carats per year in 2019 and at Finsch, to 2 million carats per year by 2018. The company also planned to increase the combined production at the Helam, the Sedibeng, and the Star Mines to 140,000 carats per year by 2015; at the Kimberley Underground Mine, to 120,000 carats per year by 2013; and at the Koffiefontein Mine, to more than 100,000 carats per year by 2017 (Mining Journal, 2011c; Petra Diamonds Ltd., 2012, p. 9–15).

Trans Hex Group produced about 70,000 carats per year; the company purchased the Namaqualand Mine from De Beers in 2011. In 2012, DiamondCorp plc of the United Kingdom planned to reopen the Lace Mine, which produced diamond from 1901 to 1931. Production at Lace was likely to be about 500,000 carats per year. Rockwell Diamonds Inc. planned to start production at the Blue Gum alluvial diamond project in late 2011 (Janse, 2011; Mining Journal, 2011c).

Fluorspar.—Minerales Y Productos Derivados SA (Minersa) of Spain held an 85% share in the Vergenoeg Mine, which up to March 2011 was South Africa's only active fluorspar mine. In 2010, Minersa cancelled plans to build a new aluminum fluoride (AlF₃) plant that would consume fluorspar mined at Vergenoeg. The project was deemed to be subeconomic because of insufficient domestic demand, which was partially attributable to the cancellation of the planned Coega aluminum smelter, and excess global supply for AlF₃ (Hodge, 2012).

Fluormin plc acquired a 63% share in Sallies Ltd., which held the Buffalo and the Witkop Mines. Sallies restarted mining operations at Witkop in March 2011 and produced about 79,000 t by yearend. The mine had a capacity of 140,000 t/yr of acid-grade fluorspar. Production was constrained by low ore grades, power and water shortages, and unplanned maintenance. The Buffalo Mine remained on care-and-maintenance status in 2011 (Roberts, 2011; Fluormin plc, 2012).

Sephaku Fluoride planned to produce a total of 180,000 t/yr of acid-grade fluorspar at its Outwash Fan and Plattekop

deposits adjacent to the Vergenoeg Mine. Production was expected to start in 2013. Sephaku also planned to build a new processing plant that would consume 130,000 t/yr of fluorspar in the production of 60,000 t/yr of hydrogen fluoride (HF). About 42,000 t/yr of HF was expected to be consumed in the production of 60,000 t/yr of AlF₃ (Roberts, 2011; Hodge, 2012).

SA Fluorite Pty Ltd. (a subsidiary of Eurasian Natural Resources Corp. of the United Kingdom) was considering the development of the Doornhoek project. Production at Doornhoek could be nearly 275,000 t/yr of acid-grad fluorspar (Roberts, 2011).

Kyanite and Related Materials.—South Africa was the world's leading producer of andalusite. Imerys South Africa (Pty) Ltd. (a subsidiary of Imerys Group of France) operated the Annesley, the Havercroft, the Krugerspost, and the Thabazimbi (Rhino) Mines, which had a combined capacity of 225,000 t/yr. By mid-2014, the company planned to increase capacity to 290,000 t/yr through debottlenecking programs at Krugerspost and Thabazimbi and opening the Segorong Mine. The debottlenecking programs were expected to increase capacity at Thabazimbi by 20,000 t/yr, and at Krugerspost, by 10,000 t/yr (Feytis, 2011a).

In mid-2010, Andalusite Resources (Pty) Ltd. increased the capacity at its Maroeloesfontein Mine to 70,000 t/yr from 50,000 t/yr. The company planned a further increase in capacity to between 80,000 and 100,000 t/yr by the end of 2012. The life of the Maroeloesfontein Mine was estimated to be about 60 years; Andalusite Resources hoped to increase the mine's life to at least 80 years by the end of 2011 by converting its exploration licenses to mining rights. In early 2011, Andalusite Resources initiated a quality improvement program to reduce impurities on its final product (Feytis, 2011a).

Rare-Earth Elements and Thorium.—The Steenkampskraal Mine in Western Cape Province produced rare-earth elements from monazite from 1953 to 1963; Great Western Minerals Group Ltd. (GWMG) of Canada planned to reopen the mine in January 2013. In August 2011, GWMG announced plans to form a joint venture with Ganzhou Qiangdong of China to build a rare-earths separation plant that would process rare-earth chlorides from Steenkampskraal to rare-earth oxides. GWMG planned to produce about 2,700 t/yr of rare-earth oxides from Steenkampskraal before ramping up to 5,000 t/yr. The company also planned to process thorium from the monazite and to store it until demand increased (Northern Miner, The, 2011).

In December 2011, Frontier Rare Earths Ltd. of Luxembourg signed a joint-venture agreement with Korea Resources Group (Kores) of the Republic of Korea to develop the Zandkopsdrift rare-earths project. Frontier planned to complete a preliminary economic assessment on a new mine at Zandkopsdrift by the end of the first quarter of 2012 and a feasibility study by the end of 2012. Depending on the results of the studies, Frontier and Kores could start mining at the Zandkopsdrift monazite deposit by 2016. The mine's production would be processed at a rare-earths separation plant at Saldanha with a capacity of 20,000 t/yr of rare-earth oxides (Engineering & Mining Journal, 2012; Watts, 2012).

Sulfur.—Copper, gold, PGM, and zinc producers recovered sulfur as a coproduct of their mining operations. South Africa

had five petroleum refineries and coal-to-liquids plants with a combined sulfur recovery capacity of more than 360,000 t/yr. In mid-2011, Sasol Synthetic Fuels (Pty) Ltd. was producing sulfur at the rate of 118,000 t/yr; South African Petroleum Refineries, 51,000 t/yr; Engen Petroleum Ltd., 26,000 t/yr; National Petroleum Refiners of South Africa (Pty) Ltd., 21,000 t/yr; and Caltex Oil SA (Pty) Ltd., 13,000 t/yr (Koottungal, 2011).

Vermiculite.—South Africa was the world's leading producer of vermiculite. In 2011, Palabora Mining's production at the Palabora Mine decreased by 14% because of decreased ore grades, heavy rain, and scheduled maintenance. The life of the mine was estimated to be 33 years. Palabora Mining had difficulties in supplying adequate coarse-grained vermiculite because of increasing demand and decreasing shares of coarse-grained material in its reserves (Elliott, 2011; Palabora Mining Company Ltd., 2012, p. 39).

Wollastonite.—Namaqua Wollastonite (Pty) Ltd., which was South Africa's last remaining producer of wollastonite, shut down its mining operations in 1999. The company restarted mining at Magata and was producing wollastonite at the rate of 2,400 t/yr in 2011. Namaqua planned to increase production to 12,000 t/yr for export to Europe and the United States. Wollastonite from Magata was likely to be used as a substitute for asbestos because its high iron content rendered it subeconomic in conventional wollastonite markets. Resources at Magata were estimated to be at least 3.2 Mt at a grade of 52% wollastonite (Feytis, 2010, 2011b).

Mineral Fuels and Related Materials

Coal.—In 2011, coal production was about 252.8 Mt compared with 254.5 Mt in 2010 and 223.5 Mt in 2001. From 2001 to 2011, the share of exports in South African coal sales, by volume, decreased to 28% from 31%. During the same period, employment in coal mining increased to 78,580 workers from about 51,000 (Chamber of Mines of South Africa, 2010, p. 17, 20; 2012, p. 12, 19, 22).

Anglo American's coal production decreased to 57 Mt in 2011 from nearly 58.5 Mt in 2010. The New Vaal Mine produced 17.4 Mt in 2011; the Kriel Mine, 8.15 Mt; the Goedehoop Mine, 5.2 Mt; the New Denmark Mine, 4.81 Mt; the Kleinkopje Mine, 4.4 Mt; the Isibonelo Mine, 4.34 Mt; the Landau Mine, 4.17 Mt; and the Zibulo Mine, 3.37 Mt. Production at Zibulo reached its full capacity of 6.6 Mt/yr in the fourth quarter of 2011. Anglo American was considering the development of the New Largo Mine, which could start production in 2015 and reach its full capacity of 13 Mt/yr of thermal coal by 2017, and the Elders project, which could start production in 2017 and reach its full capacity of 3 Mt/yr by 2019 (Anglo American plc, 2012, p. 18–19, 201).

