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MINERALS YEARBOOK

Area Reports: International 2005

Latin America and Canada

Volume III

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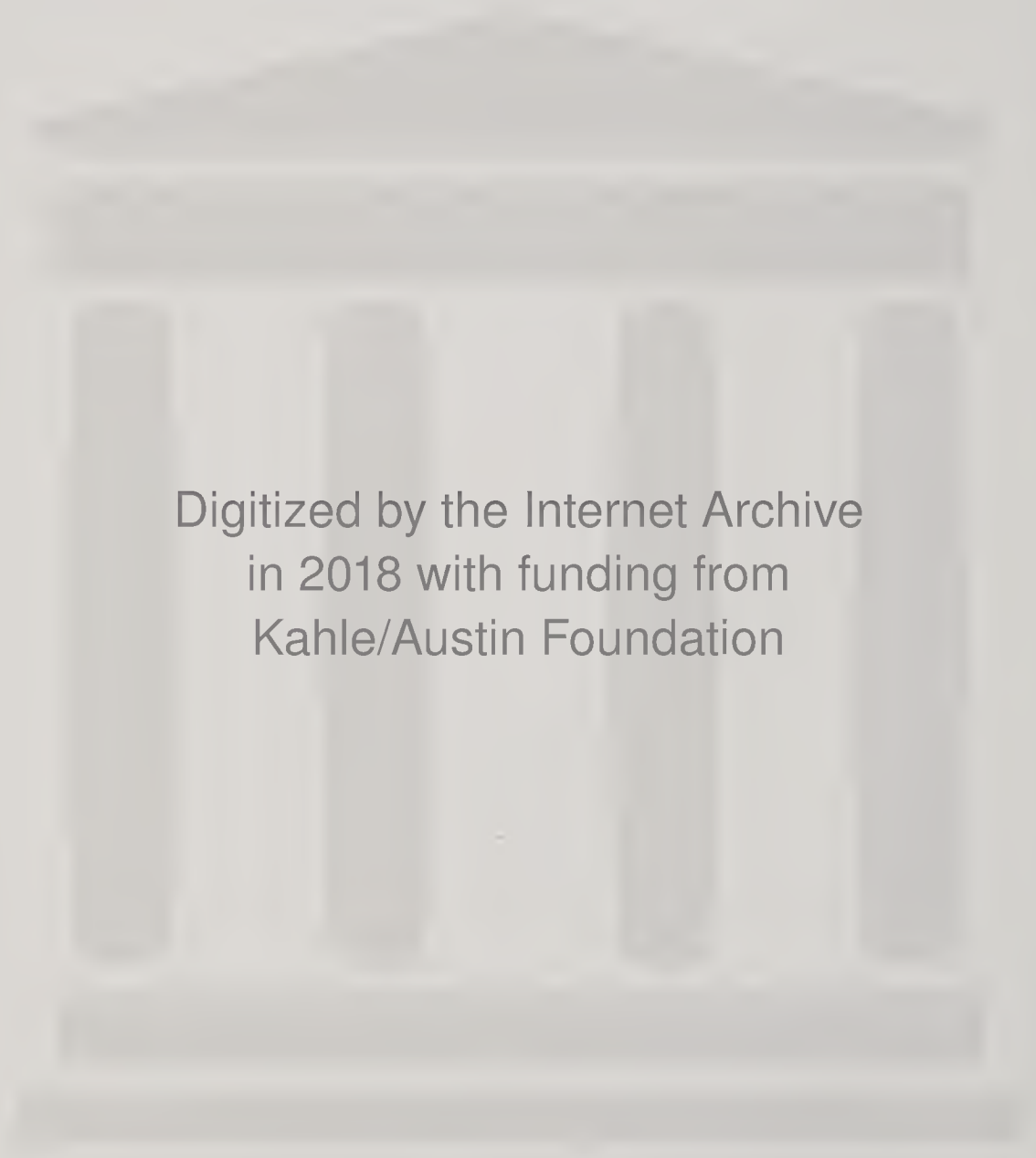

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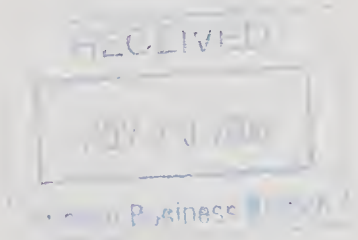

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U.S. GEOLOGICAL SURVEY
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Foreword

This edition of the U.S. Geological Survey (USGS) Minerals Yearbook discusses the performance of the worldwide minerals and materials industries during 2005 and provides background information to assist in interpreting that performance. Content of the individual Minerals Yearbook volumes follows:

- Volume I, Metals and Minerals, contains chapters about virtually all metallic and industrial mineral commodities important to the U.S. economy. Chapters on survey methods, summary statistics for domestic nonfuel minerals, and trends in mining and quarrying in the metals and industrial mineral industries in the United States are also included.
- Volume II, Area Reports: Domestic, contains a chapter on the mineral industry of each of the 50 States and Puerto Rico and the Administered Islands. This volume also has chapters on survey methods and summary statistics of domestic nonfuel minerals.
- Volume III, Area Reports: International, is published as four separate reports. These regional reports contain the latest available minerals data on more than 190 foreign countries and discuss the importance of minerals to the economies of these nations and the United States. Each report begins with an overview of the region's mineral industries during the year. It continues with individual country chapters that examine the mining, refining, processing, and use of minerals in each country of the region and how each country's mineral industry relates to U.S. industry. Most chapters include production tables and industry structure tables, information about Government policies and programs that affect the country's mineral industry, and an outlook section.

The USGS continually strives to improve the value of its publications to users. Constructive comments and suggestions by readers of the Minerals Yearbook are welcomed.

Mark D. Myers, Director

Contacts

Information about the U.S. Geological Survey, its programs, staff, and products may be accessed on the World Wide Web at URL http://www.usgs.gov or by contacting the Earth Science Information Center at 1-888-ASK-USGS. For specific information about this publication, contact the Chief, International Minerals Section, Minerals Information Team, at (703) 648-7732, or the Team secretary at (703) 648-4961. Additional minerals information may be accessed on the World Wide Web at URL http://minerals.usgs.gov/minerals.

Acknowledgments

The Country Specialists in the Minerals Information Team, U.S. Geological Survey, in preparing the International Review regional books of volume III of the Minerals Yearbook, extensively use statistics and data on mineral production, consumption, and trade provided by various foreign Government minerals and statistical agencies through various official publications. The cooperation and assistance of these organizations are gratefully acknowledged. Statistical and informational material was also obtained from reports of the U.S. Department of State, United Nations publications, and the domestic and foreign technical and trade press. Of particular assistance were reports submitted by the Resource Reporting Officers and other officers of the Department of State in U.S. Embassies worldwide. Their contributions are sincerely appreciated. Internal statistical support was provided by the staff of the Data Collection and Coordination Section of the Minerals Information Team.

The regimes of some countries reviewed in this volume may not be recognized by the U.S. Government. The information contained herein is technical and statistical in nature and is not to be construed as conflicting with or being contradictory of U.S. foreign policy.

John H. DeYoung, Jr.
Chief Scientist, Minerals Information Team

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The Mineral Industries of Latin America and Canada

By Ivette E. Torres, Steven T. Anderson, Omayra Bermúdez-Lugo, Yolanda Fong-Sam, Alfredo C. Gurmendi, Glenn J. Wallace, and David R. Wilburn

The 33 independent countries and 13 territories in Latin America (which includes the Caribbean) and Canada covered in this volume encompass an area of 30.5 million square kilometers. The region, which is three times the size of the United States, had a population of 598 million, or 9% of the world total, in 2005 (U.S. Central Intelligence Agency, 2006§[1]; World Bank, The, 2006§).

A number of countries in Latin America and Canada were major producers and exporters of mineral and fuel commodities. Such countries as Argentina, Brazil, Canada, Chile, Cuba, Jamaica, Mexico, Trinidad and Tobago, and Venezuela derived a significant portion of their economic strength, export revenues, and direct foreign investment from the production and export of mineral and/or fuel commodities. In 2005, Latin America and Canada accounted for about 53% of the world's total mine output of copper and about 45% of the mine output of silver. The region also contributed about one-third of the world's mine production of nickel and zinc and 23% of the mine output of iron ore and lead. The region was rich in mineral resources and continued to attract a significant portion of the world's exploration capital.

