



2014 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 2014, South Africa's estimated share of world mined platinum production amounted to 64%; refined rhodium, 56%; refined platinum, 55%; chromite ore, 52%; kyanite and other materials, 50%; vermiculite, 38%; mined palladium, 30%; manganese, 29%; vanadium, 25%; refined palladium, 23%; refined gold, 9%; mined gold, 5%; coal and fluorspar, 4% each; mined cobalt, iron ore, and nickel, 2% each; aluminum, bentonite, refined cobalt, ferrosilicon and silicon metal combined, phosphate rock, and silica sand, 1% each. South Africa also played a globally significant role in the production of diamond, ilmenite, rutile, and zircon (BP p.l.c., 2015, p. 32; Cobalt Development Institute, 2015; CPM Group, 2015, p. 7, 105, 170–171; World Gold Council, 2015, p. 19; Bray, 2016; Corathers, 2016; Dolley, 2016; George, 2016; Jasinski, 2016; Kuck, 2016; Loferski, 2016; McRae, 2016; Papp, 2016; Polyak, 2016; Schnebele, 2016; Shedd, 2016; Tanner, 2016a, b; Tuck, 2016).

In 2014, South Africa's estimated share of the world's coal consumption was 2.3%, and petroleum products, 0.7%. The country also accounted for 91% of Africa's total coal consumption and 16% of Africa's total petroleum products consumption in 2014 (BP p.l.c., 2015, p. 9, 33).

Minerals in the National Economy

The mineral industry accounted for 7.5% of the gross domestic product (GDP) in 2014 compared with a revised 8.1% in 2013. Employment in the mineral industry amounted to 495,592 workers in 2014 compared with 510,099 in 2013 and 448,905 in 2004. In 2014, platinum-group metal (PGM) mining accounted for 38% of the mineral industry's employment; gold, 24%; coal, 17.4%; iron ore, 4.4%; chromite, 3.8%; diamond, 3.2%; manganese, 2%; and other minerals, 7.2%. In 2004, gold mining accounted for 40% of the mineral industry's employment; PGMs, 33.6%; coal, 11.2%; diamond, 4.7%; and chromite, iron ore, and manganese combined, a total of 3.8% (Chamber of Mines of South Africa, 2015, p. 14; Statistics South Africa, 2015, p. 12; Martin Kohler, Deputy Director of Statistics, Department of Minerals and Energy of the Republic of South Africa, written commun., December 14, 2015).

Government Policies and Programs

Mining of minerals and mineral fuels was governed by the Mineral and Petroleum Resources Development Act 28 of 2002 (MPRDA), which became effective in May 2004. Section 100(2)(a) of the MPRDA allows for the establishment of a mining charter. The Mining Charter was published in 2004 and modified by the Amended Mining Charter of 2010.

Under the Amended Mining Charter of 2010, the Government's Black Economic Empowerment (BEE) program requires that black ownership of mining companies reach

26% by 2014. Companies are allowed to use the value of their domestic beneficiation activities as credit for up to 11% of their black ownership requirements. Companies are required to purchase 70% of their services, 50% of their consumable goods, and 40% of their capital goods from BEE entities by 2014. Companies are also required to report progress annually on the development of near-mine communities, the sustainability of growth and development, and mineral beneficiation (Creamer, 2010).

In September 2013, the Government issued a directive that mandated that scrap metal dealers offer domestic buyers the opportunity to purchase scrap metal at a discount of 20% to international spot prices before receiving a permit to export their products. In late 2014, the policy was under review by the Government (Breytenbach, 2014).

Government-owned utility Eskom engaged in power buybacks from producers of ferrochromium, ferrosilicon, and silicon metal in 2012 and early 2013; Eskom paid the producers to shut down some of their capacity to prevent power shortages. In March 2013, the National Energy Regulator of South Africa forbade Eskom to engage in further power buybacks after June 1, 2013 (Ryan's Notes, 2013a).

In the Witwatersrand basin, acid mine drainage from gold mining operations threatened to contaminate water supplies in Gauteng Province with increased levels of toxic heavy metals and radioactive particles. The acid mine drainage was the result of leaching from tailings piles and from abandoned deep underground mines that filled with water that became acidic. South Africa had about 6,000 abandoned mines and numerous tailings dams in the Witwatersrand basin that contained about 6 billion tons of pyrite. The oxidation of pyrite led to acid mine drainage. The tailings dams also contained an estimated 600,000 metric tons (t) of uranium. Remediation costs for the abandoned mines were estimated to be \$2.7 billion (Crowley, 2014).

Royal Dutch Shell plc of the Netherlands applied for hydraulic fracturing licenses for natural gas in shale formations in the Karoo basin. As of the end of 2014, the Government had not issued any hydraulic fracturing licenses (Moodley, 2015).

Production

In 2014, shale production increased by 98%; silicomanganese, by 70%; silicon metal, by an estimated 65%; zircon, by 60%; rutile, by an estimated 57%; natural gas, by 29%; manganese ore, by 28%; sodium sulfate, by 25%; kaolin, by 22%; flint clay, by 17%; ferrochromium, by 16%; mined copper, by 15%; ferrosilicon, iron ore, and silica sand, by 13% each; vermiculite, by 12%; and direct-reduced iron, by 11%. In 2014, plastics clay production decreased by 80%; mica, by 73%; antimony, by 66%; fire clay, by 53%; feldspar and silver, by 46% each; gypsum, by 33%; mined platinum, and mined ruthenium, by 31% each; mined lead, by 30%; refined platinum, other

refined PGMs, mined rhodium, and tellurium, by 29% each; selenium, by an estimated 27%; mined iridium, by 26%; refined rhodium, by 25%; refined palladium, by 22%; and attapulgitic and zinc, by 13% each. Crude petroleum production shut down in 2013 (table 1; Martin Kohler, Deputy Director of Statistics, Department of Minerals and Energy of the Republic of South Africa, written commun., September 10, 2015).

Structure of the Mineral Industry

Most of South Africa's mineral industry was privately owned; Government-owned PetroSA operated a gas-to-liquids plant and produced crude petroleum and natural gas in recent years. The production of diamond and gold, which were produced 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 andalusite accounted for about 70% of national production; that of iron ore, 60%; diamond, 57%; ferrochromium, 42%; nickel, 40%; gold, 33%; and coal, 21%. Antimony, fluorspar, phosphate rock, and vermiculite were produced by only one domestic company each (table 2).

The mining industry was regulated by the Department of Mineral Resources. Exploration and production of natural gas and petroleum were regulated by Petroleum Agency South Africa. Environmental regulations were enforced by the Department of Environmental Affairs. The Department of Mineral Resources issued environmental permits for mining operations; decisions regarding permits could be appealed to the Department of Environmental Affairs.

Mineral Trade

Crude and processed mineral products accounted for 37% of the value of total exports in 2013 (the latest year for which data were available). About 70% of crude mineral products and 84% of processed mineral products, by value, were exported in 2014. South Africa's exports of gold amounted to \$5.31 billion in 2014; iron ore, \$4.69 billion; coal, \$4.51 billion; platinum, \$4.09 billion; manganese ore, \$1.31 billion; palladium, \$1.2 billion; diamond, \$685 million; nickel, \$683 million; chromite, \$517 million; rhodium, \$452 million; copper, \$219 million; iridium, \$136 million; ruthenium, \$51 million; and other crude mineral products, which included ilmenite, rutile, and zircon, \$890 million. Exports of ferrochromium amounted to \$2.75 billion; manganese alloys, \$561 million; vanadium alloys and other vanadium products, \$281 million; silicon metal and alloys, \$149 million; and other processed mineral products, which included aluminum, antimony trioxide, phosphoric acid, and titanium slag, \$2.05 billion (Chamber of Mines of South Africa, 2015, p. 8; Martin Kohler, Deputy Director of Statistics, Department of Minerals and Energy of the Republic of South Africa, written commun., September 10, 2015).

The percentage of domestic consumption of mineral commodities produced in South Africa varied sharply by commodity. In 2014, gold exports, by volume, amounted to 94% of total sales; PGMs, 88%; iron ore, 87%; manganese alloys and nickel, 86% each; ferrochromium, 85%; diamond, 64%; silicon alloys, 60%; copper, 45%; granite, 37%; coal, 29%;

chromite, 27%; flint clay, 6%; and lime and silica, less than 1% each (Martin Kohler, Deputy Director of Statistics, Department of Minerals and Energy of the Republic of South Africa, written commun., September 10, 2015).

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. Production at Hillside decreased to 704,000 t in 2014 from 726,000 t in 2013, and production at Bayside decreased to 41,000 t from 96,000 t as the plant closed in June (BHP Billiton Ltd., 2014b, p. 24; 2015, p. 15).

Antimony.—The Cons Murch Mine was South Africa's only producer of antimony. In 2014, production declined sharply because of aging equipment and undercapitalization of the operations. Village Main Reef Ltd. put Cons Murch into bankruptcy proceedings in December after attempts to sell the mine to Stibium Mining (Pty) Ltd. of Australia were unsuccessful (Village Main Reef Ltd., 2014, p. 30–31; 2015).

Chromium.—Most of South Africa's chromite production was metallurgical grade. In 2014, chromite production was about 14 million metric tons (Mt) compared with 13.7 Mt in 2013 and 7.68 Mt in 2004. Increased production was partially attributable to PGM mining companies producing chromite as a coproduct. From 2004 to 2014, employment in chromite mining increased to 18,658 workers from 6,765 (table 1; Chamber of Mines of South Africa, 2015, p. 14, 17; O'Driscoll, 2015; Martin Kohler, Deputy Director of Statistics, Department of Minerals and Energy of the Republic of South Africa, written commun., December 14, 2015).

Glencore plc of Switzerland (formerly Glencore Xstrata plc) and its joint-venture partner Merafe Resources Ltd. operated the Boshhoek, the Helena, the Kroondal, the Thorncliffe, and the Waterval Mines. In 2014, Glencore and Merafe produced 3.05 Mt of chromite compared with 2.32 Mt in 2013 (Merafe Resources Ltd., 2015, p. 17).

Glencore and Merafe operated the Boshhoek, the Lion, the Lydenburg, the Rustenburg, and the Wonderkop ferrochromium plants, which had a total capacity of 2.34 million metric tons per year (Mt/yr). The companies produced 1.56 Mt of ferrochromium in 2014, which was an increase of 5% compared with that in 2013. Increased production was attributable to an expansion of the Lion plant's capacity to 720,000 metric tons per year (t/yr) from 360,000 t/yr in 2013. Glencore and Merafe planned to ramp up production at Lion to full capacity in 2015 (Merafe Resources Ltd., 2015, p. 9, 17).

Samancor Chrome (Pty) 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 company mined about 3 Mt/yr of chromite.

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 more than 1.2 Mt/yr of ferrochromium (table 2). The company produced more than 1.1 Mt of ferrochromium in 2014 compared with

860,000 t in 2013. Production was limited in early 2013 by a power buyback agreement with Government-owned utility Eskom; Samancor Chrome was paid to shut down some of its capacity to prevent power shortages (Oryx Stainless Group, 2013; Glencore plc, 2014a, p. 28; Matlala and Bisessor, 2015, p. 29).

Assmang (Pty) Ltd. [African Rainbow Minerals Ltd. (ARM), 50%, and Assore Ltd., 50%] operated the Dwarsrivier Mine in Mpumalanga Province. In 2014, production remained nearly unchanged at about 1.03 Mt. Chromite sales were expected to increase to more than 1.2 Mt/yr by 2016 (African Rainbow Minerals Ltd., 2014a, p. 72, 77; 2014b, p. 59; 2015, p. 51).

Assmang's ferrochromium production at the Machadodorp plant decreased to 22,000 t in 2014 from 23,000 t in 2013. The company converted its remaining ferrochromium furnaces at Machadodorp to ferromanganese in mid-2013; ferrochromium continued to be produced from stockpiles of slag at Machadodorp's metal recovery plant (African Rainbow Minerals Ltd., 2014a, p. 77; 2014b, p. 59; 2015, p. 51, 53).

ARM and its joint-venture partner MMC Norilsk Nickel of Russia operated the Nkomati Chrome Mine. Chromite sales from Nkomati increased to 413,000 t in 2014 from 266,000 t in 2013. Chromite sales from the Two Rivers Mine increased to 228,268 t in 2014 from 43,787 t in 2013; sales started in October 2013. ARM planned to maintain total chromite sales at Nkomati Chrome and Two Rivers at about 600,000 t/yr between 2015 and 2017 (African Rainbow Minerals Ltd., 2014a, p. 57, 61–62; 2014b, p. 64–65; 2015, p. 57–58).

Hernic Ferrochrome (Pty) Ltd. (a subsidiary of Mitsubishi Corp. of Japan) operated the Bokone Mines, which had a capacity of 1.5 Mt/yr, and a ferrochromium plant with a capacity of 420,000 t/yr (table 2). In 2014, Hernic's ferrochromium production increased to about 350,000 t from 280,000 t in 2013. The company's production was limited in early 2013 by a power buy-back agreement that shut down 40% of ferrochromium capacity from the beginning of December 2012 to the end of March 2013 (Davies, 2013; Glencore plc, 2014a, p. 28; Markram, 2014c; Matlala and Bisessor, 2015, p. 29).

ASA Metals (Pty) Ltd. (Sinosteel Corp. of China, 60%, and Limpopo Economic Development Enterprise, 40%) operated the Dilokong chromite mine near Burgersfort and a ferrochromium plant near Pietersburg with capacities of 800,000 t/yr and 400,000 t/yr, respectively. In 2014, the company's ferrochromium production increased to about 250,000 t from 189,000 t in 2013. ASA Metals' production was limited in early 2013 by a power buyback agreement that shut down three of its four ferrochromium furnaces (Davies, 2013; Glencore plc, 2014a, p. 28; Matlala and Bisessor, 2015, p. 29).

International Ferro Metals Ltd. (IFM) of Australia operated the Buffelsfontein ferrochromium plant in North West Province. In 2014, IFM produced 209,807 t of ferrochromium compared with 190,095 t in 2013. The company's Sky Chrome Mine shut down in the first half of 2014; production was 70,000 t of chromite in 2014 compared with 182,000 t in 2013. The company's Lesedi Underground and Rooderand Mines started production in the second half of 2014 and produced a total of 61,000 t of run-of-mine ore. IFM planned to produce between 202,000 and 205,000 t of ferrochromium in 2015 (Tex Report, The, 2014b; International Ferro Metals Ltd., 2015, p. 2, 5–6).

In fiscal year 2014 (which ran from October 1, 2013, to September 30, 2014), Tharisa Minerals (Pty) Ltd. of Cyprus produced nearly 1.09 Mt of chromite at the Tharisa Mine compared with 1.19 Mt in fiscal year 2013. The company planned to reach steady-state production of 1.8 Mt/yr in fiscal year 2016. The remaining life of the open pit was estimated to be 22 years, which was expected to be followed by an underground mine with a life of 36 years (Tharisa Minerals (Pty) Ltd., 2015, p. 2, 13–14).

In December 2014, Afarak Group Oyj of Finland restarted chromite production at the Mecklenburg Mine after suspending operations in May. Chromite from Mecklenburg was used to supply Afarak's Mogale Alloys plant, which was producing ferrochromium at the rate of about 48,000 t/yr in late 2014 (Ryan's Notes, 2014a; Markram, 2014c).

