



2010 Minerals Yearbook

SOUTH AFRICA

THE MINERAL INDUSTRY OF SOUTH AFRICA

By Thomas R. Yager

The Republic of South Africa remained one of the world's leading mining and mineral-processing countries. In 2010, South Africa's estimated share of world platinum production amounted to 75%; kyanite and other materials, 61%; vermiculite, 40%; chromium, 39%; ferrochromium, 38%; palladium, 37%; zirconium, 33%; vanadium, 32%; rutile, 22%; ilmenite, 19%; manganese, 17%; gold, 8%; nickel, 3%; aluminum, antimony, fluorspar, and iron ore, 2% each; and phosphate rock, 1%. The country's estimated share of world reserves of platinum-group metals (PGM) amounted to 95%; chromite, 37%; vanadium, 26%; zirconium, 25%; manganese, 22%; rutile, 20%; fluorspar, 18%; iron ore, 14%; gold, 12%; and ilmenite, 10% (Bray, 2011; Carlin, 2011; Corathers, 2011; Gambogi, 2011a, b; George, 2011; Jasinski, 2011; Jorgenson, 2011; Kuck, 2011; Loferski, 2011; Miller, 2011; Papp, 2011; Polyak, 2011; Tanner, 2011a, b; Tex Report, The, 2011).

Minerals in the National Economy

The mineral industry accounted for 8.6% of the gross domestic product in 2010; crude and processed mineral products accounted for 48% of the value of total exports. About 74% of crude mineral products and 82% of processed mineral products, by value, were exported in 2010. Employment in the mineral industry amounted to 498,141 in 2010 compared with a revised 491,744 in 2009 and 418,294 in 2000. In 2010, PGM mining accounted for 36.5% of the mineral industry's employment; gold, 31.5%; coal, 14.8%; iron ore, 3.7%; chromite, 2.8%; diamond, 2.2%; and other minerals, 8.4%. In 2000, gold mining accounted for about 52% of the mineral industry's employment, PGM, 23%; and coal, 12% (Chamber of Mines of South Africa, 2010, p. 6, 24, 31; 2011, p. 4, 6–7, 12; Martin Kohler, Deputy Director of Statistics, Department of Minerals and Energy of the Republic of South Africa, written commun., June 29, 2011).

Government Policies and Programs

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

Environment

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

Production

In 2010, fire clay production increased by 359%; cobalt metal, 253%; ferromanganese and silicomanganese, an estimated 96% each; pig iron, 88%; slate, 86%; mica and vanadium, 58% each; attapulgite and manganese ore, 57% each; ferrochromium, 54%; diamond, 45%; chromite, 44%; direct-reduced iron, 38%; ferrovanadium, an estimated 36%; bentonite, 35%; mineral pigments, 33%; zinc, 28%; crude petroleum, 27%; silica sand and silicon metal, 26% each; anthracite coal, 25%; andalusite, an estimated 20%; nickel, 15%; ferrosilicon, 14%; crude steel, 13%; and phosphate rock, 11%. The output of shale and talc decreased by 33% each; brick clay, 21%; granite and norite, 19%; stainless steel, by an estimated 18%; sodium sulfate and sulfur, 15% each; and gypsum, 14% (table 1; Martin Kohler, Deputy Director of Statistics, Department of Minerals and Energy of the Republic of South Africa, written commun., June 29, 2011).

Structure of the Mineral Industry

Most of the South African mineral industry was privately owned. 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 diamond accounted for 85% of national production; iron ore, 74%; manganese, 47%; nickel, 39%; gold, 31%; and coal, 23%.

Mineral Trade

In 2010, exports of PGM amounted to \$8.62 billion; gold, \$6.68 billion; iron ore, \$5.26 billion; coal, \$4.81 billion; manganese ore, \$1.22 billion; nickel, \$643 million; chromite, \$322 million; copper, \$158 million; and other crude mineral products, which included diamond, ilmenite, rutile, and zircon, \$1.79 billion. Exports of ferrochromium amounted to \$3.17 billion; manganese metal and alloys, \$919 million; vanadium alloys and other vanadium products, \$286 million; silicon metal and alloys, \$196 million; and other processed mineral products, which included aluminum, \$2.04 billion

(Martin Kohler, Deputy Director of Statistics, Department of Minerals and Energy of the Republic of South Africa, written commun., June 29, 2011).

The percentage of domestic consumption of mineral commodities produced in South Africa varied sharply by commodity. In 2010, gold exports, by volume, amounted to 94% of domestic production; ferrochromium, 86%; PGM, 85%; vermiculite, 84%; manganese ore and nickel, 83% each; iron ore, 81%, vanadium, 75%; silicon alloys, 71%; coal, 26%; chromite, 18%; zinc, 10%; 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., June 29, 2011).

Commodity Review

Metals

Aluminum.—South Africa produced primary aluminum from alumina imported from Guinea. BHP Billiton Ltd. of Australia operated the Bayside and the Hillside primary aluminum smelters at Richards Bay. In 2010, BHP Billiton's production remained nearly unchanged at 807,000 metric tons (t) (BHP Billiton Ltd., 2010b, p. 6; 2011, p. 6).

Chromium.—In 2010, chromite production was about 10.87 million metric tons (Mt) compared with 7.56 Mt in 2009 and 6.66 Mt in 2000. From 2000 to 2010, employment in chromite mining increased to 13,971 workers from between 5,000 and 6,000 (Chamber of Mines, 2010, p. 15; 2011, p. 12, 15).

Xstrata plc of Switzerland and its joint-venture partner Merafe Resources Ltd. operated the the Helena, the Kroondal, and the Thorncliffe Mines, which had a total (combined) capacity of 2.67 million metric tons per year (Mt/yr) of chromite. The company's production increased to 2.13 Mt in 2010 from 1.92 Mt in 2009. Output increased at the Helena and the Kroondal Mines and decreased at the Thorncliffe Mine in 2010. By the end of the first quarter of 2011, Xstrata planned to restart production at the Waterval Mine at the rate of 360,000 metric tons per year (t/yr). The company also planned to increase capacity at the Horizon Mine, which shut down in 2009, to 480,000 t/yr from 260,000 t/yr by the end of 2013 (Xstrata plc, 2011, p. 61, 96).

Xstrata and Merafe operated the Boshhoek, the Lion, the Lydenburg, the Rustenburg, and the Wonderkop ferrochromium plants. These plants had a total combined capacity of 1.98 Mt/yr. In 2010, output increased to 1.47 Mt from 1 Mt in 2009. The increase was broadly based, with production increasing at all plants in 2010. In the first quarter of 2011, the companies planned to start construction on a capacity expansion of the Lion plant. Capacity was expected to double to 720,000 t/yr in the first half of 2013. Xstrata and Merafe planned to open the new Magareng Mine within the Thorncliffe Mine complex to provide ore to the Lion plant. The Magareng Mine was likely to have a capacity of 1.2 Mt/yr. Capital costs of the Lion expansion were estimated to be \$710 million, of which \$100 million would be attributable to the Magareng Mine (Engineering & Mining Journal, 2010b; Xstrata plc, 2011, p. 61, 96).

In 2010, Xstrata and Merafe signed an agreement with Lonmin plc of the United Kingdom to purchase 1.5 Mt/yr of

tailings from Lonmin's PGM mining operations. The companies also started construction of a new pelletizing and sintering plant that would have a capacity of 600,000 t/yr. The new plant was expected to recover chromite from some of the tailings purchased from Lonmin and to be completed in 2013 (Xstrata plc, 2011, p. 61).

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

Samancor Chrome operated the Ferrometals plant in Witbank, the Middelburg plant in Middelburg, and the Tubatse plant in Steelpoort; the plants had a combined capacity of about 1.3 Mt/yr (table 2). The company produced 637,000 t of ferrochromium in 2009 compared with 819,000 t in 2008 (Kaitue, 2010, p. 6).

Assmang Ltd. [African Rainbow Minerals Ltd. (ARM), 50%, and Assore Ltd., 50%] operated the Dwarsrivier Mine in Mpumalanga. In fiscal year¹ 2010, production decreased to 587,000 t from 684,000 t in fiscal year 2009 because of weak global demand for ferrochromium (African Rainbow Minerals Ltd., 2010, p. 54).

Assmang produced ferrochromium at the Machadodorp plant in Mpumalanga Province. In fiscal year 2010, output increased to 200,000 t from 169,000 t in fiscal year 2009. Assmang converted one of the furnaces at Machadodorp from ferrochromium to ferromanganese because ferrochromium is more power intensive to produce than ferromanganese (African Rainbow Minerals Ltd., 2010, p. 50, 54).

ARM and its joint-venture partner MMC Norilsk Nickel of Russia operated the Nkomati chromite mine. In fiscal year 2010, sales increased to 816,000 t from 712,000 t in fiscal year 2009 (African Rainbow Minerals Ltd., 2010, p. 42).

International Ferro Metals Ltd. (IFM) operated the Lesedi chromite mine and Buffelsfontein ferrochromium plant in North West Province. In fiscal year 2010, IFM produced 200,440 t of ferrochromium, which was an increase of 82% compared with production in fiscal year 2009. The Lesedi open pit mine was expected to shut down as near-surface resources become depleted by the end of fiscal year 2011. IFM planned to produce about 560,000 t of chromite ore from the new underground mine at Lesedi in fiscal year 2012 and to reach peak production of 900,000 t/yr in 2014. In July 2011, the company planned to commission a new plant that would produce 180,000 t/yr of chromite from tailings at Anglo Platinum Ltd.'s PGM mining operations. IFM also planned to complete a feasibility study on expanding its ferrochromium capacity of 267,000 t/yr at the end of 2010 (Ryan's Notes, 2010c).

In 2010, ASA Metals (Pty) Ltd. (Sinosteel Corp. of China, 60%, and Limpopo Economic Development Enterprise, 40%) increased its production following the expansion in 2009 of its ferrochromium plant near Pietersburg to 400,000 t/yr from 120,000 t/yr. The company's production was 151,000 t in 2009 and 128,000 t in 2008. ASA Metals was also engaged in the

¹Fiscal years run from the end of June in one year through the end of June in the following year unless otherwise specified.

expansion of the Dilokong Mine; the company planned to finish sinking two new shafts at the end of 2011 or the beginning of 2012 (International Resource Journal, 2010, p. 128, 130, 135; Kaitue, 2010, p. 6).

Hernic Ferrochrome (Pty) Ltd. (a subsidiary of Mitsubishi Corp. of Japan) operated the Bokfontein surface mine and a ferrochromium plant with a capacity of 420,000 t/yr. The plant produced at slightly more than 50% of its capacity in 2009; Hernic planned to increase production to about 90% of capacity in 2010. The company also started development of the Bokfontein underground mine in early 2010; the life of the mine was estimated to be 60 years (Jennemann, 2010).

Tata Steel Ltd. of India was considering the sale of its plant at Richards Bay, which had a capacity of 151,000 t/yr. In mid-2010, Tata was producing at 90% of capacity. The company produced 118,000 t of ferrochromium in its 2010 fiscal year (which ran from the beginning of April 2009 to the end of March 2010) compared with 64,000 t in fiscal year 2009. The plant was unprofitable because of high power and transportation costs (Ryan's Notes, 2010f).

By mid-2011, Ruukki Group Oyj of Finland planned to complete a feasibility study on expanding the Mogale plant, which had a total capacity of 140,000 t/yr of ferrochromium and silicomanganese. Depending on the results of the study, Ruukki could build new furnaces with a total capacity of 200,000 t/yr of ferrochromium by 2012 or 2013. The company planned to increase capacity at its current ferrochromium furnace by 30,000 t/yr. Ruukki also planned to start mining chromite in 2011. Kermas Group Ltd. of the United Kingdom and Ruukki purchased Chromex in September (O'Donovan, 2010; Ryan's Notes, 2010b).

In January 2010, Aquarius Platinum Ltd. resumed construction of its new processing plant to recover chromite from tailings at its PGM mining operations. The new plant at the Everest Mine was expected to have a capacity of 218,000 t/yr and to be completed in September 2010 (Ryan's Notes, 2010d).

Copper.—The Palabora Mine, which was operated by Rio Tinto plc of the United Kingdom, was South Africa's leading copper producer. Copper was also produced as a coproduct of lead, PGM, and zinc. In 2010, the output of copper in concentrate at Palabora decreased to 74,576 t from 82,564 t in 2009; smelted copper, to 55,665 t from 65,937 t; and refined copper, to 57,984 t from 69,387 t. Mine production decreased because of mechanical problems and decreased ore grades and recovery rates. Smelter and refined production were also reduced by mechanical problems. The remaining life of the Palabora Mine was 6 years; Rio Tinto planned to increase the mine's life by between 12 and 15 years (Hannah, 2010; Palabora Mining Company Ltd., 2011, p. 10, 100–102).