In 2011, Exxaro mined 42 Mt of coal compared with 46.3 Mt in 2010. The Grootegeluk Mine produced 18.2 Mt in 2011; the Matla Mine, nearly 10.2 Mt; the Leeuwpan Mine, 4.03 Mt; the North Block Complex, 2.35 Mt; and the Arnot Mine, 2.29 Mt. Exxaro planned to complete the expansion of the Grootegeluk Mine's capacity by 14.6 Mt/yr in May 2012; full production was expected by 2015 (Exxaro Resources Ltd., 2012, p. 2–3, 34).

By the second half of 2012, Exxaro planned to complete a feasibility study on the development of the new Belfast Mine. Depending on the results of the study, production at Belfast was expected to be between 3 and 5 Mt/yr and operations were expected to start in 2014. Exxaro was also considering the development of the new Thabametsi Mine adjacent to Grootegeluk. Production at Thabametsi could be 6 Mt/yr starting in 2016 or 2017 (Exxaro Resources Ltd., 2012, p. 34, 37).

In fiscal year 2011, Sasol Ltd. of South Africa's salable coal production decreased to 37.3 Mt from 41 Mt in fiscal year 2010; output increased at all the company's mines. Total production was 38.6 Mt, of which the Syferfontein Mine accounted for 9.7 Mt; the Middelbult Mine, 7.6 Mt; the Bosjesspruit Mine, 6.8 Mt; the Brandspruit Mine, 6.5 Mt; the Twistdraai Mine, 6.1 Mt; and the Mooikraal Mine, 1.9 Mt. In 2011, Sasol started construction on the new Impumelelo Mine to replace the Brandspruit Mine (Sasol Ltd., 2011, p. 43, 45).

BHP Billiton Energy Coal South Africa Ltd. (BESCA) produced coal at the Khutala, the Klipspruit, and the Middleburg Mines in Mpumalanga Province. In 2011, BESCA produced 33.9 Mt of coal compared with 32.5 Mt in 2010. The Middleburg Mine accounted for 14.7 Mt of sales in 2011; Khutala, 12.2 Mt; and Klipspruit, 7.04 Mt (BHP Billiton Ltd., 2011b, p. 4; 2012, p. 4; Chamber of Mines of South Africa, 2012, p. 20).

In 2011, Xstrata's coal production decreased slightly to about 18.5 Mt from 18.8 Mt in 2010. The Tweefontein Division produced 7.54 Mt in 2011; the Goedgevonden Mine, 5.29 Mt; the Impunzi Division, 4.6 Mt; and the Mpumalanga Division, 1.02 Mt. Xstrata and ARM planned to produce 7 Mt/yr from the Goedgevonden Mine, of which about 3.8 Mt/yr would be consumed domestically and about 3.2 Mt/yr would be exported. In 2011, Xstrata completed the ATCOM East project, which was likely to produce an additional 4 Mt/yr of coal. The company also approved the Tweefontein Optimisation project in 2011, which was expected to extend the life of the Tweefontein Division and produce 4 Mt/yr starting in 2014 (African Rainbow Minerals Ltd., 2011a, p. 79; Xstrata plc, 2012, p. 79).

Optimum Coal Holdings (Pty) Ltd. operated the Optimum and the Koornfontein Mines, which sold 9.46 Mt and 3.39 Mt of coal in 2011, respectively. Production increased in 2011 because of the Boshmanspoort expansion project, which increased output at the Optimum Mine. The life of the project was estimated to be 11 years. Optimum planned further increases in production by opening the Vlakfontein project in 2013 or 2014. Production at Vlakfontein was expected to be 2.5 Mt/yr (Cornish, 2011; Chamber of Mines of South Africa, 2012, p. 20).

Shanduka Coal (Pty) Ltd. (Shanduka Group, 50.01%, and Glencore International plc of Switzerland, 49.99%) operated the Graspan, the Middleburg Townlands, and the Springlake Mines, which together produced about 7 Mt/yr of salable coal. The Shanduka Group also held a 30% interest in Kangra Group (Pty) Ltd., which sold 3.19 Mt of coal from the Savmore Mine in 2011 (Shanduka Group, 2011; Chamber of Mines of South Africa, 2012, p. 20).

Umcebo Mining Ltd. sold more than 6.87 Mt of coal from the Kleinfontein, the Klippan, and the Middelkraal Mines in 2011. Glencore purchased a 43.66% interest in Umcebo in December.

Umcebo planned to start production at the new Wonderfontein Mine in 2013; output was likely to be about 3.6 Mt/yr of run-of-mine coal (Mining Journal, 2011b).

In 2011, combined sales from Coal of Africa Ltd.'s Vuna and Woestalleen Mines totaled 2.66 Mt, and the Mooiplaats Mine, about 887,000 t. In November, the company resumed operations at the Vele project after the Government rescinded its suspension of water use for environmental reasons. Mining was expected to start in the first quarter of 2012 and to ramp up to 1 Mt/yr in the first phase of the project (Australia's Paydirt, 2012; Chamber of Mines of South Africa, 2012, p. 20).

Total Coal South Africa's (TCSA) sales from the Forzando South Mine were about 898,000 t; the Forzando North Mine, 652,000 t; the Dorsfontein West Mine, 446,000 t; the Tumelo Mine, 366,000 t; and the Doorsfontein East Mine, 296,000 t. TCSA planned to produce 2 Mt/yr of coal at the Dorsfontein East Mine. The life of the Dorsfontein East Mine was estimated to be 22 years; the Forzando South Mine, more than 20 years; and the Forzando North Mine, 10 years. The Dorsfontein West Mine was expected to be shut down at the end of 2012 (Mining Review Africa, 2010; Chamber of Mines of South Africa, 2012, p. 20).

In 2011, Continental Coal Ltd.'s sales from the Vlakvarkfontein Mine were about 1.15 Mt, and from the Ferreira Mine, about 630,000 t. Continental planned to start mining 750,000 t/yr of run-of-mine coal at the new Penumbra Mine beginning in 2012 and was engaged in a feasibility study on the De Wittekrans project. Mining could start at De Wittekrans in 2012 depending on the results of the study; output was likely to be between 3.6 and 4 Mt/yr of run-of-mine coal. By 2015, Continental planned to produce 10 Mt/yr of run-of-mine coal (Resource Stocks, 2011; Chamber of Mines of South Africa, 2012, p. 20).

Keaton Energy Holdings Ltd. started mining at the Vangatfontein Mine in July 2010 at the rate of 240,000 t/yr. In June 2011, Keaton completed an expansion of the mine. The company was producing at the rate of 2 Mt/yr in late 2011 and planned to ramp up to the full capacity of 2.64 Mt/yr by yearend. Keaton also acquired the Vaalkranz Mine, which produced about 360,000 t/yr. Depending on the results of feasibility studies, Keaton planned to reopen the Braakfontein Mine near Newcastle by 2015 and produce between 600,000 and 700,000 t/yr and also to produce 1 Mt/yr from the new Sterkfontein project (Lazenby, 2011).

Universal Coal plc of the United Kingdom planned to start mining at the Kangala project in 2013; production was likely to be about 3 Mt/yr. In late 2011, Universal was engaged in a feasibility study on the Roodekop project. The company planned to start a feasibility study on the Brakfontein project in the first quarter of 2012 (Thair, 2011).

Resource Generation Ltd. (Resgen) of Australia planned to start production at its new Boikarabelo Mine in 2014. In the first phase of the project, Resgen planned to produce about 6 Mt/yr of salable coal, of which 3 Mt/yr would be consumed domestically and 3 Mt/yr would be exported. By 2019, production was expected to increase to between 18 and 20 Mt/yr of salable coal. In October 2011, Transnet signed an agreement with Resgen to ship coal from Boikarabelo starting in July

2014. The development of the project would depend on Resgen securing financing. The second stage of the project would also depend on an expansion of Transnet's capacity (Resource Generation Ltd., 2011a, b).

