



2009 Minerals Yearbook

BRAZIL

THE MINERAL INDUSTRY OF BRAZIL

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In 2009, Brazil was a leading producer of minerals in the world and marketed about 80 mineral commodities. It was the world's leading producer of key steel feedstocks, such as high-content iron ore and niobium, and the third ranked producer of bauxite and alumina. Brazil's recent discoveries of pre-salt natural gas and petroleum deep offshore present great opportunities and challenges for its mineral fuels sector. The pre-salt area is massive [800 kilometers (km) long and 200 km wide], and it contains about 80 billion barrels (Gbbbl) of crude oil. Accessing the pre-salt fields will be costly because they are located at depths of 5 to 7 km and under a layer of salt up to 2 km thick. In 2009, Brazil's leading mineral exports were, in order of value, iron ore, nickel, bauxite, tantalum, and manganese, and its leading imports were coal, potassium, copper, and zinc (Bray, 2010b; Departamento Nacional de Produção Mineral, 2010a; Jorgenson, 2010; LatinPetroleum Magazine, 2010; Olson, 2010b; Papp, 2010a, b).

In 2009, Brazil's mineral sector—which included metals, industrial minerals, and mineral fuels, biofuels, and ethanol—experienced a recovery phase owing to new mineral projects that came online and to expansions of existing projects. Changes in the Government's macroeconomic policy included the elimination of all import tariffs and price controls on petroleum and derivatives and tax exemptions on imports of equipment for mineral prospecting, exploration, development, and production. These measures were taken to motivate private investment and assist the sector in confronting the recent global economic crisis on a better footing. Consequently, Brazil is expected to remain among the global leaders in the production of mineral commodities and to continue to attract domestic and international investors into the country's mineral sector. In the latter part of 2009, *Petróleo Brasileiro S.A. (Petrobrás)* and its partners struck petroleum at a pre-salt block-water depth of 2,151 meters (m). *Petrobrás* (the operator) held a 45% stake, and its partners *BG Group of the United Kingdom* and *Repsol YPF S.A. of Spain* held a 30% and a 25% share, respectively (Banco Central do Brasil, 2010a; 2010d, p. 18; Departamento Nacional de Produção Mineral, 2010a; Economic Commission for Latin America and the Caribbean, 2010, p. 24-25).

Minerals in the National Economy

The global financial crisis affected Brazil's economy in the last quarter of 2008 and the first quarter of 2009, contributing to the country's recession as global demand for Brazil's commodity-based exports decreased; however, following a sizable contraction through the first half of 2009, the country returned to growth in the second half of 2009. The economic recovery had a positive effect on the credit, earnings, liquidity, and solvency of the domestic banking system. Consumer and investor confidence revived. Brazil's real gross domestic product (GDP) growth was positive by the end of 2009, and the Banco Central do Brasil expected an increase in the GDP of

5% in 2010 (Banco Central do Brasil, 2010b, p. 16-17; 2010d, p. 18-19; International Monetary Fund, 2010a, p. 31-32, 33, 36; 2010b, p. 115-116, 205).

For 2009 as a whole, Brazil's GDP contracted by 0.2% compared with an increase of 5.1% in 2008. The mining and mineral processing industries represented almost 2.4% of the GDP in 2009 compared with 4.3% in 2008, which was reflected mostly in the high international prices of several mineral commodities, such as, in order of value, iron ore, petroleum, lead, and tin. Brazil had a total labor force of more than 95.2 million. The mineral sector employed almost 5.5% (781,000) of the industry total (14.2 million, or almost 14% of the total labor force); this percentage did not include the nearly 280,000 active placer miners, or *garimpeiros* (Banco Central do Brasil, 2010b, p. 19; 2010c, p. 16; Departamento Nacional de Produção Mineral, 2010a, p. 18; U.S. Central Intelligence Agency, 2010).

Government Policies and Programs

The Mining Code [Decree-law (Act) No. 227 of February 28, 1967] governs all aspects of the mineral industry, from exploration to production and use of mineral resources, and establishes the rights and duties of the holders of mining rights. The Ministry of Mines and Energy's (MME) National Department of Mineral Production (DNPM) has responsibility for managing the country's mineral resources, for the inspection of the mineral activity in the country, and for enforcing the Mining Code and implementing its legal provisions. Decree-law (Act) No. 227 was amended by law No. 9314 of November 14, 1996, to provide greater flexibility for investment in the Brazilian mining sector. Article 7 stipulates that the production of minerals will depend upon the exploration authorization permit granted by the General Director of the DNPM and the development concession issued by the Minister of the MME. Licensing is a restricted system applicable exclusively to the production of industrial minerals (Departamento Nacional de Produção Mineral, 2010b; Instituto Brasileiro de Mineração, 2010b).

Article 20 of Brazil's Constitution (which was enacted on October 5, 1988) and Constitutional Amendments nos. 6 and 9 dated August 15, 1995, allow the participation of the private sector by means of joint ventures and privatization investment in the mining, natural gas, and petroleum sectors. The Government allows state-owned *Petrobrás* to enter into joint ventures with foreign investors and to invest overseas. The *Agencia Nacional do Petróleo* issues exploration and production licenses and regulates the petroleum industry (Departamento Nacional de Produção Mineral, 2010b; Instituto Brasileiro de Mineração, 2010b).

The environmental licensing system is divided into three steps—a preliminary license, which is required during the planning stage; an installation license, which is required prior to any construction being done; and an operational license, which

is required before beginning mining or processing operations. Decree No. 6848 of May 14, 2009, modifies Decree No. 4340 of August 22, 2002, to regulate the environmental compensation process (Instituto Brasileiro de Mineração, 2010b).

Brazil's import tax rates for minerals vary from 3% to 9%; the rate for ores and concentrates is 5%, and that for other mineral derivatives is 7%. The export tax does not apply to exported mineral products, although there is a value-added tax. In most cases, the basis for assessment of corporate income taxes is the net profit for the fiscal year; the corporate tax rate ranges between 10% and 15% and is levied on the net profit. Profits may be expatriated. Equity ownership, which is allowed by means of privatization or by direct acquisition, may be as high as 100%. Since early 2007, the Concessions Law created additional opportunities for the private sector in public utilities previously reserved for the Government (Departamento Nacional de Produção Mineral, 2010b; Instituto Brasileiro de Mineração, 2010a, b).

The Government proposed a regulatory framework for minerals that would replace the current mining code and provide more Government control of mineral resources. Tax reform was under discussion in the Brazilian National Congress with the aim of developing a tax policy that is in line with the national interest and that takes into account the world economy. The proposed code was to strengthen the Government's participation in the regulatory process and increase its sovereignty over Brazil's mineral resources. In addition to changing the terms of concession contracts, the proposal would create a National Council of Mineral Resources to function as both a minerals regulator and advisor, with the purpose of increasing the royalties on mineral production. According to the Instituto Brasileiro de Mineração (IBRAM), the regulatory framework to be established for the pre-salt crude oil and natural gas reserves would influence the Government's proposed minerals regulation framework agreement. The IBRAM expected the Government to introduce the bill in the near future (2010-11) owing to the Presidential and Congressional elections that were scheduled for October 2010 (Instituto Brasileiro de Mineração, 2010b).

In 2009, the IBRAM reported an investment of \$234 million in mineral exploration compared with \$346 million in 2008. The MME's Companhia de Pesquisa de Recursos Minerais (CPRM) (otherwise known as the Geological Survey of Brazil) was developing programs for basic geologic mapping; geophysics, metallogenetic, and hydrogeologic mapping; and prospecting in areas of potential development. The CPRM was also creating programs for environmental geology, geologic hazards, and hydrogeology, and maintaining the country's geologic database and the corresponding economic analyses, particularly for coal, copper, diamond, gold, kaolin, nickel, peat, and zinc, to assist domestic and foreign investors in the mining sector (Companhia de Pesquisa de Recursos Minerais, 2010; Departamento Nacional de Produção Mineral, 2010a).

In 2009, the mining royalties collected by the Brazilian Financial Compensation for Exploiting Mineral Resources—Federal Royalty (CFEM) amounted to \$412 million compared with \$240 million in 2008. The CFEM rate is no more than 2% of the corporation's net profit. The prevailing rates are 3% for bauxite, manganese ore, potassium, and rock salt;

2% for coal, fertilizers, iron ore, and other minerals; 1% for gold (gold produced during prospecting is exempt); and 0.2% for other precious minerals and precious stones. The collected royalties are allocated among the municipalities, States, and the Federal Government in the proportion of 65%, 23%, and 12%, respectively. The Federal Government shares its 12% CFEM fund with the DNPM (9.8%); the Fondo Nacional de Desarrollo Científico y Tecnológico (FNDCT), which is an instrument for technological innovation for the benefit of all Brazil's productive sectors (2%); and the Brazilian Environment Agency (IBAMA) (0.2%) (Banco Central do Brasil, 2010b, p. 14; Departamento Nacional de Produção Mineral, 2010b; Instituto Brasileiro de Mineração, 2010a, b).

Production

The total value of minerals produced in 2009 was \$98.5 billion compared with \$103.1 billion in 2008. The value of crude oil and natural gas amounted to almost \$41 billion. In the Americas, Brazil continued to be the leading producer of aluminum, bauxite, cement, ferroalloys, gold, iron ore, kaolin, lead, manganese, nickel, steel, and tin. Brazil's reportedly large mineral reserves and other identified resources help make it one of the leading mining countries in the Americas and the world (table 3; Banco Central do Brasil, 2010a; 2010c, p. 16; Departamento Nacional de Produção Mineral, 2010a).

Brazil's major integrated steel operations have the capacity to produce 42.1 million metric tons per year (Mt/yr) of crude steel from 28 steel plants and 13 integrated steelmakers. In 2009, Brazilian crude steel production amounted to 26.5 million metric tons (Mt) compared with 33.7 Mt in 2008. According to the Instituto Aço Brasil, the country was the ninth ranked producer of raw steel in the world and the leading producer in Latin America. Brazil was the second ranked iron ore producer in the world after China with an output of 380 Mt; Vale S.A. produced 229.3 Mt, or 60.3% of Brazil's iron ore production (Departamento Nacional de Produção Mineral, 2010a; Instituto Aço Brasil, 2010; Vale S.A., 2010, p. 16).

Mineração Rio do Norte S.A. (MRN), the majority of which was privately owned, was the world's third ranked bauxite producer and exporter; it produced 15.6 Mt in 2009, which was about 61% of the country's total bauxite production of 25.6 Mt, followed by Vale with almost 24%, or more than 6.2 Mt. Brazil produced 22 Mt of pig iron in 2009 compared with 33 Mt in 2008 (table 1; Departamento Nacional de Produção Mineral, 2010a; Instituto Brasileiro de Mineração, 2010a; Vale S.A., 2010, p. 16).