Gold.—The long-term decline in the country's gold output continued in 2010, with national gold mine production decreasing to 188,701 kilograms (kg) from 197,628 kg in 2009 and about 428,000 kg in 2000. From 2000 to 2010, employment in gold mining declined to 157,019 workers from nearly 220,000. During the same period, South Africa's share of world gold production decreased to about 8% from 16%. Difficulties in mining at greater depths, lower ore grades, power supply constraints, and safety-related stoppages contributed to

the decline (table 1; Ruffini, 2010; Chamber of Mines of South Africa, 2010, p. 23–24; 2011, p. 12).

Gold Fields Ltd. of South Africa produced gold at the Beatrix, the Driefontein, the Kloof, and the South Deep Mines, all of which were underground mines. In 2010, production at the Driefontein Mine amounted to about 22,100 kg; the Kloof Mine, 15,700 kg; the Beatrix Mine, 11,700 kg; and the South Deep Mine, 8,500 kg. Gold Fields planned to increase production at South Deep to between 23,000 and 25,000 kilograms per year (kg/yr) of gold by July 2014. The company planned to increase its total South African production to about 62,000 kg/yr by 2015. The remaining life of the South Deep Mine was estimated to be 50 years; Driefontein, 20 years; and Kloof, between 15 and 20 years (Creamer, 2010d; Ruffini, 2010; Gold Fields Ltd., 2011).

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 remained nearly unchanged at about 55,500 kg in 2010. Production at the Mponeng Mine amounted to 16,547 kg; the Kopanang Mine, 9,487 kg; the Moab Khotsong Mine, 9,082 kg; the Tau Tona Mine, 8,056 kg; and the surface mining operations, 5,568 kg (AngloGold Ashanti Ltd., 2011, p. 59, 60, 63, 66, 69, 73, 76, 78–79).

In 2011, AngloGold Ashanti expected to produce a total of between 53,900 and 55,700 kg of gold. The company planned modest increases in production at Kopanang, Moab Khotsong and Tau Tona; output was likely to decline at the Mponeng Mine and surface mining operations. The VCR Below 120 project was expected to produce 6,800 kg/yr from the Mponeng Mine and extend the life of the mine from 2019 to 2026. The Zaaiploots project was expected to add 158,000 kg of gold production at the Moab Khotsong Mine and extend the mine's life to 2036 (Ruffini, 2010; AngloGold Ashanti Ltd., 2011, p. 59, 60, 63, 66, 69, 73, 76, 78–79).

Harmony Gold Mining Company Ltd. produced gold at numerous mines; the company's output was 42,350 kg in fiscal year 2010 compared with 45,437 kg in fiscal year 2009. Decreased production was attributable to factors that included decreased ore grades and resource depletion. Harmony planned to increase its South African gold production to more than 53,000 kg/yr by fiscal year 2013. The company planned to increase production at the Doornkop Mine to 6,500 kg/yr by fiscal year 2015 from 1,950 kg in fiscal year 2009. The Phakisa Mine produced 1,371 kg in fiscal year 2010; full output of 7,800 kg/yr was expected in fiscal year 2013. At the Kusasalethu Mine (formerly the Elandsrand Mine), production was likely to increase to 9,600 kg/yr by 2013 from 5,444 kg in fiscal year 2010. The remaining life of the Kusasalethu Mine was estimated to be about 25 years; Phakisa, between 18 and 21 years; and Doornkop, 15 years (Harmony Gold Mining Company Ltd., 2010, p. 8–9, 56, 74, 81, 84; 2011a).

Harmony also planned to increase production at the Target Mine to 6,200 kg/yr from 3,539 kg in fiscal year 2010. The company planned to maintain production at the Masimong Mine at about 5,000 kg/yr; the Bambanani Mine, 4,000 kg/yr; and the Evander Mine, about 2,800 kg/yr (Harmony Gold Mining Company Ltd., 2011a).

In 2010, gold production by DRDGold Ltd. amounted to 8,048 kg. DRDGold produced gold at the Blyvooruitzicht, the Crown, and the Ergo Mines. Production at Blyvooruitzicht in 2009 was limited by seismic activity. In the second half of 2010, output increased because of seismic stability and higher ore grades. The remaining life of the Crown and Ergo Mines was estimated to be 25 years, and the Blyvooruitzicht Mine, 20 years. DRDGold sold the East Rand Proprietary Mine to White Water Resources Ltd. in 2010 (Creamer, 2010b; DRDGold Ltd., 2011).

Rand Uranium (Pty) Ltd. (Pamodzi Resources Fund, 60%, and Harmony Gold, 40%) produced 5,070 kg of gold at the Cooke Mine in 2010. Underground resources at Cooke were estimated to be 322 t of contained gold, of which about 62 t was reserves. The company was considering the development of the Cooke Dam project, which could produce about 6,800 kg/yr of gold. Most of the gold would be recovered from tailings (Mining Journal, 2011).

Simmer and Jack Mines Ltd. acquired the Buffelsfontein Mine from DRDGold in 2005 and the Tau Lekoa Mine from AngloGold Ashanti in 2010. The company produced 3,978 kg of gold at Buffelsfontein and Tau Lekoa in 2010; the Transvaal Gold Mining Estate tailings retreatment project was placed on care-and-maintenance status in the first quarter. In late December 2010, Simmer and Jack completed a prefeasibility study on an extension of the life of the Tau Lekoa Mine until 2024 (Simmer and Jack Mines Ltd., 2010, 2011).

First Uranium Corp. of Canada (a subsidiary of Simmer and Jack) produced gold at the Ezulwini Mine and the Mine Waste Solutions (MWS) project. In fiscal year 2011 (which ran from the end of March in one year to the end of March in the subsequent year), the company planned to mine about 2,500 kg of gold at Ezulwini and 2,200 kg at MWS. First Uranium planned to increase gold production at Ezulwini to more than 6,200 kg by 2015 and to 9,300 kg/yr from 2019 through at least 2030. The company also planned to produce 3,900 kg/yr of gold at MWS from 2012 to 2025 (van der Mescht, 2010, p. 12, 28).

Gold One International Ltd. produced 1,943 kg of gold at the Modder East underground mine in 2010. The company planned to increase output to 3,700 kg in 2011 and to 4,700 kg in 2012. The remaining life of the Modder East Mine was estimated to be 13 years. Gold One planned to complete its prefeasibility study on a new mine at Ventersburg in the Free State goldfield in the first quarter of 2011. Depending on the results of the study, the mine could start production 4 years after a decision to proceed with development is made; output was likely to reach a peak of 4,900 kg/yr. The life of the mine was estimated to be 11 years (Gold One International Ltd, 2011; Mining Review Africa, 2011).

Great Basin Gold Ltd. (GBG) started production at the Burnstone underground gold mine in Mpumalanga Province in October 2010. The company planned to produce between 3,400 and 4,400 kg of gold in 2011. During the estimated 25-year life of the mine, GBG planned to produce an average of 7,900 kg/yr (Great Basin Gold Ltd., 2011).

Rand Refinery Ltd. (AngloGold Ashanti, 53%; Gold Fields, 33%; DRDGold, 10%; and Avgold Ltd. and Western Areas Ltd., 2% each), which located in in Germiston, refined all the newly

mined gold in South Africa; the company also refined gold that was mined in other African countries, including Ghana, Mali, and Tanzania. The refinery had a capacity of 1,000 t/yr (Creamer, 2010d).

Iron Ore and Iron and Steel.—In 2010, iron ore production was about 58.7 Mt compared with 53.3 Mt in 2009 and 33.7 Mt in 2000. From 2000 to 2010, employment in iron ore mining increased to 13,971 workers from about 5,000. About 80% of the steel consumed in South Africa was produced from domestically mined iron ore, manganese, and chromite. The remainder was imported specialty steel products (Chamber of Mines of South Africa, 2010, p. 16; 2011, p. 12–13, 16).

Kumba Iron Ore Ltd. operated the Sishen Mine in Northern Cape Province and the Thabazimbi Mine in Limpopo Province. In 2010, production from the Sishen Mine increased to 41.3 Mt from 39.4 Mt in 2009; export sales increased to 36.1 Mt from 34.2 Mt. Kumba was also considering expansions of the Sishen Mine's capacity by 2015; the capacity could be increased by 2 Mt/yr by 2016 and by 12 Mt/yr by 2019. The expansion project remained unapproved at the end of 2010 (Anglo American plc, 2011, p. 19, 74; Kumba Iron Ore Ltd., 2011, p. 35).

At the Thabazimbi Mine, production decreased to 2 Mt from 2.5 Mt; all production from Thabazimbi was consumed by Arcelor Mittal South Africa Ltd.'s steel plants. The mine was expected to shut down in 2016. By the end of 2013, Kumba planned to complete a prefeasibility study on the Phoenix project, which would extend the life of the Thabazimbi Mine. Production from Phoenix was expected to be 3.4 Mt/yr of iron ore (Kumba Iron Ore Ltd., 2011, p. 41–42).

At the end of 2010, Kumba had completed 81% of the work on developing the new Kolomela Mine. The company planned to start production in 2012 and to reach the mine's full capacity of 9 Mt/yr of iron ore in 2013. The estimated capital costs of the project were \$1.06 billion (Anglo American plc, 2011, p. 19, 74).

Assmang produced iron ore at the Beeshoek and the Khumani Mines. In fiscal year 2010, production at Khumani increased to 8.77 Mt from 6.65 Mt in fiscal year 2009, and production at Beeshoek decreased to 0.52 Mt from 2.66 Mt. By the end of fiscal year 2012, Assmang planned to increase capacity at Khumani to 16 Mt/yr from 10 Mt/yr. The rampup to full capacity was expected to start in fiscal year 2013. Capital costs of the project were estimated to be about \$880 million (African Rainbow Minerals Ltd., 2010, p. 52).

In 2010, Rio Tinto produced 2.99 Mt of magnetite at Palabora for domestic and international markets in 2010 compared with 2.85 Mt in 2009. Production was limited by damage to the local rail network. Rio Tinto planned to increase production each year from 2011 to 2015; the company was forced to cancel expansion plans by yearend because of infrastructural constraints (Hannah, 2010; Palabora Mining Company Ltd., 2011, p. 27).

Highveld Steel and Vanadium Corp. Ltd. (Evraz Group S.A. of Luxembourg) mined 2.32 Mt of magnetite from Mapochs in 2010 compared with 1.85 Mt in 2009. In early 2010, the company started an expansion of its capacity to 3.65 Mt/yr that it planned to complete in early 2011. Iron ore from Mapochs was consumed in Highveld's steel mill at Witbank; the company's production of crude steel was 777,190 t in 2010

compared with 660,796 t in 2009 (Evrax Highveld Steel and Vanadium Ltd., 2011, p. 16, 26).

Magnesium, Silicon, Titanium, and Zirconium.—Grupo Ferroatlantica produced about 38,600 t of silicon metal at Polokwane in 2009; the company was producing at its full capacity of 55,000 t/yr by the end of 2010. Ferrosilicon was produced by Silicon Technology (Pty) Ltd. (Ryan's Notes, 2011).

RBM (BHP Billiton Ltd., 37%; Rio Tinto plc, 37%; Blue Horizon Investments, 24%; and RBM permanent employees, 2%) of the United Kingdom was South Africa's leading producer of ilmenite, rutile, and zircon. In fiscal year 2010, titanium slag production decreased to 840,000 t from 980,000 t in fiscal year 2009, and zircon, to 220,000 t from 240,000 t. Rutile output increased to 90,000 t from 88,000 t (BHP Billiton Ltd., 2010a, p. 52).

Exxaro Resources Ltd. mined ilmenite, rutile, and zircon at its Namakwa Sands project on South Africa's western coast. Ilmenite production at Namakwa Sands increased to 251,000 t in 2010 from 244,000 t in 2009; rutile, to 28,000 t from 26,000 t; and zircon, to 128,000 t from 116,000 t. Exxaro also operated the KZN Sands project in KwaZulu Natal Province. In 2010, ilmenite production at KZN Sands decreased to 236,000 t from 368,000 t; rutile, to 17,000 t from 20,000 t; and zircon, to 33,000 t from 36,000 t. Production declined at KZN Sands because of resource depletion at the Hillendale Mine. The development of the Fairbreeze Mine, which could replace production from Hillendale, remained unapproved at yearend (Exxaro Resources Ltd., 2011, p. 10–11, 45, 53, 60).