Tata Steel (KZN) (Pty) Ltd. operated a ferrochromium plant with a capacity of 150,000 t/yr; the company was operating at close to capacity in 2014. Production was limited in 2013 by a power buyback agreement that shut the plant down completely in January and partially through at least June (Davies, 2013; Metal Bulletin, 2013; Matlala and Bisessor, 2015, p. 29).

FerroChrome Furnaces (Pty) Ltd. was building a new ferrochromium plant in Rustenburg with an initial capacity of 300,000 t/yr. The company planned to increase capacity to 420,000 t/yr by the end of 2016. At yearend, it was unclear when the plant would be completed (Markram, 2014d).

PGM producers also mined chromite as a coproduct of mining of Upper Group 2 (UG2) ore in the Bushveld Complex. Production of chromite from UG2 ore had increased in recent years because of the declining profitability of PGM mining. UG2 ore had a much lower production cost than the Lower Group 6 (LG6) chromite ore mined by ferrochromium producers. Technological advances have allowed ferrochromium producers to use UG2 ore, which had a grade of about 10% Cr₂O₃ that was much lower than the grades in LG6 ore (Ryan's Notes, 2012).

Many companies that produced chromite from UG2 ore exported their production to China. UG2 exports by volume were an estimated 40% of national chromite exports in 2014. Some ferrochromium producers shifted from processing LG6 ore to UG2 ore (Markram, 2014d; O'Driscoll, 2015).

In the first half of 2014, a labor dispute that lasted for 5 months resulted in total UG2 production losses from the three leading PGM producers of about 1.4 Mt. Lonmin plc of the United Kingdom's sales of chromite from UG2 ore were 727,000 t in 2014 compared with 1.5 Mt in 2013. In 2014, Anglo American Platinum Ltd. (Amplats) produced 289,200 t of chromite from UG2 ore compared with 399,500 t in 2013. Amplats operated the Waterval and the Masa treatment plants with capacities of 350,000 t/yr and 330,000 t/yr, respectively. In September, the company was considering the development of a new plant at the Amandelbult Mine with a capacity of 600,000 t/yr. Depending on company approval, production could start in 2017 (Kolver, 2014; Lonmin plc, 2014, p. 192; 2015; Anglo American Platinum Ltd., 2015, p. 63; O'Driscoll, 2015).

ChromTech Holdings planned to start construction on a new ferrochromium plant that would use UG2 ore in 2014. The plant would have an initial capacity of between 68,000 and 70,000 t/yr. At yearend, it was unclear when the plant would be completed (Markram, 2014d).

Cobalt.—Refined cobalt production increased to 1,332 t in 2014 from 1,294 t in 2013, most of which was attributable to South Africa’s PGM mining operations. ARM and Norilsk produced 1,096 t of cobalt at the Nkomati Mine in 2014 compared with 1,159 t in 2013 (African Rainbow Minerals Ltd., 2014a, p. 57, 62; 2014b, p. 65; 2015, p. 58; Cobalt Development Institute, 2015).

Copper.—Palabora Mining Co. Ltd. operated the Palabora Mine, which was the leading producer of copper in South Africa. About 60,000 t/yr of copper was refined at Palabora. Between January and May 2014, Palabora Mining conducted a feasibility study of the Lift II project, which would extend the life of the Palabora Mine through 2033 by opening an underground mine. At yearend, the company had not made a decision on whether to proceed with Lift II (Palabora Mining Co. Ltd., 2014, p. 11; 2015).

Amplats produced 12,500 t of refined copper in 2014 compared with 8,300 t in 2013; the company produced an additional 6,200 t of copper in matte in 2014 compared with 5,800 t in 2013. About 13,100 t of copper was mined at the company’s South African PGM mining operations in 2014 compared with 10,300 t in 2013 (Anglo American Platinum Ltd., 2015, p. 63–79).

Gold.—The long-term decline in the country’s gold output continued in 2014, with national gold mine production decreasing to 151,622 kilograms (kg) from a revised 160,016 kg in 2013 and about 342,000 kg in 2004. During the same period, South Africa’s share of world gold production decreased to about 5% from 14%. Decreased production was primarily attributable to difficult geologic conditions, high ore haulage and refrigeration costs, and low labor productivity resulting from mine depths as great as 4 kilometers. From 2004 to 2014, employment in gold mining decreased to 118,939 workers from 179,964 (table 1; du Venage, 2013; Chamber of Mines of South Africa, 2015, p. 14, 28; Martin Kohler, Deputy Director of Statistics, Department of Minerals and Energy of the Republic of South Africa, written commun., December 14, 2015).

Sibanye Gold Ltd. mined gold at the Beatrix, the Driefontein, and the Kloof Mines, which were underground mines. Production at Driefontein decreased to 17,735 kg in 2014 from 18,775 kg in 2013. At Kloof, production increased to 17,038 kg in 2014 from 15,977 kg in 2013, and at Beatrix, to 10,354 kg from 9,722 kg. In March 2014, Sibanye completed the takeover of the Cooke operations from Gold One International Ltd. (CITIC Group of China, 60%) in return for a 17% share in Sibanye. The Cooke operations produced at the rate of nearly 7,400 kilograms per year (kg/yr) in the final 7 months of 2014. The company also acquired Witwatersrand Consolidated Gold Resources Ltd. (Wits Gold), which held the Bloemhoek and the De Bron Merrispruit projects. In 2014, Sibanye exercised Wits Gold’s option to purchase the Burnstone Mine, which was on care-and-maintenance status, from Great Basin Gold Ltd. of Canada (Sibanye Gold Ltd., 2015b, p. 5, 17, 28, 165).

In Sibanye’s mining plan, total production at Beatrix, Cooke, Driefontein, and Kloof was expected to decrease to about 40,000 kg/yr by 2020, 22,000 kg/yr by 2024, and less than 6,000 kg/yr by 2028. Reserves at Cooke were likely to be depleted by 2025 and at Beatrix, by 2028. Sibanye was engaged in feasibility studies of the reopening of

the Burnstone Mine and the development of the De Bron Merrispruit project, the Kloof drop down project, and the West Rand Tailings Retreatment Project (WRTRP). The feasibility studies for Burnstone and WRTRP were scheduled for completion in 2015. In 2014, the study on the De Bron Merrispruit project was under review. The company also was engaged in prefeasibility studies of the Beisa, the Bloemhoek, and the SV4 projects. Depending on the results of the studies, Sibanye could maintain total production at nearly 47,000 kg/yr through 2028 (Sibanye Gold Ltd., 2015a, p. 14; 2015b, p. 134–135).

In the feasibility study carried out in 2013, planned production at the De Bron Merrispruit project was likely to be 6,200 kg/yr during the estimated 18-year life of the mine; peak output was planned to be nearly 7,700 kg in the 9th year of mining. Planned production at Burnstone was between 2,500 and 3,100 kg/yr. At WRTRP, output could reach 7,000 kg/yr in 2020 and more than 8,000 kg/yr in 2022, and could be maintained at more than 6,000 kg/yr through 2026 and more than 4,000 kg/yr through 2035 (Cornish, 2013a; Barradas, 2014b; Stuart, 2014, p. 20).

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 37,900 kg in 2014 from 40,500 kg in 2013. Production at the Mponeng Mine was about 9,700 kg in 2014; the Moab Khotsong Mine, 7,300 kg; the Tau Tona Mine, 7,200 kg; the surface mining operations in the Vaal River and West Wits areas and Mine Waste Solutions project, 6,900 kg; the Kopanang Mine, 4,400 kg; and the Great Nologwa Mine, 2,400 kg. In 2014, increased output from Moab Khotsong was more than offset by decreased output from Great Nologwa, Kopanang, Mponeng, Tau Tona, and the surface mining operations. AngloGold Ashanti planned to produce between 36,700 and 39,400 kg of gold from all of its South African operations in 2015 (AngloGold Ashanti Ltd., 2015, p. 101, 118).

Harmony Gold Mining Co. Ltd. produced a total of 31,933 kg of gold from its South African operations in 2014. The Target 1 and Target 3 Mines produced a combined 5,377 kg; the Tshepong Mine, 4,500 kg; the Kusasaletu Mine, 4,391 kg; the Doornkop Mine, 3,393 kg; the Phakisa Mine, 3,143 kg; the surface mining operations, 2,861 kg; the Bambanani Mine, 2,746 kg; the Masimong Mine, 2,679 kg; the Joel Mine, 2,126 kg; and the Unisel Mine, 1,798 kg. In 2014, production increased at the Kusasaletu, the Phakisa, and the Tshepong Mines and decreased at the Doornkop, the Joel, and the Masimong Mines (Harmony Gold Mining Company Ltd., 2014a, p. 42–43; 2014b, p. 106–127; 2015, p. 7–8).

As of early 2014, Harmony planned to increase production at Kusasaletu to about 8,900 kg/yr by 2016; at Doornkop, to about 6,100 kg/yr; and at Phakisa, to about 5,900 kg/yr. Harmony planned to maintain combined production at the Target 1 and Target 3 Mines of about 6,100 kg/yr; about 4,500 kg/yr at Tshepong; about 3,900 kg/yr at Masimong; about 3,000 kg/yr each at Bambanani and the surface mining operations; about 2,600 kg/yr at Joel; and about 1,900 kg/yr at Unisel. The company subsequently placed Target 3 on care-and-maintenance status and suspended the expansion at Phakisa (Harmony Gold Mining Co. Ltd., 2014a, p. 21; 2014b, p. 8, 10).

Gold Fields Ltd. produced 6,236 kg at the South Deep Mine in 2014, which was a decrease of 34% compared with that of 2013. The company had planned to increase output at South Deep to between 20,200 and 21,700 kg/yr by the end of 2017. At yearend, it was unclear when the expansion would be completed; the revised production target for 2015 was about 7,100 kg (Projects in Progress, 2014a; Greve, 2015).

In its 2014 fiscal year (which ended in June 2014), Pan African Resources plc produced 5,853 kg of gold compared with 4,059 kg in fiscal year 2013. Production at the Barberton Mine was 2,760 kg in fiscal year 2014; the Evander Mine, 2,381 kg; and the Barberton Tailings Retreatment Project (BRTP), 711 kg. The BRTP started operations in fiscal year 2014. Pan African planned to produce about 3,000 kg/yr each at Barberton and Evander, 800 kg/yr at BRTP, and 300 kg/yr from the new Evander Tailings Retreatment Project. The estimated remaining life of the Barberton Mine was 19 years; the Evander Mine, 17 years; and the BRTP, 15 years (Pan Africa Resources plc, 2014, p. 8–10, 27, 48).

In 2014, DRDGold Ltd. produced 4,270 kg of gold at the Ergo tailings retreatment operations, which are located near Johannesburg. The company's production was limited by heavy rainfall in late February and early March and problems with integrating its new processing plants and its older processing plants (Ryan, 2014; DRDGold Ltd., 2015).

Village Main Reef produced a total of 3,416 kg of gold at the Tau Lekoa Mine in 2014; the estimated remaining life of the mine was between 7 and 8 years. The company placed the Buffelsfontein Mine on care-and-maintenance status in 2013 and decided to close the mine permanently in 2014. Village Main Reef recovered gold from reprocessing tailings at the rate of 270 kg/yr in the second half of 2014 at Buffelsfontein as it started rehabilitation of the mine (Village Main Reef, 2014, p. 10, 25, 34; 2015).

Gold was also produced at PGM mining operations. Amplats produced about 2,100 kg of gold from its PGM mining operations in 2014 compared with 2,400 kg in 2013 (Anglo American Platinum Ltd., 2015, p. 63–79).

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. The company produced at the rate of about 400,000 kg/yr. Rand Refinery sourced the majority of its gold from foreign gold producers (Clark, 2013).

Iron Ore and Iron and Steel.—In 2014, iron ore production was about 80.8 Mt compared with 71.6 Mt in 2013 and 39.3 Mt in 2004 because of increased production from the Palabora and the Sishen Mines and the opening of the Khumani and the Kolomela Mines. From 2004 to 2014, employment in iron ore mining increased to 21,794 workers from 7,142 (Chamber of Mines of South Africa, 2015, p. 14; Martin Kohler, Deputy Director of Statistics, Department of Minerals and Energy of the Republic of South Africa, written commun., December 14, 2015).

Kumba Iron Ore Ltd.'s iron ore production increased to 48.2 Mt in 2014 from 42.3 Mt in 2013. In 2014, the Sishen Mine produced 35.5 Mt; the Kolomela Mine, 11.6 Mt; and the Thabazimbi Mine, 1.1 Mt. The production targets for Sishen

and Kolomela in 2014 were 35 Mt and 10 Mt, respectively (Kumba Iron Ore Ltd., 2015, p. 7, 13).

In 2014, Kumba revised its plan for steady state production at Sishen to 38 Mt/yr from 37 Mt/yr. The company planned to produce 36 Mt in 2015 and to reach 38 Mt/yr at Sishen in 2016. Steady-state production at Kolomela was revised to 11 Mt/yr from 10 Mt/yr in 2014; Kumba was engaged in a prefeasibility study on a capacity expansion to 13 Mt/yr. The study was likely to be completed in the second quarter of 2015. Kumba planned to produce 11 Mt at Kolomela in 2015 and 12 Mt in 2016. The remaining life of Kolomela was estimated to be 21 years; Sishen, 16 years; and Thabazimbi, 9 years (Kumba Iron Ore Ltd., 2015, p. 9, 51, 53).

Assmang produced iron ore at the Beeshoek and the Khumani Mines. In 2014, production at Beeshoek and Khumani increased to 16.4 Mt from 16 Mt in 2013. Assmang planned to maintain production at Khumani and Beeshoek at 13 Mt/yr and 3 Mt/yr, respectively (African Rainbow Minerals Ltd., 2014a, p. 71–72, 75; 2014b, p. 59; 2015, p. 51).

In 2013, Palabora Mining produced 6.52 Mt of magnetite at Palabora. In 2014, the company was engaged in an expansion of its magnetite production capacity to 9 Mt/yr and an upgrade to the processing plant that would increase the iron grades of its concentrates (Palabora Mining Co. Ltd., 2014, p. 11, 14, 41).

Evrz Highveld Steel and Vanadium Corp. Ltd. (Evrz Group S.A. of the United Kingdom, 79%) mined 2.31 Mt of magnetite from the Mapochs Mine in 2014 compared with 2.08 Mt in 2013. Lumpy iron ore from Mapochs was consumed in Highveld's steel mill at Witbank. The company's production of pig iron increased to 666,000 t in 2014 from 639,000 t in 2013; crude steel production decreased to 621,000 t in 2014 from 642,000 t in 2013 (Evrz plc, 2015).

In September 2014, Government-owned Industrial Development Corp. (IDC) signed an agreement with Hebei Iron & Steel Group of China for the development of a new steel mill in Limpopo Province. Hebei and IDC planned to complete a feasibility study of the plant by the first quarter of 2015. Depending on the results of the study, the companies could complete construction of the first phase of the project by 2017, and the second phase, by 2020. Production was likely to be 3 Mt/yr of steel in the first phase of the project and 5 Mt/yr in the second phase. The estimated capital cost of the first phase was \$2.8 billion, and the second phase, an additional \$1.7 billion. The plant would use magnetite tailings in the Palabora area as raw material (Barradas, 2014a).