Petroleum.—South Africa had four petroleum refineries with a combined capacity of about 508,000 barrels per day (bbl/d). PetroSA, which was a Government-owned company, planned to build a new refinery at Coega with a capacity of 400,000 bbl/d. The refinery was likely to be completed in 2016 (Quinlan, 2011).

Uranium.—AngloGold Ashanti and First Uranium mined uranium as a coproduct of gold. In 2011, AngloGold Ashanti's production of uranium oxide (U_3O_8) from the Great Nologwa, the Kopanang, and the Tau Lekoa Mines was 626 t compared with 663 t in 2010. AngloGold Ashanti planned to increase production to about 900 t/yr of U_3O_8 . The company planned to complete the infrastructure upgrades to transport additional ore from the Kopanang Mine in July 2012 and improvements to the surface mining operations' processing plant by the end of the third quarter of 2013 (Mining Journal, 2011a; AngloGold Ashanti Ltd., 2012, p. 40, 42).

Gold One planned to start production from the Cooke Uranium Project by 2015. The company planned to build a new processing plant to recover uranium from the Cooke Tailings Dam and the Cooke Underground operations. Production at the Cooke Uranium project was expected to be about 1,000 t/yr of U_3O_8 for the first 10 years and about 680 t/yr for the next 5 years (Gold One International Ltd., 2011, 2012).

Harmony was considering the development of the TPM project, which would recover uranium from newly mined gold ore at Masimong, Phakisa, and Tshepong. The project could recover nearly 390 t/yr of U_3O_8 at peak production. The estimated life of the project was 20 years. Harmony also engaged in studies on recovering uranium from gold mine tailings in Free State. Depending on favorable results of the study, Harmony could produce about 350 t/yr of U_3O_8 from tailings, which would be treated at the St. Helena plant and the Saaiplaas plant (Harmony Gold Mining Company Ltd., 2011a, p. 120–121; 2011b).

Outlook

Numerous producers are planning new mines and plants and capacity expansions of existing operations for andalusite, cement, chromite, coal, diamond, ferrochromium, ferromanganese, fluorspar, gold, iron ore, manganese ore, nickel, PGMs, rare-earth elements, uranium, and wollastonite. Iron ore production could increase by more than 25 Mt/yr by 2019, and manganese, by between 8 and 9 Mt/yr. Power shortages could constrain mining and mineral processing expansions until Eskom's new coal-fired Kusile and Medupi power stations are commissioned, particularly in power-intensive industries, such as ferrochromium.

In 2010, the cost of power for South Africa's ferrochromium producers was estimated to be \$0.06 per kilowatthour compared with \$0.09 per kilowatthour in India and \$0.085 per kilowatthour in China. By 2015, the cost of power was expected to be \$0.135 per kilowatthour in China and South Africa and \$0.115 per kilowatthour in India. South African producers could maintain their cost advantage depending on the success of

power-saving technologies, such as the process used in Xstrata's Lion plant (Tex Report, The, 2011b).

Increases in coal, iron ore, and manganese exports depend upon increased capacity on the rail network. Coal producers are facing increasing freight costs to finance state-owned Transnet's expansion of railways dedicated to coal exports to a capacity of 81 Mt/yr from the current 70 Mt/yr. Transnet plans to increase the capacity of the iron ore railways to 60 Mt/yr from 47 Mt/yr by 2012 or 2013, and railways for transporting manganese ore, to 12 Mt/yr from 5 Mt/yr (Mining Journal, 2011c).

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TABLE 1
SOUTH AFRICA: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity	2007	2008	2009	2010	2011	
METALS						
Aluminum metal, primary	899,000	811,000	809,000	807,000	809,000	
Antimony concentrate, Sb content	3,354	3,983 ^r	2,673 ^r	3,700 ^{r,e}	4,700 ^e	
Chromium, gross weight:						
44% to 48% chromic oxide	thousand metric tons	2,122	2,135	1,296	808 ^r	1,064
Less than 44% chromic oxide	do.	7,543	7,547	6,265	10,063 ^r	9,657
Total	do.	9,665	9,682	7,561	10,871	10,721
Cobalt:						
Mine output, Co content ^c	600	590	610	1,800	1,600	
Refinery output	307	244	238	840	862	
Copper:						
Mine, Cu content	97,000	108,700	107,600	102,600	96,600	
Metal:						
Smelter	111,900	94,800	86,900	75,900	82,400	
Refined, primary	113,166	92,972	89,453	81,129	86,166	
Gold:						
Mine	kilograms	252,598	212,571	197,628	188,702 ^r	180,184
Refined ²	do.	391,100 ^r	403,500 ^r	392,900 ^r	388,300 ^r	480,400
Iron and steel:						
Ore and concentrate:						
Gross weight	thousand metric tons	42,083	48,983	55,313	58,709	58,056
Fe content (62%–65%)	do.	26,500	30,800	34,800	36,900	36,500
Metal:						
Pig iron	do.	5,358	5,138 ^r	4,444 ^r	5,429 ^r	4,604
Direct-reduced iron	do.	1,736	1,178 ^r	1,340	1,120 ^r	1,414
Ferroalloys, electric arc furnace:						
Chromium ferroalloys	do.	3,552	3,269	2,346	3,607	3,426
Ferromanganese	do.	699	502	239 ^{r,3}	460 ^{r,e}	690 ^e
Ferosilicon	do.	140	135	110	118	112
Ferrovanadium ^e	do.	19	19	14 ^r	19	19
Silicomanganese ³	do.	298 ^r	237 ^r	135 ^r	274	314
Silicon metal	do.	50	52	39	56 ^r	71
Total ^e	do.	4,760	4,210	2,880 ^r	4,530 ^r	4,632
Steel:						
Crude	do.	9,098	8,246 ^r	7,484	7,617 ^r	7,546
Stainless	do.	658 ^r	528 ^r	547 ^r	478 ^r	460 ^e
Lead:						
Concentrate, Pb content	41,857	46,440	49,149	50,625	54,460	
Refined, secondary	59,000 ^r	62,000 ^r	58,000 ^r	58,000 ^r	60,000 ^e	
Manganese:						
Ore and concentrate, gross weight:						
Metallurgical:						
More than 48% manganese	thousand metric tons	1,742	712	--	847	128
45% to 48% manganese	do.	1,755	2,897	2,121	1,683	2,742
40% to 45% manganese	do.	961	1,192	498	843	1,181
30% to 40% manganese	do.	1,523	1,996	1,949 ^r	3,783	4,584
Total	do.	5,981	6,797	4,568 ^r	7,156	8,636
Chemical, 35% to 65% manganese dioxide	do.	14	9	11	15	16
Grand total	do.	5,995	6,806	4,579 ^r	7,172	8,652
Metal, electrolytic ^e	do.	26	20 ^r	11 ^r	20	29 ⁴
Nickel:						
Mine output, concentrate, Ni content	37,917	31,675	34,605	39,960	43,321	
Metal, electrolytic	35,200 ^r	29,400 ^r	34,200 ^r	34,700 ^r	35,900	

See footnotes at end of table.