In January 2010, Rare Metal Industries (RMI) started a prefeasibility study on a new plant to produce magnesium, silicon, titanium, and zirconium. Depending on the results of the study, RMI could complete a feasibility study by the first quarter of 2012. Construction could start in June 2012 depending on the results of the feasibility study, and production, in late 2014 and early 2015. RMI planned to produce 15,000 t/yr of titanium alloys and other titanium products, 5,000 t/yr each of high-purity zirconium dioxide (ZrO_2) and synthetic fused silica, 3,000 t/yr of solar-grade polycrystalline silicon, and 2,000 t/yr of zirconium sponge. Titania slag from Exxaro's mines was likely to be beneficiated to produce titanium metal. Magnesium consumption in the production process was expected to be about 5,000 t/yr; RMI was considering the production of about 25,000 t/yr of magnesium at its plant (Mining Review Africa, 2010b).

Manganese.—In 2010, manganese ore production was about 7.17 Mt compared with 4.58 Mt in 2009 and 3.64 Mt in 2000. From 2000 to 2010, employment in manganese mining increased to 5,879 workers from about 2,200. Manganese ore exports were constrained by limited rail capacity, and manganese alloy production, by power shortages (Chamber of Mines of South Africa, 2010, p. 30; 2011, p. 12; Creamer, 2010c).

Assmang produced manganese ore at the Gloria and the Nchwaning Mines. In fiscal year 2010, capacity at the Nchwaning Mine's processing plant was increased to 5 Mt/yr from 3 Mt/yr; capacity at Gloria was 600,000 t/yr. Production at Gloria and Nchwaning decreased to about 1.97 Mt in

fiscal year 2010 from 3.14 Mt in fiscal year 2009. The company planned to increase production at Nchwaning in fiscal year 2011 (African Rainbow Minerals Ltd., 2010, p. 45, 53).

In fiscal year 2010, Assmang increased output at the Cato Ridge ferromanganese plant in Kwa-Zulu Natal to 252,000 t from 216,000 t in fiscal year 2009. The company increased its ferromanganese capacity by 40,000 t/yr by converting one of its furnaces at Machadodorp from ferrochromium to ferromanganese. Assmang was also considering the conversion of two more furnaces at Machadodorp that would increase ferromanganese capacity to 400,000 t/yr (African Rainbow Minerals Ltd., 2010, p. 47, 50, 53).

Samancor Manganese (Pty) Ltd. (BHP Billiton, 60%, and Anglo American, 40%) operated the Mamatwan open pit mine and the Wessels underground mine near Hotazel in Northern Cape Province. In 2010, Samancor's production of manganese ore increased to 3.34 Mt from 1.6 Mt in 2009. The company planned to increase ore production at Wessels to 1.5 Mt/yr from 1 Mt/yr in fiscal year 2013 (BHP Billiton Ltd., 2010a, p. 44; 2010b, p. 4; 2011, p. 4).

In 2010, Samancor Manganese produced 513,000 t of manganese alloys at its Meyerton plant compared with 162,000 t in 2009. The plant had a capacity of 490,000 t/yr of ferromanganese and 125,000 t/yr of silicomanganese. Samancor Manganese was engaged in a feasibility study on increasing ferromanganese capacity to 620,000 t/yr (BHP Billiton Ltd., 2010a, p. 44; 2010b, p. 4; 2011, p. 4).

Renova was engaged in a joint-venture project with domestic companies Chancellor House and Pitsa ya Setshaba to mine the Kalahari manganese ore deposit. Manganese from the Kalahari deposit was consumed domestically in the production of silicomanganese. Renova and its partners produced manganese ore at the rate of about 600,000 t/yr in 2010; the companies planned to increase output to 1 Mt/yr (Creamer, 2010c).

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

Jupiter Mines Ltd. of Australia purchased a 49.9% share in Tshipi e Ntle Manganese Mining (Pty) Ltd. in August 2010; Black Economic Empowerment company Ntsimbintle Mining held a 50.1% share. Jupiter and Ntsimbintle planned to develop the Tshipi Borwa project, which was adjacent to the Mamatwan Mine. The companies planned to complete the new Tshipi Borwa Mine in 2013, which was expected to produce between 2.2 Mt/yr and 2.3 Mt/yr of manganese ore. Capital costs of the project were estimated to be nearly \$200 million (Ryan's Notes, 2010a).

Asia Minerals Ltd. (AML) of Hong Kong planned to start production from a new mine at its Kudumane Manganese

project in 2011. By 2013, AML planned to increase manganese ore production to 1.5 Mt/yr. The final decision was expected to be made on the mine at the end of 2010 (Ryan's Notes, 2010g).

Nickel.—Most of South Africa's nickel mine production was a coproduct of PGM mining. Anglo Platinum produced 18,500 t of refined nickel at Rustenburg Base Metal Refiners in 2010 compared with 19,500 t in 2009. About 15,700 t was attributable to the company's PGM mining operations compared with 17,300 t in 2009. Anglo Platinum planned to complete the expansion of its refinery in 2011; nickel production was expected to increase by 11,000 t/yr by 2013. Implats produced 15,200 t of refined nickel in fiscal year 2010, of which 4,900 t was attributable to the company's PGM mining operations (Impala Platinum Holdings Ltd., 2010, p. 23; Anglo American plc, 2011, p. 19; Anglo Platinum Ltd., 2011, p. 102).

ARM produced 9,666 t of nickel at the Nkomati Mine in fiscal year 2010 compared with 4,495 t in fiscal year 2009. Increased output was attributable to an expansion that increased capacity to 20,500 t/yr from 5,000 t/yr. ARM planned to reach full capacity at Nkomati by fiscal year 2013; the mine was also expected to produce 10,000 t/yr of copper and 300 t/yr of cobalt at full capacity (African Rainbow Minerals Ltd., 2010, p. 42).

Platinum-Group Metals.—In 2010, PGM mine production was 287,304 kg compared with 271,393 kg in 2009 and about 206,800 kg in 2000. From 2000 to 2010, the share of platinum in PGM production by volume decreased to 51% from 55%. During the same period, employment in PGM mining increased to 181,969 workers from about 96,000 (Chamber of Mines of South Africa, 2010, p. 31–32; 2011, p. 12, 32).

In 2010, Anglo Platinum produced 151,000 kg of refined PGM compared with 145,000 kg in 2009. About 145,000 kg was attributable to mining operations of Anglo Platinum and its joint-venture partners in 2010 compared with 138,300 kg in 2009. Platinum produced by Anglo Platinum and its joint-venture partners amounted to 76,869 kg; palladium, 43,700 kg; rhodium, 9,754 kg; and other PGM, about 14,700 kg (Anglo Platinum Ltd., 2011, p. 102).

Anglo Platinum's PGM production increased at the Batholope, the Dishaba, the Thembelani, the Kroondal, the Marikana, the Mogalakwena, the Mototolo, the Tumela, and the Union Mines in 2010. Increased output at Mogalakwena was attributable to an increase in capacity. In 2010, production decreased at the Khuseleka and Siphumelele Mines because of the closure of subeconomic mine shafts. PGM production at Mogalakwena amounted to about 18,300 kg; Tumela and Union, 17,600 kg each; Kroondal, 16,300 kg; Bathopele, 9,100 kg; and Dishaba, 8,600 kg. Anglo Platinum planned to produce nearly 80,000 kg of refined platinum in 2011, which included toll refining (Anglo Platinum Ltd., 2011, p. 106–120; Butler, 2011, p. 16).

In 2010, Royal Bafokeng Platinum Ltd. (RBPlat) increased its share in the Bafokeng-Rasimone Platinum Mine (BRPM) to 67% from 50%. RBPlat and joint-venture partner Anglo Platinum produced about 7,700 kg/yr of PGM, of which about 4,900 kg/yr was platinum and 2,000 kg/yr was palladium. The companies planned to start production at the Styldrift project in 2017, which was expected to produce about 5,700 kg/yr of PGM. Starting in 2017, RBPlat and Anglo Platinum planned

to maintain total production at BRPM and Styldrift at about 12,000 kg/yr. The estimated capital cost of the Styldrift project was \$1.54 billion (Creamer, 2010e; Anglo Platinum Ltd., 2011, p. 121).

Anooraq Resources Corp. held a 51% share in the Bokoni Platinum Mine, and Anglo Platinum, 49%. The mine produced 3,507 kg of PGM in 2010, of which 1,780 kg was platinum and 1,193 kg was palladium. Anooraq planned to increase production to about 6,800 kg/yr of PGM by 2013 and 16,200 kg/yr of PGM by 2016. The capital cost of the first phase of expansion was estimated to be about \$80 million (Prinsloo, 2010b; Anglo Platinum Ltd., 2011, p. 122).

ARM and Anglo Platinum produced 10,851 kg of PGM at Modikwa in ARM's fiscal year 2010 that included 4,090 kg of platinum and 4,008 kg of palladium. Output was expected to increase to about 11,200 kg in fiscal year 2011 (African Rainbow Minerals Ltd., 2010, p. 38).

Implats operated the Impala Mines near Rustenburg in North West Province and the Marula Mine in Limpopo Province. In fiscal year 2010, production of refined PGM at Impala decreased to 53,339 kg from 55,678 kg in fiscal year 2009, and platinum, to 27,104 kg from 29,564 kg. Production decreased because of labor disputes, safety stoppages, and a shaft collapse that resulted in revisions to mining practices. Implats planned to increase platinum production to about 31,000 kg/yr by 2014. Contained platinum resources were estimated to be about 2,100 t, of which more than 710 t was reserves (Impala Platinum Holdings Ltd., 2010, p. 16, 72–73).

In fiscal year 2010, palladium output at Marula was nearly 2,300 kg, and platinum, nearly 2,200 kg. Implats planned to increase platinum output at Marula to 2,500 kg in fiscal year 2011 and 3,100 kg/yr by fiscal year 2013. Platinum resources at Marula were estimated to be nearly 240 t, of which 59 t was reserves (Impala Platinum Holdings Ltd., 2010, p. 81–83).

Implats operated a refinery located northeast of Johannesburg; production at this plant was from concentrates produced at Marula, the Two Rivers joint venture with ARM, company operations in Zimbabwe, recycling, and toll refining. In fiscal year 2010, output increased to 61,419 kg of PGM from 50,951 kg in fiscal year 2009; platinum production increased to 27,060 kg from 23,446 kg (Impala Platinum Holdings Ltd., 2010, p. 25, 95).

ARM and Implats operated the Two Rivers Mine in Mpumalanga Province; production increased to 9,230 kg of PGM in fiscal year 2010 from 7,661 kg in fiscal year 2009. In fiscal year 2011, total PGM production was expected to increase to about 9,300 kg. Platinum production was likely to increase to nearly 4,700 kg in fiscal year 2013 from 4,383 kg in fiscal year 2010 (African Rainbow Minerals Ltd., 2010, p. 33, 39).

Lonmin mined PGM at its Marikana operations east of Rustenburg in North West Province and at the Pandora Mine. From September 2009 to September 2010, these mines produced a total of 21,598 kg of platinum compared with 20,625 kg in the previous 12 months. Total production of PGM increased to 40,929 kg from 38,855 kg, 96% of which was produced at Marikana. Lonmin planned to increase platinum production to about 26,400 kg/yr by 2013; the company planned to mine from new shafts at Marikana. The feasibility study on increasing

platinum production at Pandora was completed during 2010 and was under review at yearend (Lonmin plc, 2010, p. 16, 146; Butler, 2011, p. 18).

Northam Platinum Ltd. operated the Zondereinde Mine; PGM production at Zondereinde decreased to about 8,100 kg in 2010 from 9,600 kg in 2009 because of labor disputes and safety stoppages. Production was expected to increase in 2011. Northam was engaged in a deepening project at Zondereinde that would maintain production at about 9,300 kg/yr over the remaining 18 years of the mine's life. The company also started development on the Booyssendal project in 2010. Mining was expected to start at Booyssendal in January 2013; Northam planned to produce about 5,000 kg/yr of PGM at full capacity (Butler, 2011, p. 18–19).

In 2010, Xstrata produced about 3,100 kg of PGM at the Eland Mine (formerly the Elandsfontein Mine) compared with about 3,900 kg in 2009; platinum production was nearly 1,900 kg in 2010. The company planned to increase platinum production to about 4,700 kg/yr by the end of 2013 and to 9,300 kg/yr by the end of 2015. The life of the Eland Mine was estimated to be about 21 years (Butler, 2011, p. 18–19; Xstrata plc, 2011, p. 61, 96).

Aquarius produced about 1,600 kg of platinum at the Blue Ridge and the Everest Mines in 2010. The Everest Mine reopened in May and the Blue Ridge Mine shut down for redevelopment in September. Aquarius planned to mine about 3,700 kg of PGM at Everest in fiscal year 2011, 5,600 kg in fiscal year 2012, and 6,200 kg/yr starting in fiscal year 2013. Platinum production was expected to reach between 3,700 and 4,000 kg/yr starting in fiscal year 2013. Reserves at Everest were estimated to be 62 t of contained PGM. Aquarius planned to reopen the Blue Ridge Mine in July 2011 and ramp up production to its full capacity of between 4,000 and 4,400 kg/yr of PGM by 2014 (Engineering & Mining Journal, 2010a; Butler, 2011, p. 19).