In 2009, Petrobrás continued to operate in an integrated fashion in the segments of crude oil and natural gas exploration and production; refining, trade, and transportation; petrochemicals; and the distribution of, in order of value, petroleum derivatives, natural gas, biofuels, and electricity. According to Petrobrás, Brazil expected to achieve self-sufficiency in crude oil and natural gas production by 2013 owing to planned investments of about \$174 billion, of which about 90.2% would be invested in the country and 9.8% would be invested overseas. Petrobrás was also planning to make domestic investments of \$28 billion to develop its pre-salt

petroleum resources in the Campos and the Tupi Basins in the Atlantic zone and to produce 219,000 barrels per day (bbl/d), which would add to Brazil's total production of 33.3 million barrels per day (Mbbbl/d) by 2013. Brazil's diversified mineral endowment, competent labor force, and macroeconomic policies continued to attract investor interest in the country's mining and petroleum industries in spite of the global economic crisis during 2008 and 2009. Leading international mining, petroleum, and steel companies were notably interested in, in order of value, oil and gas, iron ore, steel, coal, gold, copper, and diamond (Departamento Nacional de Produção Mineral, 2010a; Petróleo Brasileiro S.A., 2009, p. 37; 2010a, p. 55-58).

Structure of the Mineral Industry

Brazilian corporations, which included those owned by private Brazilian and foreign investors and the Government, partially or wholly owned the major portion of the mineral and petroleum sectors. According to the DNPM, more than 500 transnational corporations (TNCs) established operations in Brazil between 1990 and 2009 owing to the country's favorable policies on mergers, joint ventures, and privatization. The competitiveness of Brazil's mineral industry resulted from investments in new technologies to improve efficiencies and productivity, particularly in, in order of value, the crude oil and natural gas, mining, and steel sectors (Departamento Nacional de Produção Mineral, 2010a, b).

In 2009, Petrobrás continued to be an integrated energy company comprising the following related units: Petrobrás Química, S.A., which had integrated refining-petrochemical operations; Petrobrás Distribuidora S.A., which distributed petroleum products in Brazil; Petrobrás International Finance Co., which facilitated the import of crude oil and derivatives; Petrobrás Gás S.A., which was responsible for trading Brazilian and imported natural gas and fertilizers; Petrobrás Transporte S.A., which constructed and operated the facilities, pipelines, terminals, and vessels needed for the transportation and storage of crude oil and derivatives, natural gas, and bulk products; Downstream Participações S.A., which facilitated asset exchange between Petrobrás and Repsol YPF's subsidiary in Argentina, Repsol-YPF S.A.; and Petrobrás Energía Participaciones S.A., which had a controlling interest in Petrolera Perez Companac S.A. of Brazil (60% of the capital stock). In 2009, Petrobrás owned mineral operations in Angola, Argentina, Bolivia, Colombia, Ecuador, Nigeria, Peru, and the United States.

In addition, the Brazilian cement companies Holcim (Brasil) S.A, Lafarge (Brasil) S.A., Votorantim Cimentos S.A., and others owned 39 cement plants in eight Brazilian States and accounted for more than 75% of the national output of more than 51.7 Mt. Among these cement plants, 12 were located in the State of Minas Gerais and 9 were located in the State of Sao Paulo (table 2; Petróleo Brasileiro S.A., 2009; Departamento Nacional de Produção Mineral, 2010a). Since 2000, TNCs had brought in about \$330 billion in registered investment with the Banco Central do Brasil; of that total, \$35 billion was invested in 2008. Among the major companies were Anglo American plc, BHP Billiton plc, and BP p.l.c. of

the United Kingdom; De Beers Group of South Africa; and Glencore International AG of Switzerland (Banco Central do Brasil, 2010c, p. 130-131; Departamento Nacional de Produção Mineral, 2010a).

In 2009, the active international mining and oil companies in Brazil included Yacimientos Petroleros Fiscales (YPF) of Argentina and Spain; Alcan Aluminum Ltd., Barrick Gold Corp., and Teck Cominco Inc. of Canada; Shanghai Baosteel of China; Royal Dutch/Shell Group (Shell) of the Netherlands; Energia de Portugal; Iberdrola S.A. of Spain; Anglo American plc, BHP Minerals International Exploration Inc. (BHP Billiton Ltd., 100%), and Rio Tinto plc of the United Kingdom; and Chevron Corp. (ChevronTexaco Brasil S.A.), Dow Chemical Co., Exxon Mobil Corp. (Esso Brasileira de Petróleo Ltda.), Newmont Mining Corp., Placer Dome U.S. Inc., and Phelps Dodge Co. of the United States (table 2; Departamento Nacional de Produção Mineral, 2010a).

In 2009, three international cement companies—Cimentos de Portugal, SGPS, S.A. (Cimpor); Lafarge S.A. of France; and Holcim Ltd. of Switzerland—were active in Brazil. According to the DNPM, 36 iron ore mining companies were operating 53 mines and 54 processing plants in Brazil, and there were about 2,500 mineral mines in Brazil, which were classified conforming to their run-of-mine outputs: large mines—between 1 Mt/yr and 3 Mt/yr or higher; medium mines—between 100,000 metric tons per year (t/yr) and 1 Mt/yr; and small mines—between 10,000 and 100,000 t/yr (Departamento Nacional de Produção Mineral, 2010a).

In 2009, Brazil produced 440,000 gigawatthours (GWh) of electric power and consumed more than 400,000 GWh. Brazil's primary domestic energy supply encompassed the following: hydroelectric, 80%; petroleum and natural gas, 11%; nuclear energy, 4%; and others, 5% (Departamento Nacional de Produção Mineral, 2010a; U.S. Central Intelligence Agency, 2010).

Mineral Trade

Brazil was the leading economy in Latin America and a member of the Mercado Común del Cono Sur, which is the second largest trade association in the Americas and the eighth worldwide. In 2009, exports were valued at almost \$153 billion, and imports, \$127.6 billion compared with \$198 billion and \$173.1 billion, respectively, in 2008. Brazil's mineral sector had a trade surplus of \$12.1 billion compared with \$8.9 billion in 2008 (Banco Central do Brasil, 2010c, p. 95-96; Departamento Nacional de Produção Mineral, 2010a).

Brazil enjoyed economic benefits from its mineral industry, which included the significant contribution the industry made to the country's trade balance. In 2009, Brazil exported iron ore and concentrates (\$15.1 billion); gasoline and petroleum (\$14.2 billion); flat-rolled products (\$6 billion); aluminum and aluminum products (\$3.5 billion); pig iron (\$3.1 billion); ferroalloys (\$2.5 billion); and tubes and cast iron (\$860 million) (Banco Central do Brasil, 2010c, p. 95; Departamento Nacional de Produção Mineral, 2010a).

Commodity Review

Metals

Aluminum and Bauxite and Alumina.—Alumina production increased to more than 8.6 Mt from more than 7.8 Mt in 2008, or by almost 10.3%. Exports of alumina totaled more than 5.5 Mt compared with almost 4.6 Mt in 2008. Primary aluminum production decreased to more than 1.5 Mt in 2009 from almost 1.7 Mt in 2008, or by almost 11.8%. Companhia Brasileira de Alumínio (CBA) produced almost 31% of Brazil's primary aluminum; Alumínio Brasileiro S.A. (Albras), 30%; Alcoa Inc., 21.2%; BHP Billiton plc, 11.3%; Vale, almost 1%; and others, 5.5%. In 2009, exports of aluminum totaled 921,000 metric tons (t) valued at more than \$3.2 billion compared with 964,000 t valued at almost \$4.8 billion in 2008. Brazil's imports of all forms of aluminum totaled 162,000 t valued at about \$656 million in 2009 compared with 209,000 t valued at more than \$1.0 billion in 2008. Bauxite production decreased to 25.6 Mt in 2009 from almost 28.1 Mt in 2008. The MRN accounted for almost 61% (15.6 Mt) of the total bauxite production for 2009. Exports amounted to more than 3 Mt of bauxite compared with more than 6.2 Mt in 2008. According to the Associação Brasileira do Alumínio, Brazil's consumption of aluminum products by end use were as follows: packaging (29%), transports (26%), electrical (12%), construction (11%), consumer durables (9%), machinery (4%), and others (9%). Brazil was the sixth ranked aluminum producer in the world after China, Russia, Canada, Australia, and the United States (Associação Brasileira do Alumínio, 2010; Bray, 2010a, b; Departamento Nacional de Produção Mineral, 2010a; Vale S.A., 2010, p. 16).

Copper.—Brazil's copper production in concentrate decreased to 219,676 t in 2009 from 222,102 t in 2008, or by almost 1.1%. The leading producers were Vale, with 198,000 t of the concentrate from its Sossego Mine in Carajás, State of Para, and Mineração Caraíba S/A, with 21,676 t from its deposit in Jaguari, State of Bahia. In 2009, Caraíba Metais S/A (CMSA) of Camacari, State of Bahia, which was the only electrolytic copper producer in Brazil, produced almost 217,600 t of primary copper metal compared with 220,000 t in 2008. To meet Brazil's demand for copper metal of 358,000 t/yr, CMSA imported 216,900 t of copper cathode mostly from Chile (75%) and Peru (25%) in 2009. CMSA was planning to produce between 450,000 and 500,000 t/yr of electrolytic copper in D'Avila, State of Bahia, by 2011 (Departamento Nacional de Produção Mineral, 2010a; Vale S.A., 2010, p. 16).

In 2009, Vale's copper project portfolio included the sulfide ore resources of, in order of volume, the Sossego, the Salobo, the Alemao, and the Cristalino deposits, and the oxidized ore deposit of Project 118; all these projects were located in the mineral province of Carajás, State of Para. Vale's subsidiary Salobo Metais S/A was conducting a feasibility study for the Salobo copper project, which was expected to be completed by 2012; development of the project would require an investment of \$1.2 billion. Salobo was expected to produce 520,000 t/yr of copper in concentrate and 255,000 t/yr of metal copper by 2013. The Salobo project is Brazil's largest copper deposit

and contains estimated reserves of 928.5 Mt at grades of 0.77% copper and 0.46 gram per metric ton (g/t) gold. Salobo is located in Marabá, State of Para, and it could support a 520,000-t/yr-capacity mill. In 2009, Vale produced 10,000 t/yr of copper cathode from Project 118 at a cost of \$235 million. Vale's subsidiary Usina Hidrometalúrgica de Carajás S/A (UHC) was constructing a \$58 million semi-industrial-scale plant for processing copper. UHC would produce copper cathode at its Sossego Mine using hydrometallurgical technology based on pressure oxidation followed by heap leaching, solvent extraction, and copper electrowinning by early 2010 (Departamento Nacional de Produção Mineral, 2010a; Vale S.A., 2010, p. 16).

A feasibility study for the Cristalino deposit (Vale, 100%) estimated reserves of 312 Mt grading 0.77% copper and 0.13 g/t gold and was expected to produce 30,000 t/yr of copper concentrate by 2015 with an investment of \$500 million. Vale continued conducting intensive geologic prospecting to identify new copper areas in the Carajás District. Mineração Maracá S/A completed a feasibility study for the Chapada copper-gold-silver project in Alto Horizonte, State of Goiás. Estimated reserves were 434.5 Mt containing 1.3 Mt of copper and 9.6 t of gold. The Chapada Mine was projected to produce 51,000 t/yr of copper concentrate, 2.8 t/yr of gold, and 6.1 t/yr of silver by early 2012 (Departamento Nacional de Produção Mineral, 2010a; Vale S.A., 2010, p. 16).