TABLE 1—Continued
SOUTH AFRICA: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity		2007	2008	2009	2010	2011
METALS—Continued						
Platinum-group metals:						
Mine:						
Iridium	kilograms	7,211	6,415	6,378	6,445	6,813
Platinum	do.	160,940	146,141	140,819	147,790	148,008
Palladium	do.	83,643	75,537	75,117 ^r	82,222	82,731
Rhodium	do.	21,056	19,348	20,007	20,001	20,332
Ruthenium	do.	31,182	28,236	29,071	30,846	30,966
Total	do.	304,032	275,677	271,393	287,304	288,850
Refined:						
Platinum	do.	163,800	149,900	149,500	156,600	155,900
Palladium	do.	89,100	80,640	86,610	94,990	89,640
Rhodium	do.	21,500	20,000	21,600	21,400	21,300
Other ⁵	do.	36,300	32,900	34,600	37,600	36,400
Total	do.	310,700	283,400	292,300	310,600	303,200
Silver, mine	do.	68,919	75,199	77,780	79,315	73,180
Titanium: ^e						
Ilmenite concentrate	thousand metric tons	2,000 ^r	1,900	1,900 ^r	1,700 ^r	2,000
Rutile concentrate	do.	114 ^r	127 ^r	134 ^r	135 ^r	130
Total	do.	2,110 ^r	2,030 ^r	2,220 ^r	1,840 ^r	2,130
Titaniferous slag	do.	1,270 ^r	1,230	1,230 ^r	1,120 ^r	1,300
Uranium, U ₃ O ₈ content		619	654	629	682	656
Vanadium, vanadium metal content		23,486	20,295	14,353	22,606	21,652
Zinc:						
Concentrate, Zn content		30,859	29,002	28,159	36,142	36,629
Metal, smelter, primary		101,000	87,000	87,000	90,000	73,000
Zirconium concentrate (baddeleyite and zircon) ^e		405,000 ^r	405,000 ^r	390,000 ^r	381,000 ^r	383,000
INDUSTRIAL MINERALS						
Andalusite		264,645	216,667	165,217 ^r	200,000 ^e	270,000 ^e
Cementitious products:						
Cement, finished product, sales	thousand metric tons	13,650	13,473	11,784	10,870	11,234
Granulated slag, fly ash, and others, sales	do.	1,666	1,396	1,200 ^e	1,100 ^e	1,200 ^e
Total	do.	15,316	14,869	13,000 ^e	12,000 ^e	12,400 ^e
Clays:						
Attapulгите		68,377	69,876	54,418 ^r	85,336	14,448
Bentonite		45,778	44,067	40,340	54,311	120,417
Brick clay, local sales	thousand metric tons	12,017	9,706	8,763 ^r	6,923	7,658
Fire clay		161,493	138,100	120,162	551,612	785,641
Flint clay, raw and calcined		53,974	47,290	37,227	39,690	29,968
Kaolin		50,839	39,197	31,048	29,929	15,220
Diamond, natural:						
Gem ^e	thousand carats	6,100	5,200	2,500	3,600	2,800
Industrial ^e	do.	9,150	7,700	3,600	5,400	4,200
Total	do.	15,250	12,895	6,113 ^r	8,868	7,047
Feldspar		90,185	105,815	101,394	94,307	101,559
Fluorspar:						
Acid-grade ^e		268,000	281,000 ^r	196,000 ^r	150,000 ^r	225,000 ^r
Metallurgical-grade ^e		17,000	18,000 ^r	8,000 ^r	10,000 ^r	15,000 ^r
Total		285,000	299,000	204,000 ^r	160,000 ^r	240,000 ^r
Gypsum, crude		627,377	571,343	597,571	513,310	476,118
Industrial or glass sand (silica)	thousand metric tons	3,385	3,342	2,306	2,905	2,722
Lime	do.	1,599	1,563	1,368 ^r	1,291	1,539
Magnesite, crude		80,700	83,900	47,600 ^r	48,000	50,000
Mica, scrap and ground		437	426	572 ^r	904	633
Nitrogen, N content of ammonia ^e		510,000 ^r	510,000 ^r	510,000 ^r	470,000 ^r	470,000

See footnotes at end of table.

TABLE 1—Continued
SOUTH AFRICA: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity	2007	2008	2009	2010	2011
INDUSTRIAL MINERALS—Continued					
Perlite ^e	400	400	400	400	400
Phosphate rock:					
Gross weight	2,556	2,287	2,237	2,494	2,565
Phosphorus pentoxide content	959	858	839	935	962
Pigments, mineral, natural:					
Ochers	20	39	--	--	--
Oxides	212	--	183	244	266
Total	232	39	183	244	266
Salt	411,511	429,888	408,422	394,493	381,177
Sodium sulfate, natural	50,000	38,717	43,835	37,369	38,290
Stone, n.e.s.: ⁶					
Dimension:					
Granite and norite	564,100	457,965	334,589 ^r	272,531	227,154
Slate	22,876	25,538	25,841 ^r	48,114	53,643
Crushed and broken:					
Limestone and dolomite	23,941	23,481	18,568 ^r	17,927	16,980
Shale:					
For cement	498	418	462	388	404
Other	1,031	814	975 ^r	570	655
Total	1,529	1,232	1,437 ^r	958	1,059
Aggregate and sand, n.e.s. ⁶	63,873	58,608	53,604 ^r	52,356	52,286
Sulfur:					
S content of pyrite	71	61	60	30	--
Byproduct:					
Metallurgy	236	187	185	165 ^e	109 ^e
Petroleum	335	323	291	262 ^e	229 ^e
Total	642	571	536	457	338
Talc and related materials:					
Talc	14,281	5,145	4,718	3,150	4,453
Pyrophyllite (wonderstone)	123,573	80,704	114,889	122,511	121,368
Vermiculite	198,526	199,764	193,334	199,285	170,571
Wollastonite	--	--	--	--	2,400 ^e
MINERAL FUELS AND RELATED MATERIALS					
Coal (salable product):					
Anthracite	2,349	2,207	1,658	2,074	2,554
Bituminous	245,317	250,492	240,880 ^r	252,448	250,203
Total	247,666	252,699	250,538 ^r	254,522	252,757
Natural gas	3,002 ^r	1,812 ^r	1,048 ^r	963	1,000 ^e
Petroleum: ⁷					
Crude	2,559	1,976	1,070	1,358	591
Refinery products:					
Liquefied petroleum gases	3,399	3,283	3,213 ^r	3,200 ^e	3,200 ^e
Gasoline	67,182	69,741	66,585 ^r	67,000 ^e	67,000 ^e
Jet fuel	13,386	14,028	13,600 ^r	14,000 ^e	14,000 ^e
Kerosene	4,715	4,800	3,587 ^r	3,600 ^e	3,600 ^e
Distillate fuel oil	46,394	50,459	52,906 ^r	53,000 ^e	53,000 ^e
Residual fuel oil	27,426	28,751	26,840 ^r	27,000 ^e	27,000 ^e
Other, includes lubricants and greases ^e	14,000	15,000	14,500	14,500	14,500
Total ^{e,8}	177,000	186,000	181,000	182,000	182,000

^eEstimated; estimated data are rounded to no more than three significant figures; may not add to totals shown. ^rRevised. do. Ditto. -- Zero.

¹Table includes data available through January 10, 2013.

²Data are for the Rand Refinery (Pty) Ltd. fiscal year ending September 30 of the year listed.

³Reported by the International Manganese Institute.

⁴Reported figure.

TABLE 1—Continued
SOUTH AFRICA: PRODUCTION OF MINERAL COMMODITIES¹

⁵May include small amounts of gold.

⁶Not elsewhere specified.

⁷In addition, Sasol Ltd. produced about 67 million barrels per year of synthetic liquid petroleum fuels from coal.

⁸Excludes refinery fuel and losses.

Source: Mineral Economics Directorate, South Africa Department of Minerals and Energy.

