THE MINERAL INDUSTRY OF

BRAZIL

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During 1995, Brazil produced bauxite, columbium, gemstones, gold, iron ore, kaolin, manganese, tantalum, and tin from world-class deposits and exported them to the global marketplace. In Latin America, particularly within the Southern Cone Common Market (MERCOSUR), Brazil continued to be the leading producer of aluminum, cement, ferroalloys, gold, iron ore, manganese, steel, and tin. The country continued with an ambitious petroleum exploration program to expand reserves and reduce its dependence on oil imports, which satisfied approximately 60% of its crude oil requirements during 1995.

In 1995, Brazil a population of nearly 170 million and a gross domestic product (GDP) of $677 billion.[1] GDP growth decreased to 4.2% in 1995, compared to 5.7% in 1994. Foreign exchange reserves were about $52 billion. Its tremendous identified and undiscovered natural resources helped make it one of the most dynamic markets in the world, ranking ninth in the global economy and constituting one-third of the Latin American economy.

Brazil, the largest debtor Nation in the developing world, according to J. P. Morgan, completed an agreement with its creditor banks to reduce its $49-billion foreign debt with lower interest rates and longer-term loans. This accord was crucial to Brazil's efforts to liberalize further its economy, attract more foreign investment, and stabilize prices. Brazil's total debt burden, including loans from banks and from other governments, amounted to $135 billion at yearend 1995.

The Government continued to utilize tight monetary policy and high interest rates (29% for 1995) with the objective of curbing inflation from the current 22% per year to 15%, preventing price explosion and indicating, in part, a successful "Plano Real." It is the Brazilian Government's stabilization plan introduced in mid-1994, which succeeded in restraining Brazil's chronically high inflation (5,000% for 1993).

Government Policies and Programs

In 1995, the Brazilian Congress approved constitutional amendments allowing the participation of the private sector (domestic and foreign) via privatization, joint ventures, and deregulating investment in the sectors of mining, petroleum exploration, natural gas distribution, coastal and river shipping, and telecommunications. Significant measures were undertaken by the Brazilian Government; the maximum Brazilian tariff was set at 20%, compared to 42% in 1993 (the commonly applied tariff is 14%); the elimination of governmental red tape affecting trade; an Industrial Products Tax, a Federal tax levied on most domestic and imported manufactured products, was set between 0% and 15%; and the allowance of 100% of equity ownership via privatization and expatriation of profits. These actions were undertaken by the Government to create a favorable and positive environment to attract domestic and foreign investments equally.

Privatization of State-owned firms led to lower employment levels and more efficiency. Since yearend 1991, the State has sold 30 companies worth $5.25 billion, mostly in the chemical, fertilizer, and steel sectors. Another $13 billion is expected from the remaining 35 corporations of the first phase of Brazil's privatization process. Sales of Government minority holdings would provide an additional $2.5 billion. The auctioning of the large State-owned mining, telephone, and energy corporations could bring in an additional $25 billion, bringing a total revenue of about $45 billion. The realization of this revenue, however, would need the removal of all trade barriers and a constitutional ruling to privatize Brazil's monopolies in the mining, telecommunication, and energy sectors. The Brazilian Congress was also considering to provide concessions for public utilities as an alternative to privatization, and construction and management of railroads, ports, and hydroelectric powerplants in joint ventures with the private sector.

The Brazilian Congress supported the Government's economic plan for stabilization "Plano Real," based on strict control of the domestic deficit, issuance of a new currency, stable foreign exchange rates, renegotiation of its foreign debt on favorable terms, and reduction of tariffs. Also, Brazil is reviewing its 1988 Constitution by both houses of Congress, which emphasizes in creation of economic opportunities for the private sector through privatization, deregulation, and removal of impediments to competition. The telecommunications and petroleum sectors were constitutionally mandated Federal monopolies. The Brazilian Congress, in 1995, approved constitutional amendments that will open these sectors to private participation. The state-owned mining giant, Companhia Vale do Rio Doce (CVRD) is scheduled for its privatization in early 1997. In the mining sector, restrictions to foreign

investments were removed in August 1995, which means that foreign corporations are allowed to mine Brazil's minerals; however, ramifications of the constitutional reviews are unknown, which would depend on implementing legislation that had not yet been approved. Furthermore, the concessions law also passed in 1995 should create additional opportunities for the private sector in public utilities previously reserved for the State. Today, the establishment of joint ventures is a common practice in Brazil.

The country's mining industry appeared to be on the verge of an investment boom in exploration and mine development, particularly in gold. The Government's aggressive economic policies, Brazil's diversified minerals endowment, and skilled manpower base stimulated a return of the major international mining companies to Brazil. Several of them, which fled Brazil after the promulgation of the 1988 Constitution, began acquiring exploration properties and mining prospects, particularly for gold. There were over 40 companies active in Brazil that included: Barrick Gold and Newmont of the United States, Placer Dome, INCO Limited, and TVX Gold Inc. of Canada, Anglo-American and General Mining Union Corp. Ltd. (GENCOR) of South Africa, Rio Tinto Zinc Mineração Ltd. (RTZ) of the United Kingdom, and BHP Minerals and Western Mining Company of Australia.

The four MERCOSUR nations, Argentina, Brazil, Paraguay, and Uruguay implemented the MERCOSUR common external tariff on January 1, 1995, which ranges between 0% and 20% for minerals. When fully implemented, the treaty would allow unrestricted movement of labor, goods, and services among the four countries. Already, MERCOSUR has had its impact on the Latin intraregional trade, which has increased from $7 billion in 1983 to about $30 billion this year. Internal MERCOSUR trade amounted to $15 billion and mineral trade amounted to $3.5 billion in 1995.

Environmental Issues

According to the National Environmental Council, Conseho Nacional de Meio Ambiente, an environmental license was required for all mining activities in Brazil. In 1986, Law No. 88351 established the National System for the Environment, composed of representatives of the Federal, State, and local governments and private foundations involved in environmental protection and improvement.

The 1988 Constitution, Article 225, stipulated that mining operators reclaim areas environmentally degraded. Later detailed legislation which was passed with a goal of harmonizing mining activities with the environment, included the Plan for Recovery of Degraded Areas and the Environmental Control Plan. In February 1989, the President of Brazil signed a decree prohibiting the use of mercury and cyanide in the mining of gold unless approved by Brazilian State environmental agencies. The States most affected were those in the Pantanal and Amazon regions.

Resolution 010 of December 6, 1990, dictated that all mining operations required environmental licenses leading to the granting of mineral rights by the National Department of Mineral Production or Departamento Nacional da Produção Mineral (DNPM). As environmental problems increased, antipollution measures were enacted to eliminate the sources of pollutants and mitigate their effects on the environment.

Production

The total value of minerals produced in 1995 was about $13 billion, or almost 2% of GDP. Crude oil and natural gas amounted to almost $6 billion. Brazilian minerals production increased approximately 3.1% over that of 1994, caused mostly by an iron ore output increase of about 10.7%. Increases also were recorded in production of chromium, 17.4%; manganese, 13.8%; kaolin, 4.9%; and to a lesser extent asbestos, phosphate, and zinc. Gold production increased by almost 3%, however, depletion of shallow gold deposits and environmental constraints on *garimpeiros* would affect future output. *(See table 1.)*

Trade

Brazil's trade balance decreased from a surplus of $10.5 billion in 1994 to a deficit of $3.1 billion in 1995. The total value of exports was approximately $46.5 billion versus the total value of imports of $49.6 billion. During 1995, Brazil sold 13% of its exports to the other MERCOSUR members and 8% to the other countries in South America. Brazilian mineral imports were valued at $4.5 billion, while its total exports were $2.8 billion or about 1.2% below the 1994 mineral exports. The negative trade balance in the minerals sector for 1995 was heavily influenced by the value ($2.5 billion) of petroleum imports and the decrease in prices of nonferrous metals. In addition to petroleum, other major mineral imports were coal, copper, lead, natural gas, potash, sulfur, and zinc.

During 1995, Brazilian exports of steel were 12.3 million metric tons (Mt), down from 13.6 Mt in 1994. Exports of steel, mostly semifinished products, were valued at $3.9 billion, an increase of about $200 million from 1994. Imports of steel products amounted to about 193,900 metric tons (t) at a value of $211 million, representing an increase from 177,900 t valued at $208 million in 1994.

Structure of the Mineral Industry

The major portion of the mineral industry of Brazil was partially or wholly owned by private Brazilian investors, Brazilian corporations, and foreign companies in 1995. The few exceptions were the natural gas and petroleum industries, which were 100% Government owned through Petróleo Brasileiro, S.A. (PETROBRAS). In 1995, PETROBRAS comprised of four subsidiaries: (1) Petrobrás Distribuidora,

S.A., the petroleum products distribution company; (2) Petrobrás Química, S.A., the petrochemical company; (3) Petrobrás Internacional, S.A. (BRASPETRO), the foreign operating company; and (4) Petrobrás Fertilizantes, S.A., the agricultural fertilizer company. PETROBRAS is the domestic operator. The Government privatized its steel industry, beginning in 1991, when it sold 75% of the common stock in Brazil's second largest steel mill, Usinas Siderúrgicas de Minas Gerais, S. A. (USIMINAS), to a variety of stockholders for $1.2 billion. The share auction for Cía. Siderúrgica do Nordeste took place in 1991, and specialty steelmaker Aços Finos Piratini, S.A. was auctioned in 1992. Additional mills were privatized: Cía. Siderúrgica de Tubarao (CST), a slab producer, in March 1992; Aços Minas Gerais, S.A. (ACOMINAS), a structural and rail producer, in mid-1992; Cía. Siderúrgica Nacional (CSN), Brazil's largest mill, the second half of 1992; and Cía. Siderúrgica Paulista (COSIPA), a carbon steelsheet and plate producer, was sold the first half of 1993. CVRD, the huge mining conglomerate, is 51% Government owned. There are several smaller companies engaged in the mineral industry that are partially or wholly Government owned.