Gold.—Gold production increased to 65 t in 2009 from 54 t in 2008, or by more than 20%; mining companies produced 58.4 t (89.8%), and garimpeiros produced 6.6 t (10.2%). In 2009, Yamana Gold Inc. was the leading gold producer and contributed 28.5% of the country's total; AngloGold Ashanti Mineração Ltda. and Mineração Serra Grande S.A. each produced 25%; Rio Paracatu Mineração S.A. contributed 18%; and others produced 28.5%. The leading States with garimpeiros' gold operations were, in order of volume, Para, Mato Grosso, Amazonas, Amapá, and Roraima (Departamento Nacional de Produção Mineral, 2010a; Yamana Gold Inc., 2010).

Iron and Steel.—*Ferroalloys.*—Ferroalloys production increased to 1.4 Mt from 1.3 Mt in 2008, or by almost 8%. The partnership between Brazil's Prometal Produtos Metalúrgicos S.A. and Norway's Elkem A/S produced 681,500 t of ferromanganese in 2009 compared with 536,610 t in 2008; the prometal project, in which Elkem held a 40% share, was located in Marabá, State of Para. The manganese was supplied by Vale's Mina do Azul, and the iron ore was from Vale's Serra dos Carajás Mine (Departamento Nacional de Produção Mineral, 2010a; Instituto Brasileiro de Mineração, 2010a).

Pig Iron.—Brazil produced 22 Mt of pig iron compared with 33 Mt in 2008. Brazil was the sixth ranked producer, and its nearly 6 Mt of exports, which was valued at almost \$2 billion, represented approximately one-third of the pig iron traded in the world (Departamento Nacional de Produção Mineral, 2010a; Fenton, 2010; Instituto Brasileiro de Mineração, 2010a).

Steel.—Raw steel production was 26.5 Mt in 2009 compared with 33.7 Mt in 2008. Brazil exported 7.5 Mt of steel valued at \$6.5 billion in 2008 compared with 9.2 Mt of steel valued at \$8 billion in 2008. The major recipients of Brazil's exports

were the United States (45%); the Republic of Korea, Mexico, Thailand, and Taiwan (6% each); and Argentina, Chile, Colombia, and Spain (4% each). Brazil imported almost 3 Mt of steel valued at \$4.5 billion compared with more than 2.7 Mt of steel valued at almost \$4 billion in 2008. The apparent domestic consumption of steel (production + imports – exports) in Brazil was about 27.2 Mt, which represented an increase of 8.4% compared with that of 2008 (25.1 Mt). The Brazilian steel industry was planning to invest \$17.2 billion by 2012 to increase the installed capacity to 59 Mt/yr from the current 36.5 Mt/yr. New steel facilities could be added, which would represent an additional capacity of 6 Mt/yr and an investment of \$4.5 billion (Departamento Nacional de Produção Mineral, 2010a; Fenton, 2010; Instituto Aço Brasil, 2010, p. 1-2).

Iron Ore.—Brazil produced 310 Mt of beneficiated iron ore in 2009 compared with 351.2 Mt in 2008. Of that production, almost 84% was from the leading iron ore producers—Vale, 62.4%; Minerações Brasileiras Reunidas S/A (MBR), 16.4%; and Samarco Mineração S/A., 5.2%. Other producers, such as Companhia Siderúrgica Nacional (CSN), contributed 16%. In 2009, Brazil exported 298 Mt of iron ore valued at almost \$13.2 billion. The leading importers of Brazilian iron ore were China (31%); Japan (11%); Germany (8.5%); France, Italy, and the Republic of Korea (4% each); and others (37.5%) (Departamento Nacional de Produção Mineral, 2010a; Instituto Brasileiro de Mineração, 2010a).

Vale was planning an investment of \$1.8 billion to produce 450 Mt/yr of beneficiated iron ore in 2011. Engineering studies for expansion of the Serra dos Carajas iron ore mine output to 130 Mt/yr in 2010 from 120 Mt in 2009 were completed. Vale was also planning to inject more than \$18 billion into the mining sector during the period 2010-13 to consolidate its leading position in the global iron ore markets (Vale S.A., 2010, p. 16-17).

Manganese.—Manganese production in concentrate (MnO_2) decreased to about 2.2 Mt in 2009 from almost 2.4 Mt in 2008. Rio Doce Manganês S.A.'s (RDM) (Vale, S.A., 100%) manganese mines in the States of Minas Gerais (Morro da Mina) and Para (Mina do Azul) produced about 1.7 Mt of manganese ore and 223,000 t of ferroalloys (ferromanganese) in 2009 compared with 2.4 Mt of manganese ore and 475,000 t of ferroalloys (ferromanganese) in 2008, owing to the recession and the contraction of the global economy. In 2009, domestic consumption of manganese was as follows: manganese ferroalloys, 80%; electrical batteries, 15%; and chemicals, 5% (Departamento Nacional de Produção Mineral, 2010a; Vale S.A., 2010, p. 20).

Nickel.—Brazil produced 67,000 t of nickel content in ore, which was about the same amount as in 2008; production of electrolytic nickel was 20,056 t in 2009 compared with 18,530 t in 2008; nickel in ferronickel alloys decreased to 9,453 t in 2009 from 10,244 t in 2008; nickel in matte decreased to 3,153 t in 2009 from 8,328 t in 2008; and nickel in carbonates was similar to the level of 19,278 t produced in 2008. Vale produced 187,000 t of nickel in 2009 compared with 275,000 t in 2008. Anglo American approved an investment of \$1.5 billion for its Barro Alto nickel project in the State of Goiás. The company planned to produce 36,000 t/yr of nickel as concentrate content

from a deposit with 117 Mt of reserves at a grade of 1.5% nickel by 2011. Vale intended to invest \$1.5 billion to use a high-pressure acid-leaching technology to produce 46,000 t/yr of nickel and 2,800 t/yr of cobalt metal from its Vermehlo project in Carajas, State of Para, which has contained reserves of 123.6 Mt of laterite (limonitic) ores at a grade of 1.25% nickel and 0.06% cobalt. Vale was also focused on the development of the Onca Puma nickel laterite project in the State of Para, which contains reserves of 82.7 Mt at a grade of 1.73% nickel, and was planning to invest \$2.3 billion to produce 58,000 t/yr of nickel metal. The Onca Puma and the Vermehlo projects were expected to be commissioned in June 2010, depending on market conditions. With these additional projects, the production of nickel ore in Brazil was expected to increase by 200,000 t/yr by 2011 (table 1; Departamento Nacional de Produção Mineral, 2010a; Vale S.A., 2010, p. 16, 20).

Zinc.—Brazil produced 189,300 t of zinc content in concentrates in 2009 compared with 173,933 t in 2008. Primary metal production increased to 270,700 t in 2009 from 248,874 t in 2008 and represented 90.5% of the installed annual metal capacity of 275,000 t. Grupo Votorantim (GV) was the only producer of zinc in Brazil. Production was through GV's two mines (Paracatu and Vazante) and two processing facilities (Juiz de Fora and Tres Marias), which were located in Minas Gerais State. GV produced 182,500 t of zinc metal mainly from domestic concentrates treated at the Tres Marias metallurgical plant, which had the capacity to produce 180,000 t/yr of zinc metal and 88,200 t of zinc metal entirely from imported concentrates (Departamento Nacional de Produção Mineral, 2010a; Votorantim Group, 2010).

Industrial Minerals

Asbestos.—In 2009, Brazil produced 282,032 t of asbestos (fiber content) compared with 287,673 t in 2008. Brazil's significant asbestos deposits are located in Cana Brava and Minacu in the State of Goiás; Goiás was the only producing State in the country. Sociedade Anônima Mineração de Amianto supplied 85% of Brazil's asbestos for the manufacture of specialized cement products, which were, in order of economic importance, ceiling tiles, protective screens, water and sewer pipes, water tanks, and molded electrical insulators. Other uses were, in order of value, thermal insulators, paper and cardboard, slabs, decorations, insecticide, asphalt for highways and airport runways, and automobiles. Asbestos mining and consumption have been highly regulated in most industrialized nations and its use continued to decline owing to health hazards. In 2009, Brazil was the third ranked world producer of asbestos after Russia and China. Brazil's asbestos reserves (15.4 Mt) were considered to be adequate to meet demand in the short to medium term; the average grade of ore from the Cana Brava Mine in Minacu was 5.2%; it had reserves (fiber content only) of 3.5 Mt, which, at a production rate of about 250,000 t/yr, would represent a 15-year mine life (table 3; Departamento Nacional de Produção Mineral, 2010a; Virta, 2010).

Gemstones.—In the Americas, Brazil followed Canada and Guyana as the leading producers and traders of mostly alluvial diamond, followed by Venezuela. In 2009, Brazil continued

to be one of South America's leading gemstone producers and exporters. Many different varieties of gemstones are found in the Araxa, the Bambui, and the Canastra geologic groups; these include, in order of value (U.S. dollars per carat), diamond, emerald, aquamarine, topaz, tourmaline, opal, chrysoberyl, amethyst, citrine, and agate. Brazil is the world's only source of some quality gemstones, such as imperial topaz and Paraíba tourmaline. In 2009, 51% of the diamond and gemstones was mined by garimpeiros and 49% was mined by private investors. According to the DNPM's Mineral Summary Statistics for 2005-09, Brazil's diamond production from year to year has been uncertain, and annual production has been declining since 2005. The leading producers were Mineradora S/A, which was located in Juina, State of Mato Grosso, and produced 80,100 carats; and Mineração Rio Novo S/A, which was located in Diamantina, State of Minas Gerais, and produced 17,900 carats. The carats produced and reported conformed to the Kimberley Process Certification Scheme's (KPCS) guidelines (table 1; Departamento Nacional de Produção Mineral, 2010a; Olson, 2010a).

In 2009, Brazil exported 280,520 carats valued at \$19.2 million; the major markets for Brazilian rough diamond were the European Union (60%), the United Arab Emirates (21%), the United States (11%), Israel (7%), and others (1%). Imports of uncut stones amounted to 16,300 carats valued at \$1.1 billion; the main sources were the United States (99%) and Australia (1%) (Departamento Nacional de Produção Mineral, 2010a).

Phosphate Rock.—Production of phosphate rock amounted to 6.8 Mt in 2009 compared with almost 6.3 Mt in 2008. The leading mining companies were, in order of reserves (which totaled 690 Mt), Vale (25%), Fosfertil S.A. and Ultrafertil S.A. (20% each), and Bunge Fertilizantes S.A. (15%) in Minas Gerais, and Copebras S.A. (6%) in Sao Paulo; together, they represented 66% of the total reserves in 2009. The reported domestic consumption of concentrates was about 9 Mt in 2009 compared with 8.3 Mt in 2008. Of the total phosphoric acid produced, 96% was used in the fertilizer industry and 4% was used in the chemical industry (Departamento Nacional de Produção Mineral, 2010a).

