



# 2007 Minerals Yearbook

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## BRAZIL

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# THE MINERAL INDUSTRY OF BRAZIL

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In 2007, Brazil continued to occupy a leading position in the global production of the following mineral commodities: bauxite (third after Australia and China), graphite (third after China and India), iron ore (second after China), manganese (second after South Africa), niobium (columbium) (first followed by Canada), and tantalum (second after Australia) (Bray, 2008b; Departamento Nacional de Produção Mineral, 2008d; Jorgenson, 2008; Olson, 2008b; Papp, 2008a, b).

Brazil was the leading economy in Latin America and a member of the Mercado Común del Cono Sur (MERCOSUR), which is the second largest trade association in the Americas and the eighth worldwide. Exports were valued at \$160.6 billion, and imports, \$120.6 billion compared with \$137.8 billion and \$91.4 billion, respectively, in 2006. Brazil's mineral sector had a trade surplus of \$8.9 billion compared with \$11.8 billion in 2006 (Banco Central do Brasil, 2008a, p. 16; 2008b; Departamento Nacional de Produção Mineral, 2008a, p. 17; 2008d).

Brazil's FDI inflows increased to \$34.6 billion in 2007 from \$18.8 billion in 2006, or by 84%, and the country maintained its large share of almost 84% of MERCOSUR's FDI, which was mostly reflected in the high international prices of several commodities, such as, in order of value, iron ore, petroleum, lead, tin, and soybeans (Banco Central do Brasil, 2008a, p. 15-16; 2008b; Departamento Nacional de Produção Mineral, 2008a, p. 18-19; Economic Commission for Latin America and the Caribbean, 2008).

## Minerals in the National Economy

In 2007, Brazil's economy benefited from floating exchange rates and interest rate increases by the Banco Central do Brasil to fight inflationary pressures. Inflation was 3.6% compared with 4.7% in 2006. The financial system benefited from FDI inflows, high capitalization, and the strengthening of fiscal and monetary discipline, which helped maintain a positive economic growth in 2007. Higher world demand for Brazilian mineral exports and higher mineral commodity prices contributed to the upturn in the country's economy. For 2007 as a whole, Brazil's real gross domestic product (GDP) was 5.4%, which was up from 3.8% in 2006. The mining and mineral processing industries represented almost 3% of the GDP in 2007. Brazil had a total labor force of more than 99.5 million. The minerals (metal, industrial minerals, and fuels) sector employed about 5% (995,000) of the industry total (19.9 million, or 20% of the total); this percent did not include the nearly 450,000 active garimpeiros. In 2007, according to the monthly employment survey, 1.8 million jobs were created in the country and employment in the mining sector amounted to 90,000 (Ferraz, 2007, p. 3; Banco Central do Brasil, 2008b; Departamento Nacional de Produção Mineral, 2008c).

## Government Policies and Programs

The Mining Code (Decree-law No. 227 of February 27, 1967) governs the regimes from exploration to production and trade of Brazilian 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 competence in the management of mineral resources and in the inspection of the mineral activity in the country. The Decree-law No. 227 was amended by law No. 9314 of November 14, 1996, which provides increased flexibility for investment in the Brazilian mining sector. Its 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 Mines and Energy. Licensing is a restricted system applicable exclusively to the production of industrial minerals. The DNPM is responsible for enforcing the Brazilian Mining Code and for implementing its legal provisions (Ferraz, 2007, p. 7; Departamento Nacional de Produção Mineral, 2008b, c).

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 Petróleo Brasileiro S.A. (Petrobrás), a state-owned firm, to enter into joint ventures with foreign investors and to invest overseas. The Agência Nacional do Petróleo continues to issue exploration and production licenses and regulates the petroleum industry (Ferraz, 2007, p. 7; Departamento Nacional de Produção Mineral, 2008b, c).

The Brazilian import tax rates for minerals vary from 3% to 9%; the rate for ores and concentrates is 5%, and that for other mineral derivatives, 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 tax rate ranges between 10% and 15% and is levied on the net profit. Profits can be expatriated. Equity ownership, which is allowed by means of privatization or by direct acquisition, can be as high as 100%. During 2006-07, the Concessions Law created additional opportunities for the private sector in public utilities previously reserved for the Government (Ferraz, 2007, p. 7; Departamento Nacional de Produção Mineral, 2008c).

The DNPM reported an investment of \$400 million in mineral exploration compared with \$284 million in 2006. The MME's Companhia de Pesquisa de Recursos Minerais (CPRM) (the Brazilian Geological Survey) was developing programs for basic geologic mapping, geophysics, metallogenetic and hydrogeologic mapping, and prospecting in areas of potential development. The CPRM was also creating 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 investors in the mineral sector (Serviço Geológico do Brasil, 2007, p. 141, 152; Departamento Nacional de Produção Mineral, 2008a, p. 22; 2008d).

The Brazilian Financial Compensation for Exploiting Mineral Resources—Federal Royalty (CFEM), was established by the Brazilian Constitution in 1988 and instituted by law No. 7990 in 1989 to compensate municipalities, States, and the Federal Government. The CFEM rate is no more than 3% of the net revenue of mineral sales. 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%). The CFEM collection increased to \$220.6 million in 2007 from \$199.1 million in 2006, or by 10.8% (Ferraz, 2007, p. 7; Banco Central do Brasil, 2008b; Departamento Nacional de Produção Mineral, 2008c).

In 2007, the States of Minas Gerais (52%), Para (30%), and Goiás (4%) were the major collectors of the CFEM; the main municipalities were Parauapebas (57%) and Oriximina (10%) in the State of Para and Itabira (12%), Nova Lima (8%), and Mariana (6%) in the State of Minas Gerais. Both States and their respective municipalities were the main producers of iron ore. The main mineral contributors to the CFEM were iron ore (51%), aluminum (10%), kaolin (5%), calcite (4.5%), and gold (4%). The State of Minas Gerais produced mainly (in order of value) iron ore, nickel, gold, and zinc, and the State of Para produced mainly (in order of value) bauxite, iron ore, kaolin, copper, and others (Departamento Nacional de Produção Mineral, 2008c, d).

In Brazil, the fundamental principles governing the compatibility of the mining sector with environmental protection are outlined by the following Federal laws (resolutions) and decrees (regulations):

- Law No. 6938 of August 31, 1981, and its amendments (nos. 7804 of July 18, 1989, and 8028 of April 12, 1990) provide the purpose and mechanism for the formulation of the National Environmental Policy,
- Law No. 9605 of February 12, 1998, provides sanctions against harmful activities to the environment,
- Decree No. 97632 of April 10, 1989, deals with rehabilitation of areas degraded by mining,
- Resolutions of the National Council for the Environment (CONAMA): (1) Resolution No. 1 of January 23, 1986, provides basic criteria and general guidelines for the Report on Environmental Impact (RIMA); (2) Resolution No. 9 of December 6, 1990, regulates environmental licenses for mineral extraction; (3) Resolution No. 10 of December 6, 1990, regulates environmental licenses for mineral extraction used in civil construction; (4) Resolution No. 2 of April 18, 1996, provides for compensation for environmental damages; and

(5) Resolution No. 237 of December 19, 1997, provides the procedures and guidelines used in environmental licensing.

The Brazilian Environmental Policy (BEP) is executed at three levels—Federal, State, and municipal. The coordination and formulation of the BEP is the responsibility of the Ministério de Meio Ambiente (MMA). Linked to the MMA is the Conselho Nacional de Meio Ambiente, which grants the environmental licenses that are required for all mining activities in Brazil. Law No. 6938 of 1981 had also established the National System for the Environment, which comprises representatives of the Federal, State, and municipal governments and private foundations involved in environmental protection and improvement. Article 225 of the Constitution stipulates that mining operators must reclaim areas that they have environmentally degraded.

In Brazil, the environmental requirements applied to the mining sector are (1) an environmental impact study (EIA), (2) environmental licensing (LA), and (3) a plan for recovery of degraded areas (PRAD). An EIA applies to mining projects of any mineral substance; an LA is mandatory for the installation, expansion, and operation of any mining activity under the systems of mining concession or licensing; and a PRAD requires suitable technical solutions to rehabilitate the soil and other aspects of the environment that might be degraded by mining operations. Resolution No. 10 of December 6, 1990, requires that all mining operations obtain LAs prior to the granting of mineral rights by the DNPM (Departamento Nacional de Produção Mineral, 2008b, c).

The MME enforces Decree No. 97632 of April 10, 1989, which prohibits the use of mercury by the small and artisanal (garimpeiros) gold mining operations; it also, however, offers technical assistance through the use and implementation of the U.S. Environmental Protection Agency's (USEPA) Mercury Capture-USEPA Model. During 2006-07, the MME and the USEPA successfully installed eight mercury capture devices for hoods in gold shops, first in Itaituba and then in Creporizao (the Amazon region of Brazil). Each hood would remove up to 60 kilograms per year (kg/yr) of mercury from the air, representing at least a 90% mercury reduction in the gold shops. Formerly, workers and residents of the mining communities inhaled this mercury and were also exposed to it in soils, water, and fish. In 2007, the USEPA model had removed more than 100 kilograms (kg) of mercury in Creporizao and Itaituba. Environmental impacts in the Amazon region were expected to be reduced in the long run. In 2007, the region was affected by cyanide use in heap-leaching and underground acidic water discharges; thus, antipollution measures had been enacted to eliminate the sources of pollutants and mitigate their effects on the environment (Departamento Nacional de Produção Mineral, 2008b; Engle, 2008, p. 36-37, 48).

## Production

In 2007, 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. Brazil's economy represents 65% of the South American economy (Departamento Nacional de Produção Mineral, 2008a, p. 9-16; 2008d).

High metal prices provided a boost to Brazil's mining sector in 2007. The total value of minerals produced in 2007 was \$42.3 billion compared with \$40.1 billion in 2006. Crude oil and natural gas amounted to almost \$40.6 billion (Banco Central do Brasil, 2008a; Departamento Nacional de Produção Mineral, 2008b; Petróleo Brasileiro S.A., 2008, p. 3, 8). Brazil's major integrated steel operations have a capacity to produce 41 million metric tons per year (Mt/yr) of crude steel from 25 steel plants and 10 integrated steelmakers. In 2007, Brazil was the eighth ranked producer of raw steel in the world and the leading producer in Latin America. In 2007, Brazilian crude steel production amounted to 33.8 million metric tons (Mt). Brazil was the second ranked iron ore producer in the world after China with an output of about 355 Mt; Vale S.A. (formerly Companhia Vale do Rio Doce) produced about 308 Mt, or 87% of Brazil's iron ore (Ferraz, 2007, p. 3; Departamento Nacional de Produção Mineral, 2008d; Vale S.A., 2008a).