The mineral industry of Brazil is large by world standards. In 1995, there were 42 cement companies operating 51 cement plants and 7 grinding plants with a clinker capacity of 36.6 Mt and an utilization rate of 70%. In the same year, there were 34 separate iron ore mining companies operating 80 mines.

The five major integrated steelworks (ACOMINAS, CSN, COSIPA, CST, and USIMINAS) produced about 17.5 Mt of the total Brazilian steel production of 25.2 Mt during 1995. CVRD produced about 62.6% of the iron ore. Mineração Río do Norte, S.A. (MRN), which is majority privately owned, produced approximately 75% of the total bauxite production, which amounted to about 11.4 Mt. The five major aluminum smelters, all predominantly private Brazilian or foreign owned, produced approximately 87% of the primary aluminum production of 1.18 Mt in 1995.

Brazil's total labor force was nearly 60 million in 1995. Of the total, services represented 42%; agriculture 31%; and industry, 27%. The minerals sector comprised approximately 4% (650,000) of the industry total of 16 million. This did not include the 500,000 to 1 million *garimpeiros* (small-scale independent miners) active in Brazil. Employment in the mining sector continued its downward trend in 1995 as Brazil's economy was affected by privatization, particularly of the steel sector. *(See table 2.)*

Commodity Review

Metals

Alumina, Aluminum, and Bauxite.—In 1995, primary aluminum production amounted to 1.18 Mt of metal, which remained near at the same level as in 1994, and bauxite production increased by about 30%, from 8.67 Mt in 1994 to 11.4 Mt in 1995. Alumina production remained at the same level of 1994, or 1.87 Mt.

CVRD constructed a 1.1 million metric tons per year (Mt/yr) alumina refinery near Paragominas, Pará, to process the bauxite from the 850-Mt deposit there. It is known as the Jabuti Project at a cost of $875 million and is scheduled to enter into full production in 1997. The startup of Jabuti was in October 1995, and produced 250,000 t of alumina. In 1995, the production capacity of primary aluminum was 1.224 Mt. About 25% of primary aluminum was produced by Albras-Aluminio Brasileiro S. A., a joint venture of CVRD (51%) and Japan's Nippon Amazon Aluminum Corp. (49%). ALCOA Mineração S.A. accounted for 24% of total primary aluminum output. Other producers included Billiton Metais S.A. with 18.1%, Compahnia Brasileira de Alumínio with 17.9%, Alumínio Poços de Caldas S.A. with 10%, and Vale do Rio Doce Aluminio S.A. (ALUVALE) with 0.5%. Valesul Alumínio, S.A. a joint venture of ALUVALE (49.7%), Billiton Metais (41.5%), and Companhia Força e Luz Cataguazes (8.8%), produced 92,600 t.

Mineração Rio do Norte, S.A. (MRN), the world's third largest bauxite producer and exporter, increased its production during 1995 by about 17.8% to 8.6 Mt compared with 7.3 Mt in 1994. MRN was planning to invest $80 million to open a new mine with 800 Mt of bauxite reserves in Trombetas, Pará, in 1997, with a capacity of 2 Mt/yr; thus, MRN's total bauxite production capacity will increase from 8 to 10 Mt/yr.

Reynolds Internacional do Brasil (Reynolds, 42.5%; Bradesco Bank, 42.5%; and J. P. Morgan, 15%) is building its third plant to produce additional 1.5 million aluminum cans, reaching a total capacity of 5.4 million cans per year. Alto Brazil Mineração is a joint venture of Alcoa Aluminio, S.A. (60%) and Billiton Metais S.A. (40%) set up to mine their bauxite deposit in the Amazon region. It proposed to mine the Oriximina deposit near the Trombetas River and MRN's bauxite mine in Pará. When in operation, it will supply the feed to the Alcoa Aluminio, S.A. refinery at São Luís, Maranhão. The Brazilian exports of primary aluminum was 800,654 t valued at about $1.5 billion.

Columbium (Niobium) and Tantalum.—Brazil was the world's most significant producer and main supplier of columbium to global markets. In 1995, Brazil produced about 83% of the world's total with approximately 23,890 t of Cb_2O_5 concentrate; 24,000 t of columbium alloys; and 1,000 t of columbium oxides. Brazil's most important columbium plant [23,000 metric tons per year (t/yr) capacity] was in Araxá, Minas Gerais, operated by the Brazilian Metallurgy and Mining Co.-Cía. Brasileira de Metalurgia e Mineração CBMM). CBMM is owned by Moreira Salles Group of Brazil, 55%; and Molycorp Inc. of the U.S.A., 45%. CBMM accounted for approximately 80% of Brazil's production capacity and supplied approximately 65% of the

world demand for ferrocolumbium. Columbium also was produced at the Chapadão plant (3,000 t/yr capacity), in Ouvidor, Goiás, owned by Mineração Catalao, a subsidiary of Anglo American Group of South Africa.

Araxá and Catalão contained 4.5 billion tons of pyrochlore reserves by yearend. Early in the year, the Mining Resources and Research Co. of Amazonas announced the discovery of what may be the largest columbium-bearing deposit in the world. It was found in the São Gabriel da Coxoeira, Amazonas, and contains approximately 2.9 billion tons of columbium ore.

Tantalum production in Brazil was 50 t in 1995. The Araxá deposit, considered to be the world's largest and the most economically viable ore body, contains columbite and tantalite. Over the long run, the upward trend in production forecast continued in response to increased world demand for tantalum, but Brazil continued to import tantalum oxide and metal products.

Copper.—Brazilian copper concentrate production amounted to 49,000 t of metal in 1995, an increase of 23% over that of 1994 production. Total primary copper metal production amounted to 165,000 t, which was produced by Caraíba Metais from the Caraíba deposit in Jaguari, Bahia (89.9%), and the Brazilian Copper Co.'s operations in Camaquã, Rio Grande do Sul (10.1%). Caraíba Metais was acquired by the Paranapanema Group, headed by Previ of "Banco do Brasil." CVRD and its partner, Mineração Morro Velho, S.A. (MMV), a company controlled by the South African group Anglo American (50%) and the Brazilian group Bozano Simonsen (50%), concluded feasibility studies for the Salobo deposit in Carajás, Pará, proving 1.2 billion tons of reserves having a grade of 0.84% copper with associated gold, molybdenum, and silver. Production is planned at the rate of 200,000 t/yr of refined copper over a 33-year life. The expected production of gold and silver is about 8 t/yr and 27 t/yr, respectively. CVRD announced plans to build a $345 million, 225,000-t/yr copper refinery near its Salobo Mine. The estimated investment for this operation will be $1.5 billion and it was expected to go on-line sometime in 1998. This would make Brazil self-sufficient in copper production.

Copper-consuming companies in Brazil imported 159,562 t of copper in 1995. Exports were 74,019 t, of which 59,229 t was primary metal; 14,557 t semifinished; and 239 t was in other forms. In 1995, Brazil's metallic copper production was used primarily in construction and in automobile manufacturing. There also was a copper trade balance deficit of $166.6 million, the largest one among the nonferrous metals in Brazil.

Gold.—Gold production in 1995 was reported at 72 t, which represented 42 t from mining companies and 30 t from *garimpos* (cooperatives of *garimpeiros*.) The increase in gold production from the *non-garimpo* sector was due to the favorable operations at CVRD's gold mines in Minas Gerais, Bahía, and Pará, which produced 16.3 t. The second largest producer of gold in Brazil was Mineração Morro Vehlo S. A. (MMV, owned by Anglo American and Bozano Simonsen) with almost 12.3 t. Rio Paracatu Mineração, a British concern (RTZ) associated with TVX Gold of Canada, produced 5.5 t from its Paracatu Mine in Minas Gerais.

São Bento Mineração, S.A. produced 3 t of gold at its Santa Barbara Mine in east-central Minas Gerais State. Gold was extracted by a combination of pressure oxidation and bioleaching using the South African General Mining Union Corp. Ltd.'s technology. Mineração Santa Elina operated its São Vicenete Mine in Mato Grosso, producing 1.3 t of gold. This mine will be expanded to produce about 10 t of gold by the end of this decade.

Brazilian gold production could increase significantly in the near future because of increased interest by domestic and foreign investors in large unexplored areas having gold mineralization. According to DNPM, more than 2,000 gold deposits are known, mostly Precambrian vein deposits and alluvial placers.

Iron and Steel.—*Ferroalloys.*—In 1995, ferroalloy production decreased to 1,147,000 t from that of 1994 (1,344,005 t). For the year, exports decreased from those of 1994 but reached 342,424 t. In 1995, Brazil was the third largest ferroalloy producer in the world and the third largest exporter. Apparent domestic consumption was approximately 742,000 t.

Norway's Elkem A/S, one of the world's largest manganese alloy producers, formed a joint venture with Brazil's Prometal Produtos Metalúrgicos, S.A. to produce 500,000 t of ferromanganese alloy during 1996. The project is in Marabá, Pará State, in which Elkem will hold a 40% share. The manganese will come from a nearby Prometal Mine, and the iron ore will come from the Carajás District.