In 2010, Eastern Platinum Ltd. (Eastplats) of Canada mined 4,102 kg of PGM at the Crocodile River Mine, of which about 2,000 kg was platinum. Production was nearly unchanged from that of 2009. Eastplats restarted its expansion of the Crocodile River Mine in April; the company planned to increase platinum production to about 3,400 kg/yr by 2013. In November, the Government granted Eastplats the mining rights for the Mareesburg project. With the expansion of the Crocodile River Mine and the opening of the new Mareesburg Mine, Eastplats could increase its total PGM production to about 10,100 kg/yr by 2013 (De Bruyn, 2010; Butler, 2011, p. 19; Eastern Platinum Ltd., 2011).

In 2010, Platmin Ltd. of Canada produced nearly 1,900 kg of PGM from its Pilanesberg Mine on the western limb of the Bushveld Complex. Platmin planned to increase production to between 3,100 and 3,700 kg in 2011 (Butler, 2011, p. 20).

By fiscal year 2013, ARM planned to produce 3,400 kg/yr of PGM at the Nkomati nickel mine as nickel capacity increased. Output increased to 1,635 kg in fiscal year 2010 from 831 kg in fiscal year 2009 (African Rainbow Minerals Ltd., 2010, p. 38, 40, 42).

In 2010, Platinum Australia Pty Ltd. (PLA) of Australia produced about 960 kg of PGM at its Smokey Hills Mine; output was limited by geologic difficulties and labor disputes.

PLA planned to increase production to the mine's full capacity of about 3,000 kg/yr by March 2011 (Butler, 2011, p. 19–20; Piper, 2011).

In November 2010, PLA and joint-venture partner ARM completed a feasibility study with favorable results on the new open pit Kalplats Mine in 2010; ARM was reviewing the study at yearend. PLA hoped to increase the high-grade portion of the reserves through a drilling program. Production of gold, palladium, and platinum could be about 3,300 kg/yr during the 9-year life of the Kalplats Mine. Capital costs of the project were estimated to be about \$186 million. PLA also planned to complete a prefeasibility study on a new mine at the Rooderand project by yearend and a feasibility study by mid-2011. Depending on the results of the study, PLA could produce at least 3,700 kg/yr of PGM at Rooderand (Butler, 2011, p. 20; Piper, 2011).

In December 2010, Platinum Group Metals Ltd. of Canada announced plans to spend \$100 million on the development of the Western Bushveld Joint Venture project. The company and its joint-venture partner Wesizwe Platinum Ltd. planned to produce nearly 8,600 kg/yr of PGM at a new mine; initial production was expected to be in late 2013. Capital costs were estimated to be about \$433 million (Platinum Group Metals Ltd., 2011).

In May 2010, Jinchuan Group Ltd. of China and the China-Africa Development Fund (CADF) purchased a 51% interest in Wesizwe. CADF and Jinchuan planned to secure \$650 million in financing for the development of Wesizwe's Frischgewaagd-Ledig project, which could produce about 10,900 kg/yr of PGM (Butler, 2011, p. 20).

Vanadium.—Evraz Group S.A. produced vanadium from titaniferous magnetite at the Mapochs and the Krokodilkraal Mines, which were operated by Highveld and Vametco Minerals Corp., respectively. In 2010, production of vanadium at Mapochs in ferrovandium, vanadium pentoxide (V_2O_5), vanadium slag, and vanadium chemicals increased to 8,680 t from 6,192 t in 2009. The vanadium content of ferrovandium produced by Highveld increased to 5,932 t from 4,930 t (Evraz Highveld Steel and Vanadium Ltd., 2011, p. 16, 62).

Xstrata produced V_2O_5 at the Rhovan Mine in Brits; output increased to 9,922 t of V_2O_5 in 2010 from 5,213 t in 2009. Ferrovandium production at Rhovan increased to 4,311 t in 2010 from 2,284 t in 2009 (Xstrata plc, 2011, p. 96).

Industrial Minerals

Cement.—South Africa had four cement producers with a total capacity of 14.8 Mt/yr. Pretoria Portland Cement Co. (Pty) Ltd. (PPC) was South Africa's leading cement producer. Domestic sales of cementitious products decreased to 10.9 Mt from 11.8 Mt in 2009.

Sephaku Cement (Pty) Ltd. planned to build a new clinker and cement plant in North West Province with a capacity of 2.2 Mt/yr and a new cement plant in Delmas with a capacity of 1.2 Mt/yr. The plants were expected to be completed in 2012. The life of Sephaku's limestone quarry was estimated to be more than 50 years. In August 2010, Dangote Industries Ltd. of Nigeria increased its share in Sephaku Cement to 64% from 19.8% (Berryman, 2010).

Diamond.—In 2010, diamond production was 8.87 million carats compared with 6.11 million carats in 2009 and 10.78 million carats in 2000. From 2000 to 2010, employment in diamond mining decreased to 11,143 workers from about 15,000 (Chamber of Mines of South Africa, 2010, p. 21; 2011, p. 12, 20).

De Beers Group accounted for most of South Africa's rough diamond production. In 2010, the company's output increased to 7.56 million carats from 4.8 million carats in 2009. At Venetia, production increased to 4.29 million carats from 2.2 million carats; at Finsch, to 1.58 million carats from 1.43 million carats; at the Kimberley surface mining operations, to 823,000 carats from 397,000 carats; and at Voorspoed, to 732,000 carats from 532,000 carats. The Namaqualand Mine suspended production in March, and mining equipment used for marine operations was moved to Namibia. Output from the Namaqualand and marine operations amounted to 97,000 and 33,000 carats, respectively (De Beers Group, 2011, p. 18, 28).

In 2010, diamond production at the Cullinan Mine by Petra Diamonds Ltd. amounted to 922,581 carats; the Helam, the Sedibeng, and the Star Mines, 76,127 carats; the Koffiefontein Mine, 63,745 carats; and the Kimberley Underground Mine, 26,350 carats. Petra planned to ramp up production at Cullinan to 1 million carats in fiscal year 2012 and 2.4 million carats in fiscal year 2019. The company also planned to increase production at the Kimberley Underground Mine to 200,000 carats per year starting in fiscal year 2012, and at the Helam, the Sedibeng, and the Star Mines, to 200,000 carats per year by fiscal year 2019. Total resources at Petra's mines were estimated to be about 221 million carats, of which 203 million carats was attributable to the Cullinan Mine (Petra Diamonds Ltd., 2011a, p. 15, 24; 2011b, p. 9–12).

The Government encouraged domestic diamond cutting and polishing by imposing an export tax of 5% on rough diamond in 2007; exports of cut diamond were duty free. About 800 workers were employed in diamond cutting and polishing. The domestic industry was limited by a shortage of skilled workers, particularly for cutting large stones (Blauer, 2010).

Fluorspar.—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 in 2010; the Buffalo and the Witkop Mines held by Sallies Ltd. remained closed at yearend. Minersa was engaged in a feasibility study on a new aluminum fluoride (AlF₃) plant. Depending on favorable results of the study, the company and its joint-venture partners planned to produce 60,000 t/yr of AlF₃ from fluorspar mined at Vergenoeg (Roberts, 2010).

Sephaku Holdings planned to develop the Nokeng Fluorspar project. The company planned to build a new mine adjacent to the Vergenoeg Mine that could produce 130,000 t/yr of acid-grade fluorspar starting by the second half of 2013. Sephaku also planned to build a new processing plant that would consume 129,600 t/yr of fluorspar and 54,000 t/yr of sulfur in the production of 60,000 t/yr of hydrogen fluoride (HF). About 42,000 t/yr of HF was expected to be consumed in the production of 60,000 t/yr of AlF₃. Sephaku planned to sell its AlF₃ output to domestic and foreign aluminum producers. The remaining 18,000 t/yr of HF was likely to be sold on the open market (Sephaku Holdings Ltd., 2010).

Graphite.—By early 2011, the Jonkel Group planned to start a small-scale graphite mine in Limpopo Province that would produce about 100 t/yr of graphite for domestic consumption. South Africa's consumption of graphite was estimated to be more than 3,000 t/yr (Feytis, 2010).

Kyanite and Related Materials.—South Africa was the world's leading producer of andalusite. Imerys South Africa (Pty) Ltd. (a subsidiary of Imerys Group of France) produced at a combined rate of about 195,000 t/yr at the Annesley, the Havercroft, the Krugerspost, and the Thabazimbi (Rhino) Mines in late 2010. By 2014, the company planned to increase production to 250,000 t/yr through a debottlenecking program at Krugerspost and Thabazimbi and opening the Segorong Mine. Andalusite Resources (Pty) Ltd. produced at the rate of about 50,000 t/yr in late 2010. The company planned to increase production at its Maroeloesfontein Mine to between 80,000 t/yr and 100,000 t/yr by 2012 (Feytis, 2010).

Rare-Earth Elements and Thorium.—The Steenkampskraal Mine in Western Cape Province produced rare-earth elements from 1953 to 1963. Great Western Minerals Group Ltd. (GWMG) of Canada and Rare Earth Extraction Company Ltd. (Rareco) planned to complete a feasibility study on reopening the mine in November 2011. Depending on the results of the study, GWMG and Rareco could produce between 2,500 and 2,700 t/yr of rare-earth oxides from monazite at Steenkampskraal starting in late 2012. The companies also planned to process thorium from the monazite and store it until demand increased. The remaining life of the mine was estimated to be 10 years (Venter, 2010).

In November 2010, Frontier Rare Earths Ltd. of Luxembourg announced plans to complete a feasibility study on its Zandkopsdrift rare-earths project by the end of 2011 and a feasibility study in 2012. Depending on the results of the studies, Frontier could start mining by the end of 2012 and produce as much as 18,000 t/yr of rare earth oxides at Zandkopsdrift. Resources at Zandkopsdrift, which is in Northern Cape Province, were estimated to be about 38.9 Mt at a grade of 2.16% rare-earth oxides (Mining Engineering, 2010).

Wollastonite.—Namaqua Wollastonite (Pty) Ltd., which was South Africa's last remaining producer of wollastonite, shut down its mining operations in 1999. The company planned to restart mining and to produce 9,000 t of wollastonite at Magata in 2011. Namaqua planned to increase production to 17,400 t in 2012 and to 23,300 t/yr starting in April 2014. Wollastonite from Magata was likely to be used as a substitute for asbestos because its high iron content rendered it subeconomic in conventional wollastonite markets. Resources at Magata were estimated to be at least 3.2 Mt at a grade of 52% wollastonite (Feytis, 2010).

Mineral Fuels and Related Materials

Coal.—In 2010, coal production was 254.5 Mt compared with 250.5 Mt in 2009 and 225.5 Mt in 2000. From 2000 to 2010, the share of exports in South African coal sales, by volume, decreased to 26% from 31%. During the same period, employment in coal mining increased to 73,817 workers from about 51,000. More than 30% of South Africa's liquid fuels were produced from coal (Chamber of Mines of South Africa, 2010, p. 19; 2011, p. 12–13, 17).

Anglo American's coal production decreased to nearly 58.5 Mt in 2010 from 59.2 Mt in 2009. The New Vaal Mine produced 17.3 Mt in 2010; the Kriel Mine, 9.53 Mt; the Goedehoop Mine, 6.03 Mt; the New Denmark Mine, 5.05 Mt; the Isibonelo Mine, 4.57 Mt; and the Kleinkopje Mine, 4.42 Mt. The Zibulo Mine produced 1.66 Mt; production was expected to reach 6.6 Mt/yr in the fourth quarter of 2012 (Anglo American plc, 2011, p. 19, 197).

Other projects under consideration by Anglo American included the New Largo Mine, which could start production in 2013 and reach its full capacity of 15 Mt/yr of thermal coal by 2016, and the Elders opencast mine, which could start production in 2016 and reach its full capacity of 12.7 Mt/yr of thermal coal by 2020. These projects remained unapproved by the Board of Directors at the end of 2010 (Anglo American plc, 2011, p. 19).

Exxaro operated the Grootegeluk and the Tshikondeni Mines in Limpopo Province and the Arnot, the Inyanda, the Leeuwpan, the Mafube, the Matla, the New Clydesdale, and the North Block Complex Mines in Mpumalanga Province. The company's production amounted to about 46.8 Mt in 2010 compared with 45.3 Mt in 2009. The Grootegeluk Mine produced nearly 18.8 Mt of coal; the Matla Mine, 12.3 Mt; the Arnot Mine, 4.17 Mt; the North Block Complex Mine, 3.37 Mt; and the Leeuwpan Mine, 3.1 Mt (Exxaro Resources Ltd., 2011, p. 10).