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 18.1 Mt in 2007, which was almost 73% of the country's total bauxite production of 24.8 Mt. Brazil produced 35.6 Mt of pig iron in 2007 compared with 32.5 Mt in 2006 (table 1; Departamento Nacional de Produção Mineral, 2008d; Vale S.A., 2008a).

In 2007, Petrobrás continued to operate in an integrated fashion in the energy sector, including crude oil and natural gas exploration and production; refining, trade, and transportation; petrochemicals; distribution of petroleum derivatives, natural gas, biofuels, and electricity. Petrobrás indicated that Brazil would achieve self-sufficiency in 2008 and that, of the \$87.1 billion in investments budgeted in its strategic plan to 2011, almost 90% would be invested in the country. In 2007, Petrobrás invested \$3.6 billion in expansions and diversification abroad. Brazil's diversified mineral endowment, competent labor force, and macroeconomic policies helped stimulate investor interest in the country's mining and petroleum industries. Leading international mining, petroleum, and steel companies were notably interested in, in order of importance, oil and gas, iron ore, steel, coal, gold, copper, and diamond (Departamento Nacional de Produção Mineral, 2008a, p. 7-9; Petróleo Brasileiro S.A., 2008, p. 55).

### Structure of the Mineral Industry

Brazilian corporations (which include private Brazilian and foreign investors, and Government-owned companies) 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 2007 owing to the country's favorable policies on mergers, joint ventures, and privatization. The competitiveness of Brazil's mineral industry resulted because of the positive effects of the globalization process, the increase in mineral consumption and prices worldwide, and the investments in new technologies to improve efficiencies and productivities,

particularly in the mining, oil and gas, and steel sectors (Ferraz, 2007; Departamento Nacional de Produção Mineral, 2008d).

In 2007, Petrobrás continued to be an integrated energy company. It was composed of various related business units, of which Petrobrás Química, S.A. was the integrated refining-petrochemical operations company; Petrobrás Distribuidora S.A. distributed petroleum products in Brazil; Petrobrás International Finance Company facilitated the import of crude oil and derivatives; Petrobrás Gás S.A. was responsible for trading Brazilian and imported natural gas and fertilizers; Petrobrás Transporte S.A. constructed and operated the pipelines, terminals, vessels, and facilities needed for the transportation and storage of crude oil and derivatives, natural gas, and bulk products; Downstream Participações S.A. facilitated asset exchange between Petrobrás and Repsol-YPF S.A. of Argentina; and Petrobrás Energía Participaciones S.A. acquired a controlling interest in Petrolera Perez Companac S.A. of Brazil (58.6% of the capital stock). Petrobrás operated in 11 countries in the Americas, 5 countries in Africa, and 3 countries in Asia in 2007 (Petróleo Brasileiro S.A., 2008, p. 53-61). In addition, 39 cement plants operated in eight Brazilian States and accounted for more than 75% of the national output of 46.4 Mt; among these cement plants, 12 were located in Minas Gerais and 9 were located in Sao Paulo (table 2; Departamento Nacional de Produção Mineral, 2008d).

From 1998 through 2007, the TNCs brought in about \$328.5 billion in registered investment with the Banco Central do Brasil; of that total, \$34.6 billion was invested in 2007. Among the major companies were Anglo American plc and BHP Billiton plc of the United Kingdom, De Beers Group of South Africa, and Glencore International AG of Switzerland (Banco Central do Brasil, 2008b; Departamento Nacional de Produção Mineral, 2008c).

In 2007, the active international mining and oil companies in Brazil included Yacimientos Petroleros Fiscales (YPF) of Spain and Argentina; BHP Minerals International Exploration Inc. (BHP Billiton Ltd., 100%), Anglo American, and Rio Tinto of the United Kingdom; Alcan Aluminum Ltd., Barrick Gold Corp., and Teck Cominco Inc. of Canada; Shanghai Baosteel of China; EDP of Portugal; Iberdrola S.A. of Spain; 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; and Royal Dutch Shell Group of the Netherlands (table 2; Departamento Nacional de Produção Mineral, 2008c).

Three international cement groups—Cimentos de Portugal, SGPS, S.A. (Cimpor) of Portugal; Lafarge S.A. of France; and Holcim Ltd. of Switzerland—began operations in 2005 and expanded their operations in 2007. According to the DNPM, 36 iron ore mining companies were operating 53 mines and 54 processing plants in Brazil, and there were nearly 2,500 mineral mines in Brazil, which were classified conforming to their run-of-mine (ROM) 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, 2008d).

New or added infrastructure in such mineral-producing States as Minas Gerais, Para, Rio de Janeiro, Sao Paulo, and others

was a factor in the increase of production, processing, and trade of various mineral commodities, such as bauxite, gypsum, iron ore, magnesite, manganese, natural gas, petroleum, and sand and gravel. It is also having a positive effect on the transport of added consumables to produce those mineral commodities (metals, industrial minerals, and fuels). The Argentine pipeline supplied gas to the State of Rio Grande do Sul's new thermoelectric plant; two additional pipelines were to take Argentine gas to Brazil's southern market, and another project was to supply energy to Brazil from a powerplant in Uruguay. Brazil's current (2007) total pipeline network was 22,289 kilometers (km) long, of which 12,665 km was used to transport gas and 9,624 km was used to transport crude oil and petroleum products. In northern Brazil, an electricity transmission line supplied energy to the State of Roraima from Venezuela. The majority of these projects were being developed by the private sector and by State-owned corporations in partnership with private domestic and foreign investors (Departamento Nacional de Produção Mineral, 2008d; *Petróleo Brasileiro S.A.*, 2008, p. 59-60).

In 2007, Brazil's production of electric power was 396,400 gigawatthours and the country consumed 368,500 gigawatthours. Hydroelectric generation accounted for 83% of Brazil's domestic energy. The balance was supplied by petroleum and natural gas (8%), nuclear energy (4%), and other (5%) (Departamento Nacional de Produção Mineral, 2008d).

## Mineral Trade

Brazil enjoyed economic benefits from its mineral industry, which included the significant contribution the industry made to the country's trade balance. In 2007, Brazil's total exports, imports, and trade balance amounted to \$160.6 billion, \$120.6 billion, and \$40 billion, respectively, compared with those of 2006, which were \$137.8 billion, \$91.4 billion, and \$46.4 billion, respectively. In 2007, Brazil's mineral sector exports, imports, and trade balance amounted to \$46.9 billion, \$37.9 billion, and \$8.9 billion, respectively, compared with those of 2006, which were \$40.1 billion, \$28.3 billion, and \$11.8 billion, respectively (Banco Central do Brasil, 2008a, p. 40-42; 2008b; Departamento Nacional de Produção Mineral, 2008a, p. 17).

In 2007, Brazil exported energy products (\$13.4 billion), which included crude petroleum (\$8.9 billion); and industrial goods and materials (\$33.5 billion), which included crude minerals and ores (\$22.3 billion), chemicals (\$760 million), metals and alloys (almost \$5.8 billion), and industrial minerals (\$4.6 billion). Brazil imported energy products (\$23.8 billion), which included crude petroleum (\$13.8 billion) and others (\$10 billion); and industrial goods and materials (\$14.5 billion), which included crude minerals and ores (\$3.6 billion), chemicals (\$5 billion), and industrial minerals (\$5.9 billion). Prominent among the crude minerals exported (\$22.3 billion) in 2007 were iron ore (47%), petroleum (40%), and others (13%) (Banco Central do Brasil, 2008a, p. 50-51; 2008b; Departamento Nacional de Produção Mineral, 2008a, p. 6).

In 2007, Brazil's total trade (exports and imports) with North American Free Trade Agreement (NAFTA) countries increased to \$218 billion from \$197 billion in 2006; most of this trade

took place with the United States, whose trade balance with Brazil increased to \$177 billion from \$159 billion in 2006. MERCOSUR had an impact on intraregional total trade, which increased to about \$116 billion in 2007 from \$92 billion in 2006 (Banco Central do Brasil, 2008a, p. 130; Departamento Nacional de Produção Mineral, 2008a, p. 17-18).

The bilateral total trade between Argentina and Brazil increased to \$100 billion in 2007 from \$79 billion in 2006. Total minerals trade between the major players of MERCOSUR—Brazil (\$2.5 billion) and Argentina (\$2.2 billion)—amounted to \$4.7 billion. In 2007, Brazil's mineral sector recorded trade surpluses with its leading trade partners, including, in order of value, China (\$4.7 billion), the United States (\$4 billion), Chile and Germany (\$1.4 billion each), Japan (\$1.3 billion), and other countries (\$9.4 billion). Exports to Europe and Japan consisted mostly of raw materials, which were, in order of volume, iron ore, crude oil, copper, kaolin, marble and granite, and agricultural commodities. Bilateral trade between Brazil and China included exports of, in order of value, iron ore, steel, airplanes, buses, auto parts, pulp, tobacco, and timber. China's main exports to Brazil included, in order of value, coke, coal, electronic parts, equipment for energy transmission, and products and material for audiovisual machinery (Banco Central do Brasil, 2008b; Departamento Nacional de Produção Mineral, 2008a, p. 18-19).

## Commodity Review

### *Metals*

**Aluminum and Bauxite and Alumina.**—Alumina production increased to almost 6.9 Mt in 2007 from 6.8 Mt in 2006, or by almost 1.5%. Exports of alumina totaled 3.8 Mt and were valued at \$1.3 billion. Primary aluminum production increased to 1.7 Mt in 2007 from 1.6 Mt in 2006, or by 6.3%. *Alumínio Brasileiro S.A.* (Albras) produced 27.7% of primary aluminum; *Companhia Brasileira de Alumínio (CBA)*, 27.2%; *Alcoa Inc.*, 22.1%; *BHP Billiton*, 10.8%; and *Vale do Sul Alumínio S.A. (Aluvale)*, 5.7%. In 2006, CBA was planning to increase its production capacity to 600,000 t/yr from 475,000 t/yr of aluminum by 2012. In 2007, exports of aluminum totaled 1.1 Mt and were valued at more than \$2.9 billion. Brazil's imports of all forms of aluminum totaled 237,000 metric tons (t) and were valued at \$705 million. Bauxite production increased to 24.8 Mt in 2007 from 22.8 Mt in 2006, or by almost 9%. The MRN accounted for about 73% (18.1 Mt) of the total bauxite production for 2007. Exports amounted to 5.8 Mt of bauxite and were valued at \$240 million (*Associação Brasileira do Alumínio*, 2007, p. 35-37; Bray, 2008a, b; Departamento Nacional de Produção Mineral, 2008d; *Vale S.A.*, 2008a-c). *Alumínio do Norte do Brasil S.A. (Alunorte)* was planning to increase the capacity of its Barcarena refinery, which is located in the State of Para, to 7.4 Mt/yr of alumina by 2008 from 2.4 Mt/yr in 2006. The first phase of Alunorte's Paragominas bauxite mine produced 1.85 Mt in 2007. The second phase of Paragominas Mine was to increase production to 9.9 Mt/yr and supply 6.5 Mt/yr of bauxite to the Barcarena refinery by early 2009 (Departamento Nacional de Produção Mineral, 2008d; *Vale S.A.*, 2008b, c).