Nova Era Silicon S. A., where CVRD (49%) is associated with Japanese capital: Mitsubishi (25.5%) and Kawasaki Steel (25.5%), is building a silicon ferroalloy plant in Nova Era, Minas Gerais State, with an installed capacity of 48,000 t/yr. About two-thirds of output will be exported, mainly to Japan by early 1996.

***Iron Ore.*—**Brazil's 1995 production of iron ore, reportedly 186 Mt, increased by 10% over that of 1994's 168 Mt. About 80% of that production was from the six major mining companies, in order of descending output, CVRD with 92.3 Mt; Minerações Brasileiras Reunidas S/A (MBR), 28 Mt; S.A. Mineração da Trindade (SAMITRI), 10.9 Mt; Ferteco Mineração, S.A., 9.7 Mt; and Samarco Mineração, S.A. (SAMARCO), 9.5 Mt.

The total iron ore exports for 1995 were about 131 Mt, which represented an increase of almost 12% compared with 1994; total export revenues increased from $2.3 billion in 1994 to $2.5 billion in 1995. The Brazilian exports were

shipped to 35 countries in 1995. The major importers of Brazilian iron ore were Japan (25%) and Germany (15%). In 1995, the United States imported 8% of Brazil's total iron ore exports. The commercial products sold were: sinter-feed and pellet-feed, 70.3%; pellets, 21.4%; and lump ore, 8.3%.

CVRD started the construction of the Kobrasco pellet plant, its seventh, which is a joint venture with Pohan Iron and Steel Co. (POSCO) of the Republic of Korea. The facility is in the port of Tubarão, Espírito Santo; CVRD-POSCO plan to invest $200 million by yearend 1996 to produce 4 Mt/yr of pellets. MBR, Brazil's second largest iron ore producer, continued its long range plans to invest $1 billion during a 10-year period beginning in 1991. The investment program is aimed at increasing reserves and production. The target is to increase output to 32 Mt/yr from the present 23 Mt/yr by the end of the decade.

SAMARCO, controlled by BHP-Utah (49%) and SAMITRI (51%), started the construction of its second pellet plant at Ponta do Ubo in Espírito Santo, where annual capacity was being increased from 5.5 Mt to 11 Mt at a cost of $230 million.

***Pig Iron.*—**Brazil produced 25.2 Mt of pig iron, which was 5.4% higher than that of 1994, and exported 2.5 Mt valued at $287 million; approximately one-third of the pig iron traded in the world. The Brazilian environmental laws stipulated that by 1995 a minimum of 50% of the charcoal used in pig iron production had to come from reforested areas rather than the virgin forests. A maximum of 20% of the charcoal usage was allowed to be purchased from third parties. It also was stipulated that the percentage of charcoal used by the pig iron producers from their own reforestation programs must reach 100% by 1997.

***Steel.*—**Brazil's 1995 steel production totaled 25.1 Mt, which decreased by 680,000 t in comparison to 1994, placing the country eighth in world ranking. The major recipients of Brazil's exports were Asia, 5 Mt; Latin America, 2 Mt; and the United States, 1.4 Mt. The Instituto Brasileiro de Siderurgia (IBS) stressed that the Brazilian steel industry no longer received subsidies or enjoyed tariff protection that it once had and that the industry became more efficient than ever because of the major changes it has made via privatization.

Privatization has fundamentally changed the Brazilian steel industry, both in efficiency and in reduced employment levels. Vertical integration was evident as suppliers and customers of the steel companies participated in the auctions. For instance, CVRD acquired significant minority holdings in CST, CSN, and USIMINAS. CVRD supplied iron ore to these companies and continued providing them with railroad, port, and shipping facilities.

After the Government's privatization program identified Brazil's steel industry as one of the first sectors for auction, via the stock exchanges of Rio de Janeiro and São Paulo, the state-owned steel companies have been largely privatized. The last companies sold during 1994-95 were COSIPA and AÇOMINAS. The decline in employment in the steel industry from 174,000 in 1989 to 102,300 in 1995 reflected, in part, the effects of privatization and associated downsizing. State-owned companies, expecting to be privatized, reduced employment levels in anticipation of the process.

Manganese.—Brazilian production of manganese ore in 1995 was 2.39 Mt, which was 3% higher than that of 1994. CVRD continued operating its high-grade manganese mine, Igarapé Azul, in the Carajás complex. It reported production of 1.27 Mt, a large increase from 512,000 t in 1994. Indústria e Comércio de Minério S. A. controlled by the Caemi Mineração e Metalurgia group, was the second largest Brazilian producer with 290,000 t. In 1995, other manganese ore producers were: Mineração Buritirama, a subsidiary of Prometal Produtos Metalurgicos S.A., 280,000 t; Urucum Mineração S.A., 210,000 t; Sociedade Mineira de Mineração Ltda., controlled by CVRD, 150,000 t; and SAMITRI, 10,000 t.

Tin.—In 1995, Brazil was the world's third largest tin producer following China and Indonesia. Tin production has decreased from the peak of 50,200 t in 1989 to 26,175 t in 1994 and to 22,370 t in 1995 . The reduction in Brazilian output was attributed to the closing of some high-cost operations, decrease in the ore grades, and the decline in tin prices. In 1995, production cuts were made at the Pitinga Mine in Amazonas, operated by the world's largest tin firm, Paranapanema, and at the *garimpeiros'* Bom Futuro operations in Rondônia. Brazilian tin exports in 1995 declined to 10,190 t, much below the 20,185 t quota based on Brazil's commitment with the Association of Tin Producing Countries.

Paranapanema, S.A. Mineração, Industría e Construção, Brazil's largest tin-mining company, reported that its tin output was 10,150 t from its high-grade Pitinga Mine, with byproducts of columbium, tantalum, zirconium, hafnium, thorium, and cryolite, in order of importance. *Garimpeiros* produced 5,200 t and continued smuggling tin ore to Bolivia. Empresa Brasileira de Estanho, S.A., 49.7%; Paranapanema and a pool of Brazilian tin mining companies, 50.3%) produced 5,660 t from its Bom Futuro tin mine.

Industrial Minerals

Asbestos.—Economically significant asbestos deposits were in Minaçu, Goiás. In 1995, Sociedade Anônima Mineração de Amianto (SAMA) produced 3.95 Mt of chrysotile ore and 208,000 t of asbestos fiber, which was 8.3% higher than that of 1994 output (192,050 t). About 80% of Brazil's asbestos output was consumed in the

manufacture of specialized cement products such as ceiling tiles, protective screens, water and sewer pipes, water tanks, and molded electrical insulators. Other uses were in thermal insulators, paper and cardboard, decorations, slabs, insecticide, asphalt for highways and airport runways, and the automobile industry.

Brazil exported about 35,000 t worth $29 million. Exports went mainly, in order, of importance, to India, Thailand, Japan, Nigeria, Angola, Mexico, Chile, Colombia, Uruguay, Argentina, and Saudi Arabia. Domestic consumption was increasing steadily in recent years. São Paulo was the country's largest consumer, followed by Paraná and Rio Grande do Sul. Asbestos mining and consumption have been highly regulated in most industrialized nations, forcing them to reduce both production and consumption. Industry experts expected asbestos use in the industrial nations to continue to decline through the turn of the century. In contrast, the world's developing nations were expected to greatly increase their collective asbestos consumption.

Brazilian asbestos reserves have been considered to be adequate to meet demand in the short to medium term, while SAMA was recently investing in an exploration program to assure a long term supply. In 1995, the average grade of ore from the Cana Brava Mine in Minaçu, Goiás, was 5.235% and its reserves, considering its fiber content only, was 5.86 Mt, which at a production rate of 200,000 t/yr represented a 29-year mine life.

Kaolin.—In 1995, Brazil produced about 1,000,000 t, which was almost 5% higher than that of 1994. Caulim da Amazônia S.A. (CADAM) continued operating its Adam Mine in Rio Jarí, Amazonas, and accounted for about 62% of the country's total output. Brazilian kaolin exports in 1995 amounted to 576,463 t valued at about $57 million; of this total CADAM exported 82%, or about 473,000 t.

In Brazil, kaolin was mainly used in the paper and ceramics industries. To a lesser degree, it was utilized in the manufacture of rubber, plastics, pesticides, animal feed, food supplements and pharmaceuticals, fertilizers, paint, and many other applications. Brazil had 1.7 billion tons of kaolin reserves, or about 14.2% of the world's total.

Cement.—In 1995, Brazil produced 25.5 million tons, which was almost 2% higher than that of 1994's output. Minas Gerais contributed 24%; São Paulo, 20%; Paraná, 9%; Rio de Janeiro, 8%; and other states, 39%. The domestic production of cement was expected to remain about 25 Mt/yr, unless slowdowns in civil construction are avoided and investments in the sector are augmented.

Most of the exported cement, 150,000 t, went to the MERCOSUR country members. Argentina imported 16%; Paraguay, 32%; and Uruguay, 6%; the remainder was exported to Bolivia and Peru, 32% and 7%, respectively.

Brazil imported about 260,000 t of cement from Greece, 56%; Venezuela, 11%; Cuba, 10%; Turkey, 8%; and also from France, the United Kingdom, and the United States.