Lead, Silver, and Zinc.—The Black Mountain Mine, which was operated by Vedanta Resources plc of the United Kingdom, produced copper, lead, silver, and zinc. Lead mine production decreased to 29,348 t in 2014 from 41,848 t in 2013, and zinc mine production, to 26,141 t from 30,145 t (Martin Kohler, Deputy Director of Statistics, Department of Minerals and Energy of the Republic of South Africa, written commun., September 10, 2015).

In late 2014, Vedanta announced plans to start large-scale production at the Gamsberg Mine. Vedanta was already engaged in small-scale production at Gamsberg in 2014. The company planned to produce 250,000 t/yr of zinc in concentrate in the first phase of mining, which was likely to have a life of 13 years.

Construction was expected to start by fiscal year 2016 and to be completed by fiscal year 2019. Vedanta planned to export about 150,000 t/yr of zinc in concentrate to its refinery in Namibia and about 100,000 t/yr to international customers (Tredway, 2014).

Manganese.—In 2014, manganese ore production was about 14.1 Mt compared with 11 Mt in 2013 and 4.28 Mt in 2004 because of increased production from the Mamatwan, the Nchwaning, and the Wessels Mines and the opening of the Kalahari, the Kudumane, and the Tshipi Borwa Mines. From 2004 to 2014, employment in manganese mining increased to 9,966 workers from 3,243 (Chamber of Mines of South Africa, 2015, p. 14, 19; Martin Kohler, Deputy Director of Statistics, Department of Minerals and Energy of the Republic of South Africa, written commun., December 14, 2015).

Assmang produced manganese ore at the Gloria and the Nchwaning Mines. Output at Gloria and Nchwaning decreased to about 3.12 Mt in 2014 from 3.44 Mt in 2013. At yearend, the company was engaged in an ongoing expansion of Nchwaning's capacity to 4.6 Mt/yr from 3.2 Mt/yr (African Rainbow Minerals Ltd., 2014a, p. 72, 76; 2014b, p. 59, 61; 2015, p. 51, 53).

In 2014, Assmang increased output to 342,000 t of ferromanganese at its Cato Ridge and Machadodorp plants from 332,000 t in 2013. The company planned to place its ferromanganese furnace at Machadodorp on care-and-maintenance status by the end of April 2015 (African Rainbow Minerals Ltd., 2014a, p. 76; 2014b, p. 59; 2015, p. 43, 51).

Hotazel Manganese Mines (Pty) Ltd. (BHP Billiton, 44.4%, and Anglo American, 29.6%) operated the Mamatwan open pit mine and the Wessels underground mine near Hotazel in Northern Cape Province. In 2014, production of manganese ore increased to 3.77 Mt from 3.61 Mt in 2013. The company planned a two-phase project to increase ore production at Wessels to 1.5 Mt/yr from 1 Mt/yr. The first phase was commissioned in December 2013; a feasibility study on the second phase with favorable results was completed in 2014. By the third quarter of 2016, the expansion was planned to be completed. The estimated life of the Wessels Mine was 46 years, and the Mamatwan Mine, 18 years (BHP Billiton Ltd., 2014a, p. 95–96; 2014b, p. 24; 2015, p. 15).

In 2014, Samancor Manganese (Pty) Ltd. (BHP Billiton, 60%, and Anglo American, 40%) produced 430,000 t of manganese alloys at its Meyerton plant compared with 370,000 t in 2013. The plant, which had the capacity to produce 500,000 t/yr of ferromanganese, consumed more than 25% of the ore mined at Mamatwan and Wessels (BHP Billiton Ltd., 2014a, p. 95; 2014b, p. 24; 2015, p. 15).

In 2013, United Manganese of Kalahari (Pty) Ltd. (UMK) (Majestic Silver Trading 40 (Pty) Ltd., 51%, and Renova Group of Russia, 49%) mined about 3.8 Mt at the Kalahari manganese ore deposit. UMK was exporting ore at the rate of 4.3 Mt/yr in the first 5 months of 2014 (Markram, 2014b).

Manganese from the Kalahari deposit was consumed by Transalloys (Pty) Ltd. (a subsidiary of Renova) in the production of silicomanganese. Renova and Majestic Silver Trading planned to increase the capacity at Transalloys to 350,000 t/yr of silicomanganese from 170,000 t/yr by 2015. Majestic Silver Trading also would acquire a share in Transalloys (Renova Group, 2013; Green, 2014).

BEE company Ntsimbitntle Mining (Pty) Ltd. held a 50.1% share in Tshipi e Ntle Manganese Mining (Pty) Ltd., and Jupiter Mines Ltd. of Australia, a 49.9% share. In the fiscal year ending in February 2014, Jupiter and Ntsimbitntle produced about 1 Mt of manganese ore from the Tshipi Borwa Mine, which was adjacent to the Mamatwan Mine. The companies were producing at the rate of 2 Mt/yr in the subsequent fiscal year; Tshipi Borwa's capacity was 2.4 Mt/yr. The life of the mine was estimated to be more than 60 years (Kotze, 2015; OM Holdings Ltd., 2015, p. 23).

Kalagadi Manganese (Pty) Ltd. (ArcelorMittal of Luxembourg, 50%; Kalahari Resources (Pty) Ltd., 40%; and IDC, 10%) planned to start production at a new underground mine at Hotazel in early 2015. Output was expected to be 3 Mt/yr of manganese ore at a grade of 38% manganese; Kalagadi completed a plant to beneficiate the mine's output into 2.4 Mt/yr of sintered ore in 2013. The sintering plant, which had a capacity of 3.7 Mt/yr, was processing manganese ore from other South African producers at the rate of 730,000 t/yr in September 2014 (Green, 2014; Projects in Progress, 2014c).

About 1.7 Mt/yr of the mine's sintered output was likely to be exported. Kalagadi also planned to build a new ferromanganese plant at Coega with a capacity of 320,000 t/yr by the first quarter of 2015; the plant was expected to consume about 700,000 t/yr of the mine's sintered output (Projects in Progress, 2014c).

Asia Minerals Ltd. (AML) of Hong Kong started exports from its Kudumane Mine in April 2013. The company planned to produce 1.5 Mt/yr of manganese ore initially and to increase output to 2.5 Mt/yr by 2019 after the startup of underground mining operations (Green, 2014).

In mid-2012, Lehating Mining (Pty) Ltd. completed a feasibility study on its new Lehating Mine with favorable results. The company submitted its mining license application and its environmental impact assessment in October 2012 and August 2013, respectively. Lehating Mining's environmental impact assessment was approved by the Government in December 2014. The company was seeking financing for its mine, which was likely to cost about \$150 million. Mining could start in 2017 depending on successfully obtaining financing and the mining license; output was planned to be 600,000 t/yr of ore at a grade of more than 44% manganese during the estimated 14-year life of the mine (Cornish, 2013b).

Nickel.—The majority of South Africa's nickel mine production was a coproduct of PGM mining. Implats produced 20,500 t of refined nickel in 2014 compared with 16,800 t in 2013; the company's nickel production in matte increased to 7,700 t from 5,800 t. About 22,200 t of nickel was mined at the company's South African PGM mining operations in 2014 compared with 17,500 t in 2013. Impala Platinum Holdings Ltd. (Implats) produced 13,900 t of refined nickel in 2014, of which about 2,000 t was attributable to the company's PGM mining operations (Impala Platinum Holdings Ltd., 2014, p. 78, 93; 2015; Anglo American Platinum Ltd., 2015, p. 63–79).

ARM and Norilsk produced 21,602 t of nickel at the Nkomati Mine in 2014 compared with 23,821 t in 2013. The company planned to maintain production at more than 20,000 t/yr at least through mid-2017 (African Rainbow Minerals Ltd., 2014a, p. 57, 62; 2014b, p. 65; 2015, p. 58).

Platinum-Group Metals.—In 2014, platinum-group metal mine production was 188,444 kg compared with 264,188 kg in 2013 and about 276,400 kg in 2004. From 2004 to 2014, the share of platinum in PGM production by volume decreased to 50% from 58%. During the same period, employment in PGM mining increased to 191,261 workers from 150,630 (table 1; Chamber of Mines of South Africa, 2015, p. 14, 34; Martin Kohler, Deputy Director of Statistics, Department of Minerals and Energy of the Republic of South Africa, written commun., December 14, 2015).

In 2014, Amplats produced about 116,200 kg of refined PGMs compared with 142,000 kg in 2013. About 93,600 kg was attributable to South African mining operations of Amplats and its joint-venture partners in 2014, of which platinum accounted for 46,369 kg; palladium, 31,622 kg; rhodium, 7,225 kg; and other PGMs, about 8,400 kg. The attributable production of PGMs decreased by 21.4% in 2014 (Anglo American Platinum Ltd., 2015, p. 63, 67–79).

In 2014, PGM production at Amplats' Mogalakwena Mine amounted to 24,416 kg; the Kroondal Platinum Mine, 15,110 kg; the Tumela Mine, 8,793 kg; the Mototolo Platinum Mine, 7,788 kg; the Modikwa Platinum Mine, 7,396 kg; the Thembelani Mine, 6,569 kg; the Union Mine, 6,137 kg; the Bathopele Mine, 5,918 kg; the Dishaba Mine, 4,967 kg; the Western Limb project, 2,936 kg; the Siphumelele Mine, 2,730 kg; and the Twickenham Mine, 849 kg. Production decreased at Bathopele, Dishaba, Siphumelele, Thembelani, Tumela, and Union because of a labor dispute in the first half of 2014, and at Modikwa, because of operational problems. From 2010 to 2014, output at Mogalakwena increased by 33% and output at Union and Tumela decreased by 65% and 50%, respectively (Anglo American Platinum Ltd., 2015, p. 22, 24, 26, 28, 30, 32, 44, 63, 67–79).

Amplats planned to increase its production of refined platinum to between 72,000 and 75,000 kg in 2015. The increase in production was likely to be broad-based, with output increasing at Bathopele, Dishaba, Mototolo, Siphumelele, Thembelani, Tumela, and Union (Anglo American Platinum Ltd., 2015, p. 12, 23, 25, 27, 29, 31, 33, 45).

In 2014, Atlatsa Resources Corp. and joint-venture partner Amplats produced 6,035 kg of PGMs (not including ruthenium or iridium) at the Bokoni Mine compared with 5,297 kg in 2013. The companies planned to increase production to about 7,800 kg/yr by 2019 and to 12,400 kg/yr by 2024. The remaining estimated life of the Bokoni Mine was 37 years; Atlatsa estimated that the mine's life could be extended to more than 100 years (Solomons, 2014; Atlatsa Resources Corp., 2015, p. 10).

Royal Bafokeng Platinum Ltd. (RBPlat) operated the Bafokeng-Rasimone Platinum Mine. Sales of platinum were 5,901 kg in 2014; palladium, 2,443 kg; ruthenium, 898 kg; rhodium, 528 kg; and iridium, 174 kg. The company planned to maintain output of PGMs (not including ruthenium or iridium) at 8,700 kg/yr until 2017 and 6,400 kg/yr for the remainder of the mine's life, which was estimated to be 35 years (Royal Bafokeng Platinum Ltd., 2015, p. 6, 69).

RBPlat was building a new mine at the Styldrift project; the company had planned to start mining in the third quarter of 2015

and to ramp up to full capacity by the second quarter of 2018. The development of the mine was delayed, with the rampup to full capacity scheduled to start in the first quarter of 2016 and to be completed in the first quarter of 2019. Production of PGMs (not including ruthenium or iridium) at Styldrift was likely to be about 8,100 kg/yr. At previously planned production levels of 9,900 kg/yr of PGMs, platinum was expected to account for 6,800 kg/yr, and palladium, rhodium, and gold, a total of 3,100 kg/yr (Projects in Progress, 2012; Royal Bafokeng Platinum Ltd., 2015, p. 6, 57).

In 2014, Implats produced 66,648 kg of refined PGMs compared with 93,808 kg in 2013. About 22,500 kg was attributable to Implats' mining operations, of which platinum accounted for about 10,800 kg; palladium, 6,400 kg; rhodium, 1,500 kg; and other PGMs, about 3,800 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., 2014, p. 10, 78, 86; 2015).

The Impala Mines near Rustenburg in North West Province produced about 16,400 kg of PGMs in 2013, of which about 8,500 kg was platinum, 4,000 kg was palladium, and 1,000 kg was rhodium. PGM production decreased by 62% because of a labor dispute that shut down mining operations for 5 months in the first half of 2014. In 2014, platinum output at Marula was about 2,300 kg; palladium, about 2,400 kg; and rhodium, about 490 kg. Implats planned to increase platinum production at the Impala Mines to about 26,400 kg/yr by 2019 by sinking new mine shafts. The company also planned to increase platinum production at Marula to 2,800 kg/yr by 2019 (Impala Platinum Holdings Ltd., 2014, p. 3, 10, 78, 86; 2015).

ARM and Implats operated the Two Rivers Mine; output increased to 11,460 kg of PGMs in 2014 from 11,335 kg in 2013. Platinum accounted for about 47% of Two Rivers' PGM output; palladium, 27%; ruthenium, 14%; rhodium, 8%; iridium, 3%; and gold, 1%. Production was expected to be maintained at about 10,900 kg/yr of PGMs (African Rainbow Minerals Ltd., 2014a, p. 52, 61; 2014b, p. 64; 2015, p. 57).

In 2014, Lonmin produced 23,572 kg of refined PGMs compared with 45,082 kg in 2013. Lonmin's mining operations produced 23,108 kg of PGMs in 2014, of which platinum accounted for 12,304 kg; palladium, 5,658 kg; ruthenium, 2,848 kg; rhodium, 1,754 kg; and iridium, 544 kg. Most of the production was attributable to the Marikana Mine. Production from mining operations decreased by 46.2% because of a labor dispute in the first half of 2014. The company planned to maintain sales at more than 23,000 kg/yr of platinum (Lonmin plc, 2014, p. 10, 174, 178, 191–192; 2015).

Northam Platinum Ltd. operated the Booyensdal and the Zondereinde Mines. In 2014, Booyensdal and Zondereinde produced a total of about 5,500 kg of platinum, 3,100 kg of palladium, and 1,100 kg of rhodium compared with about 6,400 kg of platinum, 3,100 kg of palladium, and 880 kg of rhodium in 2013 because of the rampup of Booyensdal towards full capacity. In 2015, Northam was expected to produce 6,400 kg of platinum, 3,400 kg of palladium, and 1,100 kg of rhodium (CPM Group, 2015, p. 15, 110–111, 177).

ARM and Norilsk produced PGMs at the Nkomati nickel mine. Output increased to 5,535 kg of PGM in 2014 from

4,251 kg in 2013 (African Rainbow Minerals Ltd., 2014a, p. 57, 62; 2014b, p. 65; 2015, p. 58).

Sedibelo Platinum Mines Ltd. (formerly Platmin Ltd. of Canada) produced about 2,900 kg of platinum, 1,400 kg of palladium, and 390 kg of rhodium at Pilanesberg in 2014 compared with about 2,800 kg of platinum, 1,400 kg of palladium, and 370 kg of rhodium at Pilanesberg in 2013. By the first quarter of 2016, Sedibelo planned to increase total PGM production at Pilanesberg to between 10,900 and 12,400 kg/yr. The company was considering the construction of a new smelter at Pilanesberg that would be capable of processing UG2 ore and use a less energy-intensive process than current PGM smelters (CPM Group, 2015, p. 15, 110, 177; Creamer, 2014c).