Exxaro planned to expand the capacity of the Grootegeluk Mine by 14.6 Mt/yr. The expansion project was expected to start production in the second quarter of 2012; total production from Grootegeluk could reach more than 33 Mt/yr by 2015. In June 2010, Exxaro signed an agreement to supply Eskom's new Medupi power station with the coal from the Grootegeluk expansion (Ryan, 2010a; Exxaro Resources Ltd., 2011, p. 60).

In December 2010, Exxaro completed a prefeasibility study on the development of the new Belfast Mine. The company planned to decide on conducting a feasibility study in the first quarter of 2011. Depending on the results of the study, Exxaro could produce between 3 Mt/yr and 5 Mt/yr at Belfast; mining could start in 2014. The company was also engaged in a prefeasibility study on the development of the new Thabametsi Mine adjacent to Grootegeluk. The Thabametsi Mine could produce between 6 Mt/yr and 17 Mt/yr beginning in 2016. Development of the project depended on the outcome of the prefeasibility study, enabling regulation from the Department of Energy for independent power producers, upgrades to the rail network, and expansions of water supplies (Ryan, 2010a; Exxaro Resources Ltd., 2011, p. 60).

In fiscal year 2010, Sasol Ltd. of South Africa increased its salable coal production to 41 Mt from 39.1 Mt in fiscal year 2009; output increased at all the company's mines. Total production was 42.6 Mt, of which the Syferfontein Mine accounted for 9.9 Mt; the Middelbult Mine, 8.5 Mt; the Brandspruit Mine, 8 Mt; the Bosjesspruit Mine, 7.6 Mt; the Twistdraai Mine, 6.6 Mt; and the Mooikraal Mine, 2 Mt. In 2011, Sasol planned to start construction on the new Thubelisha Mine to replace the Twistdraai Mine (Sasol Ltd., 2010, p. 45–46).

BHP Billiton Energy Coal South Africa Ltd. (BESCA) produced coal at the Douglas, the Khutala, the Klipspruit, and

the Middleburg Mines in Mpumalanga Province. In 2010, the company produced 32.5 Mt of coal compared with 29.6 Mt in 2009. BESCA completed the expansion of the Klipspruit Mine in fiscal year 2010 (BHP Billiton Ltd., 2010a, p. 47, 49; 2010b, p. 4; 2011, p. 4).

Xstrata operated coal mines at Breyten, Ermelo, and Witbank. In 2010, production at the company's mines remained nearly unchanged at 18.8 Mt. Output at the Southstock Division decreased to 4.12 Mt from 4.72 Mt; at the Tweefontein Division, to 4.76 Mt from 5.27 Mt, and at the Mpumalanga Division, to 1.11 Mt from 1.7 Mt. Production at the iMpunzi Division increased to 4.45 Mt in 2010 from 4.01 Mt in 2009, and at the Goedgevonden Mine, to 4.4 Mt from 3 Mt (Xstrata plc, 2011, p. 97).

ARM and Xstrata were engaged in a joint venture to increase output at the Goedgevonden Mine to 6.7 Mt/yr. About 3.5 Mt/yr of coal was expected to be consumed domestically and about 3.2 Mt/yr would be exported. ARM and Xstrata planned to reach full capacity at Goedgevonden in 2011. The life of the mine was expected to be 31 years. At the end of 2010, Xstrata had completed 57% of the construction of the ATCOM East project, which was expected to produce an additional 4 Mt/yr of coal. Mining was likely to start in 2011. The company also planned to complete a feasibility study on the Tweefontein Optimisation project in 2011. Depending on the results of the study, production at Tweefontein could increase by 4 Mt/yr (African Rainbow Minerals Ltd., 2010, p. 58, 61–62; Xstrata plc, 2011, p. 65).

Shanduka Coal (Pty) Ltd. [Glencore International AG of Switzerland, 70%, and Shanduka Resources (Pty) Ltd., 30%] operated the Bankfontein, the Graspan, the Lakeside, the Leeuwfontein, and the Townlands Mines, which together produced 9.1 Mt of run-of-mine coal in 2010. Shanduka Resources also held a 30% interest in Kangra Group (Pty) Ltd., which produced 4.1 Mt of run-of-mine coal at the Savmore and the Welgedacht Mines. Kangra had coal resources of more than 320 Mt, and Shanduka, more than 115 Mt (Sentula Mining Ltd., 2011).

Optimum Coal Holdings (Pty) Ltd. operated the Optimum and the Koornfontein Mines, which produced 10.8 Mt of salable coal in fiscal year 2010. The company started production at the Boshmanspoort expansion project in 2010, which increased output at the Optimum Mine. The life of the project was estimated to be 11 years. Optimum planned to increase its output to 14.2 Mt in fiscal year 2011; the company planned further increases in production by opening the Vlakkfontein project in 2013 or 2014. Production at Vlakkfontein was expected to be 2.5 Mt/yr (Cornish, 2011).

Total Coal South Africa (TCSA) operated the Dorsfontein, the Forzando North, the Forzando South, and the Tumelo Mines. In 2010, Forzando North and Forzando South produced 1 Mt/yr of salable coal each; Dorsfontein, 700,000 t/yr; and Tumelo, between 500,000 and 600,000 t/yr. TCSA planned to open the new Dorsfontein East Mine in mid-2011, and the mine was expected to reach full capacity of 2 Mt/yr starting in September or October 2011. The life of the Dorsfontein East Mine was estimated to be 22 years; the Forzando South Mine, more than 20 years; and the Forzando North Mine, 10 years. The

Dorsfontein Mine was expected to be shut down at the end of 2012 (Mining Review Africa, 2010a).

Coal of Africa Ltd. of Australia started thermal coal production at the Mooiplaats Mine in October 2008; the company was ramping up production to 2 Mt/yr. Production was likely to start at the new Vele and the Makhado projects in 2011 and 2012, respectively. The combined output at Makhado and Vele was expected to be 2 Mt/yr of metallurgical coal initially and to increase to 10 Mt/yr. Coal of Africa also purchased NuCoal Mining (Pty) Ltd., which produced 2.5 Mt/yr of coal at the Woestalleen Mine (Coal of Africa Ltd., 2010).

Continental Coal Ltd. started production at the Vlakvarkfontein project in May 2010 and purchased the Ferreira project in November. The company planned to produce 1.2 Mt/yr of run-of-mine coal at Vlakvarkfontein and 0.7 Mt/yr at Ferreira. Continental also planned to produce between 6 Mt/yr and 7 Mt/yr of run-of-mine coal at the DeWittekrans Complex, 2.4 Mt/yr at Vlakplaats, and 0.9 Mt/yr at Penumbra, which was expected to replace Ferreira. Mining was planned to start at DeWittekrans and Penumbra in 2011, and at Vlakplaats, in 2013. Continental's run-of-mine production was likely to be about 7 Mt/yr in 2012 (Continental Coal Ltd., 2011).

Universal Coal plc of the United Kingdom planned to start development of the Kangala project by the end of 2010. The company was also engaged in feasibility studies on the Brakfontein and the Roodekop projects. Depending on favorable results of the studies, Universal could start development at Brakfontein and Roodekop by the end of 2011 and in 2012, respectively. Universal planned to mine 6 Mt/yr of coal by 2014, of which 3 Mt/yr would be attributable to Kangala (Wait, 2010).

Uranium.—AngloGold Ashanti mined uranium as a coproduct of gold at the Great Noligwa, the Kopanang, and the Tau Lekoa Mines. In 2010, the company's production of uranium oxide (U_3O_8) amounted to 663 t compared with 654 t in 2009. Output was expected to decrease to about 570 t in 2011. AngloGold Ashanti planned to increase uranium production from Kopanang by between 270 and 360 t/yr of U_3O_8 ; the company planned to start ramping up production in 2012. Over the life of the Kopanang Mine, the project could produce nearly 1,500 t of additional U_3O_8 . AngloGold Ashanti's total production was expected to increase to about 900 t/yr (Jones, 2009; AngloGold Ashanti Ltd., 2011, p. 70–71).

First Uranium started uranium production at the Ezulwini Mine in 2009; the company planned to increase production to about 360 t of U_3O_8 in 2018 and more than 500 t/yr from 2019 to at least 2030. At MWS, First Uranium planned to start uranium production in 2012. Output was expected to be 225 t of U_3O_8 in 2012, 430 t in 2014, 470 t in 2016, and at least 350 t/yr thereafter until 2025 (van der Mescht, 2010, p. 11, 29).

By June 2011, Harmony planned to complete a feasibility study on the TPM project, which would recover uranium from newly mined gold ore at Masimong, Phakisa, and Tshepong. Depending on favorable results of the study, construction could take between 18 and 24 months and to reach full production of nearly 380 t/yr of U_3O_8 in an additional 27 months. The estimated life of the project was 17 years. Harmony also planned to complete a prefeasibility study on recovering uranium from gold mine tailings in Free State by June 2011. The company

was considering the reopening of the St. Helena plant and the expansion of the Saaiplaas plant to recover uranium. Depending on favorable results of the study, Harmony could produce about 350 t/yr of U_3O_8 from tailings (Harmony Gold Mining Company Ltd., 2011b).

Rand Uranium was considering the production of about 1,000 t/yr of U_3O_8 from the Cooke Dam project, which was also expected to produce gold. The capital cost of the project was estimated to be \$528 million (Mining Journal, 2011).

Outlook

Numerous producers planned new mines and plants and capacity expansions of existing operations for andalusite, cement, chromite, coal, diamond, ferrochromium, ferromanganese, fluorspar, gold, iron ore, manganese ore, nickel, PGM, rare-earth elements, uranium, and wollastonite. Power shortages could constrain mining and mineral processing expansions from 2011 to 2016. Shortfalls in power supplies are highly likely in 2012 and 2013 because of increasing demand and lack of new supply until Eskom's new coal-fired Kusile and Medupi power stations are commissioned. Expansions and new mines and plants are less likely to take place in power-intensive sectors, such as ferrochromium and deep underground gold and PGM mines unless producers provided their own power. PGM mines consumed an estimated 23,300 kilowatt hours (kWh) per kilogram of PGM recovered compared with between 13 and 20 kWh per metric ton of iron ore mined and beneficiated (Ryan, 2010b; Bleiwas, 2011, p. 60, 87).

Increases in coal and manganese exports also depend upon the likely increased capacity on the rail lines and at ports. Manganese capacity at Port Elizabeth is expected to increase to 6 Mt/yr. Other challenges include acid mine drainage, which, without efforts at remediation, is expected to contaminate water supplies in Johannesburg by 2014 (Zeelie, 2010).

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TABLE 1
SOUTH AFRICA: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity	2006	2007	2008	2009	2010	
METALS						
Aluminum metal, primary	895,000	899,000	811,000	809,000	807,000	
Antimony concentrate, Sb content	4,362	3,354	3,983 ^r	2,673 ^r	2,800 ^e	
Chromium, gross weight:						
44% to 48% chromic oxide	thousand metric tons	1,755	2,122	2,135	1,296	807
Less than 44% chromic oxide	do.	5,663	7,543	7,547	6,265 ^r	10,064
Total	do.	7,418	9,665	9,682	7,561	10,871
Cobalt:						
Mine output, Co content ^c	400	400	400	400	400	
Refinery output	267	307	244	238	840	
Copper:						
Mine, Cu content	89,500 ^r	97,000	108,700 ^r	107,600 ^r	102,600	
Metal:						
Smelter	98,900 ^r	111,900 ^r	94,800 ^r	86,900 ^r	75,900	
Refined, primary	104,052	113,166	92,972	89,453	81,129	
Gold:						
Mine	kilograms	272,128	252,598	212,571	197,628	188,701
Refined ^e	do.	427,313 ²	400,000	360,000	330,000	320,000
Iron and steel:						
Ore and concentrate:						
Gross weight	thousand metric tons	41,326	42,083	48,983	55,313	58,709
Fe content (62%–65%)	do.	26,000	26,500	30,800	34,800	36,900
Metal:						
Pig iron	do.	6,159	5,358	5,350	4,376	8,220
Direct-reduced iron	do.	1,754	1,736	1,190	1,340 ^r	1,845
Ferroalloys, electric arc furnace:						
Chromium ferroalloys	do.	3,030	3,552	3,269	2,346	3,607
Ferromanganese	do.	656	699	503	275 ^r	540 ^e
Ferrosilicon	do.	149	140	135	110	125 ^e
Ferrovandium ^e	do.	18	19	19	14 ^r	19
Silicomanganese ^e	do.	247	302	233	115 ^r	225
Silicon metal	do.	53	50	52	39	49 ^e
Total ^e	do.	4,150	4,760	4,210	2,900 ^r	4,570
Steel:						
Crude	do.	9,718	9,098	8,269	7,484	8,480
Stainless	do.	725	657	613	390	320 ^e
Lead:						
Concentrate, Pb content	48,273	41,857	46,440	49,149	50,625	
Refined, secondary ^e	67,000 ²	70,000	70,000	65,000	67,000	
Manganese:						
Ore and concentrate, gross weight:						
Metallurgical:						
More than 48% manganese	thousand metric tons	1,452	1,742	712	--	847
45% to 48% manganese	do.	1,812	1,755	2,897	2,121	1,683
40% to 45% manganese	do.	895	961	1,192	498	843
30% to 40% manganese	do.	1,042	1,523	1,996	1,949 ^r	3,783
Total	do.	5,201	5,981	6,797	4,568 ^r	7,156
Chemical, 35% to 65% manganese dioxide	do.	12	14	9	11	15
Grand total	do.	5,213	5,995	6,806	4,579 ^r	7,172
Metal, electrolytic ^e	do.	30	26	20 ^r	11 ^r	12
Nickel:						
Mine output, concentrate, Ni content	41,800	37,917	31,675	34,605	39,960	
Metal, electrolytic	41,500 ^r	39,500 ^r	32,800 ^r	37,300 ^r	38,400	

See footnotes at end of table.