Alcoa was planning a new operating hub, with an investment of \$1.4 billion, in Juruti, State of Para, where it was carrying out a geologic study of a bauxite resource of 280 Mt. The Juruti project's initial output was expected to be 2.6 Mt/yr by 2008, and its full annual production capacity would be 4 Mt of bauxite, 2 Mt of alumina, and 1 Mt of aluminum by 2009. To implement this hub, Alcoa could invest an additional \$1 billion in the construction of the required hydroelectric plant to produce aluminum in Belomonte, State of Para. CBA was planning to start its Mirai bauxite mine and new concentrator in the Zona da Mata District, State of Minas Gerais. In the first of three planned phases, the project was expected to produce 1 Mt/yr of bauxite to feed the new concentrator. In 2007, China Aluminum Group and China MinMetals were planning to invest \$3 billion in joint ventures, mostly with Vale, in the aluminum and bauxite and alumina sectors (Associação Brasileira do Alumínio, 2007, 35-36; Departamento Nacional de Produção Mineral, 2008d; Vale S.A., 2008a-c).

**Copper.**—Brazil's copper production in concentrate increased to 205,728 t in 2007 from 147,836 t in 2006, or by almost 11%. The leading producers were Vale, with 117,514 t of the concentrate from its Sossego Mine in Carajas, State of Para, and Mineração Caraíba S/A, with 22,720 t from its deposit in Jaguarari, State of Bahia. In 2007, Caraíba Metais S/A (CMSA) of Camacari, State of Bahia, which was the only electrolytic copper producer in Brazil, produced 218,367 t of primary copper metal compared with 219,700 t in 2006. The feed for this electrolytic copper output included 482,941 t of copper concentrates (154,541 t of contained metal) imported from Chile (86%) and Argentina (9%). To meet Brazil's metal copper demand of 358,267 t/yr, CMSA imported 216,899 t of copper cathode mostly from Chile (75%) and Peru (24%) in 2007. CMSA was planning to produce between 450,000 and 500,000 t/yr of electrolytic copper in D'Avila, State of Bahia, by 2010 (Departamento Nacional de Produção Mineral, 2008d; Vale S.A., 2008a-c).

In 2007, Vale's copper project portfolio included the sulfide ore resources of, in order of resources, Sossego, Salobo, Alemão, and Cristalino, and the oxidized ore deposit of Project 118; all these projects were located in the mineral province of Carajas, State of Para. Vale's subsidiary Salobo Metais S/A was conducting a feasibility study for the Salobo copper project, which was to be completed in early 2008; its development would require an investment of \$855 million. In the initial phase, Salobo was expected to produce 100,000 t/yr of copper in concentrate by 2010. The Salobo project is Brazil's largest copper deposit and contains an estimated ore resource of 986 Mt at grades of 0.82% copper and 0.49 gram per metric ton (g/t) gold at a cutoff of 0.5% copper and associated molybdenum and silver. It is located in Marabá, State of Para, and could support a mill of 140,000-t/yr capacity. Vale was also planning to produce 36,000 t/yr of copper cathode from its Project 118 at an estimated cost of \$232 million by the first half of 2009. Vale's subsidiary Usina Hidrometalúrgica de Carajás S/A (UHC) was constructing a \$58 million semi-industrial-scale plant for copper processing. 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 mid-2008. CMSA was planning to invest \$150 million to increase its copper metal output from 218,000 t/yr to 280,000 t/yr by early 2009 (Departamento Nacional de Produção Mineral, 2008d; Vale S.A., 2008a-c).

The Alemão deposit (Vale, 100%) contained 161 Mt of resources at grades of 1.3% copper and 0.86 g/t gold and was expected to produce 100,000 t of copper concentrate in 2008. A prefeasibility study for Cristalino (Vale, 100%) estimated reserves of 312 Mt grading 0.77% copper and 0.13 g/t gold and was expected to produce 90,000 t of copper concentrate by 2011. Vale continued conducting intensive geologic prospecting to identify new copper areas in the Carajas District. Mineração Maracá S/A completed a feasibility study for the Chapada copper-gold-silver project in Alto Horizonte, State of Goiás. Ore reserves amounted to 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 2012 (Departamento Nacional de Produção Mineral, 2008d; Vale S.A., 2008a-c).

In 2007, Brazil exported 177,705 t of copper concentrate and 102,000 t of metal valued at \$1.03 billion and \$726 million, respectively, and shipped them to Germany (22%), India (20%), Bulgaria (17%), the Republic of Korea (13%), and others (28%). Exports of semimanufactured goods amounted to 113,432 t valued at \$707 million and consisted mainly of 101,964 t of copper cathodes valued at \$675 million, which went to the Netherlands (34%), United States (22%), China (20%), and others (24%). Manufactured goods amounted to 46,380 t valued at \$346 million, which went to the United States (36%), Argentina (22%), Canada (15%), and others (27%). Brazil's refined copper production was used primarily in the automobile and construction industries (Departamento Nacional de Produção Mineral, 2008d).

**Gold.**—Gold production increased to 49.6 t in 2007 from 43.1 t in 2006, or by 15.1%; mining companies produced 44.4 t (89.5%) and garimpeiros, 5.2 t (10.5%). Gold production from the companies increased by 6.5 t, and that from garimpeiros remained at about the same level as that of 2006. In 2007, Yamana Gold Inc. was the leading gold producer, contributing 27.2% of the country's total; AngloGold Ashanti Mineração Ltda. and Mineração Serra Grande S/A produced 25.3% each; Rio Paracatu Mineração S/A, 16.6%; and others, 30.9%. The leading States with garimpeiros' gold operations were, in order of amount produced, Para, Mato Grosso, Amazonas, Amapá, and Roraima (Departamento Nacional de Produção Mineral, 2008d).

**Iron Ore.**—Brazil produced 354.7 Mt of beneficiated iron ore in 2007 compared with 317.8 Mt in 2006, which was an increase of 11.6%. Of that production, 89.5% was from the four major iron ore producers—Vale, 223.9 Mt; Minerações Brasileiras Reunidas S/A (MBR), 62.3 Mt; SAMARCO Mineração S/A, 16.4 Mt; and Cia. Siderúrgica Nacional (CSN), 15 Mt. In 2007, Brazil exported 219.4 Mt of iron ore valued at almost \$7.1 billion, which was 4.4% of the total value of Brazilian exports of \$160.6 billion. The leading importers of Brazilian iron ore were China (33%), Japan (13%), Germany (10%), and France and the Republic of Korea (5% each) (Departamento Nacional de Produção Mineral, 2008d; Vale S.A., 2008a, b).

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 2009 from 100 Mt in 2007 were completed in 2007. Vale was also planning to inject more than \$14 billion into the mining sector by 2009-11 to consolidate its leading position in the global iron ore and metal markets; with the development of more than 30 projects in Australia, Brazil, Canada, Chile, Indonesia, Mozambique, Oman, and Peru, among others (Vale S.A., 2008a).

**Iron and Steel.**—*Ferrous alloys.*—Ferroalloys production increased to about 1.5 Mt in 2007 from 1.4 Mt in 2006. Brazil's Prometal Produtos Metalúrgicos S.A. and Norway's Elkem A/S partnership produced 687,000 t of ferromanganese in 2007 compared with 573,000 t in 2006. The prometal project, in which Elkem held a 40% share, was located in Marabá, State of Pará. The manganese was supplied by the nearby Prometal Mine, and the iron ore from the Carajas District (Departamento Nacional de Produção Mineral, 2008d).

*Pig Iron.*—Brazil produced 35.6 Mt of pig iron compared with 32.5 Mt in 2006, which was an increase of 9.5%. Brazil was the sixth ranked producer, and its nearly 6 Mt of exports, which was valued at almost \$1.7 billion, represented approximately one-third of the pig iron traded in the world (Departamento Nacional de Produção Mineral, 2008d; Fenton, 2008).

*Steel.*—Raw steel production increased to 33.8 Mt in 2007 from 30.9 Mt in 2006, or by 9.4%. Brazil was the eighth ranked producer and exporter of steel worldwide (Departamento Nacional de Produção Mineral, 2008d, p. 10; Fenton, 2008; Siderurgia Brasileira, 2008, p. 31).

Brazil exported 10.3 Mt of steel valued at \$6.6 billion in 2007 compared with 12.5 Mt of steel valued at \$6.9 billion in 2006. The major recipients of Brazil's exports were the United States (37%); Republic of Korea, Mexico, Thailand, and Taiwan (4% each); and Argentina, Chile, Colombia, and Spain (2% each). Brazil imported 1.6 Mt of steel valued at \$1.9 billion compared with 1.9 Mt of steel valued at \$1.5 billion in 2006. The apparent domestic consumption of steel (production + imports – exports) in Brazil was 25.1 Mt, which represented an increase of about 24.3% compared with that of 2006 (20.2 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, 2008d; Instituto Brasileiro de Siderurgia, 2008, p. 8, 30).

**Manganese.**—Manganese production in concentrate (MnO<sub>2</sub>) decreased to 1.9 Mt in 2007 from 3.1 Mt in 2006. Rio Doce Manganês S.A.'s (RDM) (Vale, 100%) manganese mines in the States of Bahia and Minas Gerais accounted for 70% of metallurgical manganese production. RDM, which was the leading producer of manganese concentrate, was planning to increase its production capacity to 2 Mt by 2009, and Urucum Mineração S.A. was planning to increase its production capacity to 1.8 Mt by 2010. Exports of high-grade manganese ore amounted to 1.3 Mt at a value of \$113 million. In 2007, domestic consumption of manganese was as follows: manganese

ferroalloys, 85%; electrical batteries, 10%; and chemicals, 5%. In 2007, Vale produced about 1.3 Mt of manganese ore. Manganese ferroalloys exports increased by almost 21% to 152,000 t, which was valued at \$109 million (Departamento Nacional de Produção Mineral, 2008d; Vale S.A., 2008b).