Acknowledgments

The U.S. Geological Survey (USGS) acknowledges and thanks the following organizations for providing mineral-production statistics, basic economic data, and exploration and mineral-related information:

- Argentina—Secretaría de Minería de la Nación and Dirección Nacional de Minería;
- Barbados—Ministry of Energy and Public Utilities;
- Belize—Geology and Petroleum Department;
- Bolivia—Viceministerio de Minería y Metalurgia and Asociación Nacional de Mineros Medianos;
- Brazil—Departamento Nacional de Produção Mineral;
- Canada—Natural Resources Canada;
- Chile—Corporación Nacional del Cobre de Chile, Comisión Chilena de Cobre, and Servicio Nacional de Geología y Minería;
- Colombia—Unidad de Planeación Minero Energética and Instituto Colombiano de Geología y Minería;
- Dominican Republic—Dirección General de Minería;
- Ecuador—Ministerio de Energía y Minas and Dirección Nacional de Minería;
- El Salvador—Dirección de Hidrocarburos y Minas;
- Guatemala—Ministerio de Energía y Minas, Dirección General de Minería, and Departamento de Desarrollo Minero;
- Honduras—Dirección Ejecutiva de Fomento a la Minería;
- Jamaica—Mines and Geology Division of the Ministry of Agriculture and Lands;
- Mexico—Servicio Geológico Mexicano and Secretaría de Economía;
- Nicaragua—Administració de Recursos Geológicos and Dirección de Minas;
- Peru—Ministerio de Energía y Minas; and
- Trinidad and Tobago—Ministry of Energy & Energy Industries.

General Economic Conditions

In 2005, the gross domestic product (GDP) of Latin America and Canada based on purchasing power parity was about $5,600 billion. Latin America's real GDP increased by 4.5%, which was higher than the world's GDP growth rate of 3.4%. Canada's real GDP increased by 2.9%. The real GDP of Venezuela and Argentina grew significantly, by 9.3% and 9.2%, respectively, as both countries continued to recover from recent economic recessions. In the Caribbean, Cuba and the Dominican Republic reported increases in the real GDP of 11.8% and 9.3%, respectively. Brazil and Mexico, which were the two leading economies of Latin America, grew at a pace similar to or lower than that of Canada, or by 2.3% and 3.0%, respectively. Brazil and Mexico contributed 47% of Latin America and Canada's GDP in terms of purchasing power parity during the year (table 2; Economic Commission for Latin America and the Caribbean, 2006c, p. 14; International Monetary Fund, 2006§).

Latin America and Canada continued to benefit from strong international prices for raw materials and petroleum, low interest rates and inflation, a healthy world economy, and expansion of its export volumes. Canada, which was one of the world's leading mineral producers, benefited in particular from the strong prices of copper, potash, and uranium. High nonfuel and petroleum prices had varying effects on the region's economies. On the one hand, high petroleum prices had a positive impact on the economies of petroleum exporting countries, such as Mexico and Venezuela, because of low inventories and high world demand for these commodities. On the other hand, a number of countries in the region were net importers of fuel commodities and their trade balances were negatively affected by the high prices. Latin America's economy, in general, enjoyed an increase in domestic demand fueled by increased employment, low inflation, and fiscal revenues (Economic Commission for Latin America and the Caribbean, 2005, p. 9; 2006b, p. 26; 2006c, p. 9; International Monetary Fund, 2006§; Natural Resources Canada, 2006§).

[1]References that include a section mark (§) are found in the Internet References Cited section.

Investment Data and Political Risk

In 2005, foreign direct investment (FDI) in Latin America and the Caribbean (excluding financial centers) increased by 11% to $68 billion compared with that of 2004. This level, however, was significantly lower than that experienced during the period between 1990 and 2000 when rapid economic changes and privatization policies were the leading factors in an FDI upturn. In 2005, South America received about $44.5 billion in FDI, of which $20.4 billion went to the Mercado Común del Cono Sur (MERCOSUR), $16.9 went to the Andean Community, and $7.2 went to Chile. During the year, Mexico's FDI was $17.8 billion; this was a decrease from that of 2004. Still, Mexico received the largest amount of net inflow of FDI in Latin America, followed by Brazil ($15.1 billion) and Colombia ($10.2 billion). A significant portion of Colombia's FDI went to petroleum and natural gas exploration and production. Chile's main areas of FDI were mining, transportation and communication, and electricity. About 20% of Argentina's FDI in 2005 was for the acquisition of the cement producer Loma Negra, S.A; this company held almost 50% of the country's cement market share. In Ecuador, the largest investment was in the petroleum sector; in Peru, the largest investment was in mining, although significant activity continued in hydrocarbons. In Venezuela, FDI reached $2.9 billion, which was almost double that of 2004, despite changes in policies that were aimed at increasing the Government's participation in the hydrocarbons sector at the expense of reducing the profit of private foreign investors. The only country that saw a significant decrease in the inflows of FDI was Bolivia, whose inflows of FDI had been declining since 2000 (-$279.6 million in 2005). This continuing decline in FDI was attributed to the political and social instability of recent years and the announcement by the new Government of its intent to nationalize the hydrocarbons sector (Economic Commission of Latin America and the Caribbean, 2006a, p. 10, 22-23, 26, 30).