Mineral Fuels

In 2009, Brazil produced 18.4 billion cubic meters of natural gas and 939 Mbbbl of petroleum compared with 18.6 billion cubic meters of natural gas and 876 Mbbbl of petroleum in 2008. In 2009, Petrobrás' average production of crude oil, which included condensate and liquid natural gas, was more than 2.5 million barrels per day (Mbbbl/d) compared with 2.4 Mbbbl/d in 2008. Brazil's total energy consumption included crude oil (46%, including ethanol), hydroelectricity (39%), natural gas (8%), coal (5.5%), and nuclear (1.5%). In coming years, attempts to diversify electricity generation with means ranging from hydropower and renewable energy—ethanol and wind—to natural gas powerplants could increase the consumption of natural gas (Departamento Nacional de Produção Mineral, 2010a; Petróleo Brasileiro S.A., 2009, p. 3, 8; 2010a, p. 58).

Coal.—In 2009, Brazil produced almost 13.6 Mt of coal (run-of-mine) compared with 13.2 Mt in 2008. The Brazilian

coal industry's mine operations were concentrated in the three southernmost States of Santa Catarina (64%), Rio Grande do Sul (33%), and Parana (3%). Coal demand increased mainly because the thermoelectric plants were operating at full capacity in these three States (Departamento Nacional de Produção Mineral, 2010a).

To meet Brazil's coal demand, 18.5 Mt was imported in 2009 compared with 18 Mt in 2008. Imports came from Australia (35%), the United States (30%), Canada (10%), China (8%), South Africa (5%), and other countries (12%). Brazil's usage of coal was as 60% metallurgical coal and 40% thermal coal in 2009. The steel industry consumed 100% of the metallurgical coal (6.1 Mt). The energy coal was consumed by thermoelectric generation, 85%, and the industrial sector, 15% (including for petrochemicals, 4%; the food industry, 3%; cellulose, 3%; and others, 5%) (Departamento Nacional de Produção Mineral, 2010a).

Natural Gas.—In 2009, Brazil's natural gas production amounted to 18.4 billion cubic meters and its imports from Argentina and Bolivia amounted to 8.4 billion cubic meters. Brazil imported 45% of the domestic natural gas consumption (18.7 billion cubic meters). The leading producers of natural gas were the Campos Basin field (10 billion cubic meters) and the State of Rio de Janeiro (8 billion cubic meters). Petrobrás was planning to produce 15 million cubic meters per day of natural gas in the Campos Basin by 2010. Total Brazilian natural gas proven reserves were estimated to be 364.2 billion cubic meters (Departamento Nacional de Produção Mineral, 2010a; Petróleo Brasileiro S.A., 2009, p. 58; 2010a, p. 55, 58).

Petroleum.—In 2009, according to the DNPM, Brazil had 13.2 Gbbl of proven crude oil reserves, which were the second largest reserves in South America after Venezuela. Production of crude oil increased to almost 939 Mbbbl in 2009 from 876 Mbbbl in 2008. Imports of crude oil increased to 231 Mbbbl in 2009 from 159 Mbbbl in 2008. The leading import sources were Nigeria (43%), Algeria (14%), and Saudi Arabia (12%). In 2009, Petrobrás' total production of domestic and international crude oil and natural gas liquid, condensate, and natural gas amounted to 2,530 Mbbbl/d compared with 2,400 Mbbbl/d in 2008. Brazil's exports of crude oil amounted to 620,000 bbl/d in 2009 compared with 570,100 bbl/d in 2008, and imports of crude oil amounted to 715,000 bbl/d in 2009 compared with 632,900 bbl/d in 2008. Petrobrás had also started numerous ethanol pipeline projects, including one that runs from Goiás State to Sao Paulo State. BP Brasil Ltda. was involved in the Edia ethanol project in Goiás State, which produced 7,500 bbl/d of ethanol in 2009; ethanol is produced from sugar cane that grows in Brazil's tropical climate. In 2009, Petrobrás' foreign exploration for and production of mineral fuels took place in Angola, Argentina, Bolivia, Colombia, Ecuador, Nigeria, Peru, Venezuela, and the United States (Petróleo Brasileiro S.A., 2009, p. 9-10; 2010a, p. 58; 2010b; BP p.l.c., 2010; Departamento Nacional de Produção Mineral, 2010a;).

Brazil's largest oil discoveries in recent years have come from the Atlantic offshore, pre-salt basins. Petrobrás' pre-salt Tupi/Iracema pilot project in the Santos Basin was planned to produce 100,000 bbl/d of crude oil and 5,000,000 cubic meters per day of natural gas during 2010-12. The Tupi/Iracema deposit

was expected to enter into its final development phase by 2017. The project was a consortium of Petrobrás (65%, operator), the BG Group (25%), and Brazil's Galp Energia S.A. (10%) to carry on the project's evaluation plan, which was approved by the Agência Nacional do Petróleo, Gás Natural e Biocombustíveis (Petróleo Brasileiro S.A., 2009, p. 49-50; 2010a, p. 8, 13; LatinPetroleum Magazine, 2010; U.S. Energy Information Administration, 2010, p. 1, 4, 6).

In 2009, the partnership of Shell (80%) and Petrobrás (20%) on the Bijupira and the Salema Projects in Campos Basin also produced a combined 50,000 bbl/d of crude oil and more than 480,000 cubic meters per day of natural gas; the fields have resources of about 190 Mbbbl of crude oil and 1.8 billion cubic meters of natural gas. Other companies involved in exploration in the pre-salt basins included Chevron, ExxonMobil, Repsol YPF, Shell, and Statoil ASA of Norway (Departamento Nacional de Produção Mineral, 2010a; Petróleo Brasileiro S.A., 2010b).

Reserves and Resources

Brazil was among the world leaders in reserves of some mineral commodities (table 3). The country's world ranking for reserves of mineral commodities was as follows: first, niobium and tantalum; second, graphite; third, bauxite, tin, and zinc; fourth, magnesite and manganese; and fifth, iron ore (Departamento Nacional de Produção Mineral, 2010a).

Outlook

Brazil's mineral sector, which includes metals, industrial minerals, and fuels continued to experience a phase of real growth. The main vehicles for the foreign direct investment (FDI) inflows in the short and medium terms are expected to be consortiums, joint ventures, and acquisitions in new projects with Petrobrás, Vale, and others. Investments in biofuel, hydroelectric, nuclear, and thermoelectric powerplants are expected to meet Brazil's future energy needs. As an exporter of mineral commodities, the country is poised to gain from the continued FDI inflows into its economy, which represented an almost 47.5% share (\$25.9 billion) of South America's total FDI of \$54.5 billion in 2009. New mineral projects and expansions in progress are expected to ensure that Brazil retains its position among the global leaders in mineral commodities production in the foreseeable future. Brazil's renewed economic growth and its associated financial innovation are supporting the increase in domestic and transnational investors in Brazil's mineral industry and, in particular, in the metals, natural gas and petroleum, and biofuels and ethanol industries. According to the Banco Central do Brasil and the Economic Commission for Latin America and the Caribbean, more than 400 leading TNCs were planning to invest worldwide; these investments could position Brazil behind, in order of investment volume, China, the United States, and India. Brazil is expected to continue to be a strong economy in Latin America and the BRIC countries, which is a group made up of Brazil, Russia, India, and China. Brazil, as one of the world's leading producers of bauxite, crude oil, graphite, iron ore, manganese, niobium, tantalum, and tin,

is expected to continue to attract additional FDI inflows in the near future (Azambuja, 2010, p. 27-40; Banco Central do Brasil, 2010c, p. 20; Economic Commission for Latin America and the Caribbean, 2010, p. 25).

In 2009, Brazil had undergone dramatic changes in the crude oil and natural gas markets owing to the increase in energy investment opportunities and had become the center of an increasingly rapid process of energy integration in South America. It is expected that Petrobrás is considering developing future subsea technology solutions for its crude oil and natural gas projects offshore Brazil, which would include the development of innovative and cost-effective subsea production systems to address the challenges associated with Petrobras' pre-salt crude oil and natural gas fields and the design of subsea processing technologies that can increase recovery rates at Petrobras' maturing crude oil and natural gas fields (Petróleo Brasileiro S.A., 2009, p. 51; 2010a, p. 55; LatinPetroleum Magazine, 2010).

In spite of the global economic crisis during 2008-09, Brazil will likely continue to be the world's leading producer of key steel feedstocks, such as high-content iron ore and niobium, and the second ranked producer of bauxite and manganese. According to the Geological Survey of Brazil, there are substantial mineral deposits to be discovered in Brazil. With only one-third of the country's territory mapped, CPRM is planning to map the entire country's geology. CPRM indicated that the chances of finding first-class polymetallic deposits similar to the massive Carajas deposit in the State of Para were high, especially in the Amazon region. Carajas, which is the world's largest iron ore mine, holds an estimated 7.2 billion metric tons of iron ore resources (proven + probable) and produces about 100 Mt/yr. Vale was planning to increase Carajas' production to 130 Mt/yr by 2012. The Carajas iron deposit also holds high content of copper, gold, manganese, and nickel (Companhia de Pesquisa de Recursos Minerais, 2010; Vale S.A., 2010, p. 16).

Brazil's Federal tax exemptions on imports of equipment for minerals prospecting, exploration, development, and production are expected to continue in the medium and long term. The Agência Nacional do Petróleo was planning to extend these exemptions for the fuels sector into 2020. Petroleum companies and other investors have shown confidence in the country, which could support continued economic growth and FDI in new technologies well into the next decade. Investments in the Brazilian mining industry are expected to continue to increase exploration and mine development activities, particularly in, in order of value, iron ore, gold, copper, diamond, and emerald. This trend is expected to continue because several TNCs have joined consortiums and acquired exploration properties, mining prospects, and permits particularly for, in order of value, crude oil and ethanol, natural gas, iron ore, gold, diamond, copper, lead, and zinc (Departamento Nacional de Produção Mineral, 2010a, b).

Brazil's gold production could increase significantly in the foreseeable future because of the growth of Brazil's copper production and increased interest by domestic and foreign investors in largely unexplored areas. More than 2,500 gold occurrences, which are mostly Precambrian vein deposits and

alluvial placers, are known. During 2009-10, Brazil's investment in mineral exploration, such as for, in order of economic value, bauxite, copper, iron ore, and nickel, amounted to \$10.5 billion (Departamento Nacional de Produção Mineral, 2010a).

The aluminum, automobile, petrochemical, pulp and paper, and steel industries, which depend heavily on energy and exports, would likely benefit most from the new power-generating infrastructure. Increased consumption of fossil fuels will be a result of the 52 powerplants to be built in the foreseeable future (49 based on natural gas and 3 on coal). The Government eliminated all import tariffs and price controls on petroleum and derivatives to motivate private investment and to increase competition that would benefit the Brazilian economy. Petrobrás is expected to build additional refineries with the participation of new partners from the private sector (Petróleo Brasileiro S.A., 2010b).