**Nickel.**—Brazil produced 58,317 t of nickel content in ore in 2007 compared with 82,492 t in 2006; production of electrolytic nickel increased to 21,635 t in 2007 from 21,339 t in 2006; nickel in ferronickel alloys increased to 9,918 t in 2007 from 9,814 t in 2006; nickel in matte decreased to 3,401 t in 2007 from 5,416 t in 2006; and nickel in carbonates decreased to 20,796 t in 2007 from 21,630 t in 2006 (table 1; Departamento Nacional de Produção Mineral, 2008d). Mineração Serra da Fortaleza, which was owned by Grupo Votantim (GV) and located in Fortaleza de Minas, State of Minas Gerais, produced 47,213 t of nickel content in ore. Companhia Niquel Tocantins, which was also owned by GV and located in Niquelandia, State of Goiás, produced 21,635 t of electrolytic nickel (Departamento Nacional de Produção Mineral, 2008d).

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 2010. 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 Vermelho project in Carajas, State of Pará, which contained reserves of 123.6 Mt of laterite (limonitic) ores at a grade of 1.25% nickel and 0.06% cobalt. Vale was focused on the development of the Onca Puma nickel laterite project in the State of Pará, which contained reserves of 82.7 Mt of at a grade of 1.73% nickel, and Vale was planning to invest \$1.4 billion to produce 52,000 t/yr of nickel metal. The Onca Puma and the Vermelho projects were expected to enter into production by 2009. In January 2007, Vale acquired Inco Ltd. of Canada and emerged from this transaction as the second ranked mining company in the world, in terms of market value and capitalization. Vale's nickel, marketing, and metal sales departments were to be managed from Toronto. It was expected that an integrated management could improve the synergy among Vale's mineral operations worldwide (Departamento Nacional de Produção Mineral, 2008d; Vale S.A., 2008b, c).

**Zinc.**—Brazil produced 193,899 t of zinc content in concentrates, which was 4.6% more than in 2006. Primary metal production decreased to 265,126 t in 2007 from 272,438 t in 2006, and represented 96.4% of the installed annual metal capacity of 275,000 t. GV was the only producer of zinc in Brazil. Production was through GV's two subsidiaries—Companhia Mineira de Metais S/A., which was located in Vazante, State of Minas Gerais, and Companhia Paraibuna de Metais S/A, which was located at the Juiz de Fora complex in Minas Gerais. Companhia Mineira de Metais produced 184,200 t of metal zinc (69.5% of the total), which was 4.7% more than in 2006, mainly from domestic concentrates treated at the Três Marias metallurgical plant, which has a capacity of 180,000 t/yr of metal zinc. Companhia Paraibuna de Metais produced 88,154 t of metal zinc (33.2% of the total) and relied entirely on imported concentrates. Peru supplied 98.2% of the

concentrates and 43.1% of the metal; additional zinc metal was supplied by Argentina (451%) to meet Brazil's demand for zinc, which was 248,800 t of metal in 2007 (Departamento Nacional de Produção Mineral, 2008d).

### **Industrial Minerals**

**Asbestos.**—In 2007, Brazil produced 254,204 t of asbestos (fiber content), which was almost 11.8% more than in 2006 (227,304 t). Brazil's significant asbestos deposits were located in Cana Brava, Minacu, State of Goiás; Goiás was the only producing State in the country. Sociedade Anônima Mineração de Amianto supplied 75% 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 importance, thermal insulators, paper and cardboard, slabs, decorations, insecticide, asphalt for highways and airport runways, and the automobile industry. In 2007, Brazil exported 172,662 t of fibers valued at \$62.8 million. Brazilian asbestos exports were shipped to India (54.1%), Indonesia (15.1%), Thailand (7.1%), Mexico (6.4%), and others (17.3%) (Departamento Nacional de Produção Mineral, 2008d).

Asbestos mining and consumption have been highly regulated in most industrialized nations, thus forcing the countries to reduce production and consumption. Industry experts expected asbestos use in the industrialized nations to continue to decline owing to health hazards. In contrast, the world's developing economies were expected to increase their collective asbestos consumption by large margins. Brazilian asbestos reserves (15 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 Mt, which, at a production rate of about 200,000 t/yr, represented a 15-year mine life (Departamento Nacional de Produção Mineral, 2008d).

**Gemstones.**—In the Americas, Brazil followed Canada as the leading producers and traders of mostly alluvial diamond followed by Guyana and Venezuela. The country 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 2007, 54% of the diamond and gemstones were mined by garimpeiros, and 46%, by the private sector. According to the DNPM's Mineral Summary Statistics for 2003-07, Brazil's diamond production from year to year has been uncertain, and annual production has been declining since 2003. In both 2007 and 2006, Brazil produced 182,000 carats. The leading producers were Mineradora S/A, which was located in Juina, State of Mato Grosso, and produced 92,062 carats; and Mineração Rio Novo S/A, which was located in Diamantina, State of Minas Gerais, and produced 18,600 carats. The carats produced and reported conform to the Kimberley

Process Certification Scheme's (KPCS) guidelines (table 1; Departamento Nacional de Produção Mineral, 2008d; Olson, 2008a).

Garimpeiros' diamond production, however, continued to decline owing to resource depletion and environmental restriction. Since 2004, when the Government closed high-content gem placers in areas reserved for indigenous peoples to exploration, the jewelry industry's gemstone consumption has been unknown, and the high taxation rate affected the domestic sales of jewelry. Taking into consideration these factors, Brazil's gemstone reserves were almost impossible to quantify. Brazil, however, may have great potential because it has 1,000 million cubic meters of sedimentary rocks that contain diamond between 0.01 and 0.1 carat per cubic meter, or about 111 million carats. As of 2007, diamond had been discovered in more than 40 districts and 11 States. Some 300 kimberlite diamond-bearing pipes were reportedly found. Such companies as BHP Billiton, De Beers, and Rio Tinto were exploring for kimberlites, mostly in the States of, in order of volume, Minas Gerais, Rondonia, and Sao Paulo. These companies sold their projects to domestic and international diamond exploration companies, such as Brazilian Diamonds Ltd., which was a Canadian junior company that acquired De Beers' 140 kimberlites in the State of Minas Gerais (Ferraz, 2007, p. 5).

In 2007, Brazil exported 171,980 carats valued at \$19.6 billion; the major markets for Brazilian rough diamond were the European Union (51%), Israel (20%), the United Arab Emirates (17%), and the United States (9%). Imports of uncut stones amounted to 17,840 carats valued at \$1.9 billion; the main sources were the India (40%), Belgium (25%), the United States (15%), and the EU (10%) (Departamento Nacional de Produção Mineral, 2008d).

**Phosphate Rock.**—Production of phosphate rock amounted to about 6.2 Mt in 2007 compared with 5.9 Mt in 2006, which was an increase of 5.1%. The leading mining companies—Bunge Fertilizantes S.A., Fosfértil S.A., and Ultrafértil S.A. in the State of Minas Gerais, and Copebras S.A. in the State of Sao Paulo contributed almost 96% of the total production in 2007. The reported domestic consumption of concentrates was about 7.8 Mt in 2007 compared with 7.2 Mt in 2006. Of the total phosphoric acid produced, 73% was used in the fertilizer industry; 25%, in the chemical industry; and 2%, for other uses. These usages remained almost unchanged from those of 2006. Imports of phosphates (1.7 Mt valued at \$104.6 million), phosphoric acid (356,434 t valued at \$100 million), and intermediate products (4.9 Mt valued at \$1.7 billion) for fertilizers were valued at \$1.9 billion in 2007 (Departamento Nacional de Produção Mineral, 2008d).

### **Mineral Fuels**

In 2007, Brazil produced almost 18.2 billion cubic meters of natural gas and 638 million barrels (Mbbbl) of petroleum, which was 2.8% and almost 1.5% higher than that of 2006, respectively. The country produced, in order of economic importance, crude oil, natural gas liquid, natural gas, coal, and shale oil; production totaled 860 Mbbbl more oil equivalent than in 2006. In 2007, Petrobrás' average production of crude oil,



which included condensate and liquid natural gas, was about 2.3 million barrels per day (Mbb/d), which was about the same level as that of 2006. Petrobrás was planning to increase its daily output rate to 2.3 Mbb/d by 2010 and to produce about 75% of this output from deepwater zones. Brazil's total energy consumption included crude oil (58%, including ethanol), hydroelectricity (35%), and natural gas (7%). In coming years, attempts to diversify electric generation from hydropower to natural gas powerplants could increase the consumption of natural gas (Departamento Nacional de Produção Mineral, 2008d; *Petróleo Brasileiro S.A.*, 2008, p. 6; U.S. Energy Information Administration, 2008).

**Coal.**—In 2007, Brazil produced 6 Mt of bituminous coal, which was about the same level as that of 2006. The Brazilian coal industry's mine operations were concentrated in the three southernmost States of Rio Grande do Sul (52.3%), Santa Catarina (46.3%), and Parana (1.4%). Coal demand increased mainly because the thermoelectric plants were operating at full capacity in these three States (Departamento Nacional de Produção Mineral, 2008d).

To meet Brazil's coal demand, 18.4 Mt was imported in 2007 compared with 16.1 Mt in 2006. Imports came from Australia (35%), the United States (26%), Canada (9%), China (7%), South Africa (4%), and other countries (19%). Brazil's usage of coal was 68% as metallurgical coal and 32% as thermal coal in 2007. The steel industry consumed 100% of metallurgical coal. Eighty-five percent of the energy coal was consumed by thermoelectric generation, and 15%, by the industrial sector (petrochemical, 4%; food industry, 3%; cellulose, 3%; and others, 5%) (Departamento Nacional de Produção Mineral, 2008d).

Brazil was planning a priority thermoelectric generating program based mostly on natural gas and coal that would involve 50 new power stations based mainly on natural gas. Three new coal-fired powerplants would be built in the State of Rio Grande do Sul. These new powerplants were part of the Government's 17-gigawatt emergency plan (supplied largely by *Electrobrás S.A.*) to cope with the increased demand for electricity. Most Brazilian coals have a lower content of carbon and a higher content of ash compared with the Colombian coals in the Guajira area. Vale was planning to build three thermoelectric coal plants in Barcarena, State of Para to produce 600 megawatts (MW) by 2010. Total Brazilian coal reserves were estimated to be 930 Mt (table 3; Departamento Nacional de Produção Mineral, 2008d).

