



# 2010 Minerals Yearbook

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**BRAZIL [ADVANCE RELEASE]**

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# THE MINERAL INDUSTRY OF BRAZIL

By Alfredo C. Gurmendi

In 2010, Brazil continued to be a leading producer of minerals in the world and marketed about 80 mineral commodities.

The country was a leading producer of steel feedstocks, such as high-content iron ore and niobium, and the third ranked producer of, in terms of volume, aluminum, alumina, bauxite, and iron ore. Brazil has discovered a massive pre-salt area that contains almost 90 billion barrels (Gbbbl) of crude oil but is located at depths of 5 to 7 kilometers (km) and under a layer of salt up to 2 km thick, so developing and producing fuels from these pre-salt fields would be costly. In 2010, Brazil's leading mineral exports were, in order of value, iron ore, gold, niobium, copper, manganese, bauxite, lead, and tin, and its leading imports were coal, potash, copper, and zinc, among others (Banco Central do Brasil, 2011b, p. 97, 107; Bray, 2011b; Departamento Nacional de Produção Mineral, 2011a, p. 6, 10; 2011b; Instituto Brasileiro de Mineração, 2011a; Jorgenson, 2011; Papp, 2011a, b).

## Minerals in the National Economy

Brazil's mineral sector—which included metals, industrial minerals, and mineral fuels, biofuels, and ethanol—continued to experience a phase of real growth as a result of new mineral projects and expansions. Consequently, Brazil was expected to remain among the global leaders in the production of mineral commodities and to continue to attract domestic and foreign investors in its mineral industry. According to the Banco Central do Brasil, the country experienced two quarters of recession in 2009 as world demand for Brazil's commodity-based exports and external credit decreased. After the global economic downturn, Brazil's economy returned to growth in the second half of 2009, and in 2010, the economic recovery had a positive effect on the credit, earnings, liquidity, and solvency of the domestic banking system and made the country an attractive destination for foreign investment. With the revival of consumer and investor confidence, and boosted by the recovery in exports, Brazil's real gross domestic product (GDP) increased by 7.5% in 2010 compared with a decrease of 0.6% in 2009. The mining and mineral processing industries contributed almost 3.6% of the GDP in 2010 compared with 2.4% in 2009, which was mostly attributable to the high international prices and increases in production of several mineral commodities, such as, in order of value, iron ore, petroleum, gold, copper, and lead. Of the total labor force of 102.2 million, the industrial sector employed 14.3 million (or 14%). Within the industrial sector, the mineral industry employed 786,500 (or 5.5%), of which 160,314 people were employed in mining, including 16,700 who were placer miners or garimpeiros (Banco Central do Brasil, 2011a, p. 4, 6–7; Departamento Nacional de Produção Mineral, 2011a, p. 2, 22–23; Economic Commission for Latin America and the Caribbean, 2011, p. 31; International Monetary Fund, 2011a, p. 15–16; 2011b, p. 61; U.S. Central Intelligence Agency, 2011).

## Government Policies and Programs

The National Department of Mineral Production (DNPM) provided a document titled “Taxation of Mining Activities in Brazil—Analysis of Current Situation and of Changes Proposed for Tax Reform,” using the November 1999 legislation as its guide. The purpose of the document was to inform the tax reform discussion underway in the Brazilian National Congress (2010–11) that was aimed at developing a new tax policy in line with the national interest and the growing globalization of the economy. In addition to changing the terms of concession contracts, the proposal would create a National Council of Mineral Resources to function as both a minerals regulator and advisor, with the purpose of increasing the royalties on mineral production. According to the Instituto Brasileiro de Mineração (IBRAM), the regulatory framework to be established for the pre-salt crude oil and natural gas reserves would influence the Government's proposed minerals regulation framework agreement as well. Currently (2010), the Mining Code [Decree-law (Act) No. 227 of February 28, 1967] governs all aspects of the mineral industry, from exploration to production and use of mineral resources, and establishes the rights and duties of the holders of mining rights. The Ministry of Mines and Energy's (MME) DNPM has responsibility for managing the country's mineral resources, for the inspection of the mineral activity in the country, and for enforcing the Mining Code and implementing its legal provisions. Decree-law (Act) No. 227 was amended by law No. 9314 of November 14, 1996, to provide greater flexibility for investment in the Brazilian mining sector. Article 7 stipulates that the production of minerals will depend upon the exploration authorization permit granted by the General Director of the DNPM and the development concession issued by the Minister of the MME. Licensing is a restricted system applicable exclusively to the production of industrial minerals (Departamento Nacional de Produção Mineral, 2011c; Instituto Brasileiro de Mineração, 2011b).

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 private investment in the mining, natural gas, and petroleum sectors. The Government allows state-owned Petrobrás to enter into joint ventures with foreign investors and to invest overseas (Departamento Nacional de Produção Mineral, 2011c; Instituto Brasileiro de Mineração, 2011b).

The Agencia Nacional do Petróleo (ANP) is responsible for issuing exploration and production licenses and ensuring compliance with relevant regulations. Recent legislation concerning pre-salt exploration and production has changed the operating environment somewhat. The Brazilian Government released the proposed regulatory framework for the pre-salt reserves in August 2009. The framework consists of four pieces

of legislation. The first two bills were signed into law in July 2010. The first law creates a new agency, Petrosal, to administer new pre-salt production. The second allows the Government to capitalize Petrobrás by granting the company 5 billion barrels (Gbbbl) of unlicensed pre-salt oil reserves in exchange for a larger ownership share. The other two bills, which would establish a new development fund to manage Government revenues from pre-salt oil and lay out a new production-sharing agreement (PSA) system for pre-salt reserves, just passed by the Brazilian Congress in December 2010. Petrobrás would be the sole operator of each PSA and would hold a minimum 30% stake in all pre-salt projects (Departamento Nacional de Produção Mineral, 2011c; Empresa de Pesquisa Energética, 2011, p. 100–102).

The environmental licensing system is divided into three steps—a preliminary license, which is required during the planning stage; an installation license, which is required prior to any construction being done; and an operational license, which is required before beginning mining or processing operations. Decree No. 6848 of May 14, 2009, modifies Decree No. 4340 of August 22, 2002, to regulate the environmental compensation process (Instituto Brasileiro de Mineração, 2011b).

Brazil's import tax rates for minerals vary from 3% to 9%; the rate for ores and concentrates is 5% and that for other mineral derivatives is 7%. The export tax does not apply to exported mineral products, although there is a value-added tax. In most cases, the basis for assessment of corporate income taxes is the net profit for the fiscal year; the corporate tax rate ranges between 10% and 15% and is levied on the net profit. Profits may be expatriated. Equity ownership, which is allowed by means of privatization or by direct acquisition, may be as high as 100%. Since early 2007, the Concessions Law created additional opportunities for the private sector in public utilities previously reserved for the Government (Departamento Nacional de Produção Mineral, 2011c; Instituto Brasileiro de Mineração, 2011a, b).

In 2010, the IBRAM reported an investment of \$321 million in mineral exploration compared with \$234 million in 2009. The MME's Companhia de Pesquisa de Recursos Minerais (CPRM) (Geological Survey of Brazil) was developing programs for basic geologic mapping; geophysical, metallogenetic, and hydrogeologic mapping; and prospecting in areas of potential development. The CPRM was also creating programs for environmental geology, geologic hazards, and hydrogeology, and maintaining the country's geologic database and the corresponding economic analyses, particularly for coal, copper, diamond, gold, kaolin, nickel, peat, and zinc, to assist domestic and foreign investors in the mining sector (Companhia de Pesquisa de Recursos Minerais, 2011, p. 15, 19, 43; Departamento Nacional de Produção Mineral, 2011b; Instituto Brasileiro de Mineração, 2011a, b).

According to the CPRM, there are substantial mineral deposits to be discovered in Brazil. With only one-third of the country's territory mapped, CPRM was planning to map the entire country's geology. CPRM indicated that the chances of finding first class polymetallic deposits similar to the massive Carajas deposit in the State of Para were high, especially in the Amazon region. Carajas, which was the world's largest iron

ore mine, holds an estimated 7.2 billion metric tons of iron ore resources (proven and probable) and produced about 100 million metric tons per year (Mt/yr). Vale was planning to increase Carajas's production to 130 Mt/yr by 2012. The Carajas iron deposit also holds high content of copper, gold, manganese, and nickel (Companhia de Pesquisa de Recursos Minerais, 2011; Vale S.A., 2011).

In 2010, the mining royalties collected by the Brazilian Financial Compensation for Exploiting Mineral Resources—Federal Royalty (CFEM) amounted to \$556 million compared with \$412 million in 2009. The CFEM rate is no more than 2% of the corporation's net profit. The prevailing rates are 3% for bauxite, manganese ore, potassium, and rock salt; 2% for coal, fertilizers, iron ore, and other minerals; 1% for gold (gold in 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 a funding instrument for technological innovation benefiting all Brazil's productive sectors (2%); and the Brazilian Environment Agency (IBAMA) (0.2%) (Banco Central do Brasil, 2011a, p. 39; Departamento Nacional de Produção Mineral, 2011a, p. 24–26; 2011c; Instituto Brasileiro de Mineração, 2011a).

Brazil was the 7th ranked economy in the world and had implemented a set of economic and social policies that had produced tangible results for the country's economy. Brazil continued to participate in the BRICS (Brazil, Russia, India, China, and South Africa) economic forum, whose member countries, combined, accounted for 42% of the world's population, 26% of the world's land area, and 14.6% of the world's GDP in late 2010 (FinancialMirror, 2011).

## Production

According to IBRAM, the value of Brazil's mineral production in 2010 was \$39 billion compared with \$24 billion in 2009. In the Americas, Brazil continued to be a leading producer of aluminum, bauxite, cement, ferroalloys, gold, iron ore, kaolin, lead, manganese, nickel, steel, and tin. Brazil's reportedly large mineral reserves and other identified resources help make it one of the leading mining countries in the Americas and the world (table 3; Departamento Nacional de Produção Mineral, 2011a, p. 3; Instituto Brasileiro de Mineração, 2011a).

Brazil's major integrated steel operations had a producing area of 28 mills [13 integrated (from iron ore) and 15 semi-integrated (from processing pig iron and scrap)] managed by 10 business groups; together, the mills had an installed capacity of 44.6 Mt/yr of crude steel. In 2010, Brazil's crude steel production amounted to 33 million metric tons (Mt) compared with 26.5 Mt in 2009. According to the Instituto Aço Brasil, the country was the seventh ranked producer of raw steel in the world and the leading producer in Latin America. Brazil was the third ranked iron ore producer in the world after China and Australia with an output of 372.1 Mt; Vale S.A. produced 297 Mt, or 79.8% of Brazil's iron ore production

(Departamento Nacional de Produção Mineral, 2011b; Instituto Aço Brasil, 2011; Vale S.A., 2011).