In fiscal year 2014, Tharisa produced about 2,400 kg of PGMs compared with about 1,800 kg in fiscal year 2013. The company planned to reach its capacity of 4,500 kg/yr in fiscal year 2016, of which platinum would be about 60.5%; palladium, 15.8%; ruthenium, 11.7%; rhodium, 8.1%; and iridium, 3.8%. Sylvania Platinum Ltd. produced about 960 kg of platinum, 470 kg of palladium, and 280 kg of rhodium from its chromite tailings retreatment plants in 2014 compared with 780 kg of platinum, 370 kg of palladium, and 280 kg of rhodium in 2013 (CPM Group, 2015, p. 15, 110, 177; Tharisa Minerals (Pty) Ltd., 2015, p. 2, 14–15).

Eastern Platinum Ltd. (Eastplats) of Canada's Crocodile River Mine remained on care-and-maintenance status in 2014. The company sold 851 kg of PGMs from the Crocodile River in 2013. In November 2014, Eastplats agreed to sell all its South African PGM assets to Hebei Zhongbo Platinum Company Ltd. of China. The sale was not completed at yearend (Eastern Platinum Ltd., 2015, p. 4, 6).

Platinum Group Metals Ltd. of Canada was engaged in the development of the Western Bushveld Joint Venture (WBJV) project; the company planned to start mining by the fourth quarter of 2015. By the fourth quarter of 2017, production was expected to reach the full capacity of nearly 8,600 kg/yr of PGM (not including ruthenium or iridium), of which platinum would account for 64%; palladium, 27%; rhodium, 5%; and gold, 4%. The estimated life of the mine was more than 20 years (Platinum Group Metals Ltd., 2015, p. 13–14).

In February 2014, Platinum Group Metals completed a preliminary economic assessment of a new mine at the Waterberg project in the northern limb of the Bushveld Complex. The company subsequently started a prefeasibility study and planned to complete a feasibility study by early 2016. Depending on the results of the studies, mining could start by 2018, with full capacity reached by 2021. Planned production was 20,400 kg/yr of PGM (not including ruthenium or iridium), of which palladium would account for 60%; platinum, 30%; gold, 9%; and rhodium, 1%. Mining was likely to be maintained at full capacity for 13 years (Cornish, 2014b; Platinum Group Metals Ltd., 2015, p. 25, 31, 34).

In 2014, Wesizwe Platinum Ltd. was engaged in the development of the Bakubung Mine. Wesizwe planned to start mining in the fourth quarter of 2018 and reach the full capacity of 13,000 kg/yr of PGMs (not including ruthenium or iridium) in 2020. Platinum was expected to account for 62.4% of PGM production; palladium, 28%; rhodium, 7.4%;

and gold, 2.2%. The estimated life of the mine was 30 years (Engineering & Mining Journal, 2015).

In 2014, Ivanhoe Mines Ltd. of Canada was conducting a prefeasibility study of a new mine at its Platreef project in the northern limb of the Bushveld Complex. Depending on the results of prefeasibility and feasibility studies, mining could start in 2020. Ivanhoe had completed a preliminary economic assessment with favorable results for a phased approach to a new mine. In the first phase of mining, the company planned to mine about 4 Mt/yr of ore. In the second phase, which was planned to start in 2024, production would increase to 8 Mt/yr. Ivanhoe planned to produce 24,400 kg/yr of PGMs (not including ruthenium or iridium) in the second phase. In the third phase, which was planned to start in 2028, ore production would increase to 12 Mt/yr (Projects in Progress, 2014b).

Selenium and Tellurium.—Implats and its partners, including ARM, produced about 9,000 kg/yr of selenium and 4,000 kg/yr of tellurium from their PGM mining operations. It is likely that Implats' selenium and tellurium production decreased substantially because of the labor dispute in the first half of 2014. Selenium and tellurium were also contained in anode slimes from Palabora Mining's copper operations (Impala Platinum Holdings Ltd., 2014, p. 3; Paul Finney, Group Executive—Refining, Impala Platinum Ltd., written commun., March 8, 2013).

Silicon, Titanium, and Zirconium.—Grupo Ferroatlantica was South Africa's only producer of silicon metal; the company also produced ferrosilicon. In 2014, silicon metal production increased to an estimated 56,000 t from 34,000 t in 2013. In the first quarter of 2013, Grupo Ferroatlantica shut down 60% of its capacity at its Polokwane and Rand Carbide plants as part of a power buyback agreement with Eskom. The company temporarily shut down all production in April and May 2013; total production losses were estimated to be 22,000 t of silicon metal and 8,000 t of ferrosilicon (Ryan's Notes, 2013b).

In November 2013, Globe Specialty Metals Inc. of the United States purchased Silicon Technology Ltd. (Siltech), which owned a ferrosilicon plant at Newcastle. In November 2014, Globe reported that it had restarted operations at one of Siltech's furnaces and was ramping up production to full capacity. The company planned to restart production at the other furnace in December and to reach full capacity in a few months. Planned production was between 40,000 and 45,000 t/yr (Ryan's Notes, 2014b).

In 2014, Exxaro Resources Ltd. produced about 7,100 t of ferrosilicon, which was an increase of 30% compared with that of 2013. Increased output was attributable to the commissioning of a new plant in November (Exxaro Resources Ltd., 2015, p. 54).

Richards Bay Minerals (RBM) (Rio Tinto plc, 74%; Blue Horizon Investments, 24%; and RBM permanent employees, 2%) of the United Kingdom was South Africa's leading producer of ilmenite, rutile, and zircon; the company also processed ilmenite to titanium slag. The company mined nearly 1.8 Mt of ilmenite in 2013; production was likely to increase slightly in 2014. In 2015, production was expected to be between 2 Mt and 2.1 Mt, of which between 1.5 Mt and 1.6 Mt would be attributable to the Zulti North deposit. Production at Zulti North was expected to decrease after 2015; RBM was

engaged in a feasibility study on mining the Zulti South deposit. Depending on the results of the study, mining could start at Zulti South in 2017. RBM's total ilmenite production could increase to more than 2.2 Mt/yr by 2018 (Rio Tinto plc, 2014, p. 28).

Zircon production by RBM was about 264,000 t in 2011. RBM temporarily suspended its rutile and zircon operations in early 2013; the company resumed limited zircon production in the second quarter because of improving market conditions. Zircon output was at about 40% of 2011 levels in 2013. RBM planned to restore production to more than 90% of 2011 levels in 2014. Rutile and zircon production could increase further depending on the results of the Zulti South feasibility study (Rio Tinto plc, 2013, p. 7, 19; 2014, p. 25, 28).

Tronox Ltd. of the United States (Exxaro Resources Ltd., 44.65%) Namakwa Sands project produced 625,000 t of ilmenite in 2014 compared with 459,000 t in 2013; zircon production increased to 114,000 t from 111,000 t in 2013. Titanium slag production decreased to 161,000 t in 2014 from 168,000 t in 2013, and rutile production decreased to 26,000 t from 27,000 t (Tronox Ltd., 2014, p. 27; 2015, p. 32).

In December 2013, Tronox shut down its KZN Sands project as reserves were depleted at the Hillendale Mine. Tronox planned to start production at the Fairbreeze Mine, which would replace Hillendale, by the end of 2015. The company planned to produce 600,000 t/yr of ilmenite, 60,000 t/yr of zircon, and 30,000 t/yr of leucoxene and rutile during Fairbreeze's estimated 15-year life. In February 2014, the Government denied an appeal based on environmental concerns to the decision to grant Tronox a water use permit for Fairbreeze, and construction subsequently restarted on the mine (Tronox Ltd., 2014, p. 2, 29; 2015, p. 11).

In 2014, Mineral Commodities Ltd. of Australia started production at the Tormin Mine in Western Cape Province. Output was expected to be more than 100,000 t/yr of ilmenite, 38,000 t/yr of zircon, and 5,500 t/yr of rutile; the estimated life of the mine was between 3 and 5 years. Actual production in 2014 was 100,437 t of ilmenite and 42,668 t of rutile and zircon (Maphango, 2014; Mineral Commodities Ltd., 2015, p. 7).

Most of the titanium slag produced in South Africa was exported before additional processing. Huntsman International LLC of the United States operated a titanium dioxide (TiO₂) pigment plant at Umbogintwini with a capacity of 25,000 t/yr. Nyanza Light Metals Ltd. (Arkein Industrial Holdings Ltd. of Mauritius, 80%, and Highveld, 20%) planned to complete a feasibility study on a new TiO₂ pigment plant by early 2015. Depending on the results of the study, the company could produce 50,000 t/yr of TiO₂ pigment starting in the third quarter of 2016. Pigment would be produced using 250,000 t/yr of titanium-rich wastes from Highveld's iron ore and vanadium mining operations. The project's consumption of lime was expected to be 380,000 t/yr; sulfuric acid, 320,000 t/yr; and ammonium sulfate, 36,000 t/yr (Hughes and Ollett, 2013; Zone Newsletter, The, 2014).

Rare Metal Industries (RMI), which was a joint venture of the Government-owned companies Industrial Development Corp. (IDC) and National Empowerment Fund, Magnesium & Metals of Russia, and TJTI (Pty) Ltd., was expected to start a

feasibility study in November 2013 of a new silicon, titanium, and zirconium plant. Planned production was 15,000 t/yr of titanium metal, 2,000 t/yr of zirconium metal, and 1,900 t/yr of silicon metal and other silicon products. Depending on the results of the study, RMI could start construction in 2015 and production in late 2017. The estimated cost of the project was about \$2 billion. At the end of 2014, the study had not yet started (Maphango, 2014; Black Management Forum, 2015).

In 2013, the Council for Scientific and Industrial Research (CSIR) started producing titanium metal powder at a pilot plant using an experimental production process. CSIR planned to conduct a feasibility study of a new plant in 2015. Depending on the results of the study, the plant could start production of 500 t/yr of titanium metal powder in 2017. Depending on the success of the new plant, a large-scale plant with a capacity of 20,000 t/yr could be opened by 2020 (du Preez, 2014, p. 21).

Tin and Tungsten.—In September 2014, Bushveld Minerals Ltd. of the United Kingdom completed a scoping study of its Mokokone Tin project with favorable results. The company was considering the production of about 700 t/yr of tin in concentrate from the Groenfontein and the Zaaipplaats deposits. Concentrate would be processed at a new smelter into nearly 700 t/yr of tin metal. Bushveld Minerals was also considering the production of tungsten concentrates at Mokokone, which would be processed to ferrotungsten with a tungsten content of 55%. The total estimated life of the deposits was 12 years. Bushveld Minerals planned further exploration at Zaaipplaats, open pit planning, and pilot plant test work (Bushveld Minerals Ltd., 2014b).

Vanadium.—Evraz 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 iron ore at Mapochs; the slag was exported for processing into ferrovanadium and sold to Vametco for processing into other products. In 2014, the content of vanadium in vanadium slag was 7,127 t at Mapochs compared with 6,675 t in 2013 (Evraz plc, 2015).

Vanchem Vanadium Products (Pty) Ltd. (a subsidiary of Duferco Group of Luxembourg) purchased fine iron ore from the Mapochs Mine for processing into ferrovanadium and other products. In fiscal year 2014 (which ran from October 1, 2013, to September 30, 2014), Vanchem's output of contained vanadium was 4,166 t, which was an increase of 6% compared with that of fiscal year 2013. Increased production was attributable to improved power supplies and upgrades to one of the company's kilns. Output was at 77% of capacity in fiscal year 2014 (Duferco Group, 2014, p. 35).

Glencore produced vanadium pentoxide (V₂O₅) and ferrovanadium at the Rhovan Mine and smelter in Brits. In 2014, the production of V₂O₅ at Rhovan decreased to about 9,400 t from 9,800 t in 2013. Decreased production was attributable to a prolonged shutdown for maintenance (Glencore plc, 2015, p. 53, 55).

In 2014, Ironveld plc of the United Kingdom completed a feasibility study with favorable results on a new mine at its Ironveld Pig Iron project, which is located on the Northern Limb of the Bushveld Complex. Ironveld planned to mine

2.4 Mt/yr of magnetite, which would be processed at the company's new smelters into 1 Mt/yr of pig iron and 9,670 t/yr of ferrovanadium. Large-scale production was planned to start in 2019 depending on successful results of its feasibility study; the company planned initial production of 46,000 t/yr of pig iron and 445 t/yr of ferrovanadium from a smaller smelter starting in 2015 (Malebo and Nyabanyaba, 2015).

In July 2014, Bushveld Minerals Ltd. of the United Kingdom completed a scoping study with favorable results on a new mine at its Bushveld vanadium project. Depending on the results of prefeasibility and feasibility studies, the company could produce nearly 10,400 t/yr of V_2O_5 from 1 Mt/yr of titaniferous magnetite ore. Mining could start in 2018 or 2019. The company also was considering the production of pig iron from iron-rich calcine dumps resulting from vanadium production. The estimated life of the mine was 30 years (Bushveld Minerals Ltd., 2014a).

Industrial Minerals

Cement.—At the beginning of 2014, South Africa had four cement producers with a total capacity of 17 Mt/yr. Pretoria Portland Cement Co. (Pty) Ltd. had six plants with a combined capacity of 7 Mt/yr; the company's sales increased by about 2% in 2014. Lafarge South Africa Ltd. had a capacity of 3.6 Mt/yr; the company's sales decreased by 10% in 2014. Natal Portland Cement Co. (Pty) Ltd. had a capacity of 1.8 Mt/yr; the company's sales increased by 10% in 2014. In 2013, South Africa's limestone sales were 19.1 Mt. of which 13 Mt were to cement producers (International Cement Review, 2015; Motsie, 2015).

In 2014, Sephaku Cement (Pty) Ltd. (Dangote Industries Ltd. of Nigeria, 64%) completed its clinker grinding plant near Delmas in Mpumalanga Province and its Aganang integrated cement plant in Lichtenburg in North West Province. The cement capacity at Delmas and Aganang was 1.4 Mt/yr and 1.2 Mt/yr, respectively. Sephaku planned to ramp up production to steady-state levels at both plants in 2015 (Motsie, 2015).

Mamba Cement Company (Pty) Ltd. (Jidong Development Group of China, 51%; Continental Cement (Pty) Ltd., 25.1%; and Women Investment Portfolio Holdings Group, 23.9%) planned to build a new cement plant in Limpopo Province by the fourth quarter of 2015. The capacity of the plant was expected to be 850,000 t/yr (International Cement Review, 2015).

Osho Ventures Group of the United Arab Emirates planned to start construction on two new clinker grinding plants near Port Elizabeth and Richards Bay in February 2014. The plants would have a capacity of 600,000 t/yr each of cement; completion was scheduled for the end of 2014. The planned completion of the plants subsequently was delayed until June 2015 (International Cement Review, 2013; Government Gazette, 2014).

Diamond.—In 2014, diamond production was 8.06 million carats compared with a revised 8.13 million carats in 2013 and 14.3 million carats in 2004 because of decreased production at the Cullinan, the Finsch, and the Venetia Mines. From 2004 to 2014, employment in diamond mining decreased to 15,795 workers from 21,186 (table 1; Chamber of Mines of South Africa, 2015, p. 14, 26; Martin Kohler, Deputy Director of Statistics, Department of Minerals and Energy of the Republic of South Africa, written commun., December 14, 2015).