**Natural Gas.**—In 2007, Brazil's natural gas sources were 18.1 billion cubic meters of domestic natural gas and 10.3 billion cubic meters of natural gas imported from Bolivia (95%) and Argentina (5%). Petrobrás produced 15.8 billion cubic meters, or 87.2% of domestic natural gas. The leading producers of natural gas were the State of Rio de Janeiro (8 billion cubic meters), the State of Amazonas (3.5 billion cubic meters), and the State of Bahia (2.6 billion cubic meters). Petrobrás was planning to develop the Campo de Mexilhão in the Santos Basin to produce 15 million cubic meters per day of natural gas by 2009. In 2007, Petrobrás' involvement in Bolivia was mostly in exploration and production of natural gas, having sold its Elder Bell and Villaroel petroleum refineries located in Santa Cruz and Cochabamba Departments, respectively, to

the state-owned *Yacimientos Petrolíferos Fiscales Bolivianos* for \$112 million. Total Brazilian natural gas proven reserves were estimated to be 350 billion cubic meters. The Campos and the Santos Basins hold the majority of reserves (Departamento Nacional de Produção Mineral, 2008d; *Petróleo Brasileiro S.A.*, 2008, p. 7).

**Petroleum.**—In 2007, according to the DNPM, Brazil had 12.2 billion barrels of proven crude oil reserves (which were the second largest reserves in South America after Venezuela), and produced 638 Mbb/d of petroleum, which was 1.4% higher than that of 2006 (629 Mbb/d). Imports of crude oil increased to 159.1 Mbb/d in 2007 from 130.9 Mbb/d in 2006, or by 21.5%. The main import sources were Nigeria (42.5%), Algeria (14.3%), and Saudi Arabia (13%). Petrobrás' total production of domestic and international crude oil and derivatives amounted to 2.044 Mbb/d, or 87.8% domestic and 12.2% international outputs in 2007 compared with 1.891 Mbb/d, or 93.3% domestic and 6.7% international outputs in 2006. Petrobrás' exports of crude oil and derivatives amounted to 619,000 barrels per day (bbl/d) in 2007 compared with 575,000 bbl/d in 2006, and imports of crude oil and derivatives amounted to 709,000 bbl/d in 2007 compared with 645,000 bbl/d in 2006. Petrobrás had also started numerous ethanol pipeline projects, including one that runs from the State of Goiás to the State of São Paulo. BP Brasil Ltda. announced its involvement in the *Edia* ethanol project in Goiás State, which would produce 7,500 bbl/d of ethanol by 2008; ethanol is produced from sugar cane that grows in Brazil's tropical climate. According to Petrobrás, exploration and production took place in Angola, Argentina, Bolivia, Colombia, Ecuador, Peru, Venezuela, and the United States (BP Brasil Ltda., 2008; Departamento Nacional de Produção Mineral, 2008d; *Petróleo Brasileiro S.A.*, 2008, p. 58).

In 2007, the partnership of Royal Dutch Shell (80%) and Petrobrás (20%) on the *Bijupira* and the *Salema* Projects in Campos Basin produced a combined 50,000 bbl/d of crude oil and more than 480,000 cubic meters per day of gas; the fields have reserves of about 190 Mbb/d of oil and 1.8 billion cubic meters of natural gas. Other companies involved in exploration included Statoil ASA of Norway, Shell, ExxonMobil, Repsol-YPF, and Chevron (BP Brasil Ltda., 2008; U.S. Energy Information Administration, 2008).

## Reserves and Resources

Brazil was among the world leaders in reserves of some mineral commodities (table 3). According to the DNPM, the country's world ranking of the 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, 2008d).

## Outlook

The Brazilian minerals (metals, industrial minerals, and fuels) sector continued to enjoy a phase of real growth, which has led to a significant 84% increase in net FDI. New mineral projects and expansions in progress are expected to ensure that Brazil retains its position among the leaders in global mineral

commodity production in the foreseeable future. Brazil's rapid economic growth and its associated financial innovation are supporting the increase of domestic and transnational investors in the Brazilian mineral industry and, in particular, in the metals, natural gas and petroleum, and biofuels and ethanol sectors. According to the Banco Central do Brasil and the Economic Commission for Latin America and the Caribbean, more than 400 leading transnational companies 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 MERCOSUR and, as one of the world's leading producers of bauxite, crude oil, graphite, iron ore, manganese, niobium, tantalum, and tin, to attract additional FDI inflows in the near future (Banco Central do Brasil, 2008a, p. 50-51; 2008b; Economic Commission for Latin America and the Caribbean, 2008).

In Brazil, the main vehicles for FDI inflows, in the short and medium term, are expected to be joint ventures and acquisitions in new projects with Vale, Petrobrás, and others. Investments in hydroelectric and thermoelectric powerplants coming onstream 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 84% share (\$34.6 billion) of MERCOSUR's total FDI (\$41.3 billion) in 2007 (Banco Central do Brasil 2008a, p. 60-61; 2008b; Economic Commission for Latin America and the Caribbean, 2008).

Brazil's Federal tax exemptions on imports of equipment for mineral 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. Vale is planning to invest about \$14.2 billion by 2009 to sustain existing operations and to foster growth through research and development and the execution of Vale's diverse fuels projects, in spite of the global financial downturn in 2008 and its spillover into the Brazilian economy. Vale is still confident on its long-term minerals and metals markets, which could increase Vale's market capitalization to \$70 billion from its current (2007) level of about \$60 billion (Banco Central do Brasil, 2008a, p. 60-61; 2008b; Vale S.A., 2008 a-c).

MERCOSUR has undergone dramatic changes in the natural gas and power markets owing to the increase in cross-border energy investment opportunities, domestic gas consumption, and regionalization of the energy sector. Brazil has become the center of an increasingly rapid process of energy integration in South America owing to the country's gas market, which is evolving rapidly with an unsatisfied energy demand and a great potential for growth (Petróleo Brasileiro S.A., 2008, p. 31).

Investments in the Brazilian mining industry are expected to continue to increase exploration and mine development activities, particularly in, in order of importance, iron ore, gold, copper, diamond, and emeralds. This trend is expected to continue because several TNCs have joined to consortiums and

acquired exploration properties, mining prospects, and permits particularly for, in order of economic value, crude oil and ethanol, natural gas, iron ore, gold, diamond, copper, lead, and zinc.

Brazilian gold production could increase significantly in the foreseeable future because of the growth of Brazilian 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 2007-08, Brazil's investment in mineral exploration, such as for, in order of economic value, bauxite, copper, iron ore, and nickel, amounted to \$8.5 billion (Departamento Nacional de Produção Mineral, 2008a, p. 6, 8; 2008d). Brazil has a strong industrial base that is capable of supplying most of the required mining and natural gas and petroleum equipment; the country has modern mining and crude oil technologies and an efficient network of supporting services, and can provide skilled labor. Modern and reliable transportation and communication infrastructures were being planned to augment Brazil's ability to produce minerals competitively and in a sustainable way.

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. The 52 powerplants to be built in the foreseeable future (49 based on natural gas and 3 on coal) could become the major drivers for growth in mineral fuels demand. Since 2002, 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., 2008, p. 34).

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 while protecting the environment in a responsible and sustainable way (Departamento Nacional de Produção Mineral, 2008b, c; 2008d, p. 25-26; U.S. Energy Information Administration, 2008).

## References Cited

- Associação Brasileira do Alumínio, 2007, Profile of the Brazilian aluminum industry—Annual report 2006: Associação Brasileira do Alumínio, 125 p. (Accessed October 1, 2008, at <http://www.abal.org.br/english/index.asp>)
- Banco Central do Brasil, 2008a, Economic indicators (October 2008): Banco Central do Brasil, 185 p. (Accessed October 1, 2008, at <http://www.bcb.gov.br/?INDICATORS>.)
- Banco Central do Brasil, 2008b, Relatório anual 2007: Banco Central do Brasil. (Accessed October 1, 2008, at <http://www.bcb.gov.br/pec/boletim/banual2007/rel2007p.pdf>.)

- BP Brasil Ltda., 2008, BP in Brazil—To bring a new energy to Brazil: BP Brasil Ltda.. (Accessed December 15, 2008, at [http://www.bp.com/sectiongenericarticle.do? categoryId=453&contentId=2000600](http://www.bp.com/sectiongenericarticle.do?categoryId=453&contentId=2000600).)
- Bray, E.L., 2008a, Aluminum: U.S. Geological Survey Mineral Commodity Summaries 2008, p. 22-23.
- Bray, E.L., 2008b, Bauxite and alumina: U.S. Geological Survey Mineral Commodity Summaries 2008, p. 32-33.
- Departamento Nacional de Produção Mineral, 2008a, Informe mineral—Desenvolvimento e Economia Mineral: Brasília, DF, Brazil, Primer Semestre 2008, v. 6, 27 p.
- Departamento Nacional de Produção Mineral, 2008b, Legal aspects—Mining Information, 2007: Departamento Nacional de Produção Mineral. (Accessed November 17, 2008, via <http://www.dnpm.gov.br>.)
- Departamento Nacional de Produção Mineral, 2008c, MineralBusiness—Investor's Guide in Brazil: Departamento Nacional de Produção Mineral. (Accessed October 31, 2008, via <http://www.dnpm.gov.br>.)
- Departamento Nacional de Produção Mineral, 2008d, Sumário mineral 2007—Produção Mineral Brasileira: Departamento Nacional de Produção Mineral. (Accessed November 18, 2008, via <http://www.dnpm.gov.br>.)
- Economic Commission for Latin America and the Caribbean, 2008, Foreign investment in Latin America and the Caribbean 2007 report: Economic Commission for Latin America and the Caribbean, June, 205 p. (Accessed August 8, 2008, at <http://www.eclac.org/publicaciones/default.asp?idioma=IN>.)
- Engle, Marylyn, 2008, Technology for capturing mercury emissions from gold processing shops in Itaituba and Creporizao, Brazil: U.S. Environmental Agency report, 2007, 50 p.
- Fenton, M.D., 2008, Iron and steel: U.S. Geological Survey Mineral Commodity Summaries 2008, p. 86-87.
- Ferraz, C.P., 2007, Brazil—South American powerhouse, *in* Country Overview: Brasília, DF, Brazil, Mining Journal special publication, July, 16 p.
- Instituto Brasileiro de Siderurgia, 2008, Siderúrgica Brasileira, *in* Relatório de Sustentabilidade 2008: Rio de Janeiro, Brazil, Instituto Brasileiro de Siderurgia, 66 p.
- Jorgenson, J.D., 2008, Iron ore: U.S. Geological Survey Mineral Commodity Summaries 2008, p. 84-85.
- Olson, D.W., 2008a, Gemstones: U.S. Geological Survey Mineral Commodity Summaries 2008, p. 68-69.
- Olson, D.W., 2008b, Graphite (natural): U.S. Geological Survey Mineral Commodity Summaries 2008, p. 74-75.
- Papp, J.F., 2008a, Niobium (columbium): U.S. Geological Survey Mineral Commodity Summaries 2008, p. 116-117.
- Papp, J.F., 2008b, Tantalum: U.S. Geological Survey Mineral Commodity Summaries 2008, p. 168-169.
- Petróleo Brasileiro S.A., 2008, Petrobrás activities, *in* Petrobrás annual report 2007: Rio de Janeiro, Brazil, Petróleo Brasileiro S.A., 104 p.
- Serviço Geológico do Brasil, 2007, Relatório anual 2007: Rio de Janeiro, Brazil, Serviço Geológico do Brasil, 193 p.
- Siderurgia Brasileira, 2008, Siderurgia Brasileira—Relatório de sustentabilidade 2008: Rio de Janeiro, Brazil, Siderurgia Brasileira, 66 p.
- U.S. Energy Information Administration, 2008, Brazil: U.S. Energy Information Administration country analysis brief. (Accessed December 15, 2008, at <http://www.eia.doe.gov/emeu/cabs/Brazil/Background.html>.)
- Vale S.A., 2008a, Annual report 2007: Vale S.A. (Accessed October 1, 2008, at <http://www.vale.com/relatoriosustentabilidade2007/eng/>.)
- Vale S.A., 2008b, Company fact sheet: Vale S.A. (Accessed October 1, 2008, at [http://www.vale.com/vale\\_us/cgi/cgilua.exe/sys/start.htm?tpl=home](http://www.vale.com/vale_us/cgi/cgilua.exe/sys/start.htm?tpl=home).)
- Vale S.A., 2008c, Subsidiaries, affiliates, and joint ventures 2006: Vale S.A. (Accessed October 1, 2008, at [http://www.vale.com/vale\\_us/cgi/cgilua.exe/sys/start.htm?tpl=home](http://www.vale.com/vale_us/cgi/cgilua.exe/sys/start.htm?tpl=home).)