The Amazon region contains considerable natural gas resources that remain nonproductive as yet, especially the Urucu field, which contains Brazil's largest onshore natural gas reserves. There is also the potential for major undiscovered mineral resources in addition to the large reserves of, in order of value, iron ore, manganese, bauxite, gold, and tin. There is, however, a concern over biodiversity in the Amazon Rainforest, which comprises 30% of the world's remaining tropical forests, and which provides shelter to 10% of the globe's plant and animal species and removes excess carbon dioxide from the atmosphere. Much of future minerals production, therefore, will also depend on the approaches and new technologies to be used for economic and social development that protects the environment in a responsible and sustainable way (Departamento Nacional de Produção Mineral, 2010a).

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TABLE 1
BRAZIL: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity ²	2005	2006	2007	2008	2009 ^P
METALS					
Aluminum:					
Bauxite, dry basis, gross weight	22,034,000	22,836,000 ^r	25,460,700	28,097,500	25,628,300
Alumina	5,191,000 ^r	6,720,000 ^r	7,077,600 ^r	7,822,300 ^r	8,625,100
Metal:					
Primary	1,498,000	1,605,000	1,655,000	1,661,100 ^r	1,534,800
Secondary	251,000	253,000	255,000	292,000	272,700
Total	1,749,000	1,858,000	1,910,000	1,953,100 ^r	1,807,500
Cadmium, metal, primary ^e	200	200	200	200	200
Chromium:					
Crude ore	616,534	562,739	627,772	753,326	725,681
Concentrate and lump, Cr ₂ O ₃ content	253,082	228,721	253,254	256,300	246,900
Marketable product ^{e,3}	12,000	12,000	12,000	12,000	12,000
Cobalt:^e					
Mine output, Co content of hydroxide	1,500	1,500	1,500	1,500	1,500
Metal, electrolytic ⁴	1,200 ⁵	1,200	1,200	1,200	1,200
Copper:					
Mine output, Cu content	133,325	147,836	205,728	222,102 ^r	219,676
Metal, refined:					
Primary	199,043	219,700	218,367	220,000	217,600
Secondary	25,000	27,000	24,000	25,633	25,000
Total	224,043	246,700	242,367	245,633	242,600
Gold:					
Mine output kilograms	29,942	39,266 ^r	42,443 ^r	49,373 ^r	58,400
Garimpeiros, independent miners do.	8,351	5,150 ^r	5,300 ^r	5,627	6,600
Total do.	38,293	44,416 ^r	47,743 ^r	55,000 ^r	65,000
Iron and steel:					
Iron ore and concentrate, marketable product:⁶					
Gross weight thousand metric tons	281,462	317,800	354,674	351,246 ^r	310,000 ⁵
Fe content do.	186,891	211,020	235,504	233,514 ^r	206,100 ⁵
Metal:					
Pig iron do.	33,884	32,452	35,571	33,000 ^r	22,000
Ferrous alloys, electric arc furnace:					
Ferrosilicon	197,653	166,577	195,890	194,323	194,300
Ferrosilicon silicon	11,600	11,600 ^e	11,600 ^e	11,507	1,500
Ferrocolumbium	38,819	41,566	52,442	53,839	53,800
Ferromanganese	598,650 ^r	573,430 ^r	419,230 ^r	536,610 ^r	681,500
Ferronickel	9,596	9,814	9,918	10,244	10,200
Ferrosilicon	146,000	146,000 ^e	146,000 ^e	144,832	145,000
Ferrosilicon magnesium ^e	14,600	14,600	14,600	14,500	14,500
Inoculant ^e	11,100	11,100	11,100	11,000	11,000
Silicomanganese	180,200	180,000 ^e	180,000 ^e	178,560	178,600
Silicon metal	133,400	133,000 ^e	133,000 ^e	131,940	132,000
Other ferroalloys	19,500	19,500 ^e	19,500 ^e	19,344	19,300
Total ^e	1,360,000 ^r	1,310,000 ^r	1,190,000 ^r	1,306,693 ^{r,5}	1,441,700 ⁵
Crude steel, excluding castings thousand metric tons	31,631	30,900	34,782 ^r	33,700 ^r	26,500
Semimanufactures, flat and nonflat ^e do.	17,500	17,500	17,500	17,500	17,500
Lead:					
Mine output, Pb content in concentrate	23,616	25,764	24,574	25,286 ^r	24,600
Metal, secondary	120,625 ^r	108,951 ^r	130,963 ^r	95,704 ^r	96,000
Manganese:					
Ore and concentrate, marketable:³					
Gross weight	3,200,000	3,128,000	1,866,000	2,400,000	2,171,000
Metal content	1,370,000	1,845,000	2,214,000	2,091,200	1,892,000
Metal:					
Primary	13,700	18,450	22,140	20,910	19,580
Secondary ^e	1,600	1,600	1,600	1,600	1,600

See footnotes at end of table.

TABLE 1—Continued
BRAZIL: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity ²	2005	2006	2007	2008	2009 ^p
METALS—Continued					
Nickel:					
Mine output, ore	4,845,695	5,503,211	5,927,554	5,494,843	5,494,800
Ni content in ore	74,198	82,492	58,317	67,116 ^r	67,000
Ni content in carbonate	21,116	21,630	20,796	19,278	19,300
Ni content in matte	6,005	5,416	3,401	8,328 ^r	3,153
Ni, electrolytic	20,714	21,339	21,635	18,530 ^r	20,056
Ferronickel, Ni content	9,596	9,814	9,918	10,244 ^r	9,453
Niobium (columbium)-tantalum ores and concentrates, gross weight:					
Columbite and tantalite ^e	456	456	456	456	456
Djalmaite concentrate ^e	10	10	10	10	10
Pyrochlore concentrate, Nb ₂ O ₅ content	56,023	68,850	81,922	82,000	60,000
Rare-earth metals, monazite concentrate, gross weight	958	958	1,173	1,200	1,200
Silver⁷					
Primary kilograms	38,134	30,000	36,000	36,500	36,500
Secondary ^e do.	43,000 ^s	39,000	32,000	32,500	32,500
Total do.	81,134	69,000	68,000	69,000	69,000
Tin:					
Mine output, Sn content	11,739	9,528	11,835	13,000	13,000
Metal, smelter:					
Primary	8,986	8,780	9,384	10,308	10,300
Secondary ^e	250	250	250	250	250
Total	9,236	9,030	9,634	10,558	10,600
Titanium:					
Ilmenite:					
Gross weight	127,142	127,200	130,000	130,000	130,000
TiO ₂ content	77,571	89,195	95,559	96,600	96,600
Rutile, TiO ₂ content	2,069	2,100	3,000	3,000	3,000
Tungsten, mine output, W content	577	525	537	550	550
Zinc:					
Mine output, Zn content	170,659	185,211	193,887	173,933	189,300
Metal, smelter, primary	267,374	272,311	265,126	248,874	270,700
Zirconium, zircon concentrate, gross weight ⁸	25,657	25,120	26,739	26,739	26,700
INDUSTRIAL MINERALS					
Asbestos:					
Crude ore	3,670,000 ^e	3,541,000	3,528,000	4,154,000	4,073,000
Fiber	236,047	227,304	254,204	287,673	282,032
Barite:					
Crude	42,924	47,611	37,000	41,070	41,000
Beneficiated	39,545	19,151	13,311	7,321	7,300
Marketable product ^{e,3}	45,000	45,000	45,000	45,000	45,000
Calcite ^e	35,000	35,000	35,000	35,000	35,000
Cement, hydraulic thousand metric tons	38,705 ^r	41,895 ^r	46,551 ^r	51,970 ^r	51,748
Clays:					
Bentonite, beneficiated	221,300	235,481	238,746	238,800	239,000
Kaolin:					
Crude	6,150,000	6,200,000	6,382,000	6,881,000	6,571,000
Beneficiated	2,410,000	2,455,000	2,530,000 ^r	2,800,000	2,674,000
Marketable product ³	2,072,000	2,404,000	2,428,000	2,618,000	2,500,000
Diamond:^e					
Gem and industrial:					
Private sector thousand carats	96	84	84	84	98
Garimpagem do.	112	97	98	98	102
Total ⁹ do.	208	181	182	182	200
Diatomite:					
Crude	7,549	10,753	9,638	9,640	9,600
Beneficiated	7,670	8,968	5,555	5,560	5,600
Marketable product ^{e,3}	13,100	13,100	13,100	13,100	13,000

See footnotes at end of table.

TABLE 1—Continued
BRAZIL: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity ²	2005	2006	2007	2008	2009 ^p
INDUSTRIAL MINERALS—Continued					
Feldspar:					
Crude	196,419	166,418	182,168	182,200	182,000
Marketable product: ³					
Feldspar	117,387	71,785	166,089 ^e	166,100 ^e	166,000 ^e
Leucite ^e	5,000	5,000	5,000	5,000	5,000
Sodalite, crude ^e	500	500	500	500	500
Total	122,887	77,285	171,589	171,600	171,500
Fluorspar:					
Crude ore	201,435	192,628	198,449	191,600	192,000
Concentrates, marketable product:					
Acid-grade	42,043	41,373	45,342 ^r	44,559	44,600
Metallurgical-grade	24,469	22,231	20,582 ^r	19,014	19,000
Total	66,512	63,604	65,924 ^r	63,573	63,600
Graphite:					
Crude ^e	650,000	650,000	650,000	650,000	650,000
Marketable product, concentrate ³	75,515 ^r	76,194	77,163	77,200 ^e	77,200
Gypsum and anhydrite, crude	1,582,248	1,711,671	1,923,119	1,923,200	1,950,000
Kyanite: ^e					
Crude	750	750	750	750	750
Marketable product ³	600	600	600	600	600
Lime, hydrated and quicklime	6,500	7,057	7,393	7,400	7,400
Lithium, concentrates	8,924	8,950	8,950	9,000	9,000
Magnesite:					
Crude	1,342,754	1,163,422	1,301,827	1,301,850	1,302,000
Beneficiated	386,759	382,718	399,314	399,320	399,000
Mica, all grades ^e	4,000	4,000	4,000	4,000	4,000
Nitrogen, N content of ammonia ^e	950,000 ⁵	950,000	950,000	950,000	950,000
Phosphate rock, including apatite:					
Crude:					
Mine product	34,000	36,700	38,265	39,243	42,000
Of which sold directly ^e	35	35	35	35	35
Concentrate:					
Gross weight	5,631	5,932	6,185	6,343	6,800
P ₂ O ₅ content	2,005	2,111	2,185	2,242	2,400
Pigment, mineral, other, crude ^e	2,000	2,000	2,000	2,000	2,000
Potash, marketable (K ₂ O)	404,871	403,080	423,897	383,257	383,300
Potassium (KCl)	638,020	635,200	636,500	575,480	575,500
Precious and semiprecious stones except diamond, crude and worked: ^e					
Agate	3,000	3,000	3,000	3,000	3,000
Amethyst	1,000	1,000	1,000	1,000	1,000
Aquamarine	20	20	20	20	20
Citrine	100	100	100	100	100
Emerald	90	90	90	90	90
Opal	500	500	500	500	500
Ruby	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000
Sapphire	\$15,000	\$15,000	\$15,000	\$15,000	\$15,000
Topaz	50	50	50	50	50
Tourmaline	80	80	80	80	80
Other	500	500	500	500	500
Quartz crystal, all grades	17,860	14,195	22,561	22,600	22,600
Salt:					
Marine	5,520	5,122	5,365	5,370	5,400
Rock	1,559	1,622	1,621	1,650	1,650
Silica, silex ^e	1,600	1,600	1,600	1,600	1,600
Sodium compounds: ^e					
Caustic soda	1,050,000	1,050,000	1,050,000	1,050,000	1,050,000
Soda ash, manufactured (barilla)	200,000	200,000	200,000	200,000	200,000

See footnotes at end of table.