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 16.8 Mt in 2010, which was about 53% of the country's total revised bauxite production of 31.7 Mt, followed by Vale, which produced almost 24%, or about 7.5 Mt. Brazil produced 25 Mt of pig iron in 2010 compared with 22 Mt in 2009 (table 1; Departamento Nacional de Produção Mineral, 2011b; Instituto Brasileiro de Mineração, 2011b; Vale S.A., 2011).

In 2010, Petrobrás continued to operate in an integrated fashion in the segments of exploration and production, refining, crude oil and natural gas trade and transportation, petrochemicals and derivatives, electric energy, and biofuel and other renewable energy source distribution. Petrobrás was a leader in the Brazilian petroleum sector and had a presence in 28 countries. The company expected to achieve self-sufficiency in crude oil and natural gas production and aimed to be among the top five integrated energy companies in the world by 2020. The company's 2010–14 business plan foresees investments in the order of \$174.4 billion, of which about 90% would be invested in the country and 10% would be invested overseas. Petrobrás was also planning to make domestic investments of \$42 billion to develop its pre-salt petroleum resources in the Atlantic zone. It was expected that Brazil's total crude oil production would be 33.3 million barrels per day (Mbb/d) by 2013.

Brazil's diversified mineral endowment, competent labor force, and macroeconomic policies continued to attract investor interest in the country's mining and petroleum industries in spite of the past (2008–9) global economic crisis. Leading international mining, petroleum, and steel companies were notably interested in, in order of value, crude oil and gas, iron ore, steel, coal, gold, copper, and diamond (Departamento Nacional de Produção Mineral, 2011b; Petróleo Brasileiro S.A., 2011a).

### Structure of the Mineral Industry

Brazilian corporations, which included those owned by private Brazilian and foreign investors and by the Government, partially or wholly owned the major portion of the mineral and petroleum sectors. In 2010, the DNPM had 7,809 companies [including more than 500 transnational corporations (TNCs) recorded in its annual mining report] that had established operations in Brazil owing to the country's favorable policies on mergers, joint ventures, and privatization. The competitiveness of Brazil's mineral industry resulted from investments in new technologies to improve efficiencies and productivity, particularly in, in order of value, the mining, crude oil and natural gas, and steel sectors (Instituto Brasileiro de Mineração, 2011a, b; Departamento Nacional de Produção Mineral, 2011b, c).

In 2010, the integrated energy company Petrobrás was composed of the following related units: Petrobrás Química, S.A., which had integrated refining-petrochemical operations; Petrobrás Distribuidora S.A., which distributed petroleum products in Brazil; Petrobrás International Braspetro B.V., which handled international operations; Petrobrás International Finance Co., which facilitated the import of crude oil and

derivatives; Petrobrás Gás S.A., which was responsible for trading Brazilian and imported natural gas and fertilizers; Petrobrás Transporte S.A., which constructed and operated the facilities, pipelines, terminals, and vessels needed for the transportation and storage of crude oil and derivatives, natural gas, and bulk products; Downstream Participações S.A., which facilitated asset exchange between Petrobrás and Repsol YPF S.A. of Spain's subsidiary in Argentina for refining and distribution, among other subsidiaries. In 2010, Petrobrás' operations around the world included those in Angola, Argentina, Bolivia, Chile, China, Colombia, Cuba, Ecuador, Japan, Mexico, Namibia, Netherlands, Nigeria, Paraguay, Peru, Portugal, the United Kingdom, and the United States, among others. In addition, the Brazilian cement companies Holcim (Brasil) S.A, Lafarge (Brasil) S.A., Votorantim Cimentos S.A., and others owned 39 cement plants in eight Brazilian States and accounted for more than 75% of the national output of more than 59.1 Mt. Among these cement plants, 12 were located in the State of Minas Gerais and 9 were located in the State of Sao Paulo (tables 1, 2; Departamento Nacional de Produção Mineral, 2011b; Petróleo Brasileiro S.A., 2011b).

Since 2000, TNCs had accounted for almost \$400 billion in registered investment with the Banco Central do Brasil. Planned investments in the mineral sector during 2010–14 amounted to \$62 billion. Among the major TNCs operating in Brazil were Anglo American plc, BHP Billiton plc, and BP p.l.c. of the United Kingdom; De Beers Group of South Africa; and Glencore International AG of Switzerland (Banco Central do Brasil, 2011b, p. 91; Departamento Nacional de Produção Mineral, 2011b; Instituto Brasileiro de Mineração, 2011a).

In 2010, the active international mining and oil companies in Brazil included Alcan Aluminum Ltd., Barrick Gold Corp., and Teck Cominco Inc. of Canada; Shanghai Baosteel of China; Royal Dutch/Shell Group (Shell) of the Netherlands; Energia de Portugal; Iberdrola S.A. and Repsol of Spain; Anglo American, BHP Minerals International Exploration Inc. (BHP Billiton Ltd., 100%), and Rio Tinto plc of the United Kingdom; and Chevron Corp. (ChevronTexaco Brasil S.A.), Dow Chemical Co., Exxon Mobil Corp. (Esso Brasileira de Petróleo Ltda.), Freeport-McMoRan Copper & Gold Inc., Newmont Mining Corp., and Placer Dome U.S. Inc. of the United States (table 2; Departamento Nacional de Produção Mineral, 2011b; Instituto Brasileiro de Mineração, 2011a).

In 2010, three international cement companies—Cimentos de Portugal, SGPS, S.A. (Cimpor) of Portugal; Lafarge S.A. of France; and Holcim Ltd. of Switzerland—were active in Brazil. According to the DNPM, 36 iron ore mining companies were operating 53 mines and 54 processing plants in the country. There were about 2,500 mineral mines in Brazil, which were classified conforming to their run-of-mine outputs: large mines—between 1 Mt/yr and 3 Mt/yr or higher; medium mines—between 100,000 metric tons per year (t/yr) and 1 Mt/yr; and small mines—between 10,000 and 100,000 t/yr (Departamento Nacional de Produção Mineral, 2011a).

In 2010, Brazil produced about 460,000 gigawatthours (GWh) of electric power and consumed about 420,000 GWh. Brazil's domestic energy supply encompassed the following: hydroelectric, 74%; natural gas, 6.8%; imports, 6.5%;

biomass, 4.7%; oil products, 3.6%; nuclear, 2.7%; and others, 1.7% (Departamento Nacional de Produção Mineral, 2011b; Empresa de Pesquisa Energética, 2011, p. 14, 21; U.S. Energy Information Administration, 2011).

## Mineral Trade

Brazil was the leading economy in Latin America and a member of the Mercado Común del Cono Sur (MERCOSUR), which was the second largest trade association in the Americas and the eighth worldwide. In 2010, exports were valued at almost \$202 billion, and imports, \$182 billion compared with \$153 billion and \$128 billion, respectively, in 2009. Brazil's mineral sector had a trade surplus of \$27.6 billion compared with revised \$15.6 billion in 2009 (Banco Central do Brasil, 2011b, p. 91–92; Departamento Nacional de Produção Mineral, 2011a, p. 9; Instituto Brasileiro de Mineração, 2011a).

The mineral industry contributed significantly to the country's trade balance. In 2010, Brazil exported iron ore and concentrates (valued at \$28.9 billion), gasoline and petroleum (\$14.2 billion), flat-rolled products (\$6 billion), ferroalloys (\$5.8 billion), aluminum and aluminum products (\$3.5 billion), gold in bars (\$1.8 billion), ferroniobium (iron-niobium) (\$1.6 billion), copper (\$1.2 billion), pig iron (\$971 million), and tubes and cast iron (\$860 million) (Banco Central do Brasil, 2011b, p. 97; Departamento Nacional de Produção Mineral, 2011a, p. 10; 2011b; Instituto Brasileiro de Mineração, 2011a).

## Commodity Review

### Metals

**Aluminum and Bauxite and Alumina.**—Alumina production increased to more than 8 Mt from a revised 7.8 Mt in 2009, or by almost 3%. Exports of alumina totaled more than 6.4 Mt compared with more than 5.5 Mt in 2009. Primary aluminum production remained at about the same level as that of 2009 (1.5 Mt). Companhia Brasileira de Alumínio (CBA) produced about 31% of Brazil's primary aluminum; Alumínio Brasileiro S.A. (Albras), 29.5%; Alcoa Inc., 22.5%; BHP Billiton plc, 11.4%; and others, 5.6%. In 2010, exports of aluminum totaled 760,000 metric tons (t) valued at about \$1.7 billion compared with 926,000 t valued at about \$2.7 billion in 2009. Brazil's imports of all forms of aluminum totaled 104,000 t valued at about \$212 million in 2010 compared with 201,000 t valued at about \$457 million in 2009. Bauxite production increased to 31.7 Mt in 2010 from almost 28.1 Mt in 2009. The MRN accounted for about 53% (16.8 Mt) of the total bauxite production for 2010. Exports amounted to about 6.8 Mt of bauxite compared with more than 3 Mt in 2009. According to the Associação Brasileira do Alumínio, Brazil's consumption of aluminum products by end use were as follows: packaging (30%), transports (28%), electrical (12%), construction (10%), consumer durables (9%), machinery (4%), and others (7%). Brazil was the sixth ranked aluminum producer in the world after China, Russia, Canada, Australia, and the United States (Associação Brasileira do Alumínio, 2011; Bray, 2011a, b; Departamento Nacional de Produção Mineral, 2011b).

**Copper.**—Brazil's copper production in concentrate increased slightly to 213,548 t in 2010 from a revised 211,692 t in 2009. The leading producers were Vale, with 116,813 t of the concentrate from its Sossego Mine in Carajas, State of Para, and Mineração Caraíba S/A, with 23,311 t from its deposit in Jaguari, State of Bahia. In 2010, Caraíba Metais S/A (CMSA) of Camacari, State of Bahia, which was the only electrolytic copper producer in Brazil, produced almost 219,800 t of primary copper metal compared with 217,600 t in 2009. In 2010, Brazil imported 467,870 t of copper ore, equivalent to 140,343 t of copper metal content mostly from Chile (93%) and Portugal (5%); 251,975 t of copper cathode mostly from Chile (80%) and Peru (18%); 60,669 t of manufactured copper products from Chile (58%), China (14%), and Peru (9%). CMSA was planning to produce about 500,000 t/yr of electrolytic copper in D'Avila, State of Bahia, by 2011 (Departamento Nacional de Produção Mineral, 2011a, p. 10; 2011b; Instituto Brasileiro de Mineração, 2011a; Vale S.A., 2011).