TABLE 2
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity	
Aluminum	BHP Billiton Ltd.	Hillside smelter at Richards Bay	715.	
Do.	do.	Bayside smelter at Richards Bay	95.	
Andalusite	Samrec Pty. Ltd. [Imerys (Pty) Ltd., 100%]	Annesley and Havercroft Mines at Penge, Krugerspost Mine near Lydenburg, and Thabazimbi Mine near Thabazimbi	225.	
Do.	Andalusite Resources (Pty) Ltd. [African Mineral Trading and Exploration (Pty) Ltd.]	Maroeloesfontein, near Thabazimbi, Northern Province	70.	
Antimony	metric tons	Consolidated Murchison Ltd. (Village Main Reef Ltd., 74%)	Cons Murch Mine near Gravelotte	7,000 antimony in concentrate.
Cement	Pretoria Portland Cement Co. (Pty) Ltd. (Barloworld Trust Co. Ltd., 68%)	De Hoek, Dwaalboom, Hercules, Jupiter, Port Elizabeth, Riebeeck, and Slurry plants	6,800.	
Do.	Alpha Ltd. [AfriSam Consortium (Pty) Ltd., 48.5%]	Dudfield, Ulco, and three other plants	4,000.	
Do.	Lafarge South Africa Ltd. (Lafarge S.A.)	Lichtenburg plant in North West Province	3,600.	
Do.	Natal Portland Cement Co. (Pty) Ltd. (Cimentos de Portugal SGPS, S.A., 98%)	Simumu plant	1,600.	
Chromite	Xstrata plc, 79.5%, and Merafe Resources Ltd., 20.5%	Thorncliffe Mine at Steelpoort	995.	
Do.	do.	Kroondal Mine at Rustenburg	850.	
Do.	do.	Helena Mine at Steelpoort	825.	
Do.	do.	Waternal Mine	650.	
Do.	do.	Horizon Mine at Pilansberg ¹	260.	
Do.	Samancor Chrome Ltd. (International Mineral Resources BV, 70%)	Eastern Chrome Mines in Steelpoort Valley, Mpumalanga Province	2,000.	
Do.	do.	Western Chrome Mines in Northern Province ¹	1,500.	
Do.	Hernic Ferrochrome (Pty) Ltd. (Mitsubishi Corp., 51%)	Bokfontein Mines	1,500.	
Do.	Assmang Ltd. (African Rainbow Minerals Ltd., 50%, and Assore Ltd., 50%)	Dwarsrivier Mine in Mpumalanga Province	1,400.	
Do.	International Ferro Metals Ltd.	Lesedi Mines	1,320.	
Do.	do.	Sky Chrome Mine	600 run-of-mine.	
Do.	Nkomati Joint Venture (African Rainbow Minerals Ltd., 50%, and MMC Norilsk Nickel, 50%)	Nkomati Chrome Mine in Mpumalanga Province	1,000.	
Do.	Lonmin plc	Marikana Mines (Eastern Platinum, Karee, and Western Platinum) and Pandora Mine	810. ^e	
Do.	Eastern Platinum Ltd. (Eastplats)	Crocodile River Mine at Arbourfell	520. ^e	
Do.	Bayer (Pty) Ltd.	Rustenburg Chrome Mine	450.	
Do.	Anglo American Platinum Ltd. (Amplats) (Anglo American plc, 74.1%)	Bathopele, Dishaba, Khomanani, Khuseleka, Mogalakwena, Siphumelele, Thembelani, Union, and other mines	430. ^e	
Do.	Tharisa Minerals (Pty) Ltd.	Tharisa Mine	420.	
Do.	Dilokong Chrome Mine (Pty) Ltd. [ASA Metals (Pty) Ltd., 100%]	Dilokong Mine, near Burgersfort in Mpumalanga Province	360. ^e	
Coal	Anglo Coal Ltd. (Anglo American plc, 100%)	Goedehoop, Greenside, Isibonelo, Kleinkopje, Kriel, Landau, New Denmark, New Vaal, and Zibulo Mines	55,000. ^e	
Do.	Exxaro Resources Ltd. (BEE Holdco, 52.3%)	Grootegeeluk Mine in Limpopo Province	18,800.	
Do.	do.	Matla Mine in Mpumalanga Province	14,000.	
Do.	do.	Arnot Mine in Mpumalanga Province	5,000.	
Do.	do.	North Block Mine in Mpumalanga Province	3,300.	
Do.	do.	Leeuwpans Mine in Mpumalanga Province	3,000.	
Do.	do.	New Clydesdale Mine in Mpumalanga Province	1,400.	
Do.	do.	Tshikondeni Mine in Limpopo Province	414.	
Do.	Anglo American plc, 50%, and Exxaro Resources Ltd., 50%	Mafube Mine	5,000.	

See footnotes at end of table.

TABLE 2—Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Coal—Continued	Sasol Ltd.	Syferfontein Mine	9,700.
Do.	do.	Middelbult Mine	8,500.
Do.	do.	Brandspruit Mine	8,400.
Do.	do.	Bosjesspruit Mine	8,200.
Do.	do.	Twistdraai Mine	6,400.
Do.	do.	Mookraal Mine	2,000.
Do.	BHP Billiton Energy Coal South Africa Ltd.	Middelburg Mine	18,500.
Do.	do.	Khutala underground mine	15,100.
Do.	do.	Klipspruit Mine	8,000.
Do.	Xstrata plc, 79.8%	Impunzi Division at Witbank	9,400
Do.	do.	Tweefontein Division at Witbank	6,200.
Do.	Xstrata plc, 74%	Goedgevonden Mine at Witbank	6,000.
Do.	Xstrata plc, 79.8%	Mpumalanga Division (Spitzkop and Tselentis Mines) at Breyten and Ermelo	2,800.
Do.	Optimum Coal Holdings (Pty) Ltd	Optimum Mine	13,500.
Do.	do.	Koornfontein Mines	5,200.
Do.	Shanduka Coal (Pty) Ltd. (Shanduka Resources (Pty) Ltd., 50.01%, and Glencore International plc, 49.99%)	Graspan, Middleburg Townlands, and Springlake Mines	7,000.
Do.	Umcebo Mining Ltd. (Glencore International plc, 43.66%)	Kleinfontein, Klippan, and Middelkraal Mines	7,000. ^e
Do.	Total Coal SA (Pty) Ltd.	Dorsfontein East Mine	2,000.
Do.	do.	Forzando North Mine	1,000. ^e
Do.	do.	Forzando South Mine	1,000. ^e
Do.	do.	Dorsfontein West Mine	700. ^e
Do.	do.	Tumelo Mine	600. ^e
Do.	Coal of Africa Ltd.	Woestalleen Mine	2,500.
Do.	do.	Mooiplaats Mine	2,000.
Do.	Kangra Group Pty. Ltd. (Shanduka Resources (Pty) Ltd., 30%)	Savmore Mine	3,200. ^e
Do.	Keaton Energy Holdings Ltd.	Vanggatfontein Mine	2,640.
Do.	do.	Vaalkranz Mine	360.
Do.	Kuyasa Mining (Pty) Ltd.	Delmas Mine	2,000.
Do.	Continental Coal Ltd.	Ferreira and Vlakvarkfontein Mines	1,900. ^e
Copper:			
Mine	Palabora Mining Co. Ltd. (Rio Tinto Ltd., 57.7%, and Anglo American plc, 16.8%)	Palabora Mines at Phalaborwa	80. ²
Do.	Anglo American Platinum Ltd. (Amplats)	Bathopele, Dishaba, Khomanani, Khuseleka, Mogalakwena, Siphumelele, Thembelani, Union, and other mines	13. ²
Do.	Nkomati Joint Venture	Nkomati Mine in Mpumalanga Province	9.
Do.	Impala Platinum Ltd.	Impala Mines	7. ²
Do.	Black Mountain Mineral Development Co. (Pty) Ltd. (Vedanta Resources plc, 74%)	Black Mountain Mine near Aggeneys in Northern Cape Province	6. ²
Do.	Lonmin plc	Marikana and Pandora Mines	2. ²
Smelter	Palabora Mining Co. Ltd.	Smelter at Phalaborwa	110. ²
Do.	Anglo American Platinum Ltd. (Amplats)	Rustenburg Smelter	11. ²
Do.	Impala Platinum Ltd.	Smelter near Phokeng	7. ²
Do.	Lonmin plc	Smelter near Rustenburg	2. ²
Refined	Palabora Mining Co. Ltd.	Refinery at Phalaborwa	140. ²
Do.	Anglo American Platinum Ltd. (Amplats)	Rustenburg Base Metal Refiners	13. ²
Do.	Lonmin plc	Base Metals Refinery and scrap plant	9. ²
Do.	Impala Platinum Ltd.	Base Metals Refinery	7. ²
Diamond	thousand carats De Beers Consolidated Mines Ltd. (Anglo American plc, 45%)	Venetia Mine in Northern Province	7,500.

See footnotes at end of table.