TABLE 1—Continued
BRAZIL: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity ²	2005	2006	2007	2008	2009 ^P
INDUSTRIAL MINERALS—Continued					
Stone, sand and gravel: ^c					
Dimension stone:					
Marble, rough-cut cubic meters	200,000	200,000	200,000	200,000	200,000
Of which sold directly	50,000	50,000	50,000	50,000	50,000
Crushed and broken stone:					
Basalt cubic meters	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
Calcareous shells	450,000	450,000	450,000	450,000	450,000
Dolomite thousand metric tons	3,500	3,500	3,500	3,500	3,500
Gneiss cubic meters	1,100,000	1,100,000	1,100,000	1,100,000	1,100,000
Granite thousand cubic meters	60,000	60,000	60,000	60,000	60,000
Limestone thousand metric tons	60,000	60,000	60,000	60,000	60,000
Quartz ¹⁰	250,000	250,000	250,000	250,000	250,000
Quartzite:					
Crude	400,000	400,000	400,000	400,000	400,000
Processed	200,000	200,000	200,000	200,000	200,000
Sand, industrial	2,700,000	2,700,000	2,700,000	2,700,000	2,700,000
Sulfur:					
Frasch	19,618	20,954	22,336	22,400	22,400
Byproduct:					
Metallurgy	266,817	297,539	321,707	321,750	321,800
Petroleum	112,093	117,203	135,623	135,650	135,700
Total	398,528	435,696	479,666	479,800	479,900
Talc and related material:					
Talc:					
Crude	413,340	389,471	401,204	401,210	401,200
Marketable product ^{e,3}	2,000	2,000	2,000	2,000	2,000
Pyrophyllite, crude ^c	200,000	200,000	200,000	200,000	200,000
Vermiculite:					
Concentrate	24,191	19,279	18,952	20,089	20,100
Marketable product ^{e,3}	3,100	3,100	3,100	3,100	3,100
MINERAL FUELS AND RELATED MATERIALS					
Coal, bituminous:					
Run-of-mine thousand metric tons	12,800 ^r	13,200 ^r	13,600 ^r	13,210 ^r	13,578
Beneficiated/Marketable ³ do.	5,860 ^r	5,528 ^r	6,133 ^r	6,474	6,500
Coke, metallurgical, all types ^e do.	300 ⁵	300	300	300	300
Natural gas, gross million cubic meters	16,619 ^r	16,051 ^r	15,831 ^r	18,642 ^r	18,375
Natural gas liquids million 42-gallon barrels	4,700	4,700 ^e	4,700 ^e	4,904	4,834
Petroleum:					
Crude thousand 42-gallon barrels	596,255	628,797	638,018	876,000	938,780
Refinery products: ^{11,12}					
Liquefied petroleum gas (LPG) do.	13,757	13,891	14,175	14,437 ^r	15,675
Gasoline do.	141,332	142,703	145,673	148,365 ^r	161,091
Jet fuel do.	587	592	605	621 ^r	670
Kerosene do.	27,460	27,727	28,304	28,827 ^r	31,300
Distillate fuel oil do.	217,114	219,228	223,580	227,709 ^r	247,241
Lubricants do.	6,168	6,228	6,357	6,475 ^r	7,030
Residual fuel oil do.	124,523	125,731	128,348	130,719 ^r	141,932
Other do.	105,879	106,906	109,131	111,147 ^r	120,681
Total	636,820	643,006	656,173	668,300 ^r	725,620

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

¹Table includes data available through October 31, 2010.

²In addition to the commodities listed, bismuth, molybdenite, and uranium oxide are produced, but output is not reported, and available information is inadequate to make reliable estimates of output.

³Direct sales and (or) beneficiated (marketable product).

⁴Source: Cobalt Development Institute.

⁵Reported figure.

⁶Includes sponge iron, in metric tons, as follows: 2005-09—270,000 (estimated).

TABLE 1—Continued
BRAZIL: PRODUCTION OF MINERAL COMMODITIES¹

⁷Officially reported output. Of total production, the following quantities are identified as secondary silver (the balance being silver content of other ores and concentrates), in kilograms: 2005-07—50,000 and 2008-09—45,000.

⁸Includes baddeleyite-caldasite.

⁹Figures represent officially reported diamond output plus official Brazilian estimates of output by nonreporting miners.

¹⁰Apparently includes crude quartz used to produce quartz crystal (listed separately in this table), as well as additional quantities of common quartz.

¹¹Data are those officially reported production to the United Nations by the Ministry of Mines and Energy of Brazil. Source: Energy Statistics Yearbook.

¹²Source: Economia Mineral do Brasil, Departamento Nacional de Produção Mineral, 2009 and 2010; and Petrobrás annual report 2009 and Petrobrás Magazine 2010.

TABLE 2
BRAZIL: STRUCTURE OF THE MINERAL INDUSTRY IN 2009

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
METALS			
Aluminum	Albras-Alumínio Brasileiro S.A. (Albras) [Vale S.A., 51%, and Nippon Amazon Alumínio Co. (NAAC), 49%]	Belem and Vila do Conde, Para State (two smelters)	455 (metal).
Do.	Alcan Alumínio do Brasil S.A. [Alcan Aluminum Ltd. (Alcan), 100%]	Saramenha, Minas Gerais State (smelter and refinery)	100 (metal).
Do.	do.	do.	150 (alumina).
Do.	Alcan Empreendimentos Ltda. (Alcan Alumínio do Brasil S.A., 100%)	Lamininação de Pindamonhangaba, Sao Paulo State (smelter)	280 (metal).
Do.	Alcan Alumínio Poços de Caldas (Alucaldas) (Alcan Alumínio do Brasil S.A., 100%)	Poços de Caldas, Minas Gerais State (mine)	1,000 (bauxite).
Do.	Alcoa Alumínio S.A. (Alcoa Inc., 54%; BHP Billiton plc, 36%; Alcan Aluminum Ltd., 10%)	do.	400 (bauxite).
Do.	do.	Sao Luiz, Maranhao State (refinery)	550 (alumina).
Do.	do.	Sao Luiz, Maranhao State (smelter)	239 (metal).
Do.	Alumínio do Brasil Nordeste S.A. (Alcan Aluminum Ltd., 100%)	Aratu, Bahia State (smelter)	120 (metal).
Do.	Alumar Consortium S.A. (Alcoa Alumínio S.A., 100%)	Juriti bauxite mine, Para State	4,000 (bauxite).
Do.	Alumar Consortium S.A. (Alcoa Inc., 54%; BHP Billiton plc, 36%; Alcan Aluminum Ltd., 10%)	Sao Luis, Maranhao State (refinery)	2,000 (alumina).
Do.	Alumar Consortium S.A. (Alcoa Inc., 53.66%, and BHP Billiton plc, 46.34%)	Sao Luis, Maranhao State (smelter)	1,000 (metal).
Do.	Alumínio do Norte do Brasil S.A. (Alunorte) (Vale S.A., 57%, and Hydro Aluminium, Nippon, Japan Alunorte, 43%)	Barcarena, Para State (refinery)	6,300 (alumina).
Do.	Companhia Brasileira de Alumínio (CBA) (Votorantim Group, 100%)	Poços de Caldas, Minas Gerais State (mine)	1,000 (bauxite).
Do.	do.	Sorocaba, Sao Paulo State (refinery)	500 (alumina).
Do.	do.	Sorocaba, Sao Paulo State (smelter)	400 (metal).
Do.	Companhia Geral do Minas (Aluminum Co. of America, 79%, and others, 21%)	Poços de Caldas, Minas Gerais State (refinery)	275 (alumina).
Do.	do.	Poços de Caldas, Minas Gerais State (smelter)	95 (metal).
Do.	Mineração Rio do Norte S.A. (MRN) (Vale S.A., 40%; BHP Billiton plc, 14.8%; Alcoa Inc., 13.2%; Alcan Empreendimentos Ltda., 12%; Companhia Brasileira de Alumínio, Norsk Hydro Comercio e Industria, 5%; Reynolds Alumínio do Brasil, 5%)	Oriximina, Para State (mine)	18,000 (bauxite).
Do.	do.	Papagalo, Para State (mine)	2,000 (bauxite).
Do.	do.	Trombetas, Para State (mine)	2,000 (bauxite).
Do.	Vale do Sul Alumínio S.A. (Valesul) (Vale S.A., 100%)	Santa Cruz, Rio de Janeiro State (smelter)	95 (metal).
Do.	Reynolds Internacional do Brasil, 42.5%; Bradesco Bank, 42.5%; J.P. Morgan, 15%)	Sorocaba, Sao Paulo State (smelter)	5.4 million (cans).
Do.	Vale S.A., (private, 100%)	Paragominas, Para State (mine)	9,900 (bauxite).
Do.	do.	Jabuti, Para State (alumina)	1,860 (alumina).

See footnotes at end of table.