A large portion of the investment in mining in Latin America was in gold. However, investments were also being made in other projects of importance in the area for a variety of mineral commodities. In Bolivia, several operations were scheduled for completion by 2010, and the Mutun iron and steel project was scheduled to be completed in 2011. Of the operations scheduled to open by 2010, the San Cristobal lead, silver, and zinc property was expected to have the highest level of investment. Most of the investment in the mining sector in Chile continued to be for copper, although the largest single project, which was scheduled for completion by 2010, was the Pascua-Lama copper, gold, and silver property (a binational project with Argentina). Although most of the investment in Central America was for gold and silver, in Guatemala, the Fenix nickel project was scheduled for completion in 2009; about 90% of the project was owned by a Canadian company.

The United States was the leading foreign investor in the region, followed by the Netherlands, Spain, and France. More than 50% of FDI was in services, followed by manufacturing and natural resources (Economic Commission of Latin America and the Caribbean, 2006a, p. 21).

Legislation

Despite the Federal Government of Argentina's efforts to develop mining in the country, another Argentine Province passed a law to ban the use of cyanide in metal production in 2005. Law No. 3981 of the Province of Rio Negro passed in July was similar to law No. 5001 of the Province of Chubut, which passed in 2003.

Brazil's legal framework for implementation of the Kimberley Process Certification Scheme (KPCS) consists of a specific KPCS law adopted in 2003 (law No. 10743 of October 9, 2003) and regulations, such as regulation No. 397 of October 13, 2003; regulation No. 209 of August 5, 2005, and implementing regulation No. 295 of September 1, 2005. After violent clashes between garimpeiros and indigenous peoples in 2004, Brazil suspended diamond mining on indigenous lands. The Brazilian Government was attempting to clarify the status of garimpeiro mining through several measures. A draft Garimpeiro Law (Projecto de Lei No. 7505 de 2005) was under consideration by the Brazilian Congress. The draft law would establish a legal framework for garimpeiro activity in Brazil and identify garimpeiro rights and obligations (Departamento Nacional de Produção Mineral, 2006§).

During the year, the Government of Chile passed a new tax regulation specific to mining. The regulation, which was to become effective in January 2006, establishes a scaling tax rate based on the value of earnings by a company or group of companies; the tax rate starts at 0.5% as the value of the company's or group's production reaches a level equivalent to the value of 12,000 metric tons (t) of copper and increases to 5% as the value of its production reaches a level equivalent to the value of 50,000 t of copper.

In April, Mexico's Official Gazette published several modifications to the 1992 Mining Law. As part of the changes, the Consejo de Recursos Minerales became the Servicio Geológico Mexicano. With the change, the new decentralized entity was responsible for the geology, geophysics, geochemistry, and mining information of the country. Other changes to the Law included changes to the list of minerals covered under the Law, and simplification and updating of administrative requirements. Legislation of the Mexican mining sector was geared toward increased investment. Mining and exploration leases in Mexico were being granted in less than 6 months, and leases were freely tradable. Regional and commodity exploration restrictions were lifted as a result of this legislation (Flores, 2005).

At yearend, the Government of Venezuela created the Compañía Nacional de Industria Básica. The new company, which was under the authority of the Ministerio de Industrias Básicas y Minería, was to be a Government consortium in charge of the administration of the 16 companies that make up the Corporación Venezolana de Guayana (C.V.G.), which was the holding company responsible for the development of the Guayana region. The C.V.G. companies produced bauxite, alumina, aluminum, gold, iron ore, and other mineral commodities (Agencia Bolivariana de Noticias, 2005§). The creation of the Compañía Nacional de Industria Básica was one of many changes that were being considered or implemented in

Venezuela. A new national mining company that would produce mainly diamond and gold was being contemplated. Also, the Government was planning to begin participation in the mining industry as a majority partner in all mining activities.

Exploration

According to Metals Economics Group (MEG), Latin America maintained its position as the top destination for proposed exploration capital, and its share of the world's exploration budget increased to about 23% in 2005 from 21.8% in 2004 (Metals Economics Group, 2005). Based on data compiled by the USGS, Latin American countries with the greatest exploration activity were, in descending order by the number of sites for which data were compiled, Mexico, Peru, Brazil, Argentina, and Chile. Gold attracted about 55% of total exploration activity, but interest in base metals reached 27% and silver achieved about 12% of the total. Investment in 2005 was primarily used to further define newly discovered resources (74%), conduct further exploration at a producing site (9%), and conduct feasibility studies of promising deposits (8%). Table 3 shows selected exploration projects that were considered significant based on the amount of activity or exploration expenditures incurred in 2005.