TABLE 2—Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Diamond—Continued	thousand carats	De Beers Consolidated Mines Ltd. (Anglo American plc, 45%)	Kimberley surface mines, Kimberley	1,500.
Do.	do.	do.	Voorspoed Mine	800.
Do.	do.	Petra Diamonds Ltd.	Finsch Mine, 100 kilometers west of Kimberley	2,800.
Do.	do.	do.	Cullinan Mine	1,800.
Do.	do.	do.	Helam, Sedibeng, and Star Mines	175.
Do.	do.	do.	Koffiefontein Mine in Free State Province	120.
Do.	do.	do.	Kimberley underground mines, Kimberley	100.
Do.	do.	Trans Hex Group Ltd.	Baken, Bloeddrif, Reuning, and Saxendrift Mines	140. ^e
Fluorspar		Witkop Fluorspar Mine (Pty) Ltd. (subsidiary of Sallies Ltd.)	Witkop Mine at Zeerust	140.
Do.		do.	Buffalo Mine at Mookgopong ¹	60.
Do.		Vergenoeg Mining Corp. (Pty) Ltd. [Minerales Y Productos Derivados SA, 85%]	Vergenoeg Mine at Rust de Winter	180.
Gold:				
Mine		AngloGold Ashanti Ltd. (Anglo American plc, 41.8%)	Vaal River operations:	
Do.	kilograms	do.	Kopanang Mine	32,100 gold.
Do.	do.	do.	Great Nologwa Mine	14,600 gold.
Do.	do.	do.	Moab Khotsoeng Mine	11,000 gold.
Do.	do.	do.	Surface operations	5,100 ^e gold.
Do.	do.	do.	West Wits operations:	
Do.	do.	do.	Mponeng Mine	17,000 gold.
Do.	do.	do.	Tau Tona Mine	16,000 gold.
Do.	do.	do.	Savuka Mine ¹	12,000 gold.
Do.	do.	Gold Fields Ltd.	KDC Mine	36,900 gold.
Do.	do.	do.	Beatrix Mine	12,800 gold.
Do.	do.	do.	South Deep Mine	9,200 gold.
Do.	do.	Harmony Gold Mining Co. Ltd.	Kusasaletu Mine	9,000 gold.
Do.	do.	do.	Phakisa Mine	7,000 gold.
Do.	do.	do.	Tshepong Mine	7,000 gold.
Do.	do.	do.	Doornkop Mine	6,400 gold.
Do.	do.	do.	Target 1 and 3 Mines	6,000 gold.
Do.	do.	do.	Masimong Mine	5,100 gold.
Do.	do.	do.	Bambanani Mine	3,300 gold.
Do.	do.	do.	Evander Mine	2,800 gold.
Do.	do.	do.	Joel Mine	2,500 gold.
Do.	do.	do.	Unisel Mine	2,400 gold.
Do.	do.	do.	Surface operations	1,800 gold.
Do.	do.	do.	Kalgold Mine	1,300 gold.
Do.	do.	do.	Unisel Mine	810 gold.
Do.	do.	DRDGold Ltd.	Blyvooruitzicht Mine	4,800 gold.
Do.	do.	do.	Crown Mine	4,500 gold.
Do.	do.	do.	Ergo Mine	1,100 ^e gold.
Do.	do.	Great Basin Gold Ltd.	Burnstone Mine	7,900 gold.
Do.	do.	First Uranium Corp.	Ezulwini Mine	4,400 gold.
Do.	do.	do.	Mine Waste Solutions Project (MWS)	2,200 gold.
Do.	do.	Village Main Reef Ltd.	Buffelsfontein and Tau Lekoa Mines	5,100 ^e gold.
Do.	do.	Gold One International Ltd.	Modder East Mine	4,700 gold.
Do.	do.	Rand Uranium (Pty) Ltd.	Cooke Underground Mine	3,700 gold.
Do.	do.	do.	Randfontein Surface Mine	1,000 gold.
Do.	do.	Barberton Mines Ltd. [Metorex Ltd., 54%, and Shanduka Resources (Pty) Ltd., 26%]	Eastern Transvaal Consolidated Division (Fairview, New Consort, and Sheba Mines)	3,200 ^e gold.
Do.	do.	White Water Resources Ltd.	East Rand Proprietary Mine	2,700 gold.
Do.	do.	Central Rand Gold Ltd.	Central Rand Goldfield near Johannesburg	1,200 gold.

See footnotes at end of table.

TABLE 2—Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Gold—Continued:				
Refined	metric tons	Rand Refinery Ltd. (AngloGold Ashanti Ltd., 53%, and Gold Fields Ltd., 33%)	Germiston, Gauteng Province	1,000.
Iron and steel:				
Iron ore		Kumba Iron Ore Ltd.	Sishen Mine at Sishen	41,000.
Do.		do.	Thabazimbi Mine at Thabazimbi	2,700.
Do.		Assmang Ltd.	Khumani Mine	10,000.
Do.		do.	Beeshoek Mine near Postmasburg	1,000. ^c
Do.		Palabora Mining Co. Ltd.	Palabora Mines at Phalaborwa	3,500. ^c
Do.		Highveld Steel and Vanadium Corp. Ltd. (Ervaz Group S.A., 79%)	Mapochs Mine at Roossenekal	2,700.
Do.		Vametco Minerals Corp. (Ervaz Group S.A., 81%)	Vametco Vanadium Mine and plant near Brits	1,100.
Do.		Xstrata plc	Rhovan Mine at Brits	400.
Ferroalloys		Xstrata plc, 79.5%, and Merafe Resources Ltd., 20.5%	Wonderkop plant at Marikana	553 ferrochromium.
Do.		do.	Rustenburg plant at Rustenburg	430 ferrochromium.
Do.		Xstrata plc, 69.6%, and Merafe Resources Ltd., 30.4%	Lydenburg plant at Lydenburg	396 ferrochromium.
Do.		Xstrata plc, 79.5%, and Merafe Resources Ltd., 20.5%	Lion plant at Steelpoort	360 ferrochromium.
Do.		do.	Boshoek plant at Boshoek	240 ferrochromium.
Do.		Samancor Chrome Ltd.	Plants at Middelburg, Steelpoort, and Witbank	1,110 ferrochromium.
Do.		Hernic Ferrochrome (Pty) Ltd.	Plant at Brits	420 ferrochromium.
Do.		ASA Metals (Pty) Ltd. (Sinosteel, 60%, and Limpopo Economic Development Enterprise, 40%)	Plant near Pietersburg, Northern Province	400 ferrochromium.
Do.		Assmang Ltd.	Machadodorp plant in Mpumalanga Province	250 ferrochromium; 40 ferromanganese.
Do.		International Ferro Metals Ltd.	Plant in North West Province	267 ferrochromium.
Do.		Tata Steel Ltd.	Richards Bay	151 ferrochromium.
Do.		Samancor Manganese (Pty) Ltd. (BHP Billiton Ltd., 60%, and Anglo American plc, 40%)	Plant at Meyerton	490 ferromanganese; 135 silicomanganese.
Do.		Assmang Ltd.	Cato Ridge plant in KwaZulu Natal Province	300 ferromanganese.
Do.		Renova Group	Plant at Witbank	48 ferromanganese. 165 silicomanganese.
Do.		Silicon Technology Pty Ltd.	NA	55 ferrosilicon.
Do.		Grupo Ferroatlantica	Rand Carbide plant	35 ^c ferrosilicon.
Do.	metric tons	Vanchem Vanadium Products (Pty) Ltd.	Plant at Witbank	12,500 ferrovanadium.
Do.	do.	Xstrata plc	Rhovan plant at Brits	6,000 ferrovanadium.
Do.	do.	Vametco Minerals Corp.	Smelter near Brits	4,800 ferrovanadium.
Do.		Ruukki Group Oyj	Mogale plant	110 ferroalloys.
Steel		ArcelorMittal South Africa Ltd.	Vanderbijlpark plant	4,600 crude steel.
Do.		do.	Newcastle plant	1,900 crude steel.
Do.		do.	Saldanha plant	1,300 crude steel.
Do.		do.	Vereeniging plant	400 crude steel.
Do.		Highveld Steel and Vanadium Corp. Ltd.	Witbank	1,000 iron; 1,000 crude steel.
Do.		Columbus Stainless (Pty) Ltd. (Acerinox SA, 76%)	Stainless steel plant at Middelburg	750 crude steel.
Do.		Scaw Metals Group (Anglo American plc)	Germiston plant, Johannesburg	600 crude steel.
Do.		Davsteel Division (Cape Gate Pty. Ltd.)	Vanderbijlpark plant, Gauteng	485 crude steel; 460 rolled steel.
Do.		Cape Town Iron & Steel Works (Pty) Ltd.	Kuilsrivier plant, Cape Town	260 crude steel; 250 billet.
Do.		Duferco Steel Processing Ltd.	Cold-rolled slab steel plant at Saldanha Bay	240 rolled steel.
Lead		Black Mountain Mineral Development Co. (Pty) Ltd.	Black Mountain Mine near Aggeneys	54 lead in concentrate.