In 2010, Vale's copper project portfolio produced 207,000 t of concentrate compared with 198,000 t in 2009, or an increase of 4.5%. Vale's copper projects included the sulfide ore resources of, in order of volume, the Sossego, the Salobo, the Alemao, and the Cristalino deposits, and the oxidized ore deposit of Project 118; all these projects are 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 expected to be completed by 2012; development of the project would require an investment of \$1.2 billion. Salobo was expected to produce 520,000 t/yr of copper in concentrate and 255,000 t/yr of metal copper by 2013. The Salobo project in Maraba, State of Para, was Brazil's largest copper deposit and could support a 520,000-t/yr-capacity mill. In 2010, Vale produced 10,000 t/yr of preliminary copper cathode from Project 118 and was planning to produce 38,000 t/yr by 2015 (Departamento Nacional de Produção Mineral, 2011b; Vale S.A., 2011).

Vale's Cristalino copper deposit was in the process of a feasibility study; afterwards it was expected to produce 30,000 t/yr of copper concentrate by 2015 with an investment of \$500 million. Vale continued to conduct 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. The estimated 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, 2011b; Vale S.A., 2011).

**Gold.**—Gold production increased to 62 t in 2010 from a revised 60 t in 2009, or by more than 3%; mining companies produced 55.6 t (89.5%), and garimpeiros produced 6.5 t (10.5%). In 2010, the leading producing companies were Kinross Gold Corp. (29%), AngloGold Ashanti Mineração Ltda. (22%), Yamana Gold Inc. (17%), Gold Digging (12%), and Jaguar Mining (7%), and others (13%). The leading producing States were Minas Gerais (64%), Bahia (11%), and Para (3%) (Departamento Nacional de Produção Mineral, 2011b; Instituto Brasileiro de Mineração, 2011a).

**Iron Ore and Iron and Steel.**—Brazil produced 372.1 Mt of beneficiated iron ore in 2010 compared with a revised 298.5 Mt in 2009, which was an increase of about 24.7%. Of that production, the leading iron ore producer was Vale (79.8%); other producers, such as Companhia Siderúrgica Nacional (CSN), Minerações Brasileiras Reunidas S/A (MBR), and Samarco Mineração S/A contributed the remaining 20.2%. In 2010, Brazil exported about 258.8 Mt of iron ore valued at almost \$21.4 billion. The leading importers of Brazilian iron ore were China (46%); Japan (11%); Germany (7%), the Republic of Korea (4%); and France (3%) (Departamento Nacional de Produção Mineral, 2011a, p. 10; 2011b; Instituto Brasileiro de Mineração, 2011a; Vale S.A., 2011).

Ferroalloys production increased to almost 1.1 Mt from a revised 831,121 t in 2009, or by more than 26.3%. Vale's ferroalloys production increased to 207,000 t in 2010 compared with 99,000 t in 2009, or by 109.1%. Brazil's Prometal Produtos Metalúrgicos S.A. and Norway's Elkem A/S produced 210,000 t of ferromanganese in 2010 compared with a revised 154,000 t in 2009. The prometal project, in which Elkem held a 40% share, was located in Marabá, State of Pará. The manganese was supplied by Vale's Mina do Azul, and the iron ore was from Vale's Serra dos Carajás Mine (Departamento Nacional de Produção Mineral, 2011a, p. 10; 2011b; Instituto Brasileiro de Mineração, 2011a; Vale S.A., 2011).

Brazil produced 32 Mt of pig iron in 2010 compared with 35 Mt in 2009, which was a decrease of almost 8.6%. Brazil was the fifth ranked producer after China, Japan, Russia, and India (Departamento Nacional de Produção Mineral, 2011a, p. 10; 2011b; Fenton, 2011).

Raw steel production increased to 33 Mt in 2010 from 26.5 Mt in 2009, or by more than 24.7%. Brazil exported 7.9 Mt of steel valued at \$5 billion in 2010 compared with 7.5 Mt of steel valued at \$6.5 billion in 2009. The major recipients of Brazil's exports were the United States (45%); Mexico, the Republic of Korea, Taiwan, and Thailand (6% each); and Argentina, Chile, Colombia, and Spain (4% each). Brazil imported about 4.7 Mt of steel valued at \$4.3 billion compared with more than 3 Mt of steel valued at almost \$4.5 billion in 2009. More than 60% of China's exports to Brazil were of metal-mechanic goods. The apparent domestic consumption of steel in Brazil was about 24.6 Mt compared with 27.2 Mt in 2009, which represented a decrease of about 9.6%. The Brazilian steel industry's investments amounted to \$34.1 billion during the period 1994 through 2010. New steel facilities could be added, which would represent an additional investment of more than \$5 billion by 2013. After the effects of the past (2008–9) global economic crisis, however, investors in the sector were revising the implementation process for their new projects (Departamento Nacional de Produção Mineral, 2011a, p. 10–11; 2011b; Fenton, 2011; Instituto Aço Brasil, 2011).

**Manganese.**—Manganese production in concentrate (MnO<sub>2</sub>) increased to about 2.6 Mt in 2010 from a revised 2.3 Mt in 2009. Rio Doce Manganês S.A.'s (RDM) (a wholly owned subsidiary of Vale) manganese mines in the States of Minas Gerais (Morro da Mina) and Pará (Mina do Azul) produced about 1.8 Mt of manganese ore and 207,000 t of ferroalloys (ferromanganese) in 2010 compared with 1.7 Mt of manganese ore and 223,000 t

of ferroalloys (ferromanganese) in 2009. In 2010, domestic consumption of manganese was as follows: manganese ferroalloys, 90%, and electrical batteries, 10% (Departamento Nacional de Produção Mineral, 2011b; Instituto Brasileiro de Mineração, 2011a; Vale S.A., 2011).

**Nickel.**—Brazil produced 108,983 t of nickel content in ore in 2010 compared with revised 41,059 t in 2009; production of electrolytic nickel was 19,111 t in 2010 compared with a revised 16,598 t in 2009; nickel in ferronickel alloys decreased to 8,465 t in 2010 from a revised 9,427 t in 2009; nickel in matte increased to 14,308 t in 2010 from a revised 8,518 t in 2009; and nickel in carbonates increased to 30,161 t in 2010 from a revised 16,766 t in 2009. Vale produced 179,000 t of nickel in 2010 compared with 187,000 t in 2009. In 2010, Anglo American initiated operations in its Barro Alto nickel project in the State of Goiás. The company planned to produce 150,000 t/yr of nickel as concentrate content by 2012. In 2010, Vale invested \$430 million to use a high-pressure acid-leaching technology to produce 25,000 t/yr of nickel from its Ourilandia project in Carajás, State of Pará. Vale was also focused on the development of the Onça Puma nickel laterite project in the State of Pará, and would invest a total of \$2.3 billion in the project to produce 53,000 t/yr of nickel metal. With these additional projects, the production of nickel ore in Brazil was expected to increase by 200,000 t/yr in 2011 (table 1; Departamento Nacional de Produção Mineral, 2011b; Instituto Brasileiro de Mineração, 2011a; Vale S.A., 2011).

**Zinc.**—Brazil produced 211,203 t of zinc content in concentrates in 2010 compared with a revised 172,688 t in 2009. Primary metal production increased to 288,107 t in 2010 from a revised 242,136 t in 2009; the increase represented almost 93% of the installed annual metal capacity of 310,000 t. Grupo Votorantim (GV) was the only producer of zinc in Brazil. Production was through GV's two mines (Paracatu and Vazante) and two metallurgy operations (Juiz de Fora and Três Marias) located in Minas Gerais State. GV produced 217,000 t of zinc metal mainly from domestic concentrates treated at the Três Marias metallurgical and Juiz de Fora plants, which had the capacities to produce 180,000 t/yr and 110,000 t/yr of zinc metal, respectively, and 71,107 t of zinc metal entirely from imported concentrates (Departamento Nacional de Produção Mineral, 2011b; Instituto Brasileiro de Mineração, 2011a; Votorantim Group, 2011).

### **Industrial Minerals**

**Asbestos.**—In 2010, Brazil produced 302,257 t of asbestos (fiber content) compared with revised 288,452 t in 2009. Brazil's significant asbestos deposits are located in Cana Brava and Minacu in the State of Goiás; Goiás was the only producing State in the country. Sociedade Anônima Mineração de Amianto was planning to increase its production capacity to 350,000 t/yr from 230,000 t/yr by 2013 and would continue to supply 90% of Brazil's asbestos for the manufacture of specialized cement products, which were, in order of economic importance, ceiling tiles, protective screens, water and sewer pipes, water tanks, and molded electrical insulators. Other uses were, in order of value, thermal insulators, paper and cardboard, slabs, decorations,

insecticide, asphalt for highways and airport runways, and automobiles. Asbestos mining and consumption were highly regulated in most industrialized nations and the use of asbestos continued to decline owing to health hazards. In 2010, Brazil was the third ranked world producer of asbestos after Russia and China (Departamento Nacional de Produção Mineral, 2011b; Virta, 2011).

**Gemstones.**—In the Americas, Brazil and Guyana followed Canada as the leading producers and traders of mostly alluvial diamond. In 2010, Brazil continued to be one of South America's leading gemstone producers and exporters. Many different varieties of gemstones are found in the Araxa, the Bambui, and the Canastra geologic groups; these include, in order of value (U.S. dollars per carat), diamond, emerald, aquamarine, topaz, tourmaline, opal, chrysoberyl, amethyst, citrine, and agate. Brazil was the world's only source of some quality gemstones, such as imperial topaz and Paraíba tourmaline. In 2010, 52% of the diamond and gemstones was mined by mining companies and 48% was mined by garimpeiros. According to the DNPM's Mineral Summary Statistics for 2006–9, Brazil's diamond production from year to year had been uncertain, and annual production had been declining since 2007. The leading State producers were Mato Grosso (47%), Minas Gerais (43%), Bahia (4.9%), Piauí (2.9%), Paraná (1.9%), and Goiás (0.3%). The carats produced and reported conformed to the Kimberley Process Certification Scheme's (KPCS) guidelines (table 1; Departamento Nacional de Produção Mineral, 2011b; Olson, 2011).

In 2010, Brazil exported 20,037 carats valued at \$3.3 million; the major markets for Brazilian rough diamond were Belgium (93.2%), Israel (3.4%), China (2.3%), and India (1.1%). Brazil imported 21,747 carats valued at \$382.7 million. About 98.5% of the imports was diamond (industrial) valued at \$135.5 million from the United States and 1.5% was uncut stones valued at \$247.2 million from the European Union, particularly from Belgium (Departamento Nacional de Produção Mineral, 2011a).