Graphite.—Historically, Brazil's beneficiated natural graphite output had been centered in Minas Gerais. “Nacional de Grafite Ltda. (NGL)” mined natural graphite in the municipalities of Pedra Azul, Itapecerica, and São Francisco de Paula, which amounted to about 35,965 t grading 14% of carbon in 1995. This mine output was concentrated by NGL in products that ranged in grade from 61% to 99.5% carbon. Also in Minas Gerais in 1995 "Empresa de Mineração J. Mendes" produced 2,735 t of graphite with an average grade of 14% that was sold, domestically, after simple grinding.

There were three types of beneficiated products processed by NGL in Itapecerica and Pedra Azul: lump graphite, medium grained graphite, and graphite fines. In 1995, Brazil's demand for natural flake type crystalline graphite was met by Pedra Azul and Itapecerica beneficiation plants, which had installed capacities of 30,000 t/yr and 4,500 t/yr, respectively.

In 1995, about 370 t of graphite was imported, which was valued at $237,000, and exports amounted to 3,693 t valued at about $2.3 million.

Growth of the Brazilian apparent consumption of natural graphite, during the 1980's and 1990's, indicates a relative stability of the iron and steel sectors, which absorbed about 80% of the natural graphite consumed domestically. Other consumers included: battery manufacturing, 6.5%; refractories, 6%; paint and varnishes, 2%; and other miscellaneous uses. These trends were expected to continue into the next decade because of the healthy Brazilian steel industry.

Magnesite.—The most important magnesite mine in Brazil was Pedra Preta Mine owned and operated by “Magnesita S.A. (MSA)” in the Éguas mountain region of Brumado, Bahia, about 610 kilometers (km) from Salvador. In 1995, MSA produced 282,000 t of magnesite of which 15,076 t valued at $21.9 million was exported.

In Brazil, there were about 630 Mt of measured and indicated magnesite reserves with 180 Mt of magnesium content by yearend. It was expected that in the next decade MSA's beneficiation plant in Brumado, Bahia, and its industrial complex in Contagem, Minas Gerais, where a range of refractory materials are produced, should continue operating.

Gemstones.—For many years, Brazil has been an important world producer and exporter of gemstones. This importance has applied in terms of volume as well as variety. The large proportion of gemstones produced was mined by *garimpeiros*. For this reason, gemstone reserves are unknown, but Brazil appears to have high potential.

In 1995, the total value of gemstone (including diamond) production was $117 million, which remained at the same

level as that of 1994. Exports of uncut gemstones have declined from $20.2 million in 1993 to $3.3 million in 1995 despite the removal of some export barriers.

Phosphate Rock.—Production of phosphate rock concentrate amounted to 3.6 Mt, a decrease of 8.8% from the previous year. Production was highly concentrated in four mining companies, Fertilizantes Fosfatados, S.A. (FOSFERTIL), 37%; Arafertil, S.A. (ARAFERTIL), 16%; Goiasfertil, S.A. (GOIASFERTIL), 16%; and Copebrás controlled by Mineração Morro Velho, a subsidiary of the Anglo American Group, 13.5%, representing 82% of the total domestic output. Copebrás began to build a fertilizer plant at 150,000 t/yr capacity near its Catalão Mine in Goías, which represents a freight reduction of $50 per ton of phosphate rock. The reported domestic consumption was 4.4 Mt/yr.

Seventy-three percent of the phosphoric acid was used in the fertilizer industry, 25% in the chemical industry, and the rest in other uses. The industry has changed because of the privatization process and elimination of trade barriers; the Government has privatized ARAFERTIL, GOIASFERTIL, and FOSFERTIL.

Quartz.—Telequartz Exp. Ltda. and others continued producing quartz powder, which is an important constituent in the production of optic fibers, crucibles, oscillators, solar cells, wafers and integrated circuit packing, and ceramic materials of exceptional purity.

In 1995, Brazil produced 5,586 t valued at about $7.4 million, and continued to be the largest producer of quartz in the world. Quartz exports were 5,549 t, valued at about $10.7 million, and were shipped mostly to Japan, 45.9%; the United Kingdom, 21.9%; Germany, 20.9%; Hong Kong, 7.8%; and others, 3.5%. Brazil is estimated to have 53 Mt of reserves.

Other Industrial Minerals.—Potassium production in 1995 increased by 5.2% to 242,300 t compared with 1994 output. Brazil imported 44,000 t of potash in 1995, mainly from Russia, 31.2%; Canada, 26.9%; Germany, 20%; and Israel, 15.7%.

Mineral Fuels

According to the Brazilian Ministry of Mines and Energy, the total amount of energy produced was 163.9 Mt of oil equivalent in 1995. The primary sources, in order of importance, were hydraulic energy, firewood, petroleum, sugarcane bagasse, natural gas, steam coal, metallurgical coal, and uranium. Imported energy sources were 61.1 Mt of oil equivalent. Total energy consumption was 178.2 Mt of oil equivalent. Export, variations in inventory, non-utilized, and reinjected energy totaled 9.6 Mt of oil equivalent. The transportation sector consumed 36.1 Mt of oil equivalent and the industrial sector 78.4 Mt of oil equivalent. Consumption, in the mineral industry, by category and in order of importance, was pig iron and steel, 19.9 Mt of oil equivalent; nonferrous and other metals, 10.2 Mt of oil equivalent; cement, 3.2 Mt of oil equivalent; mining and pelletization, 3 Mt of oil equivalent; and ferroalloys, 3.1 Mt of oil equivalent.

Coal.—The Brazilian coal industry is not a large component of the minerals industry. Coal production is concentrated in the southern States of Rio Grande do Sul, 57.6%; Santa Catarina, 39.8%; and Parana, 2.6%, with minor production from Minas Gerais. Brazil's total production of coal (run-of-mine) in 1995 was about 9.12 Mt, which was transformed into 5.17 Mt of marketable product, and remained at about the same level as that of 1994. Coal consumption at yearend reached 15.7 Mt. Metallurgical coal represented 67% of this total consumption and the remainder was for power generation.

Most Brazilian coal is of lower quality than Colombian coal. Total Brazilian coal reserves were estimated at 23.7 billion tons. In 1995, imports of metallurgical coal amounted to about 10.5 Mt. The main sources of imports were the United States with 50%; Australia, 25%; Canada, 9%; and Poland, 7%. The remainder came from Colombia, Germany, South Africa, and Venezuela. According to the Brazilian Steel Institute, there were plans to invest $7 billion in 5 years to expand steel production from 24.8 Mt to 32 Mt. This expansion was based on imported metallurgical coal.

Natural Gas and Petroleum.—The gas pipeline linking the Enchova platform in the offshore Campos Basin to Macaé, Río de Janeiro, has added 5-million-cubic-meter-per-day of gas flow to the Río de Janeiro and São Paulo markets.

BRASPETRO, the international operating subsidiary of PETROBRAS, continued producing natural gas in the Gulf of Mexico. The gas was recovered from the Frederick Field, 27 km off the Louisiana coast by Petrobrás América Inc., a subsidiary of BRASPETRO.

In 1995, petroleum production averaged 719,904 barrels per day, or 262.8 million barrels, while natural gas production amounted to 22.8 million cubic meters. In 1995, Brazil's imports of petroleum were 223.4 million barrels at a cost of $3.5 billion; of this total Saudi Arabia supplied 75% and the remainder was supplied by Algeria, Argentina, Kuwait, Nigeria, and Venezuela.

Uranium.—Brazil contains the fifth largest uranium reserves in the world. Reserves in 1995 amounted to about 163,000 t of U_3O_8 and 92,000 t of inferred reserves. Private interests are permitted to participate in uranium exploration and production in Brazil through state-owned joint ventures; however, there is a restriction that no more than 20% of the country's uranium reserves may be exported.

Reserves

In 1995, Brazil was among the world leaders in reserves of the following mineral commodities, by rank: columbium (niobium) (1); talc and pyrophyllite (3); bauxite (4); iron ore (5); manganese (5); and tin (6). *(See table 3.)*

Infrastructure

In 1995, Brazil's railroads comprised 25,268 km of 1.000-meters (m) gauge, 4,339 km of 1.600-m gauge, 74 km of 1.600- to 1.000-m gauge, 13 km of 0.760-m gauge, and 2,308 km electrified; a total of 32,002 km. The country contained a total of 1,448,000 km of roads: 48,000 km paved and 1,400,000 km gravel and dirt. There was 50,000 km of navigable inland waterways. The major shipping ports were Belém, Manaus, Porto Alegre, Recife, Río de Janeiro, Río Grande, Salvador, and Santos. Among the 271 ships were: 56 tankers, 15 chemical tankers, 10 liquefied natural gas, 14 combination ore and oil, 82 bulk, and 2 combination bulk vessels. There were 2,000 km of crude petroleum pipelines, 3,804 km of refined petroleum product pipelines, and 1,095 km of natural gas pipelines. In 1994, Brazil's installed electrical generating capacity was 52,865 megawatts. Total production of electric power for the year was 202,280 gigawatt hours, which translated into 1,340 kilowatt hours per capita.

Power investment negotiations were underway between the Brazilian Government and five companies, four of which were foreign subsidiaries. The companies involved were Alcan Aluminio do Brasil, S.A. (Canada), Alcoa Aluminio, S.A. (United States), Billiton Metais, S.A. (Netherlands), Dow Química, S.A. (United States), and the Brazilian company Camargo Corréa Industrial, S.A. The proposal submitted by the five companies was to build a 1,200-MW dam on the Tocantins River on the border between Maranhão and Tocantins States. A Billiton spokesperson stated that the dam construction would cost approximately $1 billion and that Billiton has pledged $350 million. The companies all have been receiving electricity from the Tucurui Dam on the Tocantins River, but the demand has been increasing at such a rapid rate that the demand could exceed the supply in a very few years. Another factor was the 10% subsidy on electricity prices that expires in the year 2004.