TABLE 2—Continued
BRAZIL: STRUCTURE OF THE MINERAL INDUSTRY IN 2009

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
METALS—Continued			
Chromite	Coitezeirio Mineração S.A. (COMISA) (private, 75.4%, and Bayer do Brasil S.A., 24.6%)	Campo Formosa, Bahia State (mine)	50 (ore).
Do.	Companhia de Ferro Ligas da Bahia (FERBASA) (private, 100%)	do.	370 (ore).
Do.	do.	Campo Formoso, Bahia State (beneficiation plant)	292 (concentrate).
Copper	Vale S.A. (private, 100%)	Sossego Mine, Serra dos Carajas, Para State	130 (ore).
Do.	do.	Salobo Mine, Para State (copper concentrate AND refinery plant)	520 (concentrate), 255 (metal).
Do.	Mineração Caraíba S/A (Grupo PARANAPANEMA, 100%)	Jaguari, Bahia State (mine)	130 (ore).
Do.	do.	Jaguari, Bahia State (beneficiation plant)	90 (concentrate).
Do.	Caraíba Metais S/A (CMSA) (Grupo PARANAPANEMA, 100%)	Camacari, Bahia State (refinery)	220 (metal).
Do.	Yamana Gold Inc. (YGI) (private, 100%)	Chapada, Alto Horizonte in Goiás State (mine)	200 (concentrate).
Do.	Companhia Brasileira Carburito de Calcio (private, 100%)	Santos Dumont, Minas Gerais State (plant)	54.
Ferroalloys	Prometal Produtos Metalúrgicos S.A., 60%, and Elkem A/S, 40%	Maraba, Para State (plant)	500.
Do.	Nova Era Silicon S.A. (Vale S.A., 49%; Mitsubishi Corp., 25.5%; Kawasaki Steel Corp., 25.5%)	Nova Era, Minas Gerais State	48.
Do.	Companhia Ferro-Ligas de Bahia S.A. (FERBASA), 100%	Pojuca, Bahia State (plant)	194.
Do.	Companhia Ferro-Ligas Minas Gerais (MINASLIGAS), 100%	Pirapora, Minas Gerais State (plant)	58.
Do.	Companhia Paulista de Ferro-Ligas (CPF) (private, 100%)	Barbacena, Caxambu, Jeceaba, Passa Quatro, and Passa Vinte, Minas Gerais State; Corumba, Matto Grosso do Sul State; and Xanxere, Santa Catarina State	326.
Do.	Italmagnesio S.A. Indústria e Comercio (ISAIC) (private, 100%)	Braganca Paulista, São Paulo State; and Varzeada Palma, Minas Gerais State (two plants)	63.
Do.	Rio Doce Manganês S.A. (Vale S.A., 100%)	Bahia, Mato Grosso do Sul, and Minas Gerais	600.
Do.	Urucum Mineração S.A. (Vale S.A., 100%)	Corumba plant, Mato Grosso do Sul State	20.
Gold	kilograms Vale S.A. (private, 100%)	Gold mines in the States of Minas Gerais, Bahia, and Para	18,000.
Do.	do. Mineração Morro Velho S.A. (AngloGold Ashanti Mineração Ltda., 100%)	Cuiaba, Novo Lima, and Sabara, Minas Gerais State; and Jacobina, Bahia State (four mines)	8,100.
Do.	do. Mineração Serra Grande S.A. (AngloGold Ashanti Mineração Ltda., 50%, and Kinross Gold Corp., 50%)	Serra Grande, Minas Gerais State (mine)	6,000.
Do.	do. São Bento Mineração S.A. (Eldorado Gold Corp., 100%)	Santa Barbara, Minas Gerais State (mine)	4,000.
Do.	do. Rio Paracatu Mineração S.A. (Kinross Gold Corp., 50%, and Mineração Serra Grande S.A., 50%)	Paracatu Mine, Minas Gerais State (mine)	7,500.
Do.	do. Yamana Gold Inc. (YGI) (private, 100%)	Chapada, Alto Horizonte in Goiás State (mine)	1,200.
Do.	do. do.	Sao Francisco Mine, Mato Grosso State (mine)	3,100.
Do.	do. do.	Jacobina Mine, Bahia State (mine)	3,000.
Do.	do. do.	Fazenda Brasileiro, Goiás State (mine)	3,700.
Do.	do. do.	Sao Vicente Mine, Mato Grosso State (mine)	1,900.
Iron ore	Companhia Siderúrgica Nacional (CSN) (private, 100%)	Volta Mine, Minas Gerais State	15,000.
Do.	Itaminas Comércio de Minérios S.A. (private, 100%)	Itaminas, Minas Gerais State	5,000.
Do.	Vale S.A. (private, 100%)	Serra dos Carajas Mine in Parauapebas, Para State	100,400.
Do.	do.	Itabirito, Mato, Vargem Grande, and Paraopeba, Minas Gerais State (four mines)	87,300.
Do.	do.	Itabira, Ouro Preto, Santa Barbara, Xavier, Tamandúa, Capao, and Mato, Minas Gerais State (seven mines)	134,600.
Do.	do.	Mato Grosso do Sul State (one mine)	1,500.
Do.	do.	Ponta Madeira, Sao Luis, and Tubarao, Maranhão State (pellet plants)	31,700.

See footnotes at end of table.

TABLE 2—Continued
BRAZIL: STRUCTURE OF THE MINERAL INDUSTRY IN 2009

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
METALS—Continued			
Iron ore—Continued	Vale S.A. (Vale S.A., 50.9%, and Arcelor Mittal Co., 49.1%)	Hispanobras, Espirito Santo State (pellet plant)	3,800.
Do.	Vale S.A. (Vale S.A., 50%, and BHP Billiton plc., 50%)	Sepetiba, Samarco, Rio de Janeiro State (pellet plant)	21,800.
Do.	Ferteco Mineração S.A. (FERTECO) (Exploration Bergbau GmbH, 100%)	Ouro Preto and Brumadinho, Minas Gerais State (two mines)	12,800.
Do.	S.A. Mineração da Trindade (SAMITRI) (private, 100%)	Mariana, Rio Piracicaba, Itabira, Ouro Preto, and Sabara, Minas Gerais State (five mines)	9,300.
Do.	Minerações Brasileiras Reunidas S/A (MBR) (BHP Billiton plc, 50%, and Mitsui Co. Ltd., 50%)	Capao Xavier, Tamandua, and Capitao do Mato, Minas Gerais State (three mines)	32,000.
Do.	Samarco Mineração S.A. (SAMITRI), 51%, and BHP Billiton Ltd., 49%	Alegria, Minas Gerais State (mine)	15,000.
Do.	Mineração Corumbaense Reunida S/A (MCR) (Rio Tinto plc, 100%)	Corumba, Mato Grosso do Sul (mine)	2,000.
Lead	Companhia Mineira de Metais (CMM) (private, 100%)	Paracatu, Minas Gerais State (mine)	25 (ore).
Do.	do.	Paracatu, Minas Gerais State (plant)	15 (concentrate).
Manganese	Rio Doce Manganês S.A. (RDM) (Vale S.A., 100%)	Morro da Mina, Minas Gerais State	300.
Do.	do.	Mina do Azul, Carajas, Para State	2,500.
Do.	do.	Mina Mineiros, Bahia State	1,500.
Do.	Urucum Mineração S.A. (Vale S.A., 100%)	Corumba and Ladario, Mato Grosso do Sul State (two mines and plant)	1,500 (ore), 500 (concentrate).
Do.	Construtora Polares Ltda. (CPL) (private, 100%)	Corumba Minas Gerais State (mine)	200 (ore).
Nickel	Companhia Niquel Tocantins (Grupo Votarantim, 100%)	Niquelandia, Goias State (mine)	30 (ore).
Do.	do.	Niquelandia, Goias State (refinery plant)	25 (electrolytic).
Do.	Mineração Serra da Fortaleza (Grupo Votarantim, 100%)	Fortaleza, Minas Gerais State (mine)	19 (nickel matte).
Do.	CODEMIN S.A. (Anglo American plc, 100%)	Niquelandia, Goias State (refinery)	20 (metal).
Do.	Vale S.A. (private 100%)	Onca Puma and Vermelho, Para State (alloy plant)	58 (iron-nickel alloy).
Niobium (columbium)	Companhia Brasileira de Metalurgia e Mineração (Grupo Moreira Sales S.A., 55%, and Molycorp, Inc., 45%)	Araxa, Minas Gerais State (mine)	120 (ore).
Do.	do.	Araxa, Minas Gerais State (beneficiation plant)	60 (pyrochlore).
Do.	Mineração Catalão de Goiás Ltda. (MCGL) (Bozzano Simosen S.A., 68.5%, and Anglo American plc, 31.5%)	Ouvidor and Catalao I, Goias State (mines)	70 (ore).
Do.	do.	Ouvidor, Goias State (plants)	24 (pyrochlore).
Steel	Aço Minas Gerais S.A. (GERDAU AÇOMINAS, 100%)	Rodovia, Minas Gerais State	7,000.
Do.	Acesita S.A. (private, 100%)	Timoteo, Minas Gerais State (specialty steel)	900.
Do.	Companhia Siderúrgica Belgo-Mineira (private, 100%)	João Monlevade, Minas Gerais State	1,000.
Do.	Companhia Siderúrgica de Tubarão (private, 100%)	Serra, Espírito Santo State	4,800.
Do.	Companhia Siderúrgica Nacional (CSN) (private, 100%)	Volta Redonda, Rio de Janeiro State	5,800.
Do.	Companhia Siderúrgica Paulista (COSIPA) (private, 100%)	Cubatao, Sao Paulo State	4,500.
Do.	Usinas Siderúrgicas de Minas Gerais, S.A. (USIMINAS) (private, 100%)	Ipatinga, Minas Gerais State	5,500.
Tantalum	metric tons Mineração Taboca/AM (private, 100%)	Pitinga Mine, Amazonas State (mine)	180 (concentrate).
Do.	do. Companhia Industrial Fluminense (private, 100%)	Fluminense Mine, Minas Gerais State (mine)	25 (concentrate).
Tin	Mineração Jacunda Ltda. (MJL) (private, 100%)	Santa Barbara, Novo Mundo, and Potosi, Rondônia State (six mines)	108 (ore).
Do.	do.	Santa Barbara, Novo Mundo, and Potosi, Rondônia State (three beneficiation plants)	450 (concentrate).
Do.	Grupo PARANAPANEMA (private, 100%)	Aripuana, Mato Grosso State; Ariquemes, Rondônia State; Novo Aripuana, Pitinga, and Presidente Figueiredo, Amazonas State; and Sao Felix do Xingu, Para State (five mines and two plants)	5,420 (ore).
Do.	do.	Piraporada Bom Jesus, Sao Paulo State (refinery)	1,400 (concentrate), 25 (metal).
Do.	Marmoré S.A. (Grupo PARANAPANEMA, 100%)	Juiz de Fora, Minas Gerais State (mine)	20 (ore).

See footnotes at end of table.