**Phosphate Rock.**—Production of phosphate rock (concentrates) amounted to 6.2 Mt in 2010 compared with a revised 6.1 Mt in 2009. The leading mining companies, in order of percentage of the country's total reserves (340 Mt) were Vale (25%), Fosfertil S.A. and Ultrafertil S.A. (20% each), and Bunge Fertilizantes S.A. (15%) in Minas Gerais, and Copebras S.A. (6%) in São Paulo; together they represented 86% of the total reserves in 2010. The reported imports of concentrates amounted to 1.4 Mt in 2010 compared with 0.9 Mt in 2009. The reported domestic consumption of concentrates was about 7.6 Mt in 2010 compared with 7 Mt in 2009. Of the total phosphoric acid produced, 96% was used in the fertilizer industry and 4% was used in the chemical industry (Departamento Nacional de Produção Mineral, 2011b; Instituto Brasileiro de Mineração, 2011a).

### *Mineral Fuels and Other Sources of Energy*

Brazil had expanded its crude oil, natural gas, and electricity consumption in recent years. The country was the 9th ranked energy consumer in the world and the 3d ranked in the Western Hemisphere, after the United States and Canada. Total primary

energy consumption in Brazil had increased by more than 30% in the past decade owing to the country's sustained economic growth. Increasing the country's crude oil production, however, had been a long-term goal of the Brazilian Government, and recent offshore exploration in Brazil had resulted in massive discoveries of large pre-salt crude oil deposits, which could transform Brazil into one of the leading crude oil producers in the world. Total Brazilian energy consumption increased to 10.6 quadrillion British thermal units (BTU) in 2010. The largest share of Brazil's total energy consumption came from oil and other liquids (50%, including ethanol), followed by hydroelectricity (34%) and natural gas (8%). Although natural gas was a small share of total energy consumption, attempts to diversify electricity generation from hydropower to gas-fired powerplants could cause natural gas consumption to increase in the coming years. Also, attempts to diversify electricity generation, ranging from hydropower and renewable energy (biomass, ethanol, solar, and wind) to natural gas powerplants, could increase the consumption of natural gas (Departamento Nacional de Produção Mineral, 2011b; Petróleo Brasileiro S.A., 2011a; 2011b, p. 62–63).

**Coal.**—In 2010, Brazil produced 6.3 Mt of beneficiated coal compared with a revised 5.8 Mt in 2009. The Brazilian coal industry's mine operations were concentrated in the three southernmost States of Rio Grande do Sul (54.8%), Santa Catarina (43.7%), and Paraná (1.5%). Coal demand increased mainly because the thermoelectric plants were operating at full capacity in these three States (Departamento Nacional de Produção Mineral, 2011b).

To meet Brazil's coal (coke, metallurgical) demand, 19.5 Mt was imported in 2010 compared with 14.5 Mt in 2009. Imports came from the United States (37%), Australia (27%), Colombia (10%), Canada (8%), China (5%), and other countries (13%). In 2010, Brazil's usage of coal was 81% to generate electric energy and 19% for industrial use (cellulose, 3.8%; petrochemicals, 3.3%; the food industry, 1.5%; ceramic, 1.3%; and others, 9.1%) (Departamento Nacional de Produção Mineral, 2011b).

**Natural Gas, Petroleum, and Other Sources of Energy.**—In 2010, Brazil's gross natural gas production amounted to 22.9 billion cubic meters. Natural gas constituted only a small portion of Brazil's energy consumption. The largest share of Brazil's natural gas production took place in offshore fields in the Campos Basin (10 billion cubic meters) and the State of Rio de Janeiro (8 billion cubic meters). Most onshore production took place in the States of Amazonas and Bahia and was mostly for local consumption because of the shortage of transportation infrastructure. To meet increasing demand and to decrease reliance on imports, Petrobrás planned to bring several new natural gas projects online during the course of the coming years. Also, the pre-salt areas were estimated to contain sizable natural gas reserves as well. According to Petrobrás, Tupi alone could contain between 140 and 200 billion cubic meters of recoverable natural gas, which, if proven, could increase Brazil's total natural gas reserves by 50% (Departamento Nacional de Produção Mineral, 2011b; Petróleo Brasileiro S.A., 2011a; 2011b, p. 62–63).

In 2010, Brazil's total natural gas proven reserves were estimated to be 824.7 billion cubic meters. Brazil imported

natural gas from Bolivia by way of the 2,000-mile Gasbol pipeline, which links Santa Cruz, Bolivia, to Porto Alegre, Brazil, by way of Sao Paulo. Bolivia accounted for 96% (8.4 billion cubic meters) of Brazil's total natural gas imports. Brazil had two liquefied natural gas (LNG) regasification terminals, both installed in the past 2 years (2009–10); they were the Pecem terminal in the northeast and the Guanabara Bay terminal in the southeast. Both facilities were floating regasification and storage units operated by Golar LNG, with a combined capacity of 210 million cubic meters per day. According to ANP, Brazil received 4 million cubic meters of natural gas in the form of LNG in 2010, mostly from Trinidad and Tobago (Departamento Nacional de Produção Mineral, 2011b; Petróleo Brasileiro S.A., 2011a; 2011b, p. 62–63).

Petrobrás was the dominant participant in Brazil's petroleum sector, holding important positions in upstream, midstream, and downstream activities. In 2010, according to the Brazilian Empresa de Pesquisa Energética, Brazil's crude oil reserves amounted to 28.5 Gbbl at yearend 2010, which ranked it second in reserves in South America after Venezuela. The offshore Campos and Santos Basins, which are located off of the country's southern coast, hold the vast majority of Brazil's proven reserves. Brazil's crude oil production had risen steadily in recent years, and the country's oil production in 2010 was about 2.1 Mbbbl/d of liquids, or about 5% higher than in 2009. More than 90% of Brazil's oil production was from offshore in very deep water and consisted of mostly heavy grades. Five fields in the Campos Basin (Barracuda, Marlim, Marlim Leste, Marlim Sul, and Roncador) accounted for more than 50% of Brazil's crude oil production. These Petrobrás-operated fields each produced between 100,000 and 400,000 barrels per day (bbl/d). International oil companies also played a role in Brazilian production. The Shell-operated Parque de Conchas project and the Chevron-operated Frade project were expected to achieve production levels of 100,000 bbl/d and 68,000 bbl/d, respectively, by 2014. As pre-salt discoveries boost Brazilian production in the medium and long terms, crude oil exports are likely to increase steadily (BP p.l.c., 2011, p. 6–8, 20–22; Empresa de Pesquisa Energética, 2011, p. 38; Petróleo Brasileiro S.A., 2011a; 2011b, p. 62–63).

Brazil's exports of crude oil amounted to about 640,000 bbl/d in 2010 compared with 525,700 bbl/d in 2009; however, this export growth could be moderated by increases in domestic consumption driven by rapid economic growth. Brazil still imported some light crude oil to meet the needs of its refineries. Imports of crude oil decreased to 123.7 Mbbbl in 2010 from 136.9 Mbbbl in 2009. The leading import sources were Nigeria (45%), Algeria (15%), and Saudi Arabia (10%) (BP p.l.c., 2011, p. 6–8, 20–22; Empresa de Pesquisa Energética, 2011, p. 38; Petróleo Brasileiro S.A., 2011a; 2011b, p. 62–63).

Petrobrás was considering developing future subsea technology solutions for its crude oil and natural gas projects offshore Brazil, which would include the development of subsea production systems to address the challenges associated with Petrobras' pre-salt crude oil and natural gas fields and the design of subsea processing technologies that could increase recovery rates at Petrobrás' maturing crude oil and natural gas fields (Petróleo Brasileiro S.A., 2011a).

Petrobrás had also started numerous ethanol pipeline projects, including one that runs from Goiás State to Sao Paulo State. BP Brasil Ltda. was involved in the Edia ethanol project in Goiás State, which produced 7,500 bbl/d of ethanol in 2010; ethanol was produced from sugar cane that grows in Brazil's tropical climate. In 2010, Petrobrás' foreign exploration for and production of mineral fuels took place in Angola, Argentina, Bolivia, Colombia, Ecuador, Nigeria, Peru, the United States, and Venezuela (BP p.l.c., 2011, p. 6–8, 20–22; Empresa de Pesquisa Energética, 2011, p. 38; Petróleo Brasileiro S.A., 2011a; 2011b, p. 62–63).

Brazil's largest oil discoveries in recent years had come from the Atlantic offshore pre-salt basins. Petrobrás' pre-salt Tupi/Iracema pilot project in the Santos Basin was planned to produce 100,000 bbl/d of crude oil and 5,000,000 cubic meters per day of natural gas during 2011 and 2012. The Tupi/Iracema deposit was expected to enter into its final development phase by 2017. The project was a consortium of Petrobrás (65%, operator), BG Group plc of the United Kingdom (25%), and Brazil's Galp Energia S.A. (10%) to carry on the project's evaluation plan, which was approved by the Agência Nacional do Petróleo, Gás Natural e Biocombustíveis (Empresa de Pesquisa Energética, 2011, p. 39–40; Petróleo Brasileiro S.A., 2011b, p. 36, 62–63; U.S. Energy Information Administration, 2011, p. 1, 4, 6).

In 2010, the partnership of Shell (80%) and Petrobrás (20%) on the Bijupira and the Salema projects in Campos Basin also produced a combined 50,000 bbl/d of crude oil and more than 480,000 cubic meters per day of natural gas; the fields had resources of about 190 Mbbbl of crude oil and 1.8 billion cubic meters of natural gas. Other companies involved in exploration in the pre-salt basins included Chevron, ExxonMobil, Repsol, Shell, and Statoil ASA of Norway (Empresa de Pesquisa Energética, 2011, p. 38–40; Petróleo Brasileiro S.A., 2011a).

## Reserves and Resources

Brazil was among the world leaders in reserves of some mineral commodities (table 3). The country's world rankings for reserves of mineral commodities were 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, 2011b).