During the past several years, the lack of funding has led to a significant deterioration in the quality of Brazilian highways. A recent World Bank study found that 28% of the country's highways was in bad condition versus only 10% in the early 1980's. Another study found that the lack of proper maintenance of Brazilian roads added 10% to 15% to the total transportation costs in the country.

A study by the IBS found that the loading of 1 ton of steel at the Port of Santos cost $32.50. In comparison, the average cost of loading 1 ton of steel in Asian, European, and U.S. ports was $4.50. At the Ports of Rio de Janeiro and Vitória, the costs exceeded $10.00 per ton of steel.

The ports of Brazil were found to require heavy investments in modernization and expansion. The bottlenecks resulting from the lack of capacity were so great that Brazilian importers paid almost $300 million in penalties charged by ships that had to wait in line to be unloaded.

Constran, S.A. Construção e Comércio of the Itamaraty Group, of the private sector of Brazil, plans to construct 1,718 km of additional railroads linked to the existing railroad system. The cost of the new system was projected to be $2.5 billion. This addition will connect to the existing system, which runs through Vitória, Espírito Santo; Belo Horizonte, Minas Gerais; Santos, São Paulo; and Chapadao do Sul, Mato Grosso do Sul. The new railroad system will run from Chapadao do Sul, Mato Grosso do Sul, to Cuiabá, Mato Grosso, and Santarem, Pará, branching from Cuiabá, Mato Grosso, to Porto Velho, Rondônia.

Outlook

Brazil established a favorable climate for potential foreign investors by keeping inflation under control, reducing public deficit along with improvements in its external debt, providing stable rules for capital repatriation and profit remittances, reducing the tax burden, and recently reviewing its 1988 Constitution. Clearly, the flow of foreign capital into the Brazilian economy would support continued economic growth. A factor that may have a negative effect over the longer term is the environment, especially in the Amazon rain forest. Much depends on what approaches are used to protect the environment and to continue within a path of sustainable development.

Brazil's new currency, the “Real,” introduced on July 1, 1994, curbed inflation from 50% per month by June 1994 to about 2% at yearend and economic growth was about 4.2%. Most sectors of the Brazilian economy recorded positive growth during 1995, the mineral sector increased 3.1%, and if that positive rate of economic growth is sustained into 1996 and beyond, the minerals sector, for instance, should continue its recovery as the demand for mineral exports and steel intensive goods increase.

Brazil's economic plan for stabilization "Plano Real," in comparison to past plans, was based on constitutional reviews and privatization of state-owned companies to increase capital flow into the country. There were no price freezes and the “Real Plan” relied solely on macroeconomics to achieve its goals, and on strict control of the domestic deficit, issuance of the “Real,” stable foreign exchange rates, renegotiation of its international debt on favorable terms, and reduction of tariffs and nontariff barriers should position Brazil for a brighter and better future.

Foreign direct investment into the Brazilian mining industry appears to be enhancing exploration and mine development activities, particularly in gold. This is because

of Government's aggressive economic policies, Brazil's diversified minerals endowment, skilled labor, and its constitutional reform that eliminated restrictions on foreign investment in this sector, in particular. Therefore, these policy changes are enhancing the prospects of new mining projects and stimulating the return of major international mining companies to Brazil. This trend should continue as several corporations are already acquiring exploration properties and mining prospects, particularly for gold, and new investors are showing interest in the Brazilian mineral industry.

In the mineral industries, the steel industry was privatized and the petrochemicals and mining sectors are going towards privatization. However, new projects in the petroleum sector will be open up to joint ventures. The giant mining firm CVRD, 51% Government and 49% private, is scheduled for privatization in early 1997, but there is resistance in the Brazilian Senate. According to the Institute of Brazilian Issues and the Fundação Getúlio Vargas, Senators from the north and the northeast of Brazil see CVRD as a large regional development agency, and others, such as Senator Vilson Kleinubing suggested that CVRD is going to be sold to make new CVRDs. However, if this privatization is implemented, CVRD will be able to expand investments and production in several mine projects in the near future.

Privatization of state-owned firms has led to lower employment levels and greater efficiencies; as a result, the Brazilian economy became more competitive in the global economy. Privatization of Government monopolies, dismantling all trade barriers, and increased exports to the world markets will continue to be important, allowing continued inflow of fresh capital into the Brazilian economy.

Improvements and additional infrastructure will have a direct bearing on Brazilian industries in the foreseeable future. The planned Ferronorte railroad system and modernization of existing ports should augment Brazil's ability to increase industrial production and competitiveness. The sectors most likely to be affected are those that depend most heavily on electricity and transportation facilities. The aluminum, auto, steel, petrochemical, and pulp and paper industries, which depend heavily on energy and on exports, will benefit most from new and improved infrastructures. Estimates indicate that the current Brazilian network will require $4 billion investment over the next 10 years. Foreign majority participation in direct mining operations and foreign investment in new infrastructure have been barred by the Brazilian Constitution of 1988. However, the constitutional amendment to eliminate the distinction between domestic and foreign capital should eliminate these restrictions once fully implemented.

As the barriers to foreign investments continue to fall, foreign interests will increase, because Brazil is a country with great mineral potential. The Amazon region alone is considered to have possibilities for major undiscovered mineral deposits, as suggested by the large reserves of iron ore, manganese, bauxite, gold, and tin in Carajás, Pará, already producing under CVRD.

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[1]Where necessary, values have been converted from Brazilian cruzeiros (Cz$) to U.S. dollars at the rate of R$0.9725=US$1.00.

Major Sources of Information

Comissão Nacional de Energia Nuclear
Rua General Severianao
90 Botáfogo-ZC-02
22290-Rio de Janeiro-RJ-Brasil
Companhia de Pesquisa de Recurso Minerais
Avenida Pasteur 404-Anexo, 2º Andar, Pria Vermelha
22290-Rio de Janeiro-RJ-Brasil
Conselho de Não-Ferrosos e de Siderurgia
Esplanados dos Ministerios-Bloco 6-5º Andar
70053-Brasilia-DF-Brasil
Conselho Nacional do Petróleo
SGAN-Q.603 Modulos J, I e H
70830-Brasilia-DF-Brasil
Instituto Brasileiro de Mineração
Avenida Afonso Pena, 3880 3º, 4º e 5º Andares
30000-Belo Horizonte-MG-Brasil
Departamento Nacional de Produção Mineral
Ministério da Minas e Energia
SAN-Quadra 01-Bloco "B"
70040-Brasilia-DF-Brasil
Petróleo Brasileiro, S.A.
Avenida República do Chile, 65
20035-Río de Janeiro-RJ-Brasil
Rio Doce Geológica e Mineração, S.A.
Avenida President Wilson 11º Andar
22030-Rio de Janeiro-RJ-Brasil

Major Publications

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TABLE 1
BRAZIL: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/		1991	1992	1993	1994	1995 e/
METALS						
Aluminum:						
Bauxite, dry basis, gross weight		10,400,000	9,366,000	9,669,100 r/	8,673,000 r/	11,370,000 3/
Alumina		7,420,000	1,833,000	1,853,000	1,868,000	1,870,000
Metal:						
Primary		1,140,000	1,193,000	1,172,000 r/	1,185,000 r/	1,180,000 3/
Secondary		62,000 e/	66,000	62,000	90,000 r/	90,000
Beryllium, beryl concentrate, gross weight		850 e/	850	850	900 e/	900
Cadmium, metal, primary		200 e/	200	200	300 e/	300
Chromium:						
Crude ore		142,460	198,000	127,000 r/	149,000 r/	175,000 3/
Concentrate		86,749	98,588	86,759 r/	85,879 r/	86,000
Marketable product 4/		62,500	64,000	63,000 r/	62,500 r/	62,500
Cobalt: e/						
Mine output, Co content by hydroxide		400	400	400	400	400
Metal, electrolytic		240	240	240	240	180
Columbium-tantalum ores and concentrates, gross weight:						
Columbite and tantalite		290 e/	200	180	180 e/	180
Djalmaite concentrate e/		10	10	10	10	10
Pyrochlore concentrate, Cb_2O_5 content		30,500	17,807 r/	10,010 r/	15,240 r/	23,890 3/
Copper:						
Mine output, Cu content		37,947	39,845	43,568	39,674	49,000 3/
Metal:						
Primary		141,443	157,950	161,102 r/	170,027	165,000
Secondary		37,035	52,244	54,000 r/	54,290 r/	54,000
Gold:						
Mine output	kilograms	34,053	39,044	39,894 r/	40,188 r/	42,000
Garimpeiros (independent miners)	do.	55,525	37,000 r/	30,000	30,347 r/	30,000
Total	do.	89,578	76,044 r/	69,894 r/	70,535 r/	72,000
Iron and steel:						
Ore and concentrate (marketable product): 5/						
Gross weight	thousand tons	151,500	146,447	150,000 r/	168,000 r/	186,000 3/
Fe content		98,800	95,200	104,000	108,800 r/	131,000 3/
Metal:						
Pig iron	thousand tons	22,700	23,200	24,000	25,200	25,200
Ferroalloys, electric-furnace:						
Chromium metal e/		37	37	37	37	37
Ferrocalcium silicon		21,700	22,800	22,000 e/	25,000 e/	25,000
Ferrochromium		82,225	91,100	83,892	77,105	77,100
Ferrochromium silicon		4,524	6,760	4,500	5,000 e/	5,000
Ferrocolumbium		19,000	16,300	19,000	19,000 e/	19,000
Ferromanganese		169,103	178,937	201,500 r/	494,000 r/	130,000 3/
Ferromolybdenum		47	--	47	47 e/	47
Ferronickel		34,069	33,500	34,000 e/	34,000 e/	34,000
Ferrophosphorus		864	800	800 e/	2,000 e/	2,000
Ferrosilicon		190,864	243,838	284,147	270,000 r/	270,000
Ferrosilicon magnesium		10,200	10,600	10,000 e/	15,000 e/	15,000
Ferrosilicon zirconium		102	104	102	1,500 e/	1,500
Ferrotitanium		12	4	126	500 e/	500
Ferrotungsten		1	--	1	25 e/	25
Ferrovanadium		41	--	--	3,000 e/	3,000
Inoculant		24,400	20,900	24,500	25,000 e/	25,000
Silicomanganese		272,046	299,995	248,000 r/	248,000 r/	167,000 3/
Silicon metal		106,002	93,734	106,000	110,000 e/	110,000
Total		935,237 r/	1,019,409	1,038,652 r/	1,329,214 r/	884,209
Steel, crude, excluding castings		22,617	23,934	25,207	25,747	25,076 3/
Semimanufactures, flat and nonflat e/		25,000	25,000	25,000	25,000	25,000
Lead:						
Mine output, Pb content		7,273	2,517 r/	117 r/	806 r/	1,000
Metal:						
Primary		22,023	24,500	27,500 r/	14,602 r/	15,000
Secondary		42,000	38,267	47,027 r/	34,530 r/	35,000