TABLE 2—Continued
BRAZIL: STRUCTURE OF THE MINERAL INDUSTRY IN 2009

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
METALS—Continued				
Tin—Continued		Grupo PARANAPANEMA (private, 100%)	Aripuana, Mato Grosso State; Ariquemes, Rondonia State; Novo Aripuana, Pitinga, and Presidente Figueiredo, Amazonas State; and Sao Felix do Xingu, Para State (five mines and two plants)	5,420 (ore).
Do.		do.	Piraporada Bom Jesus, Sao Paulo State (refinery)	1,400 (concentrate), 25 (metal).
Do.		Marmoré S.A. (Grupo PARANAPANEMA, 100%)	Juiz de Fora, Minas Gerais State (mine)	20 (ore).
Titanium		Rutilo e Ilmenita do Brasil S.A. (RIBSA), 100%	Mataraca, Paraiba State (mine)	4,200 (ore).
Do.		do.	Mataraca, Paraiba State (two beneficiation plants)	120 (concentrate).
Zinc		Votorantim Metais Zinco S/A (Grupo Votorantim, 100%)	Vazante, Minas Gerais State (mine)	800 (ore).
Do.		do.	Vazante, Minas Gerais State (beneficiation plant)	175 (concentrate).
Do.		do.	Tres Marias, Minas Gerais State (refinery)	180 (metal).
Do.		do.	Juiz de Fora, Minas Gerais State (complex)	95 (metal).
Zirconium		Nuclemon Mineiro-Química Ltda. (Government, 100%)	Sao Joao da Barra, Rio de Janeiro State (mine)	660 (ore).
Do.		do.	Itapemirim, Espirito Santo State (mine)	90 (ore).
Do.		do.	Prado, Bahia State (mine)	90 (ore).
Do.		do.	Prado, Bahia State (three beneficiation plants)	123 (concentrate).
Do.		do.	Prado, Bahia State (three separation plants)	90 (concentrate).
INDUSTRIAL MINERALS				
Asbestos		Sociedade Anônima Mineração de Amianto (private, 100%)	Cana Brava and Minacu, Goias State (mines)	9,000 (ore).
Do.		do.	Cana Brava and Minacu, Goias State (beneficiation plant)	230 (concentrate).
Cement		Votorantim Cimentos S.A. (Grupo Votorantim, 100%)	Itapevi and Salto de Pirapora, Sao Paulo State	5,000 (3 plants).
Do.		do.	Itau de Minas, Minas Gerais State	5,000 (3 plants).
Do.		do.	Rio Branco do Sul, Parana State	5,000 (3 plants).
Do.		do.	Cipasa, Santa Elena, Sergipe State	5,000 (3 plants).
Do.		do.	Cantagalo, Esteio, Rio Grande do Sul State	5,000 (3 plants).
Do.		Companhia de Cimento Portland Paraíso (CCPP), 50% and Lafarge S.A., 50%)	States of Espirito Santo, Goias, Minas Gerais, and Rio de Janeiro (five plants)	4,000.
Do.		Companhia de Cimento Portland S.A. (CIMPOR Brazil)	States of Rio Grande do Sul, Santa Catarina, Sao Paulo, Goias, and Bahia (six plants)	6,000.
Do.		Camargo Correia Cimentos S.A. (CCSA) (private, 100%)	Ijaci, Minas Gerais State (plant)	1,600.
Do.		Holcim (Brasil) S.A.	Chacara, San Antonio, Sao Paulo State (4 plants)	5,000.
Fluorspar		Mineração Nossa Senhora do Carmo Ltda. (private, 100%)	Cerro Azul, Parana State (two mines)	180 (ore).
Do.		Mineração Santa Catarina Ltda. (MSCL) (private, 100%)	Morro da Fumaça, Santa Rosa de Lima, Rio Fortuna, Santa Catarina State; and Tangua, Rio de Janeiro State (three mines and beneficiation plant)	100 (ore), 120 (concentrate).
Gemstones	carats	Mineradora S/A (Diagem do Brasil Mineração Ltda., 100%)	Juina, Mato Grosso State	92,100.
Do.	do.	Chapada Brasil Ltda. (Grupo Elkedra Diamonds NL, 100%)	Chapada dos Guimaraes, Mato Grosso State (mine)	100,000.
Do.	do.	Mineração Rio Novo S/A. (private, 100%)	Diamantina, Minas Gerais State (mine)	107,500.
Graphite		Nacional de Grafite Ltda. (NGL) (private, 100%)	Itapecerica, Pedra Azul, Salto da Divisa, Minas Gerais State (three mines)	80 (ore).
Do.		do.	Itapecerica, Pedra Azul, Salto da Divisa, Minas Gerais State (three beneficiation plants)	60 (concentrate).
Do.		Grafita MG Ltda. (GML) (private, 100%)	Mateus Leme, Zerra Azul, Minas Gerais State (two mines)	20 (ore).
Do.		Marmoré Mineração e Metalurgia Ltda. (MML) (Grupo PARANAPANEMA, 100%)	Maiquinique, Bahia State (mine)	10 (ore).
Gypsum		Companhia Brasileira de Equipamento (private, 100%)	Codo, Maranhao State, and Ipubi, Pernambuco State (two mines)	600 (ore).
Do.		Mineradora Rancharia Ltd/Supergesso S.A (private, 100%)	Ipubi, Pernambuco State (mine)	600 (ore).
Do.		Holcin Brasil S.A. (Grupo Holderbank, 100%)	Holder, Pernambuco State (mine)	600 (ore).
Do.		Mineradora São Jorge S.A (Grupo Laudenor Lins, 100%)	Sao Jorge, Maranhao State (mine)	110 (ore).
Do.		Votorantim Cimentos N/NE (private, 100%)	Mateo, Ceara State (mine)	70 (ore).

See footnotes at end of table.

TABLE 2—Continued
BRAZIL: STRUCTURE OF THE MINERAL INDUSTRY IN 2009

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity	
INDUSTRIAL MINERALS—				
Continued				
Kaolin	Caulim da Amazônia S.A. (CADAM) (private, 100%)	Mazagao, Amapa State (mine)	720 (ore).	
Do.	do.	Mazagao, Amapa State (beneficiation plant)	360 (concentrate).	
Do.	do.	Adam Mine, Rio Jari, Amazonas State	660 (concentrate).	
Do.	Pará Pigmentos S.A. (PPSA) (private, 100%)	Para Mine, Para State	500 (concentrate).	
Do.	Ymerys Rio Capim Caulim S.A. (RCCSA) (private, 100%)	Rio Capim Mine, Para State	500 (concentrate).	
Do.	Empresa de Mineração Horii Ltda. (EMHL) (private, 100%)	Biritiba and Mogi das Cruzes, Sao Paulo State (two mines)	200 (ore).	
Do.	do.	Biritiba and Mogi das Cruzes, Sao Paulo State (two beneficiation plants)	180 (concentrate).	
Limestone	Companhia de Cimento Portland Paraiso (CCPP) (private, 100%)	States of Goiás, Minas Gerais, and Rio de Janeiro (five mines)	2,000.	
Do.	Companhia de Cimento Portland Rio Branco (CCPRB), 100%	Rio Branco do Sul, Parana State (three mines)	5,500.	
Do.	S.A. Industrias Votorantim (SAIV) (private, 100%)	States of Rio de Janeiro and Sao Paulo (four mines)	1,000.	
Magnesite	Magnesita S.A. (MSA) (private, 100%)	Brumado, Bahia State (one major mine and numerous small mines)	1,000 (ore).	
Do.	do.	Brumado, Bahia State (two beneficiation plants)	280 (concentrate).	
Phosphate rock	Bunge Fertilizantes S.A. (Bunge Ltd., 100%)	Araxa, Minas Gerais State (mine)	5,000.	
Do.	Copebrás S.A.(Copebrás) (Anglo American plc, 100%)	Ouvidor, Goiás State (mine)	4,400.	
Do.	Fosfertil S.A. (Grupo Fertifós, 81.54%; Vale S.A., 10.96%; public, 7.5%)	Tapira, Minas Gerais State (two mines)	10,500.	
Do.	Ultrafertil S.A. (Grupo Fertifós, 81.54%; Vale S.A., 10.96%; public, 7.5%)	Araxa, Minas Gerais State (mine)	5,000.	
Quartz	Telequartzo Exportação S.A. (TESA) (private, 100%)	Cristal, Minas Gerais State (mine)	6.0.	
Salt, rock	Frota Oceânica Brasileira S.A. (FOBSA) (private, 100%)	Jacupiranga, Sao Paulo State (mine)	6,000.	
Do.	Dow Química do Nordeste Ltd. (DQNL) (Dow Chemical Co., 100%)	Vera Cruz, Bahia State (mine)	1,000.	
Do.	Cia. Nacional de Alcalis S.A. (CNA) (private, 100%)	Alcalis Grupo, Rio Grande do Norte State	1,500.	
Do.	Salgema Mineração e Química S.A. (SMQ) (private, 100%)	Salgema, Maceio, Alagoas State (mine)	1,000.	
MINERAL FUELS AND RELATED MATERIALS				
Coal	Carbonífera Circiúma S.A. (CCSA) (private, 100%)	Circiúma and Sideropolis, Santa Catarina State (two mines)	1,600.	
Do.	Companhia Carbonífera Metropolitana S.A. (private, 100%)	Circiúma, Sideropolis, and Urussanga, Santa Catarina State (three mines)	1,200.	
Do.	Copelmi Mineração Ltda. (COPELMI) (private, 100%)	Arroio dos Ratos, Butia, and Charqueadas, Rio Grande do Sul State (four mines)	4,600.	
Do.	Indústria Carbonífera Rio Deserto Ltda. (private, 100%)	Circiúma and Urussanga, Santa Catarina State (two mines)	2,600.	
Natural Gas	thousand cubic meters	Petróleo Brasileiro S.A. (Petrobrás) (Government, 81.4%; private, 11.8%; public, 6.8%)	Fields in the States of Alagoas, Amazonas, Bahia, Ceara, Espirito Santo, Rio de Janeiro	20,000.
Petroleum	thousand 42-gallon barrels	do.	Fields in the States of Alagoas, Amazonas, Bahia, Ceara, Espirito Santo, Rio de Janeiro, Rio Grande do Norte, Para, Maranhao, and Sergipe	700,000.
Petroleum products	do. do.	do.	Refineries in the States of Amazonas, Bahia, Ceara, Minas Gerais, Parana, Rio de Janeiro, Rio Grande do Sul, and Sao Paulo	650,000.
Do.	do.	Refinaria de Petróleo Ipiranga S.A. (private, 100%)	Ipiranga, Rio Grande do Sul	3,400.
Do.	do.	Refinaria de Petróleos de Manguinhos S.A. (private, 100%)	Manquinhos, Rio de Janeiro State	3,650.

Do., do. Ditto.

TABLE 3
BRAZIL: RESERVES OF MAJOR MINERAL COMMODITIES IN 2009

(Thousand metric tons unless otherwise specified)

Commodity ¹	Reserves	World ranking	World percentage
Asbestos, fiber	15,400		NA
Bauxite, ore (metallurgical)	3,800,000	3	8.5
Chromite, Cr ₂ O ₃	5,362		0.3
Coal, all types ²	930,000		1.1
Copper, metal content	17,320		1.5
Fluorspar (CaF ₂ content)	2,732		0.5
Gold, metal content	metric tons 2,376		2.0
Graphite, ore	152,700 ²	2	34.8
Gypsum	1,230,220		NA
Iron ore, 60% to 65% Fe content	28,910	5	7.2
Kaolin	24,500		NA
Lead, metal content	670		0.5
Magnesite	558,100	4	8.9
Manganese, metal content	234,987	4	2.5
Natural gas ²	million cubic meters 364,200		0.2
Nickel, metal content	8,730		5.8
Niobium (columbium) (pyrochlore, and columbite ore)	4,500 ²	1	98.2
Petroleum ²	million 42-gallon barrels 13,200		1.0
Phosphate rock	308,000 ²	5	3.6
Talc and pyrophyllite	226,880		NA
Tantalum	4,220	1	46.5
Tin, metal content	593	3	11.0
Titanium, TiO ₂	116,200		NA
Uranium, U ₃ O ₈	metric tons 309,000		NA
Vermiculite	6,200	3	10.3
Zinc, metal content	6,510		1.3
Zirconium, ore	2,244		3.8

NA Not available.

¹Source: Summário Mineral 2009-10.

²Sources: Petróleo Brasileiro, S.A., Petrobrás Magazine 2010; U.S. Energy Information Administration, October 2010.