See footnotes at end of table.

TABLE 2—Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners		Location of main facilities	Annual capacity
Lime	PPC Lime Ltd. (subsidiary of Pretoria Portland Cement Company Ltd.)		Plant at Lime Acres	1,200.
Do.	Idwala Lime (Idwala Industrial Holdings)		Plant at Danielskuil	1,000.
Do.	Inca Lime (Pty) Ltd. (subsidiary of Inca Mining (Pty) Ltd.)		Plant at Immerpan, Limpopo Province	100.
Manganese	Assmang Ltd.		Nchwaning Mine near Black Rock	5,000 ore.
Do.	do.		Gloria Mine near Black Rock	600 ore.
Do.	Samancor Manganese (Pty) Ltd.		Mamatwan Mine near Hotazel	3,500 ore.
Do.	do.		Wessels Mine near Hotazel	1,000 ore.
Do.	Renova Group		Kalahari Mine	2,700 ore.
Do.	Metmin (Metorex Pty. Ltd., 100%)		Open pit mine in North West Province	24 manganese dioxide.
Do.	Manganese Metal Co. Pty. Ltd. [Samancor Manganese (Pty) Ltd., 51%]		Electrolytic plant at Nelspruit	30 manganese metal.
Nickel	Anglo American Platinum Ltd. (Amplats)		Bathopele, Dishaba, Khomanani, Khuseleka, Mogalakwena, Siphumelele, Thembelani, Union, and other mines	33 mine. ^e
Do.	do.		Rustenburg Base Metal Refiners	33 refined.
Do.	Nkomati Joint Venture		Nkomati Mine in Mpumalanga Province	21 mine.
Do.	Impala Platinum Ltd.		Impala Mines	6 mine. ^e
Do.	do.		Base Metals Refinery	16 refined. ^e
Do.	Lonmin plc		Marikana and Pandora Mines	4 mine. ^e
Do.	do.		Base Metals Refinery	5 sulfate. ^e
Nitrogen, ammonia	Sasol Ltd.		Plants at Sasolburg and Secunda	660.
Petroleum:				
Crude	thousand 42-gallon barrels	Petroleum Oil and Gas Corporation of South Africa	Oribi and Oryx fields	730.
Refined	do.	South African Petroleum Refineries (Shell SA Energy, 50%, and BP Southern Africa, 50%)	Sapref refinery in Durban	61,700.
Do.	do.	Engen Ltd., 62%	Engen refinery in Durban	43,100.
Do.	do.	Caltex Oil SA (Pty) Ltd.	Chevref refinery in Cape Town	40,200.
Do.	do.	National Petroleum Refiners of South Africa Pty. Ltd. (Sasol Ltd., 63.6%)	Natref refinery in Sasolburg	32,000.
Phosphate rock	Phosphate Development Corp. Ltd. (Foskor Ltd.)		Foskor Mine and plant at Phalaborwa	2,600 phosphate rock.
Do.	Fer-Min-Ore Ltd.		Plant at Germiston	30.
Do.	do.		Plant at Isithebe	12.
Phosphoric acid	Sasol Ltd.		Plant at Phalaborwa ²	325.
Platinum-group metals	kilograms	Anglo American Platinum Ltd. (Amplats)	Bathopele, Khomanani, Khuseleka, Siphumelele and Thembelani Mines	24,000 platinum; 11,900 palladium; 3,100 rhodium; 5,500 iridium and ruthenium.
Do.	do.	do.	Dishaba and Tumela Mines at Northam	16,000 platinum; 7,300 palladium; 2,400 rhodium; 4,200 iridium and ruthenium.
Do.	do.	Anglo American Platinum Ltd. (Amplats), 85%	Union Mine at Swartklip	10,700 platinum; 4,600 palladium; 1,800 rhodium; 3,100 iridium and ruthenium.
Do.	do.	Bafokeng Rasimone Platinum Mine [Royal Bafokeng Nation, 67%, and Anglo American Platinum Ltd. (Amplats), 33%]	Bafokeng Rasimone Platinum Mine at Rasimone	5,900 platinum; 2,400 palladium; 790 ruthenium; 460 rhodium; 150 iridium.

See footnotes at end of table.

TABLE 2—Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Platinum-group metals—Continued	kilograms	Kroondal Platinum Mines [Anglo American Platinum Ltd. (Amplats), 50%, and Aquarius Platinum Ltd., 50%]	Kroondal Mine	7,800 platinum; 3,800 palladium; 2,300 ruthenium; 1,500 rhodium; 550 iridium.
Do.	do.	Modikwa Platinum Mine [Anglo American Platinum Ltd. (Amplats), 50%, and African Rainbow Minerals, 50%]	Modikwa Mine at Makgemeng	4,200 platinum; 4,000 palladium; 1,200 ruthenium; 820 rhodium; 310 iridium.
Do.	do.	Anglo American Platinum Ltd. (Amplats)	Mogalakwena Mine at Ga-Masenya	10,600 platinum; 10,900 palladium; 700 rhodium; 760 iridium and ruthenium.
Do.	do.	Anglo American Platinum Ltd. (Amplats), 50%, and XK Platinum Partnership, 50%	Mototolo Mine at Steelpoort	4,100 platinum; 2,400 palladium; 630 rhodium; 1,300 iridium and ruthenium.
Do.	do.	Anglo American Platinum Ltd. (Amplats)	Polokwane smelter at Polokwane, Mortimer smelter at Swartklip, and Waterval smelter	85,000 platinum; 48,000 palladium; 12,000 rhodium.
Do.	do.	do.	Precious Metals Refinery	81,000 platinum; 45,700 palladium; 10,800 rhodium; 18,800 iridium and ruthenium.
Do.	do.	Impala Platinum Ltd.	Impala Mines, near Phokeng in North West Province	29,500 platinum; 16,000 palladium; 6,600 ruthenium; 4,000 rhodium; 1,600 iridium.
Do.	do.	do.	Marula Mine at Bothashoek	2,200 platinum; 2,300 palladium; 630 ruthenium; 460 rhodium; 180 iridium.
Do.	do.	do.	Smelter near Phokeng	81,000 platinum; 52,600 palladium; 11,600 rhodium; 17,000 gold, iridium, and ruthenium.
Do.	do.	do.	Precious metals refinery, near Springs in Guateng Province	71,500 platinum metal; 46,400 palladium metal; 10,200 rhodium metal; 15,000 gold, iridium, and ruthenium metal.
Do.	do.	Lonmin plc	Marikana and Pandora Mines	24,900 platinum; 11,600 palladium; 5,300 ruthenium; 3,400 rhodium; 1,100 iridium.

See footnotes at end of table.