De Beers Consolidated Mines Ltd. accounted for the majority of South Africa's rough diamond production. In 2014, the company's total output decreased to 4.63 million carats from 4.72 million carats in 2013. The Venetia Mine produced 3.2 million carats in 2014; the Kimberley Surface Mining Operations, 722,000 carats; and the Voorspoed Mine, 711,000 carats. De Beers planned to build an underground mine at Venetia that would extend the life of the project by at least 24 years. Production from the new mine would start in 2021 and reach the full capacity of 4 million carats per year in 2024. The estimated cost of the new mine was about \$2.1 billion (Janse, 2014; De Beers Group of Companies, 2015).

In 2014, diamond production at the Finsch Mine by Petra Diamonds Ltd. amounted to 1.92 million carats; the Cullinan Mine, about 754,000 carats; the Kimberley Underground Mine, about 135,000 carats; and the Koffiefontein Mine, about 42,000 carats. Petra planned to ramp up production at Cullinan to 2.2 million carats per year in 2019 and at Finsch, to 2 million carats per year. The company also planned to increase production at the Kimberley Underground Mine to 170,000 carats per year by 2016, and at the Koffiefontein Mine, to 100,000 carats per year by 2017. The estimated remaining life of the Koffiefontein Mine was 11 years (Creamer, 2014b; Moumakwa, 2015; Petra Diamonds Ltd., 2015, p. 9–14).

In the last 9 months of 2014, Batla Minerals SA of France produced 74,005 carats at the Superkolong Diamond operations. Batla Minerals purchased Emu NL of Australia's 50% share in the project in May. Trans Hex Group produced 52,081 carats in its fiscal year 2014 (which ended on March 31, 2014) compared with 67,115 carats in fiscal year 2013. In November, Trans Hex purchased the Namaqualand Mine, which was on care-and-maintenance status from De Beers. Reserves were estimated to be between 1.6 million and 1.9 million carats that could be mined during a 14-year period (Creamer, 2014a; Batla Minerals SA, 2015).

DiamondCorp plc of the United Kingdom planned to reopen the Lace Mine in late 2015; production was likely to be about 500,000 carats per year. The company had an offtake agreement for the entire life of the Lace Mine, which was estimated to be more than 25 years (Zimnisky, 2014).

South Africa's diamond-cutting industry specialized in diamonds larger than one carat because of the labor-intensive processes involved in cutting smaller diamonds. The State Diamond Trader (SDT) was allowed to purchase as much as 10% of South Africa's diamond production by weight and value for domestic beneficiation. In fiscal year 2014, the SDT purchased about 3% of national diamond production by weight and 4% by value. The domestic diamond-cutting industry faced problems including insufficient supplies of suitable rough diamond, a lack of new companies entering the market, and high labor costs (State Diamond Trader, 2014, p. 22–23, 27).

Employment in the South African diamond-cutting industry decreased to about 1,000 workers in 2013 from 1,800 workers in 2008. During the same period, production costs increased to between \$130 and \$150 per carat from between \$60 and \$100 per carat. In 2013, production costs in Namibia were between \$60 and \$140 per carat; in Botswana, between

\$60 and \$120 per carat; and in India, between \$10 and \$50 per carat (De Beers Group of Companies, 2014, p. 37).

Fluorspar.—In 2014, South Africa's production of fluorspar increased to 164,054 t from 157,776 t in 2013. In 2013, domestic sales of fluorspar were about 17,000 t compared with 14,000 t in 2012. *Minerales y Productos Derivados SA* (Minersa) of Spain held an 85% share in the Vergenoeg Mine, which was South Africa's only active fluorspar mine at the end of 2014. Vergenoeg's had the capacity to produce 250,000 t/yr of acid-grade fluorspar and 30,000 t/yr of metal-grade fluorspar powder and briquets (Modiselle, 2015b).

Sephaku Fluoride Ltd. (SepFluor) had planned to start production at the Nokeng fluorspar project by the fourth quarter of 2014; the company subsequently delayed the startup until 2017. In the first 9 years of the project, SepFluor planned to produce 185,000 t/yr of acid-grade fluorspar from the Plattekop deposit. Production was expected to decrease subsequently to 130,000 t/yr as mining shifted to the Outwash Fan deposit. SepFluor also planned to build a new processing plant that would consume 130,000 t/yr of fluorspar and 156,000 t/yr of sulfuric acid in the production of 60,000 t/yr of hydrogen fluoride (HF). About 42,600 t/yr of HF was expected to be consumed in the production of 60,000 t/yr of aluminum fluoride (AlF₃). National consumption of AlF₃ was estimated to be about 28,000 t/yr, all of which was imported (Sephaku Fluoride Ltd., 2013, p. 4, 18, 21; Modiselle, 2015b).

Kyanite and Related Materials.—South Africa was the world's leading producer of andalusite. In 2013, national production increased to 175,328 t from 163,801 t in 2012 because of improvements in mining operations; output decreased to 172,657 t in 2014, however. Domestic sales of andalusite decreased to 82,683 t in 2013 from 117,186 t in 2012 and amounted to nearly 18% of world production (Dlambulo and Motsie, 2015; Modiselle, 2015a; Tanner, 2016a).

Imerys South Africa (Pty) Ltd. (a subsidiary of Imerys Group of France) operated the Annesley, the Segorong, and the Thabazimbi (Rhino) Mines. In 2013, the company put the Havercroft and the Krugerspost Mines on care-and-maintenance status and started operations at the Segorong Mine. The company planned to increase its capacity to 250,000 t/yr from 225,000 t/yr by mid-2014. Production was limited by heavy rains in February and March 2014 (Carmichael and Lismore-Scott, 2013; Lismore-Scott, 2015).

Andalusite Resources (Pty) Ltd. operated the Maroeloesfontein Mine. Exports to Japan accounted for between 35% and 45% of the company's production; exports to European countries, between 30% and 40%; and domestic sales, about 25%. Andalusite Resources planned to produce 90,000 t in 2014 and 120,000 t/yr starting in 2015. Production was limited by heavy rains in February and March 2014 (Carmichael and Lismore-Scott, 2013; Lismore-Scott, 2015).

Phosphate Rock.—Foskor (Pty) Ltd. was South Africa's only producer of phosphate rock. In 2014, phosphate rock production decreased to 2.01 Mt from 2.13 Mt in 2013. Foskor consumed about 70% of its phosphate rock in the production of phosphoric acid, which was used to produce fertilizers. Between 15% and 20% of Foskor's output was exported to Japan, the Netherlands, and New Zealand and the remainder was sold to domestic

consumers. The company planned to start further downstream processing of its fertilizer output to soluble monoammonium phosphate and NPK fertilizers (which contained nitrogen, phosphorus, and potassium) (Muravha, 2015a).

Galileo Resources plc of the United Kingdom was considering the development of its Glenover Phosphate Rare-Earth project. The company planned to consume 400,000 t/yr of ore in the production of 310,000 t/yr of granular nitrophosphate fertilizer and 190,000 t/yr of calcium nitrate fertilizer at Glenover. Galileo Resources planned to conduct a prefeasibility study at Glenover and to obtain financing and joint-venture support (Galileo Resources plc, 2014).

Rare Earths.—In May 2014, Great Western Minerals Group Ltd. (GWMG) of Canada completed a feasibility study on reopening the Steenkampskraal Mine in Western Cape Province, with favorable results. GWMG planned to produce about 1,650 t/yr of rare-earth oxides that it deemed to be the most marketable; the company also planned to produce and stockpile cerium and lanthanum until market conditions became more favorable. Initial production from reprocessing tailings could start within 15 months of obtaining the necessary financing, and mining, within 25 months. The remaining estimated life of the mine was 13 years (Sidler, 2014).

Frontier Rare Earths Ltd. of Luxembourg and Korea Resources Group (Kores) were engaged in a prefeasibility study on a new mine at the Zandkopsdrift rare-earths project in 2014. The companies also planned to complete a feasibility study by the end of 2015. Depending on the results of the studies, Frontier and Kores could start mining at Zandkopsdrift by early 2018. The mine's output would be processed at a rare-earths separation plant at Saldanha Bay that would produce between 16,000 and 17,000 t/yr of rare-earth oxides. Frontier and Kores hoped to receive the mining license for Zandkopsdrift, which is located in Northern Cape Province, by early 2015 (Cornish, 2014a).

Galileo Resources was considering the production of about 5,500 t/yr of rare-earth oxides at its Glenover project in Limpopo Province. Depending on financing and the results of prefeasibility and feasibility studies, the life of the project could be 25 years (Galileo Resources plc, 2014).

Vermiculite.—South Africa was the world's leading producer of vermiculite. In 2014, Palabora Mining's production at the Palabora Mine increased by 12%. The company reported that efficiency gains in its mining operations resulted in increased production of medium- and fine-grained vermiculite. Palabora Mining planned to increase production to 150,000 t/yr by the end of 2015 and subsequently to its full capacity of 200,000 t/yr. Domestic sales of vermiculite increased to 8,600 t in 2013 from 7,500 t in 2012 and amounted to more than 2% of world production (Muravha, 2015b; Tanner, 2015).

Mineral Fuels and Related Materials

Coal.—In 2014, coal production was about 261.4 Mt compared with a revised 256.6 Mt in 2013 and 243.4 Mt in 2004. From 2004 to 2014, employment in coal mining increased to 86,242 workers from 50,327 (table 1; Chamber of Mines of South Africa, 2015, p. 14, 20; Martin Kohler, Deputy Director of Statistics,

Department of Minerals and Energy of the Republic of South Africa, written commun., December 14, 2015).

Anglo American's coal production was 55.8 Mt in 2014 compared with 56.6 Mt in 2013. The New Vaal Mine produced 16.7 Mt in 2014; the Kriel Mine, 6.88 Mt; the Isibonelo Mine, 5.26 Mt; the Zibulo Mine, 5.05 Mt; the Goedehoop Mine, 4.77 Mt; the Landau Mine, 4.18 Mt; the Kleinkopje Mine, 3.91 Mt; the New Denmark Mine, 3.77 Mt; the Greenside Mine, 3.62 Mt; and the Mafube Mine, 1.68 Mt. Increased production at Greenside, Isibonelo, New Denmark, and Zibulo was more than offset by decreased production from Kriel, Mafube, and New Vaal (Anglo American plc, 2015, p. 205).

In fiscal year 2014, Sasol Ltd.'s salable coal production increased to 39.7 Mt from 38.6 Mt in fiscal year 2013. Total run-of-mine production was 41.5 Mt, of which the Syferfontein Mine accounted for 9.7 Mt; the Bosjesspruit Mine, 7.9 Mt; the Brandspruit Mine, 7.7 Mt; the Middelbult Mine, 7.6 Mt; the Twistdraai Mine, 6.9 Mt; and the Sigma Mine, 1.7 Mt. Sasol planned to complete the new Impumelelo Mine to replace the Brandspruit Mine in 2015 (Sasol Ltd., 2014, p. 90).

In 2014, Exxaro's coal production was about 39.1 Mt compared with 38.8 Mt in 2013. Output at the Grootegeluk Mine was 18.8 Mt in 2014; the Matla Mine, 10.4 Mt; the Leeuwan Mine, 4.11 Mt; the North Block Complex, 2.6 Mt; the Inyanda Mine, 1.63 Mt; and the Arnot Mine, 1.44 Mt. The New Clydesdale Complex was placed on care-and-maintenance status in 2013 and the Tshikondeni Mine was depleted in 2014; production losses were offset by increased output from the Grootegeluk, the Leeuwan, and the Matla Mines. Production also decreased at Arnot, Inyanda, and North Block in 2014 (Exxaro Resources Ltd., 2015, p. 6, 40, 43; Tex Report, The 2015b).

Exxaro started mining at the Grootegeluk Medupi expansion project in 2014, which would supply coal to Eskom's new Medupi power station. The company planned to ramp up production to the full capacity of 14.6 Mt/yr by 2018. Exxaro also completed a feasibility study of a new mine at the Belfast project in 2014. Mining was likely to start at Belfast, which was located in Mpumalanga Province, by 2017. Planned production was 2.7 Mt/yr, of which 2.2 Mt/yr would be exported. Exxaro started a prefeasibility study of a new mine at the Thabametsi project in 2014; the company planned to complete the study in mid-2015 and a feasibility study by the end of 2015. Depending on the results of the studies, production could ramp up to 20 Mt/yr during a period of between 10 and 15 years (Exxaro Resources Ltd., 2015, p. 6, 17, 43, 53).

BHP Billiton Energy Coal South Africa Ltd. (BESCA) produced coal at the Khutala, the Klipspruit, the Middelburg, and the Wolvekrans Mines in Mpumalanga Province. In 2014, BESCA produced 31.9 Mt of coal compared with 30.2 Mt in 2013. The remaining life of the Middelburg Mine was estimated to be 23 years; Wolvekrans, 21 years; and Khutala and Klipspruit, 6 years each (BHP Billiton Ltd., 2014a, p. 125; 2014b, p. 15; 2015, p. 15).

Glencore operated the Goedgevonden Complex, the Tweefontein Complex, and the Impunzi Complex, which had capacities of 7.7 Mt/yr, 7.2 Mt/yr, and 6.7 Mt/yr, respectively. In the first half of 2014, Tweefontein was producing at the

rate of 7.4 Mt/yr compared with 7.2 Mt/yr in the same period in 2013. Impunzi's production increased to 5.6 Mt/yr from 5.1 Mt/yr in the first half of 2014 compared with the first half of 2013, and Goedgevonden's production decreased to 7 Mt/yr from 7.6 Mt/yr. In late 2014, Glencore was engaged in an expansion of the Tweefontein Complex's capacity to 14.2 Mt/yr of salable coal; the project was likely to be completed in 2015 (Glencore plc, 2014b, p. 19, 27).

Glencore planned to start mining at Zonnebloem in 2015; production at full capacity was expected to be 10 Mt/yr of run-of-mine coal. Other projects under consideration by Glencore included the Nooitgedacht, which could produce 3 Mt/yr of run-of-mine coal from a new mine starting in 2016; the Goedgevonden Expansion, 8 Mt/yr starting in 2020; and the Paardekop, 8 Mt/yr starting in 2021. The estimated life of the Paardekop project was 32 years; the Zonnebloem, 16 years; the Goedgevonden Expansion, 13 years; and the Nooitgedacht, 12 years (Inside Mining, 2014).

Optimum Coal Holdings (Pty) Ltd. (Glencore, 67.6%) operated the Optimum Complex and the Koornfontein Complex, which had capacities of 11.2 Mt/yr and 2.8 Mt/yr of salable coal, respectively. Optimum's production decreased to 9.8 Mt/yr from 10.1 Mt/yr in the first half of 2014 compared with the first half of 2013, and Koornfontein's production decreased to 1.8 Mt/yr from 2.4 Mt/yr. The company was considering the possibility of starting mines at the Koornfontein OC and the Schoonoord projects. The Koornfontein OC project could produce 3.3 Mt/yr of run-of-mine coal starting in 2019, and the Schoonoord project, 1.6 Mt/yr of run-of-mine coal starting in 2020 (Glencore plc, 2014b, p. 19; Inside Mining, 2014).