TABLE 1  
BRAZIL: PRODUCTION OF MINERAL COMMODITIES<sup>1</sup>

(Metric tons unless otherwise specified)

Commodity <sup>2</sup>	2003	2004	2005	2006	2007 <sup>p</sup>	
METALS						
Aluminum:						
Bauxite, dry basis, gross weight	17,363,000	20,914,000	22,034,000 <sup>r</sup>	22,836,000 <sup>r</sup>	24,754,000	
Alumina	5,111,000	5,300,000	5,300,000	6,793,000 <sup>r</sup>	6,890,000	
Metal:						
Primary	1,381,000	1,457,000	1,498,000	1,605,000 <sup>r</sup>	1,655,000	
Secondary	235,000	246,000	251,000 <sup>r</sup>	253,000 <sup>r</sup>	255,000	
Total	1,616,000	1,703,000	1,749,000 <sup>r</sup>	1,858,000 <sup>r</sup>	1,910,000	
Beryllium, beryl concentrate, gross weight	6	6	-- <sup>r</sup>	-- <sup>r</sup>	--	
Cadmium, metal, primary <sup>3</sup>	189	187	200	200 <sup>c</sup>	200 <sup>c</sup>	
Chromium:						
Crude ore	376,862	593,476	616,534 <sup>r</sup>	562,739 <sup>r</sup>	627,772	
Concentrate and lump, Cr <sub>2</sub> O <sub>3</sub> content	155,063	253,002	253,082 <sup>r</sup>	228,721 <sup>r</sup>	253,254	
Marketable product <sup>6,3</sup>	12,000	12,000	12,000	12,000	12,000	
Cobalt:						
Mine output, Co content of hydroxide <sup>c</sup>	1,300	1,400 <sup>4</sup>	1,500	1,500	1,500	
Metal, electrolytic <sup>5</sup>	1,097	1,155	1,200	1,200 <sup>c</sup>	1,200 <sup>c</sup>	
Copper:						
Mine output, Cu content	26,275	103,153	133,325 <sup>r</sup>	147,836	205,728	
Metal, refined:						
Primary	173,378	208,020	199,043	219,700	218,367	
Secondary	20,000	24,000	25,000 <sup>r</sup>	27,000	24,000	
Total	193,378	232,020	224,043 <sup>r</sup>	246,700	242,367	
Gold:						
Mine output	kilograms	26,066	28,508	29,942 <sup>r</sup>	37,907 <sup>r</sup>	44,443
Garimpeiros, independent miners	do.	14,350	19,088	8,351	5,175 <sup>r</sup>	5,170
Total	do.	40,416	47,596	38,293 <sup>r</sup>	43,082 <sup>r</sup>	49,613
Iron and steel:						
Iron ore and concentrate, marketable product <sup>6</sup> :						
Gross weight	thousand metric tons	230,707	261,675	281,462 <sup>r</sup>	317,800	354,674
Fe content	do.	153,190	173,752	186,891 <sup>r</sup>	211,020	235,504
Metal:						
Pig iron	do.	32,036	34,579	33,884 <sup>r</sup>	32,452 <sup>r</sup>	35,571 <sup>r</sup>
Ferroalloys, electric arc furnace:						
Chromium metal		NA	NA	NA	NA	NA
Ferrocadium silicon		NA	NA	NA	NA	NA
Ferrochromium		204,339	216,277	197,653	166,577 <sup>r</sup>	195,890
Ferrochromium silicon		10,500	11,560	11,600	11,600 <sup>c</sup>	11,600 <sup>c</sup>
Ferrocolumbium		24,875	25,169	38,819	38,800 <sup>c</sup>	38,800 <sup>c</sup>
Ferromanganese		438,000	466,000	480,000	573,000 <sup>c</sup>	687,000
Ferromolybdenum		NA	NA	NA	NA	NA
Ferronickel <sup>c</sup>		19,900	19,900	38,819 <sup>r</sup>	41,566 <sup>r</sup>	52,442
Ferrophosphorus		NA	NA	NA	NA	NA
Ferrosilicon		146,000	146,000	146,000	146,000 <sup>c</sup>	146,000 <sup>c</sup>
Ferrosilicon magnesium <sup>c</sup>		14,600	14,600	14,600	14,600 <sup>c</sup>	14,600 <sup>c</sup>
Ferrosilicon zirconium		NA	NA	NA	NA	NA
Ferrotitanium		NA	NA	NA	NA	NA
Ferrotungsten		NA	NA	NA	NA	NA
Ferrovandium		NA	NA	NA	NA	NA
Inoculant <sup>c</sup>		11,100	11,100	11,100	11,100	11,100
Silicomanganese		180,200	180,000 <sup>c</sup>	180,200	180,000 <sup>c</sup>	180,000 <sup>c</sup>
Silicon metal		133,400	133,000 <sup>c</sup>	133,400	133,000 <sup>c</sup>	133,000 <sup>c</sup>
Other ferroalloys		25,300 <sup>c</sup>	19,054	19,500	19,500 <sup>c</sup>	19,500 <sup>c</sup>
Total <sup>c</sup>		1,208,214 <sup>4</sup>	1,240,000	1,270,000	1,340,000	1,490,000
Crude steel, excluding castings	thousand metric tons	31,150	32,918	31,631	30,900	33,782
Semimanufactures, flat and nonflat <sup>c</sup>	do.	17,500	17,500	17,500	17,500	17,500

See footnotes at end of table.

TABLE 1—Continued  
BRAZIL: PRODUCTION OF MINERAL COMMODITIES<sup>1</sup>

(Metric tons unless otherwise specified)

Commodity <sup>2</sup>	2003	2004	2005	2006	2007 <sup>p</sup>
METALS—Continued					
Lead:					
Mine output, Pb content in concentrate	10,652	14,737	23,616 <sup>r</sup>	25,764 <sup>r</sup>	24,574
Metal, secondary	128,610	137,121	104,904	142,653 <sup>r</sup>	142,450
Manganese:					
Ore and concentrate, marketable: <sup>3</sup>					
Gross weight	2,544,000	3,143,000	3,200,000 <sup>r</sup>	3,128,000 <sup>r</sup>	1,866,000
Metal content	1,286,000	1,346,000	1,370,000 <sup>r</sup>	1,845,000 <sup>r</sup>	1,101,000
Metal:					
Primary	12,860	13,460	13,700 <sup>r</sup>	18,450	22,140
Secondary <sup>c</sup>	1,600	1,600	1,600	1,600	1,600
Nickel:					
Mine output, ore	3,893,095	3,794,868	4,845,695	5,503,211 <sup>r</sup>	5,927,554
Ni content in ore	44,928	51,886	74,198	82,492	58,317
Ni content in carbonate	18,406	19,897	21,116 <sup>r</sup>	21,630 <sup>r</sup>	20,796
Ni content in matte	5,950	6,708	6,005	5,416	3,401
Ni, electrolytic	18,155	19,742	20,714	21,339 <sup>r</sup>	21,635
Ferronickel, Ni content	6,409	6,493	9,596 <sup>r</sup>	9,814 <sup>r</sup>	9,918
Niobium (columbium)-tantalum ores and concentrates, gross weight:					
Columbite and tantalite <sup>c</sup>	249	277 <sup>4</sup>	456	456	456
Djalmaite concentrate <sup>c</sup>	10	10	10	10	10
Pyrochlore concentrate, Nb <sub>2</sub> O <sub>5</sub> content	25,859 <sup>r</sup>	23,779 <sup>r</sup>	56,023 <sup>r</sup>	68,850 <sup>r</sup>	81,922
Rare-earth metals, monazite concentrate, gross weight	--	731	958 <sup>r</sup>	958 <sup>r</sup>	1,173
Silver <sup>7</sup>					
Primary kilograms	31,440	35,497	38,134	30,000 <sup>r</sup>	36,000
Secondary <sup>c</sup> do.	50,000	45,000 <sup>4</sup>	43,000 <sup>4</sup>	39,000 <sup>r</sup>	32,000
Total do.	81,440	80,497	81,134	69,000 <sup>r</sup>	68,000
Tin:					
Mine output, Sn content	12,217	12,202	11,739 <sup>r</sup>	9,528 <sup>r</sup>	12,596
Metal, smelter:					
Primary	10,761	11,512	8,986	8,780 <sup>r</sup>	9,987
Secondary <sup>c</sup>	250	250	250	250	250
Total	11,011	11,762	9,236	9,030 <sup>r</sup>	10,237
Titanium:					
Ilmenite:					
Gross weight	120,160	133,000	127,142	127,200	130,000
TiO <sub>2</sub> content	94,000	90,000	77,571 <sup>r</sup>	89,195 <sup>r</sup>	95,559
Rutile, TiO <sub>2</sub> content	2,303	2,117	2,069	2,100	3,000
Tungsten, mine output, W content	30	262	577 <sup>r</sup>	525 <sup>r</sup>	537
Zinc:					
Mine output, Zn content	152,822	158,962	170,659 <sup>r</sup>	185,211	193,899
Metal, smelter:					
Primary	262,998	265,987	267,374	272,438 <sup>r</sup>	265,126
Secondary <sup>c</sup>	NA	NA	NA	NA	NA
Total	262,998	265,987	267,374	272,438 <sup>r</sup>	265,126
Zirconium, zircon concentrate, gross weight <sup>8</sup>	27,198	25,263	25,657	25,120 <sup>r</sup>	26,739
INDUSTRIAL MINERALS					
Asbestos:					
Crude ore	3,950,000 <sup>c</sup>	3,950,000 <sup>c</sup>	3,950,000 <sup>c</sup>	3,804,000	4,254,000
Fiber	231,117	252,067	236,047	227,304	254,204
Barite:					
Crude	67,842	72,320	42,924 <sup>r</sup>	47,611 <sup>r</sup>	22,869
Beneficiated	57,452	59,612	39,545 <sup>r</sup>	19,151 <sup>r</sup>	13,311
Marketable product <sup>e,3</sup>	65,000	65,000	45,000 <sup>r</sup>	45,000 <sup>r</sup>	45,000
Calcite <sup>c</sup>	35,000	35,000	35,000	35,000	35,000
Cement, hydraulic thousand metric tons	34,010	34,413	36,673	39,540 <sup>r</sup>	46,406