See footnotes at end of table.

TABLE 1--Continued
BRAZIL: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/		1991	1992	1993	1994	1995 e/
METALS--Continued						
Manganese metal: e/						
Primary		6,500	6,500	6,500	6,500	6,500
Secondary		1,600	1,600	1,600	1,600	1,600
Manganese ore and concentrate, marketable, gross weight 4/		2,000,000	1,703,000 r/ 3/	1,837,000 3/	2,100,000 r/ 3/	2,390,000 3/
Nickel:						
Mine output, Ni content		26,376	29,372 r/	32,154 r/	32,663 r/	33,000
Ferronickel, Ni content		8,620	8,742	8,683 r/	8,815 r/	9,000
Rare-earth metals, monazite concentrate, gross weight e/		719 3/	770	770	770	770
Silver 6/	kilograms	154,000	162,000	103,000 r/	50,400 r/	55,000
Tin:						
Mine output, Sn content		29,253	27,500	27,000	22,500 r/	22,370 3/
Metal:						
Primary		25,776 r/	27,000 r/	26,900 r/	20,400 r/	20,500
Secondary e/		250	250	250	250	250
Titanium concentrates, gross weight:						
Ilmenite		69,064	76,558	90,567 r/	97,439 r/	97,500
Rutile		1,094	1,798	1,744 r/	1,911 r/	2,000
Tungsten, mine output, W content		223	205	245 r/	155 r/	200
Zinc:						
Mine output, Zn content		130,000	149,000 r/	171,800 r/	145,900 r/	150,000
Metal, smelter:						
Primary		157,462	180,414 r/	183,393 r/	187,304 r/	183,033 3/
Secondary		5,538	7,000	7,200 r/	7,000	7,000
Zirconium, zircon concentrate, gross weight 7/		18,590	16,874	13,252 r/	17,064 r/	17,100
INDUSTRIAL MINERALS						
Asbestos:						
Crude ore e/		3,950,000	2,900,000	3,950,000	3,950,000	3,950,000
Fiber		237,000	170,000	185,000	192,050 r/	208,000 3/
Barite:						
Crude		50,978	72,172	75,835 r/	48,287 r/	70,000
Beneficiated		46,784	54,490	32,068 r/	31,499 r/	32,000
Marketable product e/ 4/		65,000	65,000	65,000	65,000	65,000
Calcite		35,700 r/	31,074 r/	32,296 r/	32,798 r/	35,000
Cement, hydraulic	thousand tons	27,490	23,903 r/	24,843 r/	25,230 r/	25,500
Clays:						
Bentonite (beneficiated)		130,000	131,000	130,000	130,000	130,000
Kaolin:						
Crude		1,838,000	1,632,538 r/	1,560,000 r/	1,800,000 r/	1,800,000
Beneficiated		746,000	810,976	900,000 r/	953,000	1,000,000 3/
Marketable product e/ 4/		1,090,000 3/	1,100,000	1,100,000	1,100,000	1,100,000
Diamond: e/						
Gem	thousand carats	600	650	700	700	700
Industrial	do.	900	665	600	600	600
Total 8/	do.	1,500	1,315	1,300	1,300	1,300
Diatomite:						
Crude e/		32,000	35,000	35,000	35,000	35,000
Beneficiated		12,446	14,669 r/	15,669 r/	17,018 r/	17,000
Marketable product e/ 4/		13,100	13,100	13,100	13,100	13,100
Feldspar:						
Crude		119,286	202,632 r/	205,000 r/	205,000 r/	205,000
Feldspar, marketable product e/ 4/		122,000	122,000 3/	122,000	122,000	122,000
Leucite, marketable product e/ 4/		5,000	5,000	5,000	5,000	5,000
Sodalite, crude, marketable product e/ 4/		500	500	500	500	500
Total e/ 4/		127,500 r/	127,500	127,500	127,500	127,500
Fluorspar:						
Crude e/		300,000 3/	250,000	250,000	250,000	250,000
Concentrates, marketable product:						
Acid-grade		52,400	61,432	68,325 r/	68,890 r/	70,000
Metallurgical-grade		28,900	22,264	24,566 r/	21,041 r/	20,000
Total		81,300	83,696 r/	92,891 r/	89,931 r/	90,000

See footnotes at end of table.

TABLE 1--Continued
BRAZIL: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/		1991	1992	1993	1994	1995 e/
INDUSTRIAL MINERALS--Continued						
Graphite:						
Crude e/		650,000	650,000	650,000	650,000	650,000
Marketable product:						
Direct-shipping crude ore		7,298	8,957 r/	9,960	9,670 r/	10,000
Concentrate		26,965	29,414	29,472	35,965 r/	36,000
Total		34,263	38,371 r/	39,432 r/	45,635 r/	46,000
Gypsum and anhydrite, crude		966,651	887,742 r/	873,719 r/	788,877 r/	780,000 3/
Kyanite: e/						
Crude		750	750	750	750	750
Marketable product 4/		600	600	600	600	600
Lime, hydrated and quicklime	thousand tons	5,000	5,240	5,700 e/	5,700 e/	5,700
Lithium, concentrates e/		1,560 3/	1,600	1,600	1,600	1,600
Magnesite:						
Crude		879,477	1,001,724	974,161 r/	1,019,688 r/	1,000,000
Beneficiated		242,000	273,014	232,367	279,751	282,000 3/
Mica, all grades e/		5,080	7,000	7,000	7,000	7,000
Nitrogen, N content of ammonia e/		940,000	940,000	940,000	940,000	940,000
Phosphate rock including apatite:						
Crude: e/						
Mine product	thousand tons	27,000	27,000	27,000	27,000	27,000
Of which, sold directly	do.	35	35	35	35	35
Concentrate:						
Gross weight	do.	3,280	2,825 r/	3,419	3,937 r/	3,590
P_2O_5 content e/	do.	650	650	700	700	700
Pigments, mineral, other, crude e/		3,000	2,500	2,000	2,000	2,000
Potash, marketable (K_2O)		100,667	85,035 r/	173,368	242,343 r/	370,000 3/
Precious and semiprecious stones except diamond, crude and worked: e/						
Agate		3,000	3,000	3,000	3,000	3,000
Amethyst		1,000	1,000	1,000	1,000	1,000
Aquamarine		20	20	20	20	20
Citrine		100	100	100	100	100
Emerald		90	90	90	90	90
Opal		500	500	500	500	500
Ruby	value	$10,000	$10,000	$10,000	$10,000	$10,000
Sapphire	do.	$15,000	$15,000	$15,000	$15,000	$15,000
Topaz		50	50	50	50	50
Tourmaline		80	80	80	80	80
Other		500	500	500	500	500
Quartz crystal, all grades		1,930	1,604 r/	4,224 r/	3,963 r/	4,000
Salt:						
Marine	thousand tons	3,703	4,030	4,780 r/	4,670 r/	4,700
Rock	do.	1,200	1,231	1,400 r/	1,373 r/	1,400
Silica (silex) e/	do.	1,600	1,600	1,600	1,600	1,600
Sodium compounds: e/						
Caustic soda		1,050,000	1,050,000	1,050,000	1,050,000	1,050,000
Soda ash, manufactured (barilla)		200,000	200,000	200,000	200,000	200,000
Stone, sand and gravel: e/						
Dimension stone:						
Marble, rough-cut	cubic meters	200,000	200,000	200,000	200,000	200,000
Slate		50,000	50,000	50,000	50,000	50,000
Crushed and broken stone:						
Basalt	cubic meters	1,300,000	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 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 tons	60,000	60,000	60,000	60,000	60,000
Quartz 9/		250,000	250,000	250,000	250,000	250,000

See footnotes at end of table.