## Outlook

Brazil's mineral sector, which includes metals, industrial minerals, and fuels, continued to experience a phase of real growth in 2010. The main vehicles for the foreign direct investment (FDI) inflows in the short and medium terms are expected to be consortia, joint ventures, and acquisitions in new projects with Petrobrás, Vale, and others. Investments in biofuel, hydroelectric, nuclear, and thermoelectric powerplants are expected to meet Brazil's future energy needs. As an exporter of mineral commodities, the country is poised to gain from the continued FDI inflows into its economy, which represented an almost 57% share (\$48.5 billion) of South America's total FDI of \$85.1 billion in 2010. New mineral projects and expansions



that were in progress are expected to ensure that Brazil retains its position among the global leaders in mineral commodity production in the foreseeable future. Brazil's renewed economic growth and its associated financial innovation are supporting an increase in the number of domestic and transnational investors in Brazil's mineral industry and, in particular, in the metals, natural gas and petroleum, and biofuels and ethanol industries

In 2010, Brazil had undergone dramatic changes in the crude oil and natural gas markets owing to the increase in energy investment opportunities, and Brazil had become the center of an increasingly rapid process of energy integration in South America. According to the Banco Central do Brasil and the Economic Commission for Latin America and the Caribbean, more than 400 leading TNCs were planning to invest in Brazil; these investments could position Brazil behind, in order of investment volume, China, the United States, and India. Brazil is expected to continue to be a strong economy in Latin America and the BRICS countries. As one of the world's leading producers of bauxite, crude oil, graphite, iron ore, manganese, niobium, tantalum, and tin, Brazil is expected to continue to attract additional FDI inflows in the near future (Azambuja, 2010, p. 27–40; Banco Central do Brasil, 2011a, p. 20; Economic Commission for Latin America and the Caribbean, 2011, p. 31; Petróleo Brasileiro S.A., 2011a).

Brazil's Federal tax exemptions on imports of equipment for minerals prospecting, exploration, development, and production are expected to continue in the medium and long terms. The ANP 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 (Departamento Nacional de Produção Mineral, 2011b, c).

Brazil's gold production could increase significantly in the foreseeable future because of the growth of Brazil's copper production and increased interest by domestic and foreign investors in largely unexplored areas. More than 2,500 gold occurrences, which are mostly Precambrian vein deposits and alluvial placers, are known. According to IBRAM, the Brazilian mining sector would receive significant investments in the amount of \$68.5 billion for the period 2011–15. In 2010, investment in mineral exploration, such as for, in order of economic value, bauxite, copper, iron ore, and nickel, amounted to \$321 million (Instituto Brasileiro de Mineração, 2011a, b; Departamento Nacional de Produção Mineral, 2011b).

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 was expected to build additional refineries with the participation of new partners from the private sector (Departamento Nacional de Produção Mineral, 2011c; Petróleo Brasileiro S.A., 2011a).

The Amazon region contains considerable natural gas resources that remain nonproductive as yet, especially the Urucu field, which contains Brazil's largest onshore natural gas reserves. There is also the potential for major undiscovered mineral resources in addition to the large reserves of, in order of value, iron ore, manganese, bauxite, gold, and tin. There is, however, a concern over biodiversity in the Amazon Rainforest,

which comprises 30% of the world's remaining tropical forests, and which provides shelter to 10% of the globe's plant and animal species and removes excess carbon dioxide from the atmosphere. Much of future minerals production, therefore, will also depend on the approaches and new technologies to be used for economic and social development that protects the environment in a responsible and sustainable way (Departamento Nacional de Produção Mineral, 2011b).

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

(Metric tons unless otherwise specified)

Commodity <sup>2</sup>	2006	2007	2008	2009	2010 <sup>P</sup>
METALS					
Aluminum:					
Bauxite, dry basis, gross weight	22,836,000	25,460,700	28,097,500	28,060,000 <sup>r</sup>	31,700,000
Alumina	6,720,000	7,077,600	7,822,300	7,800,000 <sup>r</sup>	8,040,000
Metal:					
Primary	1,605,000	1,655,000	1,661,100	1,536,000 <sup>r</sup>	1,536,000
Secondary	253,000	255,000	256,000	250,000 <sup>r</sup>	252,000
Total	1,858,000	1,910,000	1,917,100	1,786,000 <sup>r</sup>	1,788,000
Cadmium, metal, primary <sup>e</sup>	200	200	200	200	200
Chromium:					
Crude ore	562,739	627,772	664,347 <sup>r</sup>	365,210 <sup>r</sup>	520,129
Concentrate and lump, Cr <sub>2</sub> O <sub>3</sub> content	228,721	253,254	256,300	246,900	258,308
Marketable product <sup>e,3</sup>	12,000	12,000	12,000	12,000	12,000
Cobalt: <sup>e</sup>					
Mine output, Co content of hydroxide	1,500	1,500	1,500	1,500	1,500
Metal, electrolytic <sup>4,5</sup>	1,200	1,200	1,200	1,200	1,200
Copper:					
Mine output, Cu content	147,836	205,728	218,295 <sup>r</sup>	211,692 <sup>r</sup>	213,548
Metal, refined:					
Electrowon	-- <sup>r</sup>	900 <sup>r</sup>	3,800 <sup>r</sup>	6,500 <sup>r</sup>	7,400
Primary	179,700 <sup>r</sup>	178,380 <sup>r</sup>	191,008 <sup>r</sup>	193,899 <sup>r</sup>	177,800
Secondary <sup>e</sup>	40,000 <sup>r</sup>	40,000 <sup>r</sup>	39,000 <sup>r</sup>	31,000 <sup>r</sup>	47,700
Total	219,700 <sup>r</sup>	219,280 <sup>r</sup>	233,808 <sup>r</sup>	231,399 <sup>r</sup>	232,900
Gold:					
Mine output kilograms	39,266	44,443 <sup>r</sup>	46,066 <sup>r</sup>	52,207 <sup>r</sup>	55,592
Garimpeiros, independent miners do.	5,150	5,170 <sup>r</sup>	8,600 <sup>r</sup>	8,123 <sup>r</sup>	6,455
Total do.	44,416	49,613 <sup>r</sup>	54,666 <sup>r</sup>	60,330 <sup>r</sup>	62,047
Iron and steel:					
Iron ore and concentrate, marketable product: <sup>6</sup>					
Gross weight thousand metric tons	317,800	354,674	350,707 <sup>r</sup>	298,528 <sup>r</sup>	372,120
Fe content do.	211,020	235,504	233,514	198,771 <sup>r</sup>	247,772
Metal:					
Pig iron do.	32,452	35,571	35,000 <sup>r</sup>	35,000 <sup>r</sup>	32,000
Ferroalloys, electric arc furnace:					
Ferrochromium	166,577	195,890	199,324 <sup>r</sup>	131,048 <sup>r</sup>	277,114
Ferrochromium silicon	11,600 <sup>e</sup>	11,600 <sup>e</sup>	11,507	1,500	1,500
Ferromanganese	573,430 <sup>r</sup>	419,230 <sup>r</sup>	388,000 <sup>r</sup>	154,000 <sup>r</sup>	210,000
Ferronickel	9,814	9,918	7,136 <sup>r</sup>	9,427 <sup>r</sup>	8,465
Ferroniobium	41,566	52,442	53,839	34,746 <sup>r</sup>	52,588
Ferrosilicon	146,000 <sup>e</sup>	146,000 <sup>e</sup>	144,832	145,000	145,000
Ferrosilicon magnesium <sup>e</sup>	14,600	14,600	14,560 <sup>r</sup>	14,500	14,500
Inoculant <sup>e</sup>	11,100	11,100	11,100	11,000	11,000
Silicomanganese	180,000 <sup>e</sup>	180,000 <sup>e</sup>	178,560	178,600	178,600
Silicon metal	133,000 <sup>e</sup>	133,000 <sup>e</sup>	131,940	132,000	132,000
Other ferroalloys	19,500 <sup>e</sup>	19,500 <sup>e</sup>	19,344	19,300	19,300
Total <sup>e</sup>	1,310,000 <sup>r</sup>	1,190,000 <sup>r</sup>	1,160,142 <sup>r,5</sup>	831,121 <sup>5</sup>	1,050,067 <sup>5</sup>
Crude steel, excluding castings thousand metric tons	30,900	34,782 <sup>r</sup>	33,700 <sup>r</sup>	26,500	33,033
Semimanufactures, flat and nonflat <sup>e</sup> do.	17,500	17,500	17,500	17,500	17,500
Lead:					
Mine output, Pb content in concentrate	25,764	24,574	25,286 <sup>r</sup>	15,890 <sup>r</sup>	19,650
Metal, secondary	108,951	130,963	95,704	104,160 <sup>r</sup>	114,887
Manganese:					
Ore and concentrate, marketable: <sup>3</sup>					
Gross weight	3,390,000 <sup>r</sup>	1,570,000 <sup>r</sup>	3,200,000 <sup>r</sup>	2,320,000 <sup>r</sup>	2,620,000
Metal content	1,120,000 <sup>r</sup>	520,000 <sup>r</sup>	1,280,000 <sup>r</sup>	928,000 <sup>r</sup>	1,048,000
Metal:					
Primary	18,450	22,140	20,910	19,580	19,580
Secondary <sup>e</sup>	1,600	1,600	1,600	1,520	1,710