Umcebo Mining Ltd. (Glencore, 48.7%) operated the Kleinfontein, the Klippan, the Middelkraal, and the Wonderfontein Mines, which had a total capacity of 7.7 Mt/yr of salable coal. In the first half of 2014, Umcebo was producing at the rate of 7.2 Mt/yr compared with 6.7 Mt/yr in the same period in 2013. The company started production from the Wonderfontein Mine in 2014; planned production was 3.6 Mt/yr of run-of-mine coal (Glencore plc, 2014b, p. 19; 2015, p. 11; Inside Mining, 2014).

Shanduka Coal (Pty) Ltd. (Shanduka Resources, 50.01%, and Glencore, 49.99%) operated the Middelburg Complex, which had a capacity of 6.3 Mt/yr of salable coal. Middelburg's production decreased to 5.6 Mt/yr from 6.5 Mt/yr in the first half of 2014 compared with the first half of 2013. In early 2014, the company was engaged in a feasibility study on a new mine at the Argent project. Depending on the results of the study, Argent could start production in the second quarter of 2015 and ramp up to its full capacity of 2.4 Mt/yr of run-of-mine thermal coal by the end of 2015. Shanduka coal was also considering the possibility of a new mine at the Springboklaagte project, which could produce 2.4 Mt/yr of run-of-mine coal starting in 2019 (Glencore plc, 2014b, p. 19; Inside Mining, 2014).

Total Coal South Africa (Pty) Ltd. (TCSA) (Total S.A. of France, 100%) operated the Dorstfontein, the Forzando, and the Tumelo Mines. Export sales from TCSA's mines were about 4 Mt/yr. Total signed an agreement to sell TCSA's assets to Exxaro in July 2014; the sale was not completed at yearend (Exxaro Resources Ltd., 2015, p. 43, 53).

Kangra Group (Pty) Ltd. (Shanduka Resources (Pty) Ltd., 30%) produced about 5 Mt/yr of run-of-mine coal from the Savmore Mine, of which about 3 Mt/yr was salable coal. The Savmore Mine had an estimated remaining life of between 3 and 5 years. The company was considering the development of the Kusipongo project to extend Savmore's life by between 10 and 20 years. Kusipongo could produce between 3.6 and 3.8 Mt/yr of run-of-mine coal (Environmental Resources Management Southern Africa (Pty) Ltd., 2015, p. 1.1, 3.6).

In fiscal year 2014 (which ended on March 31, 2014), Keaton Energy Holdings Ltd. sold about 2.2 Mt of thermal coal to Eskom from its Vanggatfontein Mine. The company also sold about 304,000 t of anthracite coal from its Vaalkranz Mine. Keaton planned to increase output to about 5 Mt/yr by 2017 by developing the Braakfontein, the Koudelager, and the Moabsvelden projects. In 2014, Keaton completed the acquisition of Xceed Resources Ltd. of Australia, which owned Moabsvelden. Mining was likely to start by August 2015 at Moabsvelden, with steady-state production of 1.4 Mt/yr planned by March 2016. The Braakfontein and the Koudelager projects were expected to start production between mid-2015 and early 2017. The estimated life of the Koudelager project was 20 years; Vanggatfontein, at least 13 years; Moabsvelden, 15 years; and Braakfontein, 12 years (Greve, 2014; Mining Review Africa, 2014).

Wescoal Holdings Ltd. operated the Intibane and the Khanyisa Mines, which produced about 1 Mt/yr of coal each in 2014. At yearend, Khanyisa's remaining estimated life was between 12 and 18 months. Wescoal was in negotiations to purchase nearby coal properties with resources to extend the mine's life by between 10 and 12 years. Intibane was likely to be depleted in March 2017. The company planned to start production at the new Elandspruit Mine by early 2015; production was expected to be 2 Mt/yr of coal (Cornish, 2014d).

Universal Coal plc of the United Kingdom opened the Kangala Mine in 2014. The mine was producing at the rate of 1.8 Mt/yr of salable coal, of which 1.7 Mt/yr was supplied to Eskom and 100,000 t/yr was exported, in late 2014. The remaining life of the mine was estimated to be 9 years; the company subsequently could develop a second contiguous pit with a similar lifespan. In early 2015, Universal planned to start mining at the Roodekop project, which would produce between 1.2 Mt/yr and 1.5 Mt/yr of run-of-mine thermal coal. The adjacent New Clydesdale Colliery would produce between 700,000 t/yr and 800,000 t/yr (Cornish, 2014c).

In the second half of 2014, Continental Coal Ltd.'s total sales from the Penumbra and the Vlakvarkfontein Mines were running at the rate of 1.6 Mt/yr compared with nearly 2.1 Mt/yr during the same period in 2013. Continental planned to start mining at the new De Wittekrans Mine by late 2014; production was expected to be 1.6 Mt/yr. The company was unable to develop the mine because of a lack of funds (World Coal, 2014; Tex Report, The, 2015a).

In 2014, Coal of Africa Ltd. was engaged in the construction of a new processing plant at the Vele Mine. The company planned to restart mining at Vele after the new plant was reopened in mid-2015 and to produce 1.1 Mt/yr of salable coal. Coal of Africa also planned to start construction of the Makhado

project at the Southpansberg coalfield in Limpopo Province in 2016; production was expected to start in 2018 or 2019. The company planned to produce 3.2 Mt/yr of thermal coal and 2.3 Mt/yr of coking coal during the estimated 16-year life of the mine (Tex Report, The, 2014a; Creamer, 2015).

Firestone Energy Ltd. of Australia and Sekoko Coal (Pty) Ltd. planned to start production at a new mine in the Waterberg coalfield by the end of 2015. The companies planned to produce 10 Mt/yr for power generation by Eskom during the first 30 years of the project. The life of the mine was estimated to be about 100 years (Projects in Progress, 2014e).

Resource Generation Ltd. (Resgen) of Australia was engaged in the construction of its new Boikarabelo Mine in 2014. The company planned to start mining in the first half of 2016. In the first stage of the project, production was likely to be 6 Mt/yr of thermal coal, of which about 3 Mt/yr would be consumed domestically and 3 Mt/yr would be exported. Resgen planned to start the second phase of the project by 2020; production was expected to increase to 20 Mt/yr of thermal coal. Estimated reserves at Boikarabelo were 745 Mt (Projects in Progress, 2014d).

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 300,000 bbl/d. As of September 2014, it was unclear when the refinery would be completed (Quinlan, 2014).

Uranium.—AngloGold Ashanti mined uranium as a coproduct of gold. In 2014, AngloGold Ashanti's production of uranium oxide (U_3O_8) from its Kopanang and surface mining operations was about 590 t, which was a decrease of 7% compared with the 626 t produced in 2013. With the purchase of the MWS operations, AngloGold Ashanti acquired resources of 352 Mt at a grade of 0.008% U_3O_8 . The company started production at the uranium circuit at the MWS processing plant in the fourth quarter of 2014, which would allow its total production to increase to between 1,400 and 2,000 t/yr of U_3O_8 . The estimated life of the MWS operations was more than 30 years (AngloGold Ashanti Ltd., 2012; 2015, p. 19, 70, 72).

In the final 7 months of 2014, Sibanye produced and stockpiled 82 t of U_3O_8 from the Cooke Operations. Sibanye planned to increase production at the Cooke Operations to more than 110 t in 2015 and to 125 t/yr by 2016. The company also planned to complete a feasibility study of the West Rand Tailings Retreatment project in March 2015. Depending on the results of the study, Sibanye's initial production from retreating tailings could be about 160 t/yr of U_3O_8 (Sibanye Gold Ltd., 2015b, p. 20, 78).

In 2013, Peninsula Energy Ltd. of Australia completed a scoping study with favorable results of a new mine at its Karoo project. Planned production in the study was nearly 1,400 t/yr of U_3O_8 . In 2014, Peninsula started a prefeasibility study of the mine, which was likely to be completed in 2015. The company also planned to complete a feasibility study in mid- or late 2016. Depending on the results of the studies, Peninsula could start mining at Karoo in 2017 or 2018. Resources at Karoo were estimated to contain 25,800 t of U_3O_8 (Andrews, 2015).

Reserves and Resources

South Africa's estimated share of world reserves of PGMs amounted to 95%; chromite, 42%; manganese, 26%; vanadium, 23%; rutile and zirconium, 18% each; fluor spar, 17%; gold, 11%; ilmenite, 9%; and nickel, 5%. The country also had substantial reserves of andalusite, antimony, coal, copper, iron ore, lead, phosphate rock, uranium, vermiculite, and zinc (table 3; Bedinger, 2015a, b; Corathers, 2015; George, 2015; Kuck, 2015; Loferski, 2015; McRae, 2015; Papp, 2015; Polyak, 2015).

Outlook

Numerous producers are planning new mines and plants and capacity expansions of existing operations for andalusite, cement, chromite, coal, copper, diamond, ferrochromium, ferromanganese, ferrovandium, fluor spar, gold, ilmenite, iron ore, manganese ore, nickel, pig iron, PGMs, phosphate fertilizers, rare-earth elements, rutile, silicomanganese, tin, titanium metal, uranium, vanadium, zinc, zircon, and zirconium metal. 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. Load-shedding was forecasted to continue through at least late 2019. Power costs were likely to increase by at least 8% in early 2015 (Markram, 2014a).

Increases in coal, iron ore, and manganese exports depend upon increased rail network capacity. Transnet planned to spend about \$20 billion on expanding its railways by 2019. The railway capacity dedicated to coal exports was expected to increase in increments to 97.5 Mt/yr in 2019 from 81 Mt/yr in 2012. During the same period, Transnet planned to increase the capacity of the iron ore railways to 82.5 Mt/yr from 60 Mt/yr, and railways for transporting manganese ore, to 16 Mt/yr from 5.5 Mt/yr (Bhuckory and Burkhardt, 2014).

The long-term future of the domestic gold mining industry depended upon new mining technologies. The gold content of resources in the Witwatersrand basin were estimated to be 40,000 t, of which 34,000 t was likely to be subeconomic because of factors such as depth and low ore grades (Creamer, 2014d).

In the PGM mining industry, production is expected to continue to shift away from platinum and towards other PGMs. Many PGM mining companies are producing less ore from the platinum-rich Merensky layer and more from the UG2 layer, which is rich in other PGMs.

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TABLE 1
SOUTH AFRICA: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity	2010	2011	2012	2013	2014
METALS					
Aluminum metal, primary	807,000	809,000	665,000	822,000	745,000
Antimony concentrate, Sb content	3,239	3,175	3,066	2,405 ^r	815
Chromite ore, gross weight:					
44% to 48% chromic oxide	808	1,070	1,073	1,608	2,043
Less than 44% chromic oxide	10,063	10,795	10,244	12,082 ^r	11,995
Total	10,871	11,865	11,317	13,690 ^r	14,038
Cobalt:					
Mine output, Co content ^c	1,800	1,600	2,500	2,800	2,800
Refinery output	840	862	1,102	1,294	1,332
Copper:					
Mine, Cu content	102,600	96,600	81,000	76,500 ^r	87,600
Metal:					
Smelter	75,900	82,400	62,300	69,700 ^r	71,800
Refined, primary	81,129	86,166	66,416	80,821	78,697
Gold:					
Mine	188,702	180,293	155,286	160,016 ^r	151,622
Refined ²	385,244	476,229	440,000 ^c	400,000 ^{r,c}	400,000 ^c
Iron and steel:					
Ore and concentrate:					
Gross weight	58,709	58,057	67,100	71,645 ^r	80,759
Fe content (62% to 65%)	36,900	36,500	42,000 ^c	45,000 ^c	51,000 ^c
Metal:					
Direct-reduced iron	1,120	1,414	1,493	1,444 ^r	1,600 ^c
Pig iron	5,429	4,604	4,599	4,960 ^r	4,700 ^c
Ferroalloys, electric arc furnace:					
Ferrochromium	3,607	3,426	3,063	3,219	3,719
Ferromanganese	473	714	706	702 ^r	772
Ferrosilicon	128	126	83	78	88 ^c
Ferrovandium ^c	19	19	18	18	19
Silicomanganese ³	274	314	149	134	228
Silicon metal	46	59	53	34 ^r	56 ^c
Total ^c	4,550	4,660	4,070	4,190 ^r	4,880
Steel:					
Crude	7,617	7,546	6,938	7,254 ^r	6,600 ^c
Stainless	478	444	505	493	473
Lead:					
Concentrate, Pb content	50,625	54,460	52,489	41,848	29,348
Refined, secondary	51,000	56,000	54,000 ^r	52,000 ^r	52,000 ^c
Manganese:					
Ore and concentrate, gross weight:					
Metallurgical:					
More than 48% manganese	847	128	200	--	--
45% to 48% manganese	1,683	2,742	2,711	3,057	2,572
40% to 45% manganese	843	1,181	1,187	1,319	1,703
30% to 40% manganese	3,783	4,584	4,833	6,581	9,776
Total	7,156	8,636	8,931	10,957	14,051
Chemical, 35% to 65% manganese dioxide	15	16	12	1	--
Grand total	7,172	8,652	8,943	10,958	14,051
Metal, electrolytic ^c	20	29 ⁴	30 ⁴	30 ^c	30 ^c
Nickel:					
Mine output, concentrate, Ni content	39,960	43,321	45,945	51,208	54,956
Metal, electrolytic	34,700	35,900	32,900	33,200	34,100

See footnotes at end of table.