TABLE 1--Continued
BRAZIL: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/		1991	1992	1993	1994	1995 e/
INDUSTRIAL MINERALS--Continued						
Stone, sand and gravel e/--Continued:						
Crushed and broken stone--Continued:						
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		5,456	18,182	21,924 r/	20,708 r/	21,000
Pyrites		66,447	24,684	1,700 r/	153 r/	1,500
Byproduct:						
Metallurgy		163,576	184,057	183,529 r/	182,638 r/	183,000
Petroleum		46,826	58,513	58,582 r/	53,256 r/	55,000
Total		282,305	285,436	265,735 r/	256,755 r/	260,500
Talc and related materials:						
Talc:						
Crude		292,270	286,000 r/	320,000 r/	360,000 r/	360,000
Marketable product e/ 4/		1,960 3/	1,500	2,000	2,000	2,000
Pyrophyllite, crude		186,000	144,000 r/	160,000 r/	148,000 r/	150,000
Vermiculite						
Concentrate		11,031	11,615 r/	14,541 r/	16,000 r/	16,000
Marketable product 4/		2,206 r/	3,393 r/	3,514 r/	4,000 r/	4,000
MINERAL FUELS AND RELATED MATERIALS						
Coal, bituminous, marketable 4/	thousand tons	4,254	4,605 r/	4,581 r/	5,122	5,173 3/
Coke, metallurgical, all types	do.	162	143	227 r/	118 r/	200
Gas, natural, gross	million cubic meters	6,600	6,970	7,355 r/	7,756 r/	8,115 3/
Natural gas liquids e/	thousand 42-gallon barrels	12,900 3/	13,000	13,000	13,000	13,000
Petroleum:						
Crude	do.	236,000	228,000	234,792 r/	243,831 r/	257,127 3/
Refinery products: 10/						
Gasoline	do.	146,000	146,000 e/	134,000	126,000 e/	126,000
Jet fuel	do.	20,400	20,500 e/	19,000	17,800 e/	17,800
Kerosene	do.	1,540	1,540 e/	1,450	1,370 e/	1,370
Distillate fuel oil	do.	171,000	171,000 e/	157,000	149,000 e/	149,000
Lubricants	do.	4,870	4,900 e/	4,350	4,120 e/	4,120
Residual fuel oil	do.	90,900	90,900 e/	83,000	79,000 e/	79,000
Other	do.	68,900	69,000 e/	63,400	60,000 e/	60,000
Refinery fuel and losses	do.	23,700	23,700 e/	21,800	20,600 e/	20,600
Total		527,310	527,540 r/ e/	484,000	457,890	457,890

e/ Estimated. r/ Revised.

1/ Table includes data available through May 1996.

2/ 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 levels.

3/ Reported figure.

4/ Direct sales and/or beneficiated (marketable product).

5/ Includes sponge iron as follows, in thousand metric tons: 1991-94--260; and 1995--270 (estimated).

6/ 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: 1991--73,000 (revised); 1992--21,170 (revised); 1993--20,650 (revised); 1994--14,760 (revised); and 1995--15,000 (estimated).

7/ Includes baddeleyite-caldasite.

8/ Figures represent officially reported output plus official Brazilian estimates of output by nonreporting miners.

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

10/ Figures represent officially reported production to the United Nations (Energy Statistics Yearbook) by the Ministry of Mines and Energy of Brazil.

TABLE 2
BRAZIL: STRUCTURE OF THE MINERAL INDUSTRY FOR 1995

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum		Albras-Aluminio Brasileiro S.A. (ALBRAS) [Government, 26%; private, 25%; Nippon Amazon Aluminum Co. (NAAC), 49%]	Belem, Para State (smelter)	160 (metal).
Do.		Alcan Aluminio do Brasil S.A. (Alcan Aluminum Ltd., 100%)	Saramenha, Minas Gerais State (refinery)	150 (alumina).
Do.		Alcan Aluminio Poços de Caldas (ALUCALDAS) (Alcan Aluminio do Brasil S.A., 100%)	Pocos de Caldas, Minas Gerais State (mine)	1,000 (bauxite).
Do.		Alcoa Aluminio S.A. (ALUMAR) (Aluminum Co. of America, 60%; Billiton International Metals B.V., 40%)	Pocos de Caldas, Minas Gerais State (mine) Sao Luis, Maranhao State (refinery) (smelter)	400 (bauxite). 550 (alumina). 174 (metal).
Do.		Aluminio do Brasil Nordeste S.A. (Alcan Aluminum Ltd., 100%)	Aratu, Bahia State (smelter)	58 (metal).
Do.		Billiton Metais S.A. (Billiton International Metals B.V., 100%)	Sao Luis, Maranhao State (refinery)	375 (metal).
Do.		Compahnia Brasileira de Aluminio (CBA) (private, 100%)	Pocos de Caldas, Minas Gerais State (mine) Sorocaba, Sao Paulo State (refinery) (smelter)	1,000 (bauxite). 170 (alumina). 170 (metal).
Do.		Compahnia Geral do Minas (private, 21%; Aluminum Co. of America, 79%)	Pocos de Caldas, Minas Garais State (refinery) (smelter)	275 (alumina). 90 (metal).
Do.		Mineraçao Rio do Norte S.A.(MRN) (Government, 24%; private, 32%; Alcan Empreendimentos Ltda., Billiton International Metals B.V., 10%; Norsk Hydro Comercio e Industria, 5%; Reynolds Aluminio do Brasil, 5%)	Oriximina, Para State (mine)	8,000 (bauxite).
Do.		Vale do Sul Aluminio S.A. (Government, 27%; private, 25%; Shell do Brasil S.A., 44%; Reynolds Metals Co., 4%)	Santa Cruz, Rio de Janeiro State (smelter)	86 (metal).
Chromite		Coitezeirio Mineraçao S.A. (COMISA) (private, 75.4%; 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) (beneficiation plant)	370 (ore). 292 (concentrate).
Copper		Companhia Brasileira do Cobre (CBC) (private, 100%)	Cacapava do Sul, Rio Grande do Sul State (mine) (beneficiation plant)	1,000 (ore). 1,800 (concentrate).
Do.		Mineraçao Caraiba Ltda. (private, 100%)	Jaquarari, Bahia State (mine) (beneficiation plant)	3,000 (ore). 5,700 (concentrate).
Columbium		Companhia Brasileira de Metalurgia e Mineracao (CBMM) (private, 55%; Molycorp, Inc., 45%)	Araxa, Minas Gerais State (mine) (beneficiation plant)	1,200 (ore). 44.
Do.		Mineracao Catalao de Goias Ltda. (private, 68.5%; Anglo American Corp. do Brasil, 31.5%)	Ouvidor, Goias State (mine)	500 (ore).
Ferroalloys		Companhia Brasileira Carbureto de Calcio (CBCC) (private, 100%)	Santos Dumont, Minas Gerais State (plant)	54.
Do.		Companhia Ferro-Ligas de Bahia S.A. (FERBASA) (private, 100%)	Pojuca, Bahia State (plant)	194.
Do.		Companhia Ferro-Ligas Minas Gerais (MINASLIGAS) (private, 100%)	Pirapora, Minas Gerais State (plant)	58.
Do.		Companhia Paulista de Ferro-Ligas (private, 100%)	Barbacena, Caxambu, Jeceaba, Passa Quatro and Passa Vinte, Minas Gerais State; Corumba, Matto Grosso do Sul State; and Xanxere, Santa Catarina State (seven plants)	326.
Do.		Italmagnesio S.A. Indústria e Comercio (private, 100%)	Braganca Paulista, Sao Paulo State; and Varzeada Palma, Minas Gerais State (two plants)	63.
Gold	kilograms	Companhia de Mineraçao e Participaçoes (CMP) (private, 100%)	Lourenco, Amapa State (mine) Currais Novos, Rio Grande do Norte (mine)	1,080 (ore). 300.
Do.	do.	Mineraçao Morro Velho S.A. (private, 50%; Anglo American Corp. do Brasil, 50%)	Novo Lima, Raposos, and Sabara, Minas Gerais State; and Jacobina, Bahia State (four mines)	2,000.
Do.	do.	Sao Bento Mineraçao S.A. (Gencor Indústria e Comercio Ltda., 49%; Amcor S.A., 29.4%; Amcor Metals Ltda., 21.6%	Santa Barbara, Minas Gerais State (mine)	500.
Iron ore		Companhia Vale do Rio Doce (CVRD) (Goverrntment, 51%; private, 49%)	Serra dos Carajas, Para State; and Itabira, Ouro Preto, and Santa Barbara, Minas Gerais State (four mines)	91,000
Do.		Ferteco Mineraçao S.A. (FERTECO) (Exploration und Bergbau Gmbh, 100%)	Ouro Preto and Brumadinho, Minas Gerais State (two mines)	12,800.
Do.		Mineraçoes Brasileiras Reunidas (MBR) (private, 85.3%; Mitsui e Co. Ltd. 14.7%)	Novo Lima and Itibirito, Minas Gerais State (two mines)	31,500.
Do.		Samarco Mineraçao S.A. (Samarco) (private, 51%; Broken Hill Properties Ltd., 49%)	Mariana, Minas Gerais State (mine)	11,700.