See footnotes at end of table.

TABLE 1—Continued  
BRAZIL: PRODUCTION OF MINERAL COMMODITIES<sup>1</sup>

(Metric tons unless otherwise specified)

Commodity <sup>2</sup>	2003	2004	2005	2006	2007 <sup>p</sup>	
INDUSTRIAL MINERALS—Continued						
Clays:						
Bentonite, beneficiated	198,981	226,874	221,300 <sup>r</sup>	235,481 <sup>r</sup>	238,746	
Kaolin:						
Crude	5,205,513	5,958,057	6,150,000	6,200,000 <sup>r</sup>	6,382,000	
Beneficiated	2,081,039	2,381,000	2,410,000 <sup>r</sup>	2,455,000 <sup>r</sup>	2,527,000	
Marketable product <sup>3</sup>	1,852,376	2,149,000	2,072,000	2,404,000 <sup>r</sup>	2,364,000	
Diamond, gem and industrial: <sup>c</sup>						
Private sector	thousand carats	100	111	96 <sup>r</sup>	84 <sup>r</sup>	84
Garimpagem	do.	300	189	112 <sup>r</sup>	97 <sup>r</sup>	98
Total <sup>9</sup>	do.	400	300	208 <sup>r</sup>	181 <sup>r</sup>	182
Diatomite:						
Crude	10,293	8,847	7,549	10,753 <sup>r</sup>	9,638	
Beneficiated	6,920	7,200	7,670	8,968 <sup>r</sup>	5,555	
Marketable product <sup>e, 3</sup>	13,100	13,100	13,100	13,100 <sup>e</sup>	13,100 <sup>e</sup>	
Feldspar:						
Crude <sup>e</sup>	102,077	280,293	196,419	166,418 <sup>r</sup>	182,168 <sup>r</sup>	
Marketable product: <sup>3</sup>						
Feldspar	53,476	115,952	117,387	71,785 <sup>r</sup>	166,089 <sup>e</sup>	
Leucite <sup>e</sup>	5,000	5,000	5,000	5,000	5,000	
Sodalite, crude <sup>e</sup>	500	500	500	500	500	
Total	58,976	121,452	122,887	77,285 <sup>r</sup>	171,589	
Fluorspar:						
Crude ore	164,208	181,991	201,435	192,628	198,449	
Concentrates, marketable product:						
Acid-grade	34,462	40,948	42,043 <sup>r</sup>	41,373 <sup>r</sup>	44,869	
Metallurgical-grade	21,884	16,824	24,469 <sup>r</sup>	22,231 <sup>r</sup>	20,657	
Total	56,346	57,772	66,512	63,604 <sup>r</sup>	65,526	
Graphite:						
Crude <sup>e</sup>	650,000	650,000	650,000	650,000 <sup>e</sup>	650,000 <sup>e</sup>	
Marketable product: <sup>3</sup>						
Direct-shipping ore	NA	NA	NA	NA	NA	
Concentrate	70,739	76,332	77,494	76,194	76,194	
Total	70,739	76,332	77,494	76,194	76,194	
Gypsum and anhydrite, crude	1,592,015	1,474,911	1,582,248	1,711,671 <sup>r</sup>	1,923,119 <sup>r</sup>	
Kyanite: <sup>e</sup>						
Crude	750	750	750	750	750	
Marketable product <sup>3</sup>	600	600	600	600	600	
Lime, hydrated and quicklime	thousand metric tons	6,600	6,900	6,500 <sup>r</sup>	7,057 <sup>r</sup>	7,393
Lithium, concentrates	9,755	9,064	8,924	8,950	8,950	
Magnesite:						
Crude	1,134,385	1,339,441	1,342,754	1,163,422 <sup>r</sup>	1,301,827	
Beneficiated	306,444	366,174	386,759	382,718 <sup>r</sup>	399,314	
Mica, all grades <sup>e</sup>	4,000	4,000	4,000	4,000	4,000	
Nitrogen, N content of ammonia	938,800	1,077,400	950,000	950,000 <sup>e</sup>	950,000 <sup>e</sup>	
Phosphate rock, including apatite:						
Crude:						
Mine product	thousand metric tons	34,700	35,000	34,000	36,700	38,265
Of which sold directly <sup>e</sup>	do.	35	35	35	35	35
Concentrate:						
Gross weight	do.	5,584	5,690	5,631 <sup>r</sup>	5,932 <sup>r</sup>	6,185
P <sub>2</sub> O <sub>5</sub> content	do.	2,005	2,181	2,005 <sup>r</sup>	2,111 <sup>r</sup>	2,185
Pigment, mineral, other, crude <sup>e</sup>	2,000	2,000	2,000	2,000	2,000	
Potash, marketable (K <sub>2</sub> O)	415,549	403,080	404,871	403,080	471,333	
Potassium (KCl)	657,750	638,020	638,020	635,200	636,500	

See footnotes at end of table.

TABLE 1—Continued  
BRAZIL: PRODUCTION OF MINERAL COMMODITIES<sup>1</sup>

(Metric tons unless otherwise specified)

Commodity <sup>2</sup>	2003	2004	2005	2006	2007 <sup>p</sup>	
<b>INDUSTRIAL MINERALS—Continued</b>						
Precious and semiprecious stones except diamond, crude and worked: <sup>e</sup>						
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	value	\$10,000	\$10,000	\$10,000	\$10,000	
Sapphire	do.	\$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	7,420	18,116	17,860	14,195 <sup>r</sup>	22,561	
Salt:						
Marine	thousand metric tons	5,144	5,206	5,520 <sup>r</sup>	5,122 <sup>r</sup>	5,365
Rock	do.	1,420	1,442	1,559	1,622 <sup>r</sup>	1,621
Silica, silix <sup>e</sup>		1,600	1,600	1,600	1,600	1,600
Sodium compounds: <sup>e</sup>						
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
Stone, sand and gravel: <sup>e</sup>						
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 <sup>10</sup>		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		19,246	20,000	19,618 <sup>r</sup>	20,954 <sup>r</sup>	22,336
Byproduct:						
Metallurgy		285,821	286,000	266,817 <sup>r</sup>	297,539 <sup>r</sup>	321,707
Petroleum		90,332	90,400	112,093 <sup>r</sup>	117,203 <sup>r</sup>	135,623
Total		395,399	396,000	398,528 <sup>r</sup>	435,696 <sup>r</sup>	479,666
Talc and related material:						
Talc:						
Crude		369,000	417,716	413,340	389,471 <sup>r</sup>	401,204
Marketable product <sup>e, 3</sup>		2,000	2,000	2,000	2,000	2,000
Pyrophyllite, crude <sup>e</sup>		200,000	200,000	200,000	200,000	200,000
Vermiculite:						
Concentrate		26,055	25,103	24,191 <sup>r</sup>	19,279 <sup>r</sup>	18,952
Marketable product <sup>e, 3</sup>		3,100	3,100	3,100	3,100	3,100
<b>MINERAL FUELS AND RELATED MATERIALS</b>						
Coal, bituminous:						
Run-of-mine	thousand metric tons	4,643	5,077	6,000 <sup>r</sup>	5,981	6,000
Marketable <sup>e, 3</sup>	do.	6,000	5,370	6,480	6,220 <sup>4</sup>	6,220 <sup>4</sup>
Coke, metallurgical, all types	do.	159	294	300	300 <sup>e</sup>	300 <sup>e</sup>
Natural gas, gross	million cubic meters	15,792	16,971	17,699	17,706 <sup>r</sup>	18,152
Natural gas liquids	million 42-gallon barrels	4,284	4,667	4,700	4,700 <sup>e</sup>	4,700 <sup>e</sup>

See footnotes at end of table.

TABLE 1—Continued  
BRAZIL: PRODUCTION OF MINERAL COMMODITIES<sup>1</sup>

(Metric tons unless otherwise specified)

Commodity <sup>2</sup>	2003	2004	2005	2006	2007 <sup>p</sup>	
MINERAL FUELS AND RELATED MATERIALS—Continued						
Petroleum:						
Crude	thousand 42-gallon barrels	562,137	544,799	596,255 <sup>r</sup>	628,797 <sup>r</sup>	638,018
Refinery products: <sup>11, 12</sup>						
Liquefied petroleum gas	do.	13,503	13,652	13,757 <sup>r</sup>	13,891 <sup>r</sup>	14,175
Gasoline	do.	138,452	139,975	141,332 <sup>r</sup>	142,703 <sup>r</sup>	145,673
Jet fuel	do.	576	582	587 <sup>r</sup>	592 <sup>r</sup>	605
Kerosene	do.	26,900	27,196	27,460 <sup>r</sup>	27,727 <sup>r</sup>	28,304
Distillate fuel oil	do.	212,640	215,052	217,114 <sup>r</sup>	219,228 <sup>r</sup>	223,580
Lubricants	do.	6,043	6,109	6,168 <sup>r</sup>	6,228 <sup>r</sup>	6,357
Residual fuel oil	do.	121,985	123,327	124,523 <sup>r</sup>	125,731 <sup>r</sup>	128,348
Other	do.	103,686	104,827	105,879 <sup>r</sup>	106,906 <sup>r</sup>	109,131
Refinery fuel and losses	do.	NA	NA	NA	NA	NA
Total	do.	623,785	630,720	636,820 <sup>r</sup>	643,006 <sup>r</sup>	656,173

<sup>6</sup>Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. <sup>p</sup>Preliminary. <sup>r</sup>Revised. do. Ditto.