TABLE 1—Continued
SOUTH AFRICA: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity		2006	2007	2008	2009	2010
METALS—Continued						
Platinum-group metals:						
Mine:						
Iridium	kilograms	6,172	7,211	6,415	6,378	6,445
Platinum	do.	168,125	160,940	146,141	140,819	147,790
Palladium	do.	86,265	83,643	75,537	75,117 ^r	82,222
Rhodium	do.	19,633	21,056	19,348	20,007	20,001
Ruthenium	do.	27,333	31,182	28,236	29,071	30,846
Total	do.	307,528	304,032	275,677	271,393	287,304
Refined:						
Platinum	do.	173,000	163,800	149,900	149,500	156,600
Palladium	do.	92,470	89,100	80,640	86,610	94,990
Rhodium	do.	21,300	21,500	20,000	21,600	21,400
Silver, mine	do.	86,951	68,919	75,199	77,780	79,315
Titanium: ^e						
Ilmenite concentrate	thousand metric tons	1,900	1,900	1,900	2,100	1,800
Rutile concentrate	do.	123	123	123	122	123
Total	do.	2,020	2,020	2,020	2,220	1,900
Titaniferous slag	do.	1,230	1,230	1,230	1,250	1,100
Uranium, U ₃ O ₈ content		639	619	654	629	682
Vanadium, vanadium metal content		23,780	23,486	20,295	14,353	22,606
Zinc:						
Concentrate, Zn content		34,444	30,859	29,002	28,159	36,142
Metal, smelter, primary		90,000	101,000	87,000	87,000	90,000
Zirconium concentrate (baddeleyite and zircon) ^e		398,000	398,000	398,000	387,000	376,000
INDUSTRIAL MINERALS						
Andalusite		221,209	264,645	216,667	165,217 ^r	200,000 ^e
Cementitious products:						
Cement, finished product, sales	thousand metric tons	12,657	13,650	13,473	11,784	10,870
Granulated slag, fly ash, and others, sales	do.	1,600	1,666	1,396	1,200 ^e	1,100 ^e
Total	do.	14,257	15,316	14,869	13,000 ^e	12,000 ^e
Clays:						
Attapulgit		49,225	68,377	69,876	54,418 ^r	85,336
Bentonite		32,878	45,778	44,067	40,340	54,311
Brick clay, local sales	thousand metric tons	11,131	12,017	9,706	8,763 ^r	6,923
Fire clay		157,087	161,493	138,100	120,162	551,612
Flint clay, raw and calcined		34,413	53,974	47,290	37,227	39,690
Kaolin		51,602	50,839	39,197	31,048	29,929
Diamond, natural:						
Gem ^c	thousand carats	6,100	6,100	5,200	2,500	3,600
Industrial ^c	do.	9,050	9,150	7,700	3,600	5,400
Total	do.	15,153	15,250	12,895	6,113 ^r	8,868
Feldspar		76,722	90,185	105,815	101,394	94,307
Fluorspar:						
Acid-grade ^e		240,000	268,000	282,000	130,000	130,000
Metallurgical-grade ^e		16,000	17,000	17,000	10,000	10,000
Total		256,000	285,000	299,000	140,000	140,000
Gypsum, crude		554,020	627,377	571,343	597,571	513,310
Industrial or glass sand (silica)	thousand metric tons	3,234	3,385	3,342	2,306	2,905
Lime	do.	1,583	1,599	1,563	1,368 ^r	1,291
Magnesite, crude		73,300	80,700	83,900	47,600 ^r	48,000 ^e
Mica, scrap and ground		828	437	426	572 ^r	904
Nitrogen, N content of ammonia ^e		460,000	460,000	460,000	460,000	460,000
Perlite ^e		400	400	400	400	400

See footnotes at end of table.

TABLE 1—Continued
SOUTH AFRICA: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity		2006	2007	2008	2009	2010
INDUSTRIAL MINERALS—Continued						
Phosphate rock:						
Gross weight	thousand metric tons	2,629	2,556	2,287	2,237	2,494
Phosphorus pentoxide content	do.	986	959	858	839	935
Pigments, mineral, natural:						
Ochers		372	20	39	--	--
Oxides		218	212	--	183	244
Total		590	232	39	183	244
Salt		464,909	411,511	429,888	408,422	394,493
Sodium sulfate, natural		43,303	50,000	38,717	43,835	37,369
Stone, n.e.s.: ³						
Dimension:						
Granite and norite		497,600	564,100	457,965	334,589 ^r	272,531
Slate		33,154	22,876	25,538	25,841 ^r	48,114
Crushed and broken:						
Limestone and dolomite	thousand metric tons	27,366	23,941	23,481	18,568 ^r	17,927
Shale:						
For cement	do.	533	498	418	462	388
Other	do.	1,010	1,031	814	975 ^r	570
Total	do.	1,543	1,529	1,232	1,437 ^r	958
Aggregate and sand, n.e.s.: ³	do.	58,519	63,873	58,608	53,604 ^r	52,356
Sulfur:						
S content of pyrite	do.	68	71	61	60	30
Byproduct:						
Metallurgy	do.	231	236	187	185 ^r	165 ^e
Petroleum	do.	343	335	323	291 ^r	262 ^e
Total	do.	643	642	571	536	457
Talc and related materials:						
Talc		10,966	14,281	5,145	4,718	3,150
Pyrophyllite (wonderstone)		74,886	123,573	80,704	114,889	122,511
Vermiculite		197,765	198,526	199,764	193,334	199,285
MINERAL FUELS AND RELATED MATERIALS						
Coal (salable product):						
Anthracite	thousand metric tons	1,584	2,349	2,207	1,658	2,074
Bituminous	do.	243,198	245,317	250,492	240,880 ^r	252,448
Total	do.	244,782	247,666	252,699	250,538 ^r	254,522
Natural gas	million cubic meters	2,888 ^r	3,002 ^r	1,812 ^r	1,048 ^r	963
Petroleum: ⁴						
Crude	thousand 42-gallon barrels	4,441	2,559	1,976	1,070	1,358
Refinery products:						
Liquefied petroleum gases	do.	3,793	3,399	3,283	3,200 ^e	3,200 ^e
Gasoline	do.	67,711	67,182	69,741	68,000 ^e	68,000 ^e
Jet fuel	do.	15,300	13,386	14,028	13,500 ^e	13,500 ^e
Kerosene	do.	4,824	4,715	4,800	4,700 ^e	4,700 ^e
Distillate fuel oil	do.	73,653	46,394	50,459	49,000 ^e	49,000 ^e
Residual fuel oil	do.	32,674	27,426	28,751	28,000 ^e	28,000 ^e
Other, includes lubricants and greases ^e	do.	17,000	14,000	15,000	14,500	14,500
Total ^{e,5}	do.	215,000	177,000	186,000	181,000	181,000

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

¹Table includes data available through December 30, 2011.

²Reported figure.

³Not elsewhere specified.

⁴In addition, Sasol Ltd. produced about 67 million barrels per year of synthetic liquid petroleum fuels from coal.

⁵Excludes refinery fuel and losses.

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

TABLE 2
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum	BHP Billiton Ltd.	Hillside smelter at Richards Bay	715.
Do.	do.	Bayside smelter at Richards Bay	96.
Andalusite	Samrec Pty. Ltd. [Imerys (Pty) Ltd., 100%]	Thabazimbi Mine near Thabazimbi	120.
Do.	do.	Annesley Mine at Penge	75.
Do.	do.	Havercroft Mine at Penge	60.
Do.	do.	Krugerspost Mine, near Lydenburg	50.
Do.	Andalusite Resources (Pty) Ltd. [African Mineral Trading and Exploration (Pty) Ltd.]	Maroeloesfontein, near Thabazimbi, Northern Province	50.
Antimony	metric tons Consolidated Murchison Ltd. (Metorex Pty. Ltd., 100%)	Consolidated Murchison Mine near Gravelotte	7,000 antimony in concentrate.
Cement	Pretoria Portland Cement Co. (Pty) Ltd. (Barlworld Trust Co. Ltd., 68%)	De Hoek, Dwaalboom, Hercules, Jupiter, Port Elizabeth, Riebeeck, and Slurry plants	6,800.
Do.	Alpha Ltd. [AfriSam Consortium (Pty) Ltd., 48.5%]	Dudfield and Ulco plants	3,700.
Do.	Lafarge South Africa Ltd. (Lafarge S.A.)	Lichtenburg plant in North West Province	2,700.
Do.	Natal Portland Cement Co. (Pty) Ltd. (Cimentos de Portugal SGPS, S.A., 98%)	Simumu plant	1,640.
Chromite	Xstrata plc, 79.5%, and Merafe Resources Ltd., 20.5%	Thorncliffe Mine at Steelpoort	995.
Do.	do.	Kroondal Mine at Rustenburg	850.
Do.	do.	Helena Mine at Steelpoort	825.
Do.	do.	Waterval Mine ¹	650.
Do.	do.	Horizon Mine at Pilansberg ¹	260.
Do.	Samancor Chrome Ltd. (International Mineral Resources BV, 70%)	Eastern Chrome Mines in Steelpoort Valley, Mpumalanga Province	2,000.
Do.	do.	Western Chrome Mines in Northern Province ¹	1,500.
Do.	Hernic Ferrochrome (Pty) Ltd. (Mitsubishi Corp., 51%)	Bokfontein Mine	1,500.
Do.	International Ferro Metals Ltd.	Lesedi Mine	1,320.
Do.	Nkomati Joint Venture (African Rainbow Minerals Ltd., 50%, and MMC Norilsk Nickel, 50%)	Nkomati Chrome Mine in Mpumalanga Province	1,000.
Do.	Assmang Ltd. (African Rainbow Minerals Ltd., 50%, and Assore Ltd., 50%)	Dwarsrivier Mine in Mpumalanga Province	880. ^e
Do.	Bayer (Pty) Ltd.	Rustenburg Chrome Mine	450.
Do.	Dilokong Chrome Mine (Pty) Ltd. [ASA Metals (Pty) Ltd., 100%]	Dilokong Mine, near Burgersfort in Mpumalanga Province	360. ^e
Do.	National Manganese Mines (Pty) Ltd.	Buffelsfontein Mine at Mooinooi	180.
Coal	Anglo Coal Ltd. (Anglo American plc, 100%)	Goedehoop, Greenside, Isibonelo, Kleinkopje, Kriel, Landau, Mafube, New Denmark, New Vaal, and Nooitgedacht Mines	60,000. ^e
Do.	Exxaro Resources Ltd. (BEE Holdco, 52.3%)	Grootegeeluk Mine in Limpopo Province	18,600.
Do.	do.	Matla Mine in Mpumalanga Province	14,000.
Do.	do.	Arnot Mine in Mpumalanga Province	5,000.
Do.	do.	North Block Mine in Mpumalanga Province	3,000.
Do.	do.	Leeuwan Mine in Mpumalanga Province	2,500.
Do.	do.	Inyanda Mine	2,000. ^e
Do.	do.	New Clydesdale Mine in Mpumalanga Province	1,400.
Do.	do.	Tshikondeni Mine in Limpopo Province	414.
Do.	Anglo American plc, 50%, and Exxaro Resources Ltd., 50%	Mafube Mine	5,000.
Do.	Sasol Ltd.	Syferfontein Mine	9,400.
Do.	do.	Brandspruit Mine	8,600.
Do.	do.	Middelbult Mine	8,300.
Do.	do.	Bosjesspruit Mine	8,000.
Do.	do.	Twistdraai Mine	7,400.

See footnotes at end of table.