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>	2006	2007	2008	2009	2010 <sup>p</sup>
METALS—Continued					
Nickel:					
Mine output, ore	5,503,211	5,927,554	6,380,055 <sup>r</sup>	4,333,069 <sup>r</sup>	11,128,385
Ni content in ore	82,492	58,317	67,116	41,059 <sup>r</sup>	108,983
Ni content in carbonate	21,630	20,796	18,580 <sup>r</sup>	16,766 <sup>r</sup>	30,161
Ni content in matte	5,416	3,401	8,328	8,518 <sup>r</sup>	14,308
Ni, electrolytic	21,339	21,635	18,530	16,598 <sup>r</sup>	19,111
Ferronickel, Ni content	9,814	9,918	7,136 <sup>r</sup>	9,427 <sup>r</sup>	8,465
Niobium (columbium)-tantalum ores and concentrates, gross weight:					
Columbite and tantalite <sup>e</sup>	456	456	456	456	456
Djalmaite concentrate <sup>e</sup>	10	10	10	10	10
Pyrochlore concentrate, Nb <sub>2</sub> O <sub>3</sub> content	68,850	81,922	60,692 <sup>r</sup>	88,920 <sup>r</sup>	63,320
Silver: <sup>7</sup>					
Primary	30,000	36,000	35,500 <sup>r</sup>	35,000 <sup>r</sup>	36,500
Secondary	39,000	32,000	31,500 <sup>r</sup>	31,000 <sup>r</sup>	32,000
Total	69,000	68,000	67,000 <sup>r</sup>	66,000 <sup>r</sup>	68,500
Tin:					
Mine output, Sn content	9,528	11,835	13,899 <sup>r</sup>	9,500 <sup>r</sup>	10,400
Metal, smelter:					
Primary	8,780	9,384	11,020 <sup>r</sup>	8,311 <sup>r</sup>	9,098
Secondary <sup>c</sup>	250	250	250	250	250
Total	9,030	9,634	10,558	10,600	10,600
Titanium:					
Ilmenite:					
Gross weight	127,200	130,000	130,000	52,800 <sup>r</sup>	166,000
TiO <sub>2</sub> content	89,195	95,559	96,292 <sup>r</sup>	39,117 <sup>r</sup>	123,391
Rutile, TiO <sub>2</sub> content	2,100	3,000	2,309 <sup>r</sup>	2,737 <sup>r</sup>	2,519
Tungsten, mine output, W content	525	537	408 <sup>r</sup>	192 <sup>r</sup>	166
Zinc:					
Mine output, Zn content	185,211	193,887	173,933	172,688 <sup>r</sup>	211,203
Metal, smelter, primary	272,311	265,126	248,874	242,136 <sup>r</sup>	288,107
Zirconium, zircon concentrate, gross weight <sup>8</sup>	25,120	26,739	26,739	26,700	26,700
INDUSTRIAL MINERALS					
Asbestos:					
Crude ore	3,541,000	3,528,000	4,154,000	4,165,250 <sup>r</sup>	4,364,600
Fiber	227,304	254,204	287,673	288,452 <sup>r</sup>	302,257
Barite:					
Crude	47,611 <sup>r</sup>	22,869 <sup>r</sup>	241,179 <sup>r</sup>	196,860 <sup>r</sup>	198,161
Beneficiated	19,151	13,311	23,276 <sup>r</sup>	49,847 <sup>r</sup>	41,385
Marketable product <sup>e,3</sup>	45,000	45,000	45,000	45,000	45,000
Calcite	16,736 <sup>r</sup>	21,844 <sup>r</sup>	22,255 <sup>r</sup>	14,565 <sup>r</sup>	18,930
Cement, hydraulic	41,895 <sup>r</sup>	46,551	51,884 <sup>r</sup>	51,748	59,066
Clays:					
Bentonite, beneficiated	235,481	238,746	340,141 <sup>r</sup>	264,243 <sup>r</sup>	531,693
Kaolin:					
Crude	6,200,000	6,382,000	7,042,000 <sup>r</sup>	7,928,000 <sup>r</sup>	6,460,000
Beneficiated	2,455,000	2,530,000	2,456,000 <sup>r</sup>	1,987,000 <sup>r</sup>	2,200,000
Marketable product <sup>3</sup>	2,404,000	2,428,000	2,618,000	2,115,000	2,300,000
Diamond: <sup>e</sup>					
Gem and industrial:					
Private sector	84	84	38 <sup>r</sup>	11 <sup>r</sup>	13
Garimpagem	97	98	33 <sup>r</sup>	10 <sup>r</sup>	12
Total <sup>9</sup>	181	182	71 <sup>r</sup>	21 <sup>r</sup>	25
Diatomite:					
Crude	10,753	9,638	12,126 <sup>r</sup>	7,534 <sup>r</sup>	9,264
Beneficiated	8,968	5,555	4,430 <sup>r</sup>	4,350 <sup>r</sup>	4,082
Marketable product <sup>e,3</sup>	13,100	13,100	13,100	13,000 <sup>r</sup>	13,000

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>	2006	2007	2008	2009	2010 <sup>P</sup>
INDUSTRIAL MINERALS—Continued					
Feldspar:					
Crude	166,418 <sup>5</sup>	182,168 <sup>5</sup>	182,200 <sup>5</sup>	182,000 <sup>e</sup>	182,000
Marketable product: <sup>3</sup>					
Feldspar	71,785	166,089 <sup>e</sup>	166,100 <sup>e</sup>	166,000 <sup>e</sup>	166,000 <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	77,285	171,589	171,600	171,500	171,500
Fluorspar:					
Crude ore	192,628	198,449	191,600	192,000 <sup>e</sup>	192,000
Concentrates, marketable product:					
Acid-grade	41,373	45,342	45,032	28,803 <sup>r</sup>	7,486
Metallurgical-grade	22,231	20,582	18,209	15,161 <sup>r</sup>	18,328
Total	63,604	65,924	63,241	43,964 <sup>r</sup>	25,814
Graphite:					
Crude <sup>e</sup>	650,000	650,000	650,000	650,000	650,000
Marketable product, concentrate <sup>3</sup>	76,194	77,163 <sup>r</sup>	74,831 <sup>r</sup>	59,425 <sup>r</sup>	72,623
Gypsum and anhydrite, crude	1,711,671	1,923,119	2,238,645 <sup>r</sup>	2,348,390 <sup>r</sup>	2,750,000
Kyanite: <sup>e</sup>					
Crude	750	750	750	750	750
Marketable product <sup>3</sup>	600	600	600	600	600
Lime, hydrated and quicklime	7,057	7,393	7,400 <sup>e</sup>	7,400	7,400
Lithium, concentrates	8,950	8,950	14,460 <sup>r</sup>	15,929 <sup>r</sup>	15,733
Magnesite:					
Crude	1,163,422	1,301,827	1,475,814 <sup>r</sup>	1,234,041 <sup>r</sup>	1,535,052
Beneficiated	382,718	399,314	421,333 <sup>r</sup>	409,909 <sup>r</sup>	483,882
Mica, all grades <sup>e</sup>	4,000	4,000	4,000	4,000	4,000
Nitrogen, N content of ammonia <sup>e</sup>	950,000	950,000	950,000	950,000	950,000
Phosphate rock, including apatite:					
Crude:					
Mine product	36,700	38,265	39,243	42,000	42,000
Of which sold directly <sup>e</sup>	35	35	35	35	35
Concentrate:					
Gross weight	5,932	6,185	6,727 <sup>r</sup>	6,084 <sup>r</sup>	6,192
P <sub>2</sub> O <sub>5</sub> content	2,111	2,185	2,472 <sup>r</sup>	2,163 <sup>r</sup>	2,179
Pigment, mineral, other, crude <sup>e</sup>	2,000	2,000	2,000	2,000	2,000
Potash, marketable (K <sub>2</sub> O)	403,080	423,897	383,257	452,698 <sup>r</sup>	417,990
Potassium (KCl)	635,200	636,500	575,480	716,630 <sup>r</sup>	661,690
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	14,195	22,561	21,511 <sup>r</sup>	11,588 <sup>r</sup>	13,024
Rare-earth metals, monazite concentrate, gross weight	958	1,173	834 <sup>r</sup>	303 <sup>r</sup>	500
Salt:					
Marine	5,122	5,365	5,200 <sup>r</sup>	4,462 <sup>r</sup>	5,615
Rock	1,622	1,621	1,528 <sup>r</sup>	1,443 <sup>r</sup>	1,415
Silica, silix <sup>e</sup>	1,600	1,600	1,600	1,600	1,600

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>	2006	2007	2008	2009	2010 <sup>P</sup>
INDUSTRIAL MINERALS—Continued					
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	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	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	3,500	3,500	3,500	3,500	3,500
Gneiss	1,100,000	1,100,000	1,100,000	1,100,000	1,100,000
Granite	60,000	60,000	60,000	60,000	60,000
Limestone	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	20,954	22,336	22,400	22,400	22,400
Byproduct:					
Metallurgy	297,539	321,707	321,750	321,800 <sup>r</sup>	321,800
Petroleum	117,203	135,623	135,650	135,700 <sup>e</sup>	135,700
Total	435,696	479,666	479,800	479,900 <sup>e</sup>	479,900
Talc and Pyrophyllite:					
Combined:					
Crude	389,471	401,204	513,433 <sup>r</sup>	577,935 <sup>r</sup>	655,436
Marketable product <sup>e,3</sup>	2,000	2,000	2,000	2,000	2,000
Vermiculite:					
Concentrate	19,279	18,952	32,503 <sup>r</sup>	50,438 <sup>r</sup>	49,976
Marketable product <sup>e,3</sup>	3,100	3,100	3,100	3,100	3,100
MINERAL FUELS AND RELATED MATERIALS					
Coal, bituminous:					
Run-of-mine	13,200	13,600 <sup>r</sup>	13,210 <sup>r</sup>	13,578	13,600
Beneficiated/Marketable <sup>3</sup>	5,528	6,133 <sup>r</sup>	6,723 <sup>r</sup>	5,818 <sup>r</sup>	6,310
Coke, metallurgical, all types	7,493 <sup>r</sup>	8,315 <sup>r</sup>	8,286 <sup>r</sup>	7,259 <sup>r</sup>	9,189
Natural gas, gross	17,706 <sup>r</sup>	18,152 <sup>r</sup>	21,593 <sup>r</sup>	21,142 <sup>r</sup>	22,938
Natural gas liquids	10,196 <sup>e</sup>	10,767 <sup>e</sup>	10,365 <sup>e</sup>	9,673 <sup>e</sup>	9,570
Petroleum:					
Crude	630,516 <sup>r</sup>	640,039 <sup>r</sup>	664,338 <sup>r</sup>	714,041 <sup>r</sup>	752,253
Refinery products: <sup>11, 12</sup>					
Liquefied petroleum gas (LPG)	13,891	14,175	14,437 <sup>r</sup>	15,675	15,700
Gasoline	142,703	145,673	148,365 <sup>r</sup>	161,091	161,100
Jet fuel	592	605	621 <sup>r</sup>	670	700
Kerosene	27,727	28,304	28,827 <sup>r</sup>	31,300	31,300
Distillate fuel oil	219,228	223,580	227,709 <sup>r</sup>	247,241	247,200
Lubricants	6,228	6,357	6,475 <sup>r</sup>	7,030	7,000
Residual fuel oil	125,731	128,348	130,719 <sup>r</sup>	141,932	142,000
Other	106,906	109,131	111,147 <sup>r</sup>	120,681	121,700
Total	643,006	656,173	668,300 <sup>r</sup>	725,620	726,700

<sup>e</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. -- Zero.

<sup>1</sup>Table includes data available through December 31, 2011.

<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>Source: Cobalt Development Institute.

<sup>5</sup>Reported figure.

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

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<sup>6</sup>Includes sponge iron, in metric tons, as follows: 2006 to 2010—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: 2006 and 2007, 50,000; 2008 through 2010, 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>Data are those officially reported to the United Nations by the Ministry of Mines and Energy of Brazil. Source: Energy Statistics Yearbook.

<sup>12</sup>Source: Economia Mineral do Brasil, Departamento Nacional de Produção Mineral, 2009 and 2010; and Petrobrás Annual Report 2009 and Petrobrás Magazine 2010.