TABLE 2—Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Platinum-group metals— Continued	kilograms	Lonmin plc	Precious Metals Refinery at Western Platinum	31,000 platinum metal; 14,600 palladium metal; 7,000 ruthenium metal; 4,300 rhodium metal; 1,400 iridium metal.
Do.	do.	Northam Platinum Ltd. [Anglo American Platinum Ltd. (Amplats), 22.5%, and Mvelaphanda Resources Ltd., 21.9%]	Zondereinde Mine near Northam	9,400 platinum; 4,600 palladium; 1,100 rhodium.
Do.	do.	Marikana Platinum Mine [Anglo American Platinum Ltd. (Amplats), 50%, and Aquarius Platinum Ltd., 50%]	Marikana Mine	2,700 platinum; 1,300 palladium; 760 ruthenium; 480 rhodium; 210 iridium.
Do.	do.	Aquarius Platinum Ltd.	Everest Platinum Mine at Lydenburg	3,800 platinum; 2,100 palladium; 1,100 ruthenium; 640 rhodium; 230 iridium.
Do.	do.	do.	Blue Ridge Mine ¹	3,900 platinum-group metals.
Do.	do.	Platmin Ltd.	Pilanesberg Mine	5,400 platinum; 1,700 palladium; 490 rhodium.
Do.	do.	Xstrata plc, 74%	Eland Mine at Brits	7,500 platinum-group metals.
Do.	do.	Anooraq Resources Corp., 51%, and Anglo American Platinum Ltd. (Amplats), 49%	Bokoni Mine at Sefateng	4,100 platinum; 2,700 palladium; 470 rhodium.
Do.	do.	Two Rivers Platinum Mine (Pty) Ltd. (African Rainbow Minerals Ltd., 55%, and Impala Platinum Holdings Ltd., 45%)	Two Rivers Platinum Mine near Steelpoort	4,600 platinum; 2,700 palladium; 1,300 ruthenium; 780 rhodium; 310 iridium.
Do.	do.	Eastern Platinum Ltd. (Eastplats)	Crocodile River Mine at Arbourfell	3,100 platinum; 1,300 palladium; 950 ruthenium; 520 rhodium; 220 iridium.
Do.	do.	Nkomati Joint Venture	Nkomati Mine in Mpumalanga Province	3,400 platinum-group metals.
Do.	do.	Platinum Australia Pty Ltd. (PLA)	Smokey Hills Mine	3,000 platinum-group metals.
Pyrophyllite		Idwala Industrial Minerals (Benoni)	Ottsdal Mine in North West Province	15.
Do.		Wonderstone Ltd. (The Associated Ore & Metals Corp. Ltd.)	Pyrophyllite (wonderstone) mine, North West Province	NA.
Do.		G&W Base and Industrial Minerals Pty. Ltd.	Piet Retief Mine	NA.
Silicon		Grupo Ferroatlantica	Polokwane plant, near Pietersburg	55 silicon metal.
Silver	metric tons	Rand Refinery Ltd.	Germiston, Gauteng Province	200 refined silver.
Sulfur		Sasol Synthetic Fuels (Pty) Ltd.	Plant at Secunda	180.
Do.		South African Petroleum Refineries	Plant at Durban	63.
Do.		Engen Petroleum Ltd.	do.	47.
Do.		National Petroleum Refiners of South Africa (Pty) Ltd.	Plant at Sasolburg	44.
Do.		Caltex Oil SA (Pty) Ltd.	Plant at Cape Town	30.

See footnotes at end of table.

TABLE 2—Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Synthetic fuels	thousand 42-gallon barrels	Sasol Synthetic Fuels (Pty) Ltd.	Coal to oil plant at Secunda	58,400.
Do.	do.	Petroleum Oil and Gas Corporation of South Africa	Natural gas to petroleum products plant at Mossel Bay	16,400.
Titanium:				
Titanium concentrates		Richards Bay Minerals (RBM) (BHP Billiton Ltd., 37%; Rio Tinto Plc, 37%; Blue Horizon Investments, 24%)	Open cast operations, near Richards Bay	1,280 ilmenite; ^c 125 rutile. ^c
Do.		Exxaro Resources Ltd.	Mine near Brand-se-Baai and mineral separation plant at Koekenaap	540 ilmenite; 25 rutile.
Do.		do.	KZN Sands Mine near Richards Bay	550 ilmenite; 20 rutile; 5 leucoxene.
Titanium slag		Richards Bay Minerals (RBM)	Smelter at Richards Bay	1,050 titanium slag; 110 rutile.
Do.		Exxaro Resources Ltd.	Smelter at Vredenberg, Saldanha Bay area	200 titanium slag.
Do.		Highveld Steel and Vanadium Corp. Ltd.	Steel plant at Witbank	48 titanium slag. ^c
Do.		Exxaro Resources Ltd.	Empangeni smelter near Richards Bay	250 titanium slag.
Uranium oxide	metric tons	AngloGold Ashanti Ltd.	Vaal Rivers operation, near Klerksdorp	3,000.
Do.	do.	First Uranium Corp.	Ezulwini Mine	100. ^c
Vanadium pentoxide	do.	Highveld Steel and Vanadium Corp. Ltd. (Ervaz Group S.A., 79%)	Mapochs Mine near Lydenburg	17,500.
Do.	do.	do.	Plant at Witbank	10,800.
Do.	do.	Xstrata plc, 74%	Rhovan Mine at Brits	10,000.
Do.		Vanchem Vanadium Products Pty Ltd.	Plant at Witbank	5,000. ^c
Do.	do.	Vametco Minerals Corp.	Krokodilkraal Mine and plant near Brits	3,800.
Vermiculite		Palabora Mining Co. Ltd.	Palabora Mine and plant at Phalaborwa	200.
Wollastonite	metric tons	Namaqua Wollastonite (Pty) Ltd.	Magata Mine	2,400. ^c
Zinc		Zinc Corp. of South Africa Ltd. (Exxaro Resources Ltd., 100%)	Struisbult Springszinc refinery at Springs, southeast of Johannesburg	110 refined zinc; 170 sulfuric acid.
Do.		Black Mountain Mineral Development Co. (Pty) Ltd.	Black Mountain Mine near Aggeneys in Northern Cape Province	41 zinc in concentrate.
Zirconium		Richards Bay Minerals (RBM)	Open cast mines near Richards Bay	300 zircon in concentrate.
Do.		Exxaro Resources Ltd.	Mine near Brand-se-Baai and mineral separation plant at Koekenaap	125 zircon in concentrate.
Do.		do.	Hillendale Mine near Richards Bay, KwaZulu Natal Province	45 zircon in concentrate.
Do.		Palabora Mining Co. Ltd.	Palabora Mine and plant at Phalaborwa	14 baddeleyite. ^c
Do.		do.	Zirconium sulfate plant at Phalaborwa	8 zirconium sulfate.
Do.		Phosphate Development Corp. Ltd. (Foskor Ltd.)	Plant at Phalaborwa	8 baddeleyite. ^c
Do.		do.	Fused zirconia plant	6 synthetic zirconia.

^cEstimated. Do., do. Ditto. NA Not available.

¹Not operating at the end of 2011.

²Data from International Copper Study Group.

TABLE 3
SOUTH AFRICA: RESERVE BASE OF MAJOR MINERALS IN 2011¹

(Million metric tons unless otherwise specified)

Commodity	Reserve base
Andalusite ²	51
Antimony	thousand metric tons 350
Chromium, ore	5,500
Coal, recoverable	30,408
Copper	13
Fluorspar	80
Gold	thousand metric tons 6
Iron ore	1,500
Lead	3
Manganese, ore	4,000
Nickel	thousand metric tons 3,700
Phosphate rock, concentrates	2,500
Platinum-group metals	thousand metric tons 70
Titanium minerals	71
Uranium	thousand metric tons 435
Vanadium	12
Vermiculite	80
Zinc	15
Zirconium	14

¹Metallic minerals are contained metal.

²Includes aluminosilicate and sillimanite.

Source: Mwape, P., Malebo, L., Mokwena, E., Tjatjie, T., Mnguni, M., Mashaba, P., Mahote, M., Andreas, A., Masetlana, R., and Menoe, K., 2010, General review, *in* South Africa's Mineral Industry 2009/2010: Johannesburg, South Africa, Department of Mineral Resources of the Republic of South Africa, p. 1–22.