TABLE 2--Continued
BRAZIL: STRUCTURE OF THE MINERAL INDUSTRY FOR 1995

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Iron ore--Continued:	S.A. Mineraçao da Trindade (SAMITRI) (private, 100%)	Mariana, Rio Piracicaba, Itabira, Ouro Preto and Sabara; Minas Gerais State (five mines)	9,300.
Lead	Mineraçao Boquira S.A. (private, 100%)	Boquira, Bahia State (mine)	300 (ore).
		(beneficiation plant)	310 (concentrate).
Manganese	Companhia Vale do Rio Doce (CVRD) (private 49%; Government 51%)	Corumba, Minas Gerais State (mine)	2,500 (ore).
		Serra dos Carajas, Para State (beneficiation plant)	1,000 (concentrate).
Do.	Indústria e Comercio de Minerios S.A. (ICOMI) (private, 100%)	Macapa and Mazagao, Amapa State (two mines)	1,500 (ore).
		(beneficiation plant)	800 (concentrate).
Nickel	Companhia Niquel Tocantins (private, 100%)	Niquelandia, Goias State (mine)	150 (ore).
Steel	Aco Minas Gerais S.A. (AÇOMINAS) (private, 100%)	Rodovia, Minas Gerais State	2,000.
Do.	Companhia Aços Especiais Itabira (ACESITA) (Government, 90.9%; private, 9.1%)	Timoteo, Minas Gerais State (stainless steel plant)	600.
Do.	Companhia Siderúrgica Belgo - Mineira (private, 100%)	Joao Monlevade, Minas Gerais State	1,000.
Do.	Companhia Siderúrgica de Tubarao (CST) (private, 100%)	Serra, Espirito Santo State	3,000.
Do.	Companhia Siderurgia Nacional (CSN) (private, 100%)	Volta Redonda, Rio de Janeiro State	4,600.
Do.	Companhia Siderurgica Paulista (COSIPA) (private, 100%)	Cubatao, Sao Paulo State	3,900.
Do.	Usinas Siderurgicas de Minas Gerais S.A. (USIMINAS) (private, 100%)	Ipatinga, Minas Gerais State	4,400.
Tin	Mineraçao Jacunda Ltda (private, 100%)	Santa Barbara, Novo Mundo, and Potosi; Rondonia State (six mines)	108 (ore).
		(three beneficiation plants)	450 (concentrate).
Do.	Paranapanema S.A. Mineraçao, Industria e Construçao (private, 100%)	Aripuana, Mato Grosso State; Ariquemes, Rondonia State; Novo Aripuana and Presidente Figueiredo, Amazonas State; and Sao Felix do Xingu, Para State (five mines)	5,420 (ore).
		(two beneficiation plants)	1,400 (concentrate).
		Piraporada Bom Jesus, Sao Paulo State (refinery)	25 (metal).
Titanium	Rutilo e Ilmenita do Brasil S.A. (RIB) (private, 100%)	Mataraca, Paraiba State (mine)	4,200 (ore).
		(two beneficiation plants)	120 (concentrate).
Zinc	Companhia Minera de Metais (CMM) (private, 100%)	Vazante, Minas Gerais State (mine)	800 (ore).
		(beneficiation plant)	48 (concentrate).
Do.	do.	Tres Marias, Minas Gerais State (refinery)	72 (metal).
Do.	Mineraçao Areiense S.A.-MASA (MASA) (private, 100%)	Vazante, Minas Gerais State (mine)	400 (ore).
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).
Do.	do.	Prado, Bahia State (mine)	90 (ore).
		(three beneficiation plants)	123 (concentrate).
		(three separation plants)	90 (concentrate).
Asbestos	SAMA-Sociedade Anonima Mineraçao de Amianto (SAMA) (private, 100%)	Minacu, Goias State (mine)	9,000 (ore).
		(beneficiation plant)	230 (concentrate).
Cement	Cimento Santa Rita S.A. (private, 100%)	Itapevi, Sao Paulo State (plant)	1,000.
		Salto de Pirapora, Sao Paulo State (plant)	1,200.
Do.	Companhia Cimento Portland Itau (private, 100%)	Itau de Minas, Minas Gerais State (three plants)	2,400.
Do.	Companhia de Cimento Portland Paraiso (private, 100%)	States of Espirito Santo, Goias, Minas Gerais and Rio de Janeiro (five plants)	4,000.
Do.	Companhia de Cimento Portland Rio Branco (private, 100%)	Rio Branco do Sul, Parana State (two plants)	5,000.
Diamond	Mineraçao Tejucana S.A. (private, 100%)	Diamantina, Minas Gerais State (mine)	100.
Fluorspar	Mineraçao Nossa Senhora do Carmo Ltda. (private, 100%)	Morro da Fumaca and Pedras Grandes, Santa Catarina State (four mines)	180 (ore).
		(two beneficiation plants)	220 (concentrate).
Do.	Mineraçao Santa Catarina Ltda. (private, 100%)	Morro da Fumaca and Pedras Grandes, Santa Catarina State (four mines)	100 (ore).
		(beneficiation plant)	120 (concentrate).
Do.	Nacional de Grafite Ltda. (private, 100%)	Itapecerica and Pedra Azul, Minas Gerais State (three mines)	840 (ore).
		(two beneficiation plants)	720 (concentrate).

TABLE 2--Continued
BRAZIL: STRUCTURE OF THE MINERAL INDUSTRY FOR 1995

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Gypsum		CBE-Companhia Brasileira de Equipamento (CBE) (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) (beneficiation plant)	720 (ore). 360 (concentrate).
		Empresa de Mineraçao Horii Ltda. (Horii) (private, 100%)	Biritiba and Mogi das Cruzes, Sao Paulo State (two mines) (two beneficiation plants)	200 (ore). 180 (concentrate).
Limestone		Companhia de Cimento Portland Paraiso (private, 100%)	States of Goias, Minas Gerais, and Rio de Janeiro (five mines)	2,000.
Do.		Companhia de Cimento Portland Rio Branco (private, 100%)	Rio Branco do Sul, Parana State (three mines)	5,500.
Do.		S.A. Industrias Votorantim (private, 100%)	States of Rio de Janeiro, and Sao Paulo (four mines)	1,000.
Magnesite		Magnesita S.A. (private, 100%)	Brumado, Bahia State (one major mine and numerous small mines) (two beneficiation plants)	770 (ore). 820 (concentrate).
Phosphate rock		Arafertil S.A. (ARAFERTIL) (Government, 33.33%; private 66.67%).	Araxa, Minas Gerais State (mine)	5,000.
Do.		Copebras S.A.(Copebras) (private, 90.55%; Anglo American Corp. do Brasil, 9.45%)	Ouvidor, Goias State (mine)	4,400.
Do.		Fertilizantes Fosfatados S.A.-Fosfertil (FOSFERTIL) (Government, 100%)	Tapira, Minas Gerais State (two mines)	10,500.
Salt (rock)		Serrana S.A. de Mineraçao (Serrana) (private, 100%) Mineraçao e Quimica do Nordeste S.A. (Dow Produtos Quimicos Ltda., 100%)	Jacupiranga, Sao Paulo State (mine) Vera Cruz, Bahia State (mine)	6,000. 1,000.
Coal		Carbonífera Criciuma S.A. (private, 100%)	Circiuma and Sideropolis, Santa Catarina State (two mines)	4,000.
Do.		Companhia Carbonífera de Urussanga (CCU) (private, 100%)	Criciuma, Sideropolis, and Urussanga; Santa Catarina State (three mines)	7,200.
Do.		Companhia de Pesquisas e Lavras Minerais-Copelmi (COPELMI) (private, 100%)	Arroio dos Ratos, Butia, and Charqueadas; Rio Grande do Sul State (four mines)	5,700.
Petroleum	thousand 42-gallon barrels	Petróleo Brasileiro S.A. (PETROBRAS) (Government, 81.4%, private, 11.8%; public, 6.8%)	99 fields in the States of Alagoas, Amazonas, Bahia, Ceara, Espirito Santo, Rio de Janeiro, Rio Grande do Norte, Para, Maranhao, and Sergipe	220,000.
Petroleum products	do.	do.	11 refineries in the States of Amazonas, Bahia, Ceara, Minas Gerais, Parana, Rio de Janeiro, Rio Grande do Sul, and Sao Paulo	503,000.
Do.		Refinaria de Petróleo Ipiranga S.A. (private, 100%)	Ipiranga, Rio Grande do Sul	3,400.
Do.		Refinaria de Petróleos de Manguinhos S.A. (private, 100%)	Manquinhos, Rio de Janeiro State	3,650.

TABLE 3
BRAZIL: RESERVES OF MAJOR MINERAL COMMODITIES FOR 1995 1/

(Thousand metric tons unless otherwise specified)

Commodity		Reserves
Asbestos, fiber		3,000
Bauxite, ore		3,908,000
Chromite, Cr_2O_3		6,500
Coal, all types		32,283,000
Columbium, pyrochlore, and columbite ore		4,530
Copper, metal content		14,700
Fluospar, ore		8,000
Gold, metal	metric tons	800
Graphite, ore		56,000
Gypsum		677,000
Iron ore, 60% to 65% Fe content		20,000,000
Kaolin		1,700,000
Lead, metal content		365
Magnesite		180,000
Manganese, metal content		69,000
Natural gas 2/	million cubic meters	362,200
Nickel, metal content		6,000
Petroleum 2/	thousand 42-gallon barrels	11,000,000
Phosphate rock		277,000
Talc and pyrophyllite		178,000
Tin, metal content	metric tons	602,000
Titanium, TiO_2		5,890
Uranium, U_3O_8	metric tons	163,000
Zinc, metal content		5,000
Zirconium, ore		1,930

1/ Summário Mineral 1995.
2/ Petroleo Brasileiro, S.A. (PETROBRAS), 1996 Annual Report.