TABLE 2  
BRAZIL: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(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)	455 (metal).
Do.	Alcan Alumínio do Brasil S.A. [Alcan Aluminum Ltd. (Alcan), 100%]	Saramenha, Minas Gerais State (smelter and refinery)	100 (metal).
Do.	do.	do.	150 (alumina).
Do.	Alcan Empreendimentos Ltda. (Alcan Alumínio do Brasil S.A., 100%)	Lamininação de Pindamonhangaba, Sao Paulo State (smelter)	280 (metal).
Do.	Alcan Alumínio Poços de Caldas (Alucaldas) (Alcan Alumínio do Brasil S.A., 100%)	Poços de Caldas, Minas Gerais State (mine)	1,000 (bauxite).
Do.	Alcoa Alumínio S.A. (Alcoa Inc., 54%; BHP Billiton plc, 36%; Alcan Aluminum Ltd., 10%)	do.	400 (bauxite).
Do.	do.	Sao Luiz, Maranhao State (refinery)	550 (alumina).
Do.	do.	Sao Luiz, Maranhao State (smelter)	239 (metal).
Do.	Alumínio do Brasil Nordeste S.A. (Alcan Aluminum Ltd., 100%)	Aratu, Bahia State (smelter)	120 (metal).
Do.	Alumar Consortium S.A. (Alcoa Alumínio S.A., 100%)	Juriti bauxite mine, Para State	4,000 (bauxite).
Do.	Alumar Consortium S.A. (Alcoa Inc., 54%; BHP Billiton plc, 36%; Alcan Aluminum Ltd., 10%)	Sao Luis, Maranhao State (refinery)	2,000 (alumina).
Do.	Alumar Consortium S.A. (Alcoa Inc., 53.66%, and BHP Billiton plc, 46.34%)	Sao Luis, Maranhao State (smelter)	1,000 (metal).
Do.	Alumínio do Norte do Brasil S.A. (Alunorte) (Vale S.A., 57%, and Hydro Aluminium, Nippon, Japan Alunorte, 43%)	Barcarena, Para State (refinery)	6,300 (alumina).
Do.	Companhia Brasileira de Alumínio (CBA) (Votorantim Group, 100%)	Poços de Caldas, Minas Gerais State (mine)	1,000 (bauxite).
Do.	do.	Sorocaba, Sao Paulo State (refinery)	500 (alumina).
Do.	do.	Sorocaba, Sao Paulo State (smelter)	400 (metal).
Do.	Companhia Geral do Minas (Aluminum Co. of America, 79%, and others, 21%)	Poços de Caldas, Minas Gerais State (refinery)	275 (alumina).
Do.	do.	Poços de Caldas, Minas Gerais State (smelter)	95 (metal).
Do.	Mineração Rio do Norte S.A. (MRN) (Vale S.A., 40%; BHP Billiton plc, 14.8%; Alcoa Inc., 13.2%; Alcan Empreendimentos Ltda., 12%; Companhia Brasileira de Alumínio, Norsk Hydro Comercio e Industria, 5%; Reynolds Alumínio do Brasil, 5%)	Oriximina, Para State (mine)	18,000 (bauxite).
Do.	do.	Papagalo, Para State (mine)	2,000 (bauxite).
Do.	do.	Trombetas, Para State (mine)	2,000 (bauxite).
Do.	Vale do Sul Alumínio S.A. (Valesul) (Vale S.A., 100%)	Santa Cruz, Rio de Janeiro State (smelter)	95 (metal).
Do.	Reynolds Internacional do Brasil, 42.5%; Bradesco Bank, 42.5%; J.P. Morgan, 15%)	Sorocaba, Sao Paulo State (smelter)	5.4 million (cans).
Do.	Vale S.A., (private, 100%)	Paragominas, Para State (mine)	9,900 (bauxite).
Do.	do.	Jabutí, Para State (alumina)	1,860 (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%)	do.	370 (ore).
Do.	do.	Campo Formoso, Bahia State (beneficiation plant)	292 (concentrate).
Copper	Vale S.A. (private, 100%)	Sossego Mine, Serra dos Carajas, Para State	130 (ore).
Do.	do.	Salobo Mine, Para State (copper concentrate and refinery plant)	520 (concentrate), 255 (metal).
Do.	Mineração Caraíba S/A (Grupo PARANAPANEMA, 100%)	Jaguari, Bahia State (mine)	130 (ore).
Do.	do.	Jaguari, Bahia State (beneficiation plant)	90 (concentrate).
Do.	Caraíba Metais S/A (CMSA) (Grupo PARANAPANEMA, 100%)	Camacari, Bahia State (refinery)	220 (metal).
Do.	Yamana Gold Inc. (YGI) (private, 100%)	Chapada, Alto Horizonte in Goias State (mine)	200 (concentrate).
Do.	Companhia Brasileira Carbureto de Calcio (private, 100%)	Santos Dumont, Minas Gerais State (plant)	54.

See footnotes at end of table.



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

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners		Location of main facilities	Annual capacity
<b>METALS—Continued</b>				
Ferroalloys	Prometal Produtos Metalúrgicos S.A., 60%, and Elkem A/S, 40%		Maraba, Para State (plant)	500.
Do.	Nova Era Silicon S.A. (Vale S.A., 49%; Mitsubishi Corp., 25.5%; Kawasaki Steel Corp., 25.5%)		Nova Era, Minas Gerais State	48.
Do.	Companhia Ferro-Ligas de Bahia S.A. (FERBASA), 100%		Pojuca, Bahia State (plant)	194.
Do.	Companhia Ferro-Ligas Minas Gerais (MINASLIGAS), 100%		Pirapora, Minas Gerais State (plant)	58.
Do.	Companhia Paulista de Ferro-Ligas (CPF) (private, 100%)		Barbacena, Caxambu, Jeceaba, Passa Quatro, and Passa Vinte, Minas Gerais State; Corumba, Matto Grosso do Sul State; and Xanxere, Santa Catarina State	326.
Do.	Italmagnesio S.A. Indústria e Comercio (ISAIC) (private, 100%)		Braganca Paulista, 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.
Do.	Urucum Mineração S.A. (Vale S.A., 100%)		Corumba plant, Mato Grosso do Sul State	20.
Gold	kilograms	Vale S.A. (private, 100%)	Gold mines in the States of Minas Gerais, Bahia, and Para	18,000.
Do.	do.	Mineração Morro Velho S.A. (AngloGold Ashanti Mineração Ltda., 100%)	Cuiaba, Novo Lima, and Sabara, Minas Gerais State; and Jacobina, Bahia State (four mines)	8,100.
Do.	do.	Mineração Serra Grande S.A. (AngloGold Ashanti Mineração Ltda., 50%, and Kinross Gold Corp., 50%)	Serra Grande, Minas Gerais State (mine)	6,000.
Do.	do.	São Bento Mineração S.A. (Eldorado Gold Corp., 100%)	Santa Barbara, Minas Gerais State (mine)	4,000.
Do.	do.	Rio Paracatu Mineração S.A. (Kinross Gold Corp., 50%, and Mineração Serra Grande S.A., 50%)	Paracatu Mine, Minas Gerais State (mine)	7,500.
Do.	do.	Yamana Gold Inc. (YGI) (private, 100%)	Chapada, Alto Horizonte in Goiás State (mine)	1,200.
Do.	do.	do.	Sao Francisco Mine, Mato Grosso State (mine)	3,100.
Do.	do.	do.	Jacobina Mine, Bahia State (mine)	3,000.
Do.	do.	do.	Fazenda Brasileiro, Goiás State (mine)	3,700.
Do.	do.	do.	Sao Vicente Mine, Mato Grosso State (mine)	1,900.
Iron ore	Companhia Siderúrgica Nacional (CSN) (private, 100%)		Volta Mine, Minas Gerais State	15,000.
Do.	Itaminas Comércio de Minérios S.A. (private, 100%)		Itaminas, Minas Gerais State	5,000.
Do.	Vale S.A. (private, 100%)		Serra dos Carajas Mine in Parauapebas, Para State	100,400.
Do.	do.	do.	Itabirito, Mato, Vargem Grande, and Paraopeba, Minas Gerais State (four mines)	87,300.
Do.	do.	do.	Itabira, Ouro Preto, Santa Barbara, Xavier, Tamandúa, Capao, and Mato, Minas Gerais State (seven mines)	134,600.
Do.	do.	do.	Mato Grosso do Sul State (one mine)	1,500.
Do.	do.	do.	Ponta Madeira, Sao Luis, and Tubarao, Maranhao State (pellet plants)	31,700.
Do.	Vale S.A. (Vale S.A., 50.9%, and Arcelor Mittal Co., 49.1%)		Hispanobras, Espirito Santo State (pellet plant)	3,800.
Do.	Vale S.A. (Vale S.A., 50%, and BHP Billiton plc, 50%)		SePETiba, Samarco, Rio de Janeiro State (pellet plant)	21,800.
Do.	Ferteco Mineração S.A. (FERTECO) (Exploration Bergbau GmbH, 100%)		Ouro Preto and Brumadinho, Minas Gerais State (two mines)	12,800.
Do.	S.A. Mineração da Trindade (SAMITRI) (private, 100%)		Mariana, Rio Piracicaba, Itabira, Ouro Preto, and Sabara, Minas Gerais State (five mines)	9,300.
Do.	Minerações Brasileiras Reunidas S/A (MBR) (BHP Billiton plc, 50%, and Mitsui Co. Ltd., 50%)		Capao Xavier, Tamandua, and Capitao do Mato, Minas Gerais State (three mines)	32,000.
Do.	Samarco Mineração S.A. (SAMITRI), 51%, and BHP Billiton Ltd., 49%		Alegria, Minas Gerais State (mine)	15,000.
Do.	Mineração Corumbaense Reunida S/A (MCR) (Rio Tinto plc, 100%)		Corumba, Mato Grosso do Sul (mine)	2,000.
Lead	Companhia Mineira de Metais (CMM) (private, 100%)		Paracatu, Minas Gerais State (mine)	25 (ore).
Do.	do.		Paracatu, Minas Gerais State (plant)	15 (concentrate).

See footnotes at end of table.