TABLE 2—Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners		Location of main facilities	Annual capacity
Coal—Continued	Sasol Ltd.		Mooikraal Mine	1,900.
Do.	BHP Billiton Energy Coal South Africa Ltd., 84%, and Xstrata plc, 16%		Middelburg Mine	17,000 bituminous.
Do.	BHP Billiton Energy Coal South Africa Ltd.		Khutala underground mine	15,100 bituminous.
Do.	BHP Billiton Energy Coal South Africa Ltd., 84%, and Xstrata plc, 16%		Douglas Mine	8,500 bituminous.
Do.	BHP Billiton Energy Coal South Africa Ltd.		Klipspruit Mine	4,800 bituminous.
Do.	Xstrata plc, 74%		Goedevonden Mine at Witbank	6,000.
Do.	Xstrata plc, 79.8%		Southstock Division at Witbank	5,700.
Do.	do.		iMpunzi Division (Phoenix and Tavistock Mines) at Witbank	5,400.
Do.	do.		Tweefontein Division (Boschmans, South Witbank, Waterpan, and Witcons Mines) at Witbank	5,200.
Do.	do.		Mpumalanga Division (Spitzkop and Tselentis Mines) at Breyten and Ermelo	2,800.
Do.	Optimum Coal Holdings (Pty) Ltd		Optimum Mine	13,500 bituminous.
Do.	do.		Koornfontein Mines	5,200 bituminous.
Do.	Shanduka Coal (Pty) Ltd. [Glencore International AG, 70%, and Shanduka Resources (Pty) Ltd., 30%]		Bankfontein, Graspan, Lakeside, Leeuwfontein, and Townlands Mines	13,000.
Do.	Coal of Africa Ltd.		Woestalleen Mine	2,500.
Do.	do.		Mooiplaats Mine	2,000.
Do.	Kangra Group Pty. Ltd. [Shanduka Resources (Pty) Ltd., 30%]		Savmore and Welgedacht Mines	3,000. ^c
Do.	Stuart Coal Group		Stuart Colliery	3,000. ^c
Do.	Total Coal SA (Pty) Ltd.		Forzando North and Forzando South Mines	2,000. ^c
Do.	do.		Dorsfontein Mine	700. ^c
Do.	do.		Tumelo Mine	600. ^c
Copper	Palabora Mining Co. Ltd. (Rio Tinto Ltd., 57%, and Anglo American plc, 29%)		Palabora Mines at Phalaborwa	80 copper in concentrate.
Do.	do.		Smelter at Phalaborwa	130 anodes.
Do.	do.		Refinery at Phalaborwa	130 cathodes.
Do.	Anglo Platinum Ltd. (Anglo American plc, 74.1%)		Amandebult, Rustenburg, and Union sections; and Bafokeng Rasimone, Lebowa, Modikwa, Potgietersrust, and Western Limb Mines	13 mine. ^c
Do.	do.		Rustenburg Base Metal Refiners	12 refined. ^c
Do.	Black Mountain Mineral Development Co. (Pty) Ltd. (Anglo American plc, 74%)		Black Mountain Mine near Aggeneys in Northern Cape Province	6 copper in concentrate.
Diamond	thousand carats	De Beers Consolidated Mines Ltd. (Anglo American plc, 29%)	Venetia Mine in Northern Province	7,500.
Do.	do.	do.	Finsch Mine, 100 kilometers west of Kimberley	2,800.
Do.	do.	do.	Kimberley surface mines, Kimberley	1,500.
Do.	do.	do.	Namaqualand Mine near Kleinsee	1,200.
Do.	do.	do.	Voorspoed Mine	800.
Do.	do.	do.	South Africa Sea Areas ¹	240.
Do.	do.	Petra Diamonds Ltd.	Cullinan Mine	1,800.
Do.	do.	do.	Helam, Sedibeng, and Star Mines	175.
Do.	do.	do.	Koffiefontein Mine in Free State Province	120.
Do.	do.	do.	Kimberley underground mines, Kimberley ¹	100.
Do.	do.	Trans Hex Group Ltd.	Baken, Bloeddrif, Reuning, and Saxendrift Mines	140. ^c
Fluorspar		Witkop Fluorspar Mine (Pty) Ltd. (subsidiary of Sallies Ltd.)	Witkop Mine at Zeerust ¹	180.
Do.		do.	Buffalo Mine at Mookgopong ¹	60.

See footnotes at end of table.

TABLE 2—Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners		Location of main facilities	Annual capacity
Fluorspar—Continued	Vergenoeg Mining Corp. (Pty) Ltd. (Minerales Y Productos Derivados SA , 85%)		Vergenoeg Mine at Rust de Winter	120.
Gold:				
Mine	AngloGold Ashanti Ltd. (Anglo American plc, 41.8%)		Vaal River operations:	
			Kopanang Mine	5,000 ore.
Do.	kilograms	do.	do.	34,000 gold.
Do.		do.	Great Nologwa Mine	2,700 ore.
Do.	kilograms	do.	do.	15,000 gold.
Do.		do.	Tau Lekoa Mine	5,000 ore.
Do.	kilograms	do.	do.	17,000 gold.
Do.		do.	Moab Khotsong Mine	1,200 ore.
Do.	kilograms	do.	do.	11,000 gold.
Do.		do.	West Wits operations:	
			Tau Tona Mine	2,160 ore.
Do.	kilograms	do.	do.	16,000 gold.
Do.		do.	Savuka Mine	2,160 ore.
Do.	kilograms	do.	do.	12,000 gold.
Do.		do.	Mponeng Mine	1,920 ore.
Do.	kilograms	do.	do.	17,000 gold.
Do.		Gold Fields Ltd.	Kloof Mine	3,960 ore.
Do.	kilograms	do.	do.	24,000 gold.
Do.		do.	Driefontein Mine	6,660 ore.
Do.	kilograms	do.	do.	28,000 gold.
Do.		do.	Beatrix Mine	4,920 ore.
Do.	kilograms	do.	do.	20,000 gold.
Do.		do.	South Deep Mine	2,640 ore.
Do.	kilograms	do.	do.	12,000 gold.
Do.	do.	Harmony Gold Mining Co. Ltd.	Kusasaletu Mine	9,700 gold.
Do.	do.	do.	Phakisa Mine	7,800 gold.
Do.	do.	do.	Tshepong Mine	7,200 gold.
Do.	do.	do.	Doornkop Mine	6,500 gold.
Do.	do.	do.	Target Mine	6,200 gold.
Do.	do.	do.	Masimong Mine	5,000 gold.
Do.	do.	do.	Bambanani Mine	4,000 gold.
Do.	do.	do.	Evander Mine	2,800 gold.
Do.	do.	do.	Virginia Mine	2,600 gold.
Do.	do.	do.	Joel Mine	2,500 gold.
Do.	do.	do.	Surface operations	1,900 gold.
Do.	do.	do.	Kalgold Mine	1,400 gold.
Do.		DRDGold Ltd.	Blyvooruitzicht Mine	4,800 ore.
Do.	kilograms	do.	do.	4,800 gold.
Do.		do.	Crown Mine	11,760 ore.
Do.	kilograms	do.	do.	4,500 gold.
Do.	do.	do.	Ergo Mine	1,100 gold. ^e
Do.	do.	Great Basin Gold Ltd.	Burnstone Mine	7,900 gold.
Do.	do.	First Uranium Corp.	Ezulwini Mine	4,400 gold.
Do.	do.	do.	Mine Waste Solutions Project (MWS)	2,200 gold.
Do.	do.	Gold One International Ltd.	Modder East Mine	5,600 gold.
Do.	do.	Simmer and Jack Mines Ltd.	Buffelsfontein and Tau Lekoa Mines	4,000 gold.
Do.	do.	White Water Resources Ltd.	East Rand Proprietary Mine	2,700 gold.
Do.	do.	Barberton Mines Ltd. [Metorex Ltd., 54%, and Shanduka Resources (Pty) Ltd., 26%]	Eastern Transvaal Consolidated Division (Fairview, New Consort, and Sheba Mines)	3,200. ^e
Do.	do.	Central Rand Gold Ltd.	Central Rand Goldfield near Johannesburg	1,200 gold.
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 2010

(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	41,000.
Do.	do.	Thabazimbi Mine at Thabazimbi	2,700.
Do.	Assmang Ltd.	Khumani Mine	10,000.
Do.	do.	Beeshoek Mine near Postmasburg	6,000.
Do.	Highveld Steel and Vanadium Corp. Ltd. (Ervaz Group S.A., 79%)	Mapochs Mine at Roossenekal	2,450.
Do.	Xstrata plc	Rhovani Mine at Brits	400.
Do.	Vametco Minerals Corp. (Ervaz Group S.A., 81%)	Krokodilkraal Mine and plant near Brits	180.
Ferroalloys	Xstrata plc, 79.5%, and Merafe Resources Ltd., 20.5%	Wonderkop	553 ferrochromium.
Do.	do.	Rustenburg	430 ferrochromium.
Do.	Xstrata plc, 69.6%, and Merafe Resources Ltd., 30.4%	Lydenburg	396 ferrochromium.
Do.	Xstrata plc, 79.5%, and Merafe Resources Ltd., 20.5%	Lion plant at Steelpoort	360 ferrochromium.
Do.	do.	Boshoek	240 ferrochromium.
Do.	Samancor Chrome Ltd.	Plants at Middelburg, Steelpoort, and Witbank	1,300 ferrochromium.
Do.	Hernic Ferrochrome (Pty) Ltd. (Mitsubishi Corp., 51%)	Plant at Brits	420 ferrochromium.
Do.	ASA Metals (Pty) Ltd. (Sinosteel, 60%, and Limpopo Economic Development Enterprise, 40%)	Plant near Pietersburg, Northern Province	400 ferrochromium.
Do.	Assmang Ltd.	Machadodorp plant in Mpumalanga Province	250 ferrochromium.
Do.	International Ferro Metals Ltd.	Plant in North West Province	267 ferrochromium.
Do.	Tata Steel Ltd.	Richards Bay	151 ferrochromium.
Do.	Samancor Manganese (Pty) Ltd. (BHP Billiton Ltd., 60%, and Anglo American plc, 40%)	Plant at Meyerton	490 ferromanganese; 125 silicomanganese.
Do.	Assmang Ltd.	Cato Ridge plant in KwaZulu Natal Province	300 ferromanganese.
Do.	Advalloy (Pty) Ltd. [Samancor Manganese (Pty) Ltd., 100%]	Furnace at Samancor's Meyerton plant	82 ferromanganese.
Do.	Renova Group	Plant at Witbank	48 ferromanganese.
Do.	do.	do.	170 silicomanganese.
Do.	Silicon Technology Pty Ltd.	NA	55 ferrosilicon.
Do.	Grupo Ferroatlantica	Rand Carbide plant	55 ferrosilicon.
Do.	metric tons Vanchem Vanadium Products (Pty) Ltd.	Plant at Witbank	12,500 ferrovanadium.
Do.	do. Xstrata plc	Rhovani plant at Brits	6,000 ferrovanadium.
Do.	do. Vametco Minerals Corp.	Smelter near Brits	4,800 ferrovanadium.
Do.	Ruukki Group Oyj	Mogale plant	110 ferroalloys.
Steel	ArcelorMittal South Africa Ltd.	Vanderbijlpark plant	4,600 crude steel.
Do.	do.	Newcastle plant	1,900 crude steel.
Do.	do.	Saldanha plant	1,300 crude steel.
Do.	do.	Vereeniging plant	400 crude steel.
Do.	Highveld Steel and Vanadium Corp. Ltd.	Witbank	1,000 iron; 1,000 crude steel.
Do.	Columbus Stainless (Pty) Ltd. (Acerinox SA, 76%)	Stainless steel plant at Middelburg	750 crude steel.
Do.	Scaw Metals Group (Anglo American plc)	Germiston plant, Johannesburg	600 crude steel.
Do.	Davsteel Division (Cape Gate Pty. Ltd.)	Vanderbijlpark plant, Gauteng	480 crude steel; 480 billet.
Do.	Cape Town Iron & Steel Works (Pty) Ltd.	Kuilsrivier plant, Cape Town	250 crude steel; 250 billet.
Do.	Duferco Steel Processing Ltd.	Cold-rolled slab steel plant at Saldanha Bay	240 rolled steel.

See footnotes at end of table.