TABLE 1—Continued
SOUTH AFRICA: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity		2010	2011	2012	2013	2014
METALS—Continued						
Platinum-group metals:						
Mine:						
Iridium	kilograms	6,445	6,813	5,665	5,680	4,231
Platinum	do.	147,790	148,008	128,590	137,024	93,991
Palladium	do.	82,222	82,731	74,738	76,008	58,410
Rhodium	do.	20,001	20,332	17,810	18,129	12,916
Ruthenium	do.	30,846	30,966	27,535	27,347	18,896
Total	do.	287,304	288,850	254,338	264,188	188,444
Refined:						
Platinum	do.	156,600	155,900	141,700	144,700	102,400
Palladium	do.	94,990	89,640	84,800	82,300	64,100
Rhodium	do.	21,400	21,300	19,300	18,600	13,900
Other ⁵	do.	37,600	36,400	32,400	32,100	22,800
Total	do.	310,600	303,200	278,200	277,700	203,200
Selenium, Se content of anode slimes ^c	do.	16,000	18,000	14,000	15,000 ^r	11,000
Silver, mine	do.	79,315	73,180	67,304	68,777	37,268
Tellurium, Te content of anode slimes ^c	do.	7,500	8,500	6,400 ^r	7,200 ^r	5,100
Titanium:						
Ilmenite concentrate ^c	thousand metric tons	2,200 ^r	2,750 ^r	2,650 ^r	2,530 ^r	2,300
Rutile concentrate	do.	130	149	150 ^c	70 ^c	110 ^c
Total	do.	2,339 ^r	2,896 ^r	2,801 ^r	2,604	2,406
Titaniferous slag	do.	1,210	1,367	1,300 ^c	1,150	1,150
Vanadium, V content		22,606	21,652	19,957	21,397	21,582
Zinc:						
Concentrate, Zn content		36,142	36,629	37,034	30,145	26,141
Metal, smelter, primary		90,000	73,000	--	--	--
Zircon concentrate		389,233 ^r	432,282 ^r	367,190 ^r	224,446 ^r	360,156
INDUSTRIAL MINERALS						
Andalusite		189,185	186,242	163,801	175,328 ^r	172,657
Cementitious products:						
Cement, finished product, sales	thousand metric tons	10,870	11,234	11,560	12,170 ^r	12,070
Granulated slag, fly ash, and others, sales ^c	do.	1,100	1,200	1,200	1,300	1,300
Total ^c	do.	12,000	12,400	12,800	13,500	13,400
Clays:						
Attapulgite		85,336	14,448	15,019	21,233	18,376
Bentonite		54,311	120,417	120,592	177,187	169,591
Brick clay, local sales	thousand metric tons	6,923	7,658	7,227	6,897	6,858
Fire clay		551,612	785,641	643,285	506,019	239,906
Flint clay, raw and calcined		39,690	29,968	21,065	22,984	26,891
Kaolin		29,929	15,220	20,791	22,295	27,258
Plastic clay		NA	NA	NA	1,328	268
Diamond, natural:						
Gem ^c	thousand carats	3,600	2,800	2,900	3,300	3,300
Industrial ^c	do.	5,300	4,300	4,400	4,800 ^r	4,800
Total	do.	8,868	7,112	7,250	8,129 ^r	8,060
Feldspar		94,307	101,559	94,458	191,443	102,541
Fluorspar:						
Acid-grade ^c		150,000	180,000 ^r	160,000 ^r	150,000 ^r	150,000
Metallurgical-grade ^c		7,000 ^r	15,000	10,000 ^r	8,000 ^r	14,000
Total		157,116 ^r	195,502 ^r	170,338 ^r	157,776 ^r	164,054
Gypsum, crude		513,310	476,118	558,242	559,443	376,223
Lime	thousand metric tons	1,291	1,539	1,209	1,187	1,255
Magnesite, crude		27,700	31,900	12,878 ^r	8,219 ^r	12,335
Mica, scrap and ground		904	633	400	309	83
Nitrogen, N content of ammonia ^c		620,000 ^r	620,000 ^r	620,000 ^r	620,000 ^r	620,000
Perlite		NA	NA	NA	1,078	1,100

See footnotes at end of table.

TABLE 1—Continued
SOUTH AFRICA: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity		2010	2011	2012	2013	2014
INDUSTRIAL MINERALS—Continued						
Phosphate rock:						
Gross weight	thousand metric tons	2,494	2,565	2,242	2,132	2,011
P ₂ O ₅ content	do.	935	962	829 ^r	788 ^r	743
Pigments, mineral, natural oxides		244	266	--	-- ^c	-- ^c
Salt		394,493	381,177	399,135	479,024	493,828
Silica, industrial or glass sand	thousand metric tons	2,905	2,722	2,155	2,296 ^r	2,587
Sodium sulfate, natural		37,369	38,290	36,435	41,428	51,751
Stone, n.e.s.: ⁶						
Dimension:						
Granite and norite		272,531	227,154	187,475	236,231 ^r	135,584
Slate		48,114	53,643	23,938	19,266	19,051
Crushed and broken:						
Limestone and dolomite	thousand metric tons	17,927	16,980	17,269	21,966 ^r	21,776
Shale:						
For cement	do.	388	404	423	464	404
Other	do.	570	655	547	830 ^r	2,158
Total	do.	958	1,059	970	1,294	2,562
Aggregate and sand, n.e.s. ⁶	do.	52,356	52,286	54,649	61,414	62,158
Sulfur:						
S content of pyrite	do.	30	--	--	--	-- ^c
Byproduct:						
Metallurgy	do.	141	174	103	111 ^r	110 ^c
Petroleum	do.	205	163	154	159 ^r	170 ^c
Total	do.	376	336	257	270	277
Talc and related materials:						
Talc		3,150	4,453	4,765	4,924	4,827
Pyrophyllite (wonderstone)		122,511	121,368	18,734	17,336	18,900
Vermiculite		199,285	170,571	132,886	127,658	143,007
Wollastonite		--	2,400 ^c	2,400 ^c	2,400 ^c	2,400 ^c
MINERAL FUELS AND RELATED MATERIALS						
Coal (salable product):						
Anthracite	thousand metric tons	2,074	2,554	3,005	3,621	3,517
Bituminous	do.	252,448	248,153	256,007	252,942 ^r	257,882
Total	do.	254,522	250,707	259,012	256,563 ^r	261,399
Natural gas	million cubic meters	1,718	1,516	1,313	927	1,194
Petroleum: ⁷						
Crude	thousand 42-gallon barrels	1,358	591	343	139	--
Refinery products:						
Liquefied petroleum gases	do.	3,086	3,666	3,422	3,387 ^r	3,400 ^c
Natural gas liquids	do.	1,456	1,456	1,019	1,529 ^r	1,500 ^c
Gasoline	do.	49,773	53,236	53,295	58,976 ^r	59,000 ^c
Jet fuel	do.	10,951	12,410	9,445	13,077 ^r	13,000 ^c
Kerosene	do.	2,644	2,806	2,729	3,278 ^r	3,300 ^c
Distillate fuel oil	do.	50,265	56,450	57,494	58,442 ^r	58,000 ^c
Residual fuel oil	do.	15,205	14,399	19,021	22,344 ^r	22,000 ^c
Other, includes lubricants and greases ^c	do.	16,000	17,000	17,000	19,000 ^r	19,000
Total ^{c, 8}	do.	133,000	144,000 ^r	146,000	161,000 ^r	160,000
Uranium, U ₃ O ₈ content		682	656	551	626	668

^cEstimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. ^rRevised. do. Ditto. NA Not available. -- Zero.

¹Table includes data available through December 18, 2015.

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.

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.

TABLE 2
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(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	726.	
Do.	do.	Bayside smelter at Richards Bay ¹	97.	
Andalusite	Imerys South Africa (Pty) Ltd. (subsidiary of Imerys Group)	Annesley and Segorong Mines at Penge, and Thabazimbi Mine near Thabazimbi	250. ^c	
Do.	do.	Havercroft and Krugerspost Mines ¹	NA.	
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 ¹	7,000 antimony in concentrate.
Cement	Pretoria Portland Cement Co. (Pty) Ltd. (Barloworld Trust Co. Ltd., 68%)	De Hoek, Dwaalboom, Hercules, Jupiter, Riebeeck, and Slurry plants	7,000.	
Do.	AfriSam Consortium (Pty) Ltd.	Dudfield, Roodepoort, and Ulco plants	4,600.	
Do.	Lafarge South Africa Ltd. (Lafarge S.A.)	Lichtenburg plant in North West Province	3,600.	
Do.	Sephaku Cement (Pty) Ltd. (Dangote Industries Ltd., 64%)	Plant near Delmas in Mpumalanga Province	1,400.	
Do.	do.	Aganang plant in Lichtenburg	1,200.	
Do.	Natal Portland Cement Co. (Pty) Ltd. (Cimentos de Portugal SGPS, S.A., 98%)	Simumu plant	1,800.	
Chromite	Glencore 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.	Waterval Mine	650.	
Do.	do.	Boshhoek and Helena Mines	NA.	
Do.	Samancor Chrome (Pty) Ltd. (International Mineral Resources BV, 70%)	Eastern Chrome Mines in Steelpoort Valley, Mpumalanga Province	2,000.	
Do.	do.	Western Chrome Mines in North West Province	1,500.	
Do.	Tharisa Minerals (Pty) Ltd.	Tharisa Mine	1,920.	
Do.	Hernic Ferrochrome (Pty) Ltd. (Mitsubishi Corp., 51%)	Bokone Mines	1,500.	
Do.	Assmang (Pty) Ltd. [African Rainbow Minerals Ltd. (ARM), 50%, and Assore Ltd., 50%]	Dwarsrivier Mine in Mpumalanga Province	1,400.	
Do.	International Ferro Metals Ltd.	Sky Chrome Mine ¹	840 run-of-mine.	
Do.	do.	Lesedi Underground and Rooderand Mines	NA.	
Do.	Lonmin plc	Marikana Mines (Eastern Platinum, Karee, and Western Platinum) and Pandora Mine	1,500. ^c	
Do.	Nkomati Joint Venture [African Rainbow Minerals Ltd. (ARM), 50%, and MMC Norilsk Nickel, 50%]	Nkomati Chrome Mine in Mpumalanga Province	1,000.	
Do.	Dilokong Chrome Mine (Pty) Ltd. [ASA Metals (Pty) Ltd., 100%]	Dilokong Mine, near Burgersfort in Mpumalanga Province	800.	
Do.	Eastern Platinum Ltd. (Eastplats)	Crocodile River Mine at Arbourfell ¹	520. ^c	
Do.	Bayer (Pty) Ltd.	Rustenburg Chrome Mine	450.	
Do.	Anglo American Platinum Ltd. (Amplats) (Anglo American plc, 74.1%)	Waterval Plant near Rustenburg	350.	
Do.	Anglo American Platinum Ltd. (Amplats) and Siyanda Resources	Masa Plant at Union Mine	330.	
Do.	Afarak Group Oyj	Mecklenburg Mine	300 run-of-mine.	
Coal	Anglo Coal Ltd. (Anglo American plc, 100%)	New Vaal Mine	18,000.	
Do.	Anglo Coal Ltd., 73%	Kriel Mine	10,000.	
Do.	do.	Zibulo Mine	8,000.	
Do.	Anglo Coal Ltd.	Goedehoop Mine	7,500.	
Do.	do.	Isibonelo Mine	5,000.	
Do.	do.	New Denmark Mine	5,000.	
Do.	do.	Kleinkopje Mine	4,500.	
Do.	do.	Landau Mine	4,200.	
Do.	do.	Greenside Mine	3,100.	

See footnotes at end of table.

TABLE 2—Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Coal—Continued	Exxaro Resources Ltd. (BEE Holdco, 52.3%)	Grootegeluk 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.	Leeuwpans Mine in Mpumalanga Province	4,200. ^c
Do.	do.	North Block Mine in Mpumalanga Province	3,300.
Do.	do.	New Clydesdale Mine in Mpumalanga Province ¹	1,400.
Do.	do.	Tshikondeni Mine in Limpopo Province ³	350. ^c
Do.	Exxaro Resources Ltd., 50%, and Anglo American plc, 50%	Mafube Mine	4,200.
Do.	Sasol Ltd.	Syferfontein Mine	9,500.
Do.	do.	Bosjesspruit Mine	7,900.
Do.	do.	Middelbult Mine	7,400.
Do.	do.	Brandspruit Mine	6,900.
Do.	do.	Twistdraai Mine	6,900.
Do.	do.	Sigma Mine	1,900.
Do.	BHP Billiton Energy Coal South Africa Ltd. (BESCA)	Middelburg and Wolverkrans Mines	17,000.
Do.	do.	Khutala underground mine	12,000.
Do.	do.	Klipspruit Mine	7,000.
Do.	Glencore plc, 74%	Goedgevonden Complex at Witbank	7,700.
Do.	Glencore plc, 79.8%	Twefontein Complex at Witbank	7,200.
Do.	do.	Impunzi Complex at Witbank	6,700.
Do.	Optimum Coal Holdings (Pty) Ltd. (Glencore plc, 67.6%)	Optimum Complex	11,000.
Do.	do.	Koornfontein Complex	2,800.
Do.	Umcebo Mining Ltd. (Glencore plc, 48.7%)	Kleinfontein, Klippan, Middelkraal, and Wonderfontein Mines	7,700.
Do.	Shanduka Coal (Pty) Ltd. [Shanduka Resources (Pty) Ltd., 50.01%, and Glencore plc, 49.99%]	Middelburg Complex	6,300.
Do.	Total Coal SA (Pty) Ltd. (TCSA)	Dorstfontein, Forzando, and Tumelo Mines	4,000.
Do.	Kangra Group Pty. Ltd. [Shanduka Resources (Pty) Ltd., 30%]	Savmore Mine	3,000.
Do.	Keaton Energy Holdings Ltd.	Vanggatfontein Mine	2,640.
Do.	do.	Vaalkranz Mine	360.
Do.	Imbawula Group	Mpumalanga Division (Spitzkop and Tselentis Mines) at Breyten and Ermelo	2,800.
Do.	Continental Coal Ltd.	Vlaskfontein Mines	1,400. ^c
Do.	do.	Ferreira Mine	500. ^c
Do.	do.	Penumbra Mine	500.
Do.	Kuyasa Mining (Pty) Ltd.	Delmas Mine	2,000.
Do.	Wescoal Holdings Ltd.	Khanyisa Mine	1,000.
Do.	do.	Intibane Mine	1,000.
Do.	Coal of Africa Ltd.	Vele Mine ¹	1,000.
Copper:			
Mine	Palabora Mining Co. Ltd.	Palabora Mine at Phalaborwa	65. ²
Do.	Anglo American Platinum Ltd. (Amplats) (Anglo American plc, 74%)	Bathopele, Dishaba, Khomanani, Khuseleka, Mogalakwena, Siphumelele, Thembelani, Union, and other mines	13. ²
Do.	Nkomati Joint Venture	Nkomati Mine in Mpumalanga Province	10.
Do.	Impala Platinum Ltd. (Implats)	Impala Mines	7. ²
Do.	Black Mountain Mineral Development Co. (Pty) Ltd. (Vedanta Resources plc, 74%)	Black Mountain Mine near Aggeneyns in Northern Cape Province	6. 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. (Implats)	Smelter near Phokeng	7. ²
Refined	Palabora Mining Co. Ltd.	Refinery at Phalaborwa	140. ²

See footnotes at end of table.