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

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
<b>METALS—Continued</b>			
Manganese	Rio Doce Manganês S.A. (RDM) (Vale S.A., 100%)	Morro da Mina, Minas Gerais State	300.
Do.	do.	Mina do Azul, Carajas, Para State	2,500.
Do.	do.	Mina Mineiros, Bahia State	1,500.
Do.	Urucum Mineração S.A. (Vale S.A., 100%)	Corumba and Ladario, Mato Grosso do Sul State (two mines and plant)	1,500 (ore), 500 (concentrate).
Do.	Construtora Polares Ltda. (CPL) (private, 100%)	Corumba Minas Gerais State (mine)	200 (ore).
Nickel	Companhia Niquel Tocantins (Grupo Votorantim, 100%)	Niquelandia, Goiás State (mine)	30 (ore).
Do.	do.	Niquelandia, Goiás State (refinery plant)	25 (electrolytic).
Do.	Mineração Serra da Fortaleza (Grupo Votorantim, 100%)	Fortaleza, Minas Gerais State (mine)	19 (nickel matte).
Do.	CODEMIN S.A. (Anglo American plc, 100%)	Niquelandia, Goiás State (refinery)	20 (metal).
Do.	Vale S.A. (private 100%)	Onca Puma and Vermelho, Para State (alloy plant)	58 (iron-nickel alloy).
Niobium (columbium)	Companhia Brasileira de Metalurgia e Mineração (Grupo Moreira Sales S.A., 55%, and Molycorp, Inc., 45%)	Araxa, Minas Gerais State (mine)	120 (ore).
Do.	do.	Araxa, Minas Gerais State (beneficiation plant)	60 (pyrochlore).
Do.	Mineração Catalão de Goiás Ltda. (MCGL) (Bozzano Simosen S.A., 68.5%, and Anglo American plc, 31.5%)	Ouvidor and Catalao I, Goiás State (mines)	70 (ore).
Do.	do.	Ouvidor, Goiás State (plants)	24 (pyrochlore).
Steel	Aço Minas Gerais S.A. (GERDAU AÇOMINAS, 100%)	Rodovia, Minas Gerais State	7,000.
Do.	Acesita S.A. (private, 100%)	Timoteo, Minas Gerais State (specialty steel)	900.
Do.	Companhia Siderúrgica Belgo-Mineira (private, 100%)	João Monlevade, Minas Gerais State	1,000.
Do.	Companhia Siderúrgica de Tubarão (private, 100%)	Serra, Espírito Santo State	4,800.
Do.	Companhia Siderúrgica Nacional (CSN) (private, 100%)	Volta Redonda, Rio de Janeiro State	5,800.
Do.	Companhia Siderúrgica Paulista (COSIPA) (private, 100%)	Cubatao, Sao Paulo State	4,500.
Do.	Usinas Siderúrgicas de Minas Gerais, S.A. (USIMINAS) (private, 100%)	Ipatinga, Minas Gerais State	5,500.
Tantalum	metric tons Mineração Taboca/AM (private, 100%)	Pitinga Mine, Amazonas State (mine)	180 (concentrate).
Do.	do. Companhia Industrial Fluminense S.A. (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)	130 (metal).
Zirconium	Nuclemon Minero-Química Ltda. (Government, 100%)	Sao Joao da Barra, Rio de Janeiro State (mine)	660 (ore).
Do.	do.	Itapemirim, Espirito Santo State (mine)	90 (ore).

See footnotes at end of table.

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

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
<b>METALS—Continued</b>			
Zirconium—Continued	Nuclemon Minerio-Química Ltda. (Government, 100%)	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).
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 S.A., 50%	States of Espirito Santo, Goias, Minas Gerais, and Rio de Janeiro (five plants)	4,000.
Do.	Companhia de Cimento Portland S.A. (CIMPOR Brazil)	States of Rio Grande do Sul, Santa Catarina, Sao Paulo, Goias, and Bahia (six plants)	6,000.
Do.	Camargo Correia Cimentos S.A. (CCSA) (private, 100%)	Ijaci, Minas Gerais State (plant)	1,600.
Do.	Holcim (Brasil) S.A.	Chacara, San Antonio, Sao Paulo State (four plants)	5,000.
Fluorspar	Mineração Nossa Senhora do Carmo Ltda. (private, 100%)	Cerro Azul, Parana State (two mines)	180 (ore).
Do.	Mineração Santa Catarina Ltda. (MSCL) (private, 100%)	Morro da Fumaça, Santa Rosa de Lima, Rio Fortuna, Santa Catarina State; and Tangua, Rio de Janeiro State (three mines and beneficiation plant)	100 (ore), 120 (concentrate).
Gemstones	carats Mineradora S/A (Diagem do Brasil Mineração Ltda., 100%)	Juina, Mato Grosso State	92,100.
Do.	do. Chapada Brasil Ltda. (Grupo Elkedra Diamonds NL, 100%)	Chapada dos Guimaraes, Mato Grosso State (mine)	100,000.
Do.	do. Mineração Rio Novo S/A. (private, 100%)	Diamantina, Minas Gerais State (mine)	107,500.
Graphite	Nacional de Grafite Ltda. (NGL) (private, 100%)	Itapecerica, Pedra Azul, Salto da Divisa, Minas Gerais State (three mines)	80 (ore).
Do.	do.	Itapecerica, Pedra Azul, Salto da Divisa, Minas Gerais State (three beneficiation plants)	60 (concentrate).
Do.	Grafita MG Ltda. (GML) (private, 100%)	Mateus Leme, Zerra Azul, Minas Gerais State (two mines)	20 (ore).
Do.	Marmoré Mineração e Metalurgia Ltda. (MML) (Grupo PARANAPANEMA, 100%)	Maiquinique, Bahia State (mine)	10 (ore).
Gypsum	Companhia Brasileira de Equipamento (private, 100%)	Codo, Maranhao State, and Ipubi, Pernambuco State (two mines)	600 (ore).
Do.	Mineradora Rancharia Ltd/Supergesso S.A (private, 100%)	Ipubi, Pernambuco State (mine)	600 (ore).
Do.	Holcin Brasil S.A. (Grupo Holderbank, 100%)	Holder, Pernambuco State (mine)	600 (ore).
Do.	Mineradora São Jorge S.A (Grupo Laudenor Lins, 100%)	Sao Jorge, Maranhao State (mine)	110 (ore).
Do.	Votorantin Cimentos N/NE (private, 100%)	Mateo, Ceara State (mine)	70 (ore).
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).

See footnotes at end of table.

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

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
<b>INDUSTRIAL MINERALS—</b>			
<b>Continued</b>			
Limestone	Companhia de Cimento Portland Paraiso (CCPP) (private, 100%)	States of Goiás, Minas Gerais, and Rio de Janeiro (five mines)	2,000.
Do.	Companhia de Cimento Portland Rio Branco (CCPRB), 100%	Rio Branco do Sul, Parana State (three mines)	5,500.
Do.	S.A. Industrias Votorantim (SAIV) (private, 100%)	States of Rio de Janeiro and Sao Paulo (four mines)	1,000.
Magnesite	Magnesita S.A. (MSA) (private, 100%)	Brumado, Bahia State (one major mine and numerous small mines)	1,000 (ore).
Do.	do.	Brumado, Bahia State (two beneficiation plants)	280 (concentrate).
Phosphate rock	Bunge Fertilizantes S.A. (Bunge Ltd., 100%)	Araxa, Minas Gerais State (mine)	5,000.
Do.	Copebrás S.A.(Copebrás) (Anglo American plc, 100%)	Ouvidor, Goiás State (mine)	4,400.
Do.	Fosfêtil S.A. (Grupo Fertifôs, 81.54%; Vale S.A., 10.96%; public, 7.5%)	Tapira, Minas Gerais State (two mines)	10,500.
Do.	Ultrafêtil S.A. (Grupo Fertifôs, 81.54%; Vale S.A., 10.96%; public, 7.5%)	Araxa, Minas Gerais State (mine)	5,000.
Quartz	Telequartzo Exportação S.A. (TESA) (private, 100%)	Cristal, Minas Gerais State (mine)	6.0.
Salt, rock	Frota Oceânica Brasileira S.A. (FOBSA) (private, 100%)	Jacupiranga, Sao Paulo State (mine)	6,000.
Do.	Dow Química do Nordeste Ltd. (DQNL) (Dow Chemical Co., 100%)	Vera Cruz, Bahia State (mine)	1,000.
Do.	Cia. Nacional de Alcalis S.A. (CNA) (private, 100%)	Alcalis Grupo, Rio Grande do Norte State	1,500.
Do.	Salgema Mineração e Química S.A. (SMQ) (private, 100%)	Salgema, Maceio, Alagoas State (mine)	1,000.
<b>MINERAL FUELS AND RELATED MATERIALS</b>			
Coal	Carbonífera Circiúma S.A. (CCSA) (private, 100%)	Circiúma and Sideropolis, Santa Catarina State (two mines)	1,600.
Do.	Companhia Carbonífera Metropolitana S.A. (private, 100%)	Circiúma, Sideropolis, and Urussanga, Santa Catarina State (three mines)	1,200.
Do.	Copelmi Mineração Ltda. (COPELMI) (private, 100%)	Arroio dos Ratos, Butia, and Charqueadas, Rio Grande do Sul State (four mines)	4,600.
Do.	Indústria Carbonífera Rio Deserto Ltda. (private, 100%)	Circiúma and Urussanga, Santa Catarina State (two mines)	2,600.
Natural Gas	thousand cubic meters Petróleo Brasileiro S.A. (Petrobrás) (Government, 81.4%; private, 11.8%; public, 6.8%)	Fields in the States of Alagoas, Amazonas, Bahia, Ceara, Espirito Santo, Rio de Janeiro	20,000.
Petroleum	thousand 42-gallon barrels do.	Fields in the States of Alagoas, Amazonas, Bahia, Ceara, Espirito Santo, Rio de Janeiro, Rio Grande do Norte, Para, Maranhao, and Sergipe	700,000.
Petroleum products	do. do.	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 2010<sup>1,\*</sup>

(Thousand metric tons unless otherwise specified)

Commodity	Reserves
Asbestos, fiber	11,261
Bauxite	2,600,000
Chromite, Cr <sub>2</sub> O <sub>3</sub>	2,170
Coal, all types	2,482,000 <sup>2</sup>
Cobalt	metric tons 89,000
Copper, metal content	9,800
Fluorspar (CaF <sub>2</sub> content)	1,000
Gold, metal content	metric tons 2,600
Graphite	59,500
Gypsum	228,411
Iron ore	20,359,000
Kaolin	7,300,000
Lead, metal content	metric tons 86,000
Lithium	do. 46,000
Magnesite	298,626
Manganese, metal content	60,000
Natural gas	million cubic meters 423,003 <sup>2</sup>
Nickel, metal content	7,532
Niobium (columbium) (pyrochlore and columbite ore)	4,097
Petroleum, crude	million 42-gallon barrels 14,247 <sup>2</sup>
Phosphate rock	273,000
Rare earths	metric tons 31,000
Talc and pyrophyllite	227,000
Tantalum	metric tons 88,782
Tin, metal content	712
Titanium minerals, TiO <sub>2</sub> content	1,670
Uranium, U <sub>3</sub> O <sub>8</sub>	metric tons 309,000 <sup>3</sup>
Vanadium	do. 175,000
Vermiculite	9,500
Zinc, metal content	2,600
Zirconium	4,053

<sup>1</sup>Source: Summário Mineral 2010–11.

<sup>2</sup>Sources: Empresa de Pesquisa Energética—Balanço Energético Nacional 2011; Petróleo Brasileiro, S.A., Petrobrás Magazine 2010–11; U.S. Energy Information Administration, Brazil—Overview/Data, October 2010–11 (Available at <http://www.eia.gov/countries/country-data.cfm?fips=BR>).

<sup>3</sup>Source: Instituto Brasileiro de Mineração, 2011.

\*Revised table with corrections posted on October 2, 2012.