NA Not available. -- Zero.

<sup>1</sup>Table includes data available through May 31, 2009.

<sup>2</sup>In 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.

<sup>3</sup>Direct sales and (or) beneficiated (marketable product).

<sup>4</sup>Reported figure.

<sup>5</sup>Source: Cobalt Development Institute.

<sup>6</sup>Includes sponge iron, in metric tons, as follows: 2003-07—270,000 (estimated).

<sup>7</sup>Officially 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: 2003-05—50,000 and 2006-07—45,000.

<sup>8</sup>Includes baddeleyite-caldasite.

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

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

<sup>11</sup>Source: Ministry of Mines and Energy of Brazil or Brazil's Energy Statistics Yearbook.

<sup>12</sup>Departamento Nacional de Produção Mineral, 2007-08; and Petrobrás: Annual Report 2007 and Magazine 2008.



TABLE 2  
BRAZIL: STRUCTURE OF THE MINERAL INDUSTRY IN 2007

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
<b>METALS</b>			
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)	440 (metal).
Do.	Alcan Alumínio do Brasil S.A. [Alcan Aluminum Ltd., 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%)	Lamininacao de Pindamonhangaba, Sao Paulo State (smelter)	280 (metal).
Do.	Alcan Alumínio Poços de Caldas (Alucaldas) (Alcan Alumínio do Brasil S.A., 100%)	Pocos de Caldas, Minas Gerais State (mine)	1,000 (bauxite).
Do.	Alcoa Alumínio S.A. (Alcoa Inc., 54%; BHP Billiton, 36%; Alcan Aluminum Ltd., 10%)	Pocos de Caldas, Minas Gerais State (mine)	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, 36%; Alcan Aluminum Ltd., 10%)	Sao Luis, Maranhao State (refinery)	2,000 (alumina).
Do.	Alumar Consortium S.A. (Alcoa Inc., 53.66%; BHP Billiton, 46.34%)	Sao Luis, Maranhao State (smelter)	1,000 (metal).
Do.	Alumínio do Norte do Brasil S.A. (Alunorte) (Vale S.A., 80%, and Norsk Hydro Comercio e Industria, 20%)	Barcarena, Para State (refinery)	7,400 (alumina).
Do.	Companhia Brasileira de Alumínio (CBA) (Votorantim Group, 100%)	Pocos 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%)	Pocos de Caldas, Minas Gerais State (refinery)	275 (alumina).
Do.	do.	Pocos 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 (CBA), 10%; Norsk Hydro Comercio e Industria, 5%; Reynolds Alumínio do Brasil, 5%)	Oriximina, Para State (mine)	14,500 (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. (Aluvale) (Government, 27%; private, 25%; Shell do Brasil S.A., 44%)	Santa Cruz, Rio de Janeiro State (smelter)	86 (metal).
Do.	Aluvale (Vale S.A., 54.5%, and Billiton Metais S.A., 45.5%)	do.	93 (metal).
Do.	Reynolds Internacional do Brasil (Reynolds, 42.5%; Bradesco Bank, 42.5%; J.P. Morgan, 15%)	Sorocaba, Sao Paulo State (smelter)	5.4 million (cans).
Do.	Consortium Paragominas S.A. [Vale S.A., 48.7%; Mineração Rio do Norte S.A. (MRN), 24.6%; Nippon Amazon Aluminum Co., 12.2%; Companhia Brasileira de Alumínio (CBA), 5.7%; others, 8.8%]	Jabuti, Para State (mine)	4,500 (bauxite).
Do.	do.	Jabuti, Para State (alumina)	1,200 (alumina).
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%)	Campo Formoso, Bahia State (mine)	370 (ore).
Do.	do.	Campo Formoso, Bahia State (beneficiation plant)	292 (concentrate).
Copper	Vale S.A. (private, 100%)	Serra dos Carajas, Para State	110 (ore).
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 Goias State (mine)	200 (concentrate).
Do.	Companhia Brasileira Carbureto de Calcio (private, 100%)	Santos Dumont, Minas Gerais State (plant)	54.

TABLE 2—Continued  
BRAZIL: STRUCTURE OF THE MINERAL INDUSTRY IN 2007

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity	
<b>METALS—Continued</b>				
Ferrous alloys	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, Mato Grosso do Sul State; and Xanxere, Santa Catarina State	326.	
Do.	Italmagnesio S.A. Indústria e Comercio (ISAIC) (private, 100%)	Braganca Paulista, Sao 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.	
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. (Vale-Companhia Siderúrgica Nacional, 100%)	Serra dos Carajas Mine in Parauapebas Para State	100,000.	
Do.	do.	Itabira, Ouro Preto, Santa Barbara, Xavier, Tamandua, Capao, and Mato, Minas Gerais State (seven mines)	100,000.	
Do.	do.	Mato Grosso do Sul State (one mine)	1,500.	
Do.	do.	Ponta de Madeira, Maranhao State (pellet plant)	6,000.	
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 Ltd., 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%; (BHP Billiton Ltd., 49%)	Alegria, Minas Gerais State (mine)	15,000.	
Do.	SOCOIMEX S.A. (Vale S.A., 100%)	Mato, Minas Gerais State (mine)	7,000.	
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. (Vale S.A., 100%)	Morro da Mina, Minas Gerais State	1,500.	
Do.	do.	Mina do Azul, Carajas, Para State	1,500.	
Do.	do.	Mina Minérios, 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), 800 (concentrate).	
Do.	Construtora Polares Ltda. (CPL) (private, 100%)	Corumba Minas Gerais State (mine)	200 (ore).	

TABLE 2—Continued  
BRAZIL: STRUCTURE OF THE MINERAL INDUSTRY IN 2007

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity	
<b>METALS—Continued</b>				
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).	
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%)	Joao Monlevade, Minas Gerais State	1,000.	
Do.	Companhia Siderúrgica de Tubarão (private, 100%)	Serra, Espirito 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, Rondonia State (six mines)	108 (ore).	
Do.	do.	Santa Barbara, Novo Mundo, and Potosi, Rondonia State (three beneficiation plants)	450 (concentrate).	
Do.	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).	
Do.	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).	
<b>INDUSTRIAL MINERALS</b>				
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).	

TABLE 2—Continued  
BRAZIL: STRUCTURE OF THE MINERAL INDUSTRY IN 2007

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity	
<b>INDUSTRIAL MINERALS—</b>				
<b>Continued</b>				
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 Paraiso (CCPP), 50%, and Lafarge Group, 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.	
Diamond	carats	Mineração Tejucana S.A. (MTSA, 100%)	Diamantina, Minas Gerais State (mine)	100 (carats).
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 Fumaca, Santa Rosa de Lima, Rio Fortuna, Santa Catarina State; and Tangua, Rio de Janeiro State (three mines and beneficiation plant)	100 (ore), 120 (concentrate).	
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)	100.	
Do.	Companhia de Cimento Portland Paraiso (private, 100%)	Ipubi, Pernambuco State (mine)	50.	
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 Goias, 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 Limited, 100%)	Araxa, Minas Gerais State (mine)	5,000.	
Do.	Copebrás S.A.(Copebrás) (Anglo American plc, 100%)	Ouvidor, Goias State (mine)	4,400.	
Do.	Fosfértil S.A. (Grupo Fertifós, 81.54%; Vale S.A., 10.96%; public, 7.5%)	Tapira, Minas Gerais State (two mines)	10,500.	
Do.	Ultrafértil 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.	

TABLE 2—Continued  
 BRAZIL: STRUCTURE OF THE MINERAL INDUSTRY IN 2007

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners		Location of main facilities	Annual capacity
<b>INDUSTRIAL MINERALS—</b>				
Continued				
Salt, rock—Continued	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.
<b>MINERAL FUELS</b>				
<b>AND RELATED MATERIALS</b>				
Coal	Carbonifera Circiúma S.A. (CCSA) (private, 100%)		Circiúma and Sideropolis, Santa Catarina State (two mines)	1,600.
Do.	Companhia Carbonifera 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.
Petroleum	thousand 42-gallon barrels	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, Rio Grande do Norte, Para, Maranhao, and Sergipe	700,000.
Petroleum products	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 2007<sup>1</sup>

(Thousand metric tons unless otherwise specified)

Commodity	Reserves	World ranking	World percentage
Asbestos, fiber	15,400		NA
Bauxite, ore	2,700,000	3	8.4
Chromite, Cr <sub>2</sub> O <sub>3</sub>	5,362		0.3
Coal, all types <sup>2</sup>	930,000		1.1
Copper, metal content	14,365		1.5
Fluorspar (Ca F <sub>2</sub> content)	1,066		0.5
Gold, metal content metric tons	1,800		2.0
Graphite, ore	113,000	2	28.3
Gypsum	1,233,500		NA
Iron ore, 60% to 65% Fe content	26,474	5	7.2
Kaolin	7,700,000		NA
Lead, metal content	700		0.5
Magnesite	345,000	4	8.9
Manganese, metal content	132,000	4	2.5
Natural gas <sup>2</sup> million cubic meters	350,000		0.2
Nickel, metal content	8,300		5.8
Niobium (columbium) (pyrochlore, and columbite ore)	3,761	1	96.4
Petroleum <sup>2</sup> million 42-gallon barrels	12,200		1.0
Phosphate rock	246,000		0.5
Talc and pyrophyllite	125,800		NA
Tantalum	88,388	1	46.5
Tin, metal content	777	3	12.4
Titanium, TiO <sub>2</sub>	7,990		NA
Uranium, U <sub>3</sub> O <sub>8</sub> metric tons	163,000		NA
Vermiculite	23,000	3	10.3
Zinc, metal content	6,200		1.3
Zirconium, ore	2,637		3.8

NA Not available.

<sup>1</sup>Source: Summário Mineral 2007-08.

<sup>2</sup>Sources: Petróleo Brasileiro, S.A., Annual Report 2007; U.S. Energy Information Administration, October 2008.