TABLE 2—Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Copper—Continued				
Refined—Continued		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. (Implats)	Base Metals Refinery	7. ²
Diamond	thousand carats	De Beers Consolidated Mines Ltd. (Anglo American plc, 85%)	Venetia Mine in Northern Province	7,500.
Do.	do.	do.	Kimberley surface mines, Kimberley	1,500.
Do.	do.	do.	Voorspoed Mine	800.
Do.	do.	Petra Diamonds Ltd.	Finsch Mine, 100 kilometers west of Kimberley	1,900. ^c
Do.	do.	do.	Cullinan Mine	950. ^c
Do.	do.	do.	Helam, Sedibeng, and Star Mines ¹	175.
Do.	do.	do.	Kimberley underground mines, Kimberley	130. ^c
Do.	do.	do.	Koffiefontein Mine in Free State Province	50. ^c
Do.	do.	Diamcor Mining Inc.	Krone-Endorda Mine	120.
Fluorspar		Vergenoeg Mining Corp. (Pty) Ltd. [Minerales y Productos Derivados SA (Minersa), 85%]	Vergenoeg Mine at Rust de Winter	250.
Do.		Witkop Fluorspar Mine (Pty) Ltd. (subsidiary of Sallies Ltd.)	Witkop Mine at Zeerust ¹	140.
Gold:				
Mine	kilograms	AngloGold Ashanti Ltd. (Anglo American plc, 41.8%)	Kopanang Mine	32,100 gold.
Do.	do.	do.	Great Noligwa Mine	14,600 gold.
Do.	do.	do.	Moab Khotsong Mine	11,000 gold.
Do.	do.	do.	Surface operations	5,100 gold. ^c
Do.	do.	do.	Tau Tona Mine	28,000 gold.
Do.	do.	do.	Mponeng Mine	17,000 gold.
Do.	do.	do.	Mine Waste Solutions (MWS) project	3,400 gold.
Do.	do.	Sibanye Gold Ltd.	Driefontein and Kloof Mines	36,900 gold.
Do.	do.	do.	Beatrix Mine	12,800 gold.
Do.	do.	do.	Cooke Operations	7,500 gold. ^c
Do.	do.	do.	Burnstone Mine ¹	3,100 gold.
Do.	do.	Harmony Gold Mining Co. Ltd.	Kusasaletu Mine	8,900 gold.
Do.	do.	do.	Doornkop Mine	6,100 gold.
Do.	do.	do.	Target 1 and Target 3 ¹ Mines	5,800 gold. ^c
Do.	do.	do.	Tshepong Mine	4,500 gold.
Do.	do.	do.	Masimong Mine	3,900 gold.
Do.	do.	do.	Phakisa Mine	3,200 gold. ^c
Do.	do.	do.	Bambanani Mine	3,000 gold.
Do.	do.	do.	Surface operations	3,000 gold.
Do.	do.	do.	Joel Mine	2,600 gold.
Do.	do.	do.	Unisel Mine	1,900 gold.
Do.	do.	Gold Fields Ltd.	South Deep Mine	9,200 gold.
Do.	do.	Pan African Resources plc	Barberton Mine	3,000 gold.
Do.	do.	do.	Evander Mine	3,000 gold.
Do.	do.	do.	Barberton Tailings Retreatment Project (BRTP)	800 gold.
Do.	do.	Gold One International Ltd.	Modder East Mine	4,700 gold.
Do.	do.	DRDGold Ltd.	Ergo operations near Johannesburg	4,500 gold. ^c
Do.	do.	Village Main Reef Ltd.	Tau Lekoa Mine	3,200 gold. ^c
Do.	do.	do.	Buffelsfontein Mine ³	NA.
Do.		Anglo American Platinum Ltd. (Amplats) (Anglo American plc, 78%)	Bathopele, Dishaba, Khomanani, Khuseleka, Mogalakwena, Siphumelele, Thembelani, Union, and other mines	3,000 gold. ^c
Refined	metric tons	Rand Refinery Ltd. (AngloGold Ashanti Ltd., 53%, and Gold Fields Ltd., 33%)	Germiston, Gauteng Province	1,000.

See footnotes at end of table.

TABLE 2—Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Iron and steel:			
Iron ore	Kumba Iron Ore Ltd.	Sishen Mine at Sishen	38,000.
Do.	do.	Kolomela Mine	11,000.
Do.	do.	Thabazimbi Mine at Thabazimbi	2,700.
Do.	Assmang (Pty) Ltd.	Khumani Mine	16,000.
Do.	do.	Beeshoek Mine near Postmasburg	4,000.
Do.	Palabora Mining Co. Ltd.	Palabora Mines at Phalaborwa	9,000.
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.	Glencore plc	Rhovan Mine at Brits	400.
Ferroalloys	Glencore plc, 79.5%, and Merafe Resources Ltd., 20.5%	Lion plant at Steelpoort	720 ferrochromium.
Do.	do.	Wonderkop plant at Marikana	553 ferrochromium.
Do.	do.	Rustenburg plant at Rustenburg	430 ferrochromium.
Do.	Glencore plc, 69.6%, and Merafe Resources Ltd., 30.4%	Lydenburg plant at Lydenburg	396 ferrochromium.
Do.	Glencore plc, 79.5%, and Merafe Resources Ltd., 20.5%	Boshoek plant at Boshoek	240 ferrochromium.
Do.	Samancor Chrome (Pty) Ltd.	Plants at Middelburg, Steelpoort, and Witbank	1,200 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.	International Ferro Metals Ltd.	Buffelsfontein plant in North West Province	267 ferrochromium.
Do.	Tata Steel (KZN) (Pty) Ltd.	Richards Bay	150 ferrochromium.
Do.	Assmang (Pty) Ltd.	Cato Ridge plant in KwaZulu Natal Province	300 ferromanganese.
Do.	do.	Machadodorp plant in Mpumalanga Province	290 ferromanganese.
Do.	Samancor Manganese (Pty) Ltd. (BHP Billiton Ltd., 60%, and Anglo American plc, 40%)	Plant at Meyerton	500 ferromanganese.
Do.	Assmang (Pty) Ltd.	Cato Ridge plant in KwaZulu Natal Province	300 ferromanganese.
Do.	Transalloys (Pty) Ltd. (subsidiary of Renova Group)	Plant at Witbank	50 ferromanganese; ¹ 170 silicomanganese.
Do.	Globe Speciality Metals Inc.	New Castle plant at Ballengeich	45 ferrosilicon.
Do.	Grupo Ferroatlantica	Rand Carbide plant	40 ferrosilicon.
Do.	metric tons Vanchem Vanadium Products (Pty) Ltd. (subsidiary of Duferco Group)	Plant at Witbank	12,500 ferrovanadium.
Do.	do. Glencore plc	Rhovan plant at Brits	6,000 ferrovanadium.
Do.	do. Vametco Minerals Corp.	Smelter near Brits	4,800 ferrovanadium.
Do.	Afarak Group Oyj	Mogale plant	110 ferroalloys.
Steel	ArcelorMittal South Africa Ltd.	Vanderbijlpark plant	4,500 crude steel.
Do.	do.	Newcastle and Vereeniging plants	2,300 crude steel.
Do.	do.	Saldanha plant	1,200 crude steel.
Do.	Ervaz Highveld Steel and Vanadium Ltd.	Witbank	815 crude steel.
Do.	Columbus Stainless (Pty) Ltd. (Acerinox SA, 76%)	Stainless steel plant at Middelburg	750 crude steel.
Do.	Scaw Metals Group	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. (Cisco)	Kuilsrivier plant, Cape Town	300 crude steel; 300 billet.
Do.	Duferco Steel Processing Ltd.	Cold-rolled slab steel plant at Saldanha Bay	240 rolled steel.
Lead	Vedanta Resources plc	Black Mountain Mine near Aggeneys in Northern Cape Province	55 lead in concentrate.

See footnotes at end of table.

TABLE 2—Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(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 Daniëlskuil	1,000.
Do.	Inca Lime (Pty) Ltd. [subsidiary of Inca Mining (Pty) Ltd.]		Plant at Immerpan, Limpopo Province	100.
Manganese	Hotazel Manganese Mines (Pty) Ltd. (BHP Billiton, 44.4%, and Anglo American plc, 29.6%)		Mamatwan Mine near Hotazel	3,500 ore.
Do.	do.		Wessels Mine near Hotazel	1,000 ore.
Do.	United Manganese of Kalahari (Pty) Ltd. (UMK) [Majestic Silver Trading 40 (Pty) Ltd., 51%, and Renova Group, 49%]		Kalahari Mine	4,000 ore.
Do.	Assmang (Pty) Ltd.		Nchwaning Mine near Black Rock	3,200 ore.
Do.	do.		Gloria Mine near Black Rock	600 ore.
Do.	Tshipi e Ntle Manganese Mining (Pty) Ltd. (Ntsimbitntle Mining (Pty) Ltd., 50.1%, and Jupiter Mines Ltd., 49.9%)		Tshipi Borwa Mine	2,400 ore.
Do.	Asia Minerals Ltd. (AML)		Kudumane Mine	1,500 ore.
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. ^c
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. ^c
Do.	do.		Base Metals Refinery	16 refined. ^c
Do.	Lonmin plc		Marikana and Pandora Mines	4 mine. ^c
Do.	do.		Base Metals Refinery	5 sulfate. ^c
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 ¹	730.
Refined ^d	do.	South African Petroleum Refineries (Shell SA Energy, 50%, and BP Southern Africa, 50%)	Sapref refinery in Durban	65,700.
Do.	do.	Engen Ltd. (62%)	Enref refinery in Durban	43,800.
Do.	do.	National Petroleum Refiners of South Africa Pty. Ltd. (Sasol Ltd., 63.6%)	Natref refinery in Sasolburg	39,400.
Do.	do.	Caltex Oil SA (Pty) Ltd.	Chevref refinery in Cape Town	36,500.
Phosphate rock	Phosphate Development Corp. Ltd. [Foskor (Pty) Ltd.]		Foskor Mine and plant at Phalaborwa	2,800 phosphate rock.
Phosphoric acid	Farmers World Limpopo (Pty) Ltd.		Plant at Phalaborwa	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.	do.	Union Mine at Swartklip	10,700 platinum; 4,600 palladium; 1,800 rhodium; 3,100 iridium and ruthenium.

See footnotes at end of table.

TABLE 2—Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(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	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.
Do.	do.	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 Ltd. (ARM), 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-Maseny	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)	Western Limb Tailings Retreatment project	1,900 platinum; ^c 680 palladium; ^c 260 other. ^c
Do.	do.	do.	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 Holdings Ltd. (Implats)	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.

See footnotes at end of table.

TABLE 2—Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(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	Marikana and Pandora Mines	24,900 platinum; 11,600 palladium; 5,300 ruthenium; 3,400 rhodium; 1,100 iridium.
Do.	do.	do.	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.	do.	Booyensdal Mine	2,900 platinum; 1,600 palladium; 470 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.	Blue Ridge Mine ¹	3,900 platinum-group metals.
Do.	do.	Sedibelo Platinum Mines Ltd.	Pilanesberg Mine	5,400 platinum; 1,700 palladium; 490 rhodium.
Do.	do.	Glencore plc, 74%	Eland Mine at Brits	7,500 platinum-group metals.
Do.	do.	Atlatsa Resource 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. (ARM), 55%, and Impala Platinum Holdings Ltd., 45%]	Two Rivers Platinum Mine near Steelpoort	5,100 platinum; 2,900 palladium; 1,500 ruthenium; 870 rhodium; 330 iridium.
Do.	do.	Eastern Platinum Ltd. (Eastplats)	Crocodile River Mine at Arbourfell ¹	3,100 platinum; 1,300 palladium; 950 ruthenium; 520 rhodium; 220 iridium.
Do.	do.	Tharisa Minerals (Pty) Ltd.	Tharisa Mine	2,700 platinum; 710 palladium; 530 ruthenium; 360 rhodium; 170 iridium.
Do.	do.	Nkomati Joint Venture	Nkomati Mine in Mpumalanga Province	5,500 platinum-group metals. ^c
Do.	do.	Platinum Australia Pty Ltd. (PLA)	Smokey Hills Mine ¹	3,000 platinum-group metals.
Do.	do.	Sylvania Platinum Ltd.	Sylvania Dump Operations	1,800 platinum-group metals. ^c
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.

See footnotes at end of table.

TABLE 2—Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Selenium	kilograms	Impala Platinum Ltd. (Implats)	Impala and Marula Mines	12,000. ^c
Do.	do.	Palabora Mining Co. Ltd.	Palabora Mine and plant at Phalaborwa	10,000. ^c
Silicon		Grupo Ferroatlantica	Polokwane plant, near Pietersburg	55 silicon metal.
Do.	do.		Rand Carbide plant	12 silicon metal.
Silver:				
Mine	metric tons	Vedanta Resources plc	Black Mountain Mine	50 mined silver.
Refined	do.	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.
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.
Tellurium	kilograms	Impala Platinum Ltd. (Implats)	Impala and Marula Mines	5,000. ^c
Do.	do.	Palabora Mining Co. Ltd.	Palabora Mine and plant at Phalaborwa	5,300. ^c
Titanium:				
Titanium mineral concentrates		Richards Bay Minerals (RBM) (Rio Tinto plc, 74%, and Horizon Investments, 24%)	Open cast operations, near Richards Bay	2,000 ilmenite; ^c 100 rutile. ^c
Do.		Tronox Ltd. (Exxaro Resources Ltd., 44.65%), 74%	Namakwa Mine near Brand-se-Baai and mineral separation plant at Koekenaap	540 ilmenite; 31 rutile.
Do.		do.	Hillendale Mine near Richards Bay, KwaZulu Natal Province ¹	550 ilmenite; 30 rutile.
Do.		Mineral Commodities Ltd. (MCL)	Tormin Mine in Western Cape Province	100 ilmenite; 5.5 rutile.
Titanium slag		Richards Bay Minerals (RBM)	Smelter at Richards Bay	1,050 titanium slag.
Do.		Tronox Ltd., 74%	Empangeni smelter near Richards Bay	220 titanium slag.
Do.		do.	Smelter at Vredenberg, Saldanha Bay area	190 titanium slag.
Do.		Ervaz Highveld Steel and Vanadium Ltd.	Steel plant at Witbank	48 titanium slag. ^c
Uranium, U ₃ O ₈ content	metric tons	AngloGold Ashanti Ltd.	Vaal Rivers operation, near Klerksdorp	3,000.
Do.	do.	First Uranium Corp.	Ezulwini Mine	100. ^c
Vanadium, V ₂ O ₅ content	do.	Highveld Steel and Vanadium Ltd. (Ervaz Group S.A., 79%)	Mapochs Mine near Lydenburg	17,500.
Do.	do.	do.	Plant at Witbank	10,800.
Do.	do.	Glencore plc, 74%	Rhovan Mine at Brits	10,000.
Do.		Vanchem Vanadium Products (Pty) Ltd. (a subsidiary of Duferco Group)	Plant at Witbank	5,000. ^c
Do.	do.	Vametco Minerals Corp.	Vametco 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		Black Mountain Mineral Development Co. (Pty) Ltd.	Black Mountain Mine near Aggeneys in Northern Cape Province	40 zinc in concentrate.
Zirconium		Richards Bay Minerals (RBM)	Open cast mines near Richards Bay	300 zircon in concentrate.
Do.		Tronox Ltd., 74%	Namakwa Mine near Brand-se-Baai and mineral separation plant at Koekenaap	135 zircon in concentrate.
Do.		do.	Hillendale Mine near Richards Bay, KwaZulu Natal Province ¹	60 zircon in concentrate.
Do.		Mineral Commodities Ltd. (MCL)	Tormin Mine in Western Cape Province	38 zircon in concentrate.

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

¹On care-and-maintenance status at the end of 2014.

²Data from the International Copper Study Group.

³Permanently closed at the end of 2014.

⁴South Africa also has a coal-to-liquids plant and a gas-to-liquids plant with capacities of 55 million barrels per year and 16 million barrels per year, respectively.

TABLE 3
SOUTH AFRICA: RESERVES OF MAJOR MINERALS IN 2014¹

(Million metric tons unless otherwise specified)

Commodity	Reserves
Andalusite ²	51
Antimony	thousand metric tons 27
Coal, recoverable	30,156
Copper	11
Fluorspar	41
Gold	thousand metric tons 6
Iron ore	650
Manganese, ore	150
Nickel	thousand metric tons 3,700
Phosphate rock	1,500
Platinum-group metals	thousand metric tons 63
Titanium minerals, TiO ₂ content	71
Vanadium	thousand metric tons 3,500
Vermiculite	14
Zinc	15
Zirconium, ZrO ₂ content	14

¹Metallic minerals are contained metal or element in ore.

²Includes aluminosilicate and sillimanite.

Source: Mwape, P., Mnguni, M., Jali, N., and Menoe, K., 2015, General review, *in* South Africa's mineral industry 2013/2014: Pretoria, South Africa, Department of Mineral Resources of the Republic of South Africa, p. 1–40.