TABLE 2—Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners		Location of main facilities	Annual capacity
Lead	Black Mountain Mineral Development Co. (Pty) Ltd.		Black Mountain Mine near Aggeneys in Northern Cape Province	54 lead in concentrate.
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. [a subsidiary of Inca Mining (Pty) Ltd.]		Plant at Immerpan, Limpopo Province	100.
Manganese	Samancor Manganese (Pty) Ltd.		Mamatwan Mine near Hotazel	3,500 ore.
Do.	do.		Wessels Mine near Hotazel	1,000 ore.
Do.	Assmang Ltd.		Nchwaning Mine near Black Rock	3,000 ore.
Do.	do.		Gloria Mine near Black Rock	600 ore.
Do.	Renova Group		Kalahari Mine	1,000 ore.
Do.	Metmin (Metorex Pty. Ltd., 100%)		Open pit mine in North West Province	24 manganese dioxide.
Do.	Manganese Metal Co. Pty. Ltd. [Samancor Manganese (Pty) Ltd., 51%]		Electrolytic plant at Nelspruit	30 manganese metal.
Nickel	Anglo Platinum Ltd.		Amandebult, Rustenburg, and Union sections; and Bafokeng Rasimone, Lebowa, Modikwa, Potgietersrust, and Western Limb Mines	24 mine. ^c
Do.	do.		Rustenburg Base Metal Refiners	22 refined. ^c
Do.	Nkomati Joint Venture		Nkomati Mine in Mpumalanga Province	21 mine.
Do.	Impala Platinum Ltd.		Impala Mines	8 mine. ^c
Do.	do.		Impala Refining Services	10 refined. ^c
Do.	do.		Base Metals Refinery	14 refined. ^c
Do.	Lonmin plc		Marikana Mines (Eastern Platinum, Karee, and Western Platinum) near Rustenburg and Limpopo Mine	5 mine. ^c
Do.	do.		Base Metals Refinery	5 refined. ^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, 55%, and Pioneer Natural Resources Co., 45%	Pioneer offshore field	21,900.
Do.	do.	Petroleum Oil and Gas Corporation of South Africa	Oribi field 140 kilometers southwest offshore from Mossel Bay	9,100.
Do.	do.	do.	Oryx field	4,400.
Refined	do.	Shell and BP Refineries Pty. Ltd. (Shell SA Energy, 50%, and BP Southern Africa, 50%)	Sapref refinery in Durban	65,700.
Do.	do.	Engen Ltd. (62%)	Engen 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.	Chevron South Africa	Chevref refinery in Cape Town	36,500
Phosphate rock		Phosphate Development Corp. Ltd. (Foskor Ltd.)	Foskor Mine and plant at Phalaborwa	2,500 phosphate rock. ²
Do.		Fer-Min-Ore Ltd.	Plant at Germiston	30.
Do.		do.	Plant at Isithebe	12.
Phosphoric acid		Sasol Ltd.	Plant at Phalaborwa ²	325.
Platinum-group metals		Anglo Platinum Ltd.	Bathopele, Khomanani, Khuseleka, Siphumelele and Thembelani Mines	12,000 ore.
Do.	kilograms	do.	do.	24,000 platinum; 13,000 palladium; 3,300 rhodium.
Do.		do.	Dishaba and Tumela Mines at Northam	7,000 ore.
Do.	kilograms	do.	do.	18,000 platinum; 8,700 palladium; 2,300 rhodium.

See footnotes at end of table.

TABLE 2—Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners		Location of main facilities	Annual capacity
Platinum-group metals—Continued	Anglo Platinum Ltd., 85%		Union Mine at Swartklip	6,000 ore.
Do.	kilograms	do.	do.	10,000 platinum; 4,800 palladium; 1,700 rhodium.
Do.	Bafokeng Rasimone Platinum Mine (Royal Bafokeng Nation, 67%, and Anglo Platinum Ltd., 33%)		Bafokeng Rasimone Platinum Mine at Rasimone	2,400 ore.
Do.	kilograms	do.	do.	6,100 platinum; 2,500 palladium; 420 rhodium.
Do.	do.	Kroondal Platinum Mines (Anglo Platinum Ltd., 50%, and Aquarius Platinum Ltd., 50%)	Kroondal Mine	7,900 platinum; 3,800 palladium; 1,400 rhodium.
Do.	Modikwa Platinum Mine (Anglo Platinum Ltd., 50%, and African Rainbow Minerals, 50%)		Modikwa Mine at Makgemeng	2,400 ore.
Do.	kilograms	do.	do.	4,300 platinum; 4,200 palladium; 870 rhodium.
Do.	Anglo Platinum Ltd.		Mogalakwena Mine at Ga-Masenya	11,800 ore.
Do.	kilograms	do.	do.	9,600 platinum; 10,000 palladium; 580 rhodium.
Do.	do.		Mototolo Mine at Steelpoort	2,640 ore.
Do.	kilograms	do.	do.	3,400 platinum; 2,400 palladium; 580 rhodium.
Do.	do.		Polokwane smelter at Polokwane	650 concentrate.
Do.	do.		Mortimer smelter at Swartklip	180 concentrate.
Do.	do.		Waterval smelter	650 concentrate.
Do.	kilograms	do.	Mortimer, Polokwane, and Waterval smelters	85,000 platinum; 48,000 palladium; 12,000 rhodium.
Do.	do.	do.	Precious Metals Refinery	81,000 platinum metal; 44,000 palladium metal; 11,000 rhodium metal.
Do.	Impala Platinum Ltd. (Impala Platinum Holdings Ltd., 100%)		Impala Mines, near Phokeng in North West Province	17,000 ore.
Do.	kilograms	do.	do.	34,000 platinum; 15,000 palladium; 3,300 rhodium.
Do.	Impala Platinum Ltd.		Marula Mine at Bothashoek	2,200 ore.
Do.	kilograms	do.	do.	3,900 platinum; 4,000 palladium; 820 rhodium.
Do.	do.	do.	Smelter near Phokeng	87,000 platinum.
Do.	do.	do.	Smelter near Springs	71,500 platinum; 33,400 palladium; 8,300 rhodium.
Do.	do.	do.	Refinery near Phokeng	87,000 platinum.
Do.	do.	do.	Precious metals refinery, near Springs in Guateng Province	71,500 platinum metal; 33,400 palladium metal; 8,300 rhodium metal.

See footnotes at end of table.

TABLE 2—Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners		Location of main facilities	Annual capacity
Platinum-group metals—Continued	Lonmin plc		Marikana Mines near Maroelakop	11,000 ore. ^c
Do.	kilograms	do.	do.	22,000 platinum; ^e 10,000 palladium; ^e 3,000 rhodium. ^e
Do.	do.	do.	Precious Metals Refinery at Western Platinum	31,000 platinum metal; 14,000 palladium metal; 4,000 rhodium metal.
Do.		Northam Platinum Ltd. (Anglo Platinum Ltd., 22.5%, and Mvelaphanda Resources Ltd., 21.9%)	Zondereinde Mine near Northam	1,800 Merensky ore; 900 UG2 ore.
Do.	kilograms	do.	do.	8,100 platinum; 3,900 palladium; 900 rhodium.
Do.		Marikana Platinum Mine (Anglo Platinum Ltd., 50%, and Aquarius Platinum Ltd., 50%)	Marikana Mine	2,640 ore.
Do.	kilograms	do.	do.	2,700 platinum; 1,300 palladium; 390 rhodium.
Do.	do.	Everest Platinum Mine (Aquarius Platinum Ltd., 50.5%, and Impala Platinum Holdings Ltd., 20%)	Everest Platinum Mine at Lydenburg	6,200 platinum-group metals.
Do.	do.	Aquarius Platinum Ltd.	Blue Ridge Mine ¹	3,900 platinum-group metals.
Do.	do.	Platmin Ltd.	Pilanesberg Mine	7,800 platinum-group metals.
Do.	do.	Xstrata plc, 74%	Eland Mine	7,500 platinum-group metals.
Do.		Anooraq Resources Corp., 51%, and Anglo American Platinum Ltd., 49%	Bokoni Mine at Sefateng	1,860 ore.
Do.	kilograms	do.	do.	4,100 platinum; 2,700 palladium; 470 rhodium.
Do.		Two Rivers Platinum Mine (Pty) Ltd. (African Rainbow Minerals Ltd., 55%, and Impala Platinum Holdings Ltd., 45%)	Two Rivers Platinum Mine near Steelpoort	2,900 ore.
Do.	kilograms	do.	do.	4,100 platinum; 2,300 palladium; 660 rhodium.
Do.	do.	Eastern Platinum Ltd. (Eastplats)	Crocodile River Mine at Arbourfell	4,000 ^e platinum-group metals.
Do.	do.	Platinum Australia Pty Ltd. (PLA)	Smokey Hills Mine	3,000 platinum-group metals.
Pyrophyllite		Idwala Industrial Minerals (Benoni)	Ottsdal Mine in North West Province	15.
Do.		Wonderstone Ltd. (The Associated Ore & Metals Corp. Ltd.)	Pyrophyllite (wonderstone) mine, North West Province	NA.
Do.		G&W Base and Industrial Minerals Pty. Ltd.	Piet Retief Mine	NA.
Silicon		Grupo Ferroatlantica	Polokwane plant, near Pietersburg	55 silicon metal.
Silver	metric tons	Rand Refinery Ltd.	Germiston, Gauteng Province	200 refined silver.
Sulfur		Sasol Ltd.	Plants at Sasolburg and Secunda	205.
Synthetic fuels	thousand 42-gallon barrels	do.	Coal to oil plant at Secunda	54,800.
Do.	do.	Petroleum Oil and Gas Corporation of South Africa	Natural gas to petroleum products plant at Mossel Bay	18,300.

See footnotes at end of table.

TABLE 2—Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Titanium:				
Titanium concentrates		Richards Bay Minerals (RBM) (BHP Billiton Ltd., 37%; Rio Tinto Plc, 37%; Blue Horizon Investments, 24%)	Open cast operations, near Richards Bay	1,280 ilmenite; ^c 125 rutile. ^c
Do.		Exxaro Resources Ltd.	Mine near Brand-se-Baai and mineral separation plant at Koekenaap	540 ilmenite; 25 rutile.
Do.		do.	KZN Sands Mine near Richards Bay	550 ilmenite; 20 rutile; 5 leucoxene.
Titanium slag		Richards Bay Minerals (RBM)	Smelter at Richards Bay	1,060 titanium slag; 110 rutile.
Do.		Exxaro Resources Ltd.	Smelter at Vredenberg, Saldanha Bay area	200 titanium slag.
Do.		Highveld Steel and Vanadium Corp. Ltd.	Steel plant at Witbank	48 titanium slag. ^c
Do.		Exxaro Resources Ltd.	Empangeni smelter near Richards Bay	250 titanium slag.
Uranium oxide	metric tons	AngloGold Ashanti Ltd.	Vaal Rivers operation, near Klerksdorp	3,000.
Do.	do.	First Uranium Corp.	Ezulwini Mine	100. ^c
Vanadium pentoxide	do.	Highveld Steel and Vanadium Corp. Ltd. (Ervaz Group S.A., 79%)	Mapochs Mine near Lydenburg	17,500.
Do.	do.	do.	Plant at Witbank	10,800.
Do.	do.	Xstrata plc	Rhovan Mine at Brits	10,000.
Do.	do.	Vametco Minerals Corp.	Krokodilkraal Mine and plant near Brits	3,800.
Do.	do.	Vanchem Vanadium Products Pty Ltd.	Wapadskloof Mine and plant, 60 kilometers northeast of Middelburg	2,250. ^c
Vermiculite		Palabora Mining Co. Ltd.	Palabora Mine and plant at Phalaborwa	223.
Zinc		Zinc Corp. of South Africa Ltd. (Exxaro Resources Ltd., 100%)	Struisbult Springszinc refinery at Springs, southeast of Johannesburg	110 refined zinc; 170 sulfuric acid.
Do.		Black Mountain Mineral Development Co. (Pty) Ltd.	Black Mountain Mine near Aggeneys in Northern Cape Province	41 zinc in concentrate.
Zirconium		Richards Bay Minerals (RBM)	Open cast mines near Richards Bay	300 zircon in concentrate.
Do.		Exxaro Resources Ltd.	Mine near Brand-se-Baai and mineral separation plant at Koekenaap	125 zircon in concentrate.
Do.		do.	Hillendale Mine near Richards Bay, KwaZulu Natal Province	45 zircon in concentrate.
Do.		Palabora Mining Co. Ltd.	Palabora Mine and plant at Phalaborwa	14 baddeleyite. ^c
Do.		do.	Zirconium sulfate plant at Phalaborwa	8 zirconium sulfate.
Do.		Phosphate Development Corp. Ltd. (Foskor Ltd.)	Plant at Phalaborwa	8 baddeleyite. ^c
Do.		do.	Fused zirconia plant	6 synthetic zirconia.

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

¹Not operating at the end of 2010.

²Most of Foskor's phosphate output is from phosphate concentrates supplied by the neighboring Palabora copper mine.

TABLE 3
SOUTH AFRICA: RESERVES OF MAJOR MINERALS IN 2010^{1,*}

(Million metric tons unless otherwise specified)

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

¹Metallic minerals are contained metal.

²Includes aluminosilicate and sillimanite.

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

*Correction posted September 28, 2012.