The Andean countries of Argentina, Bolivia, Chile, and Peru continued to attract mineral exploration activity because of their promising geology and successful production history. Investment for mineral exploration and development during the next 5 years was expected to reach $4.5 billion in Argentina, and $10 billion each in Chile and Peru (Turner, 2005§). Copper, gold, and silver projects received the most interest. Several large deposits were being developed, most notably Barrick Gold Corp's Pascua-Lama gold deposit, which at an elevation of about 4,600 meters (reported as 15,000 feet) requires the removal of glacial ice prior to mining. Environmental concerns for this region typically were focused on the use of cyanide in gold ore treatment and water contamination issues. Exploration projects of note based on their level of drilling included Minera Andes Inc.'s San Jose gold-silver deposit (Argentina), Quadra Mining Limited's Sierra Gorda copper-molybdenum deposit (Chile), and several gold-silver-base metal deposits in Peru. The number of exploration claims that had been approved in Chile totaled about 29,000, and accounted for 12% of the country's territory (Mining Magazine, 2006).

As had been the pattern for many years, exploration activity in Mexico focused on gold and silver. Gammon Lake Resources, Inc. began development of its Ocampo gold-silver project. Large-scale drilling for base metals, gold, and silver continued to expand resources at new sites and in areas adjacent to producing sites.

The discovery of several large gold deposits in Peru during the past decade has been followed by aggressive exploration in the country. Higher metals prices encouraged extensive exploration in 2005 for base metals, gold, and silver in Peru. Three copper projects that had 2005 exploration budgets greater than $5 million were Chariot Resources Limited's Marcona project, Peru Copper Inc.'s Toromocho project, and Xstrata Copper Corp.'s Las Bambas project. Peruvian silver projects with extensive 2005 exploration included the Berenguela project of Silver Standard Resources Inc., the Corani project of Bear Creek Mining Corp., and the Morococha project of Pan American Silver Corp. Cambior Inc. also conducted extensive work at its La Arena project in Peru.

Statistics released by the Canadian Government in March 2005 showed anticipated 2005 exploration spending in Canada of $930 million,[2] which was up by 3% from an expenditure of $900 million in 2004 (Natural Resources Canada, 2005§). MEG reported budgeted exploration spending in Canada for 2005 was $929 million, or about 19% of the estimated total worldwide exploration expenditures.

Domestic exploration budget allocations as reported by the Canadian Government were greatest in Ontario (about 28% of the country's total exploration and deposit appraisal budget), Quebec (19%), Nunavut (14%), British Columbia (10%), and the Northwest Territories (10%) (Natural Resources Canada, 2005§). Canadian Provinces or Territories with more than a 20% increase in exploration activity in 2005 compared with 2004 (based on reported budget estimates) were Alberta, New Brunswick, Newfoundland and Labrador, Manitoba, Nova Scotia, and the Yukon Territory. The Province and the Territory with estimated reductions in their exploration budgets for 2005 were British Columbia and Nunavut, respectively. Canadian Provinces or Territories with the greatest exploration activity were, in descending order by number of sites as compiled by the USGS, Ontario, British Columbia, Quebec, Nunavut, and Saskatchewan. Based on the site data, exploration for gold accounted for approximately 52% of Canadian exploration; copper accounted for about 16%; diamond, 15%; nickel, 10%; and lead and zinc, about 3%. Approximately 94% of all reported exploration sites were considered early-stage sites.

In 2005, the amount of exploration attributed to nonproducing sites was about 68% of the total anticipated exploration expenditure (Natural Resources Canada, 2005§). The share of junior exploration companies reached 50% of total expenditures for the first time since 1988. Anticipated spending was primarily for gold, base metals, and diamond (in order of value). Canadian gold exploration activity based on the number of sites in 2005 for which data were collected focused primarily on British Columbia, Ontario, and Quebec; diamond exploration focused on the Northwest Territories, Nunavut, Quebec, and Saskatchewan. In recent years, De Beers Consolidated Mines Limited spent up to 40% of its US$100 million exploration budget in the search for diamond in Canada although that figure was expected to shrink dramatically in 2006 (Mining Review Africa, 2005). Noteworthy exploration projects in Latin America and Canada that were active in 2005 are listed in table 3.

Commodity Overview

This section summarizes the potential developments and production and consumption trends for leading mineral commodities in Canada and Latin America. The region's share

[2]Where necessary, values have been converted from Canadian dollars (Cn$) to U.S. dollars (US$) at the rate of Cd$1.1468=US$1.00.

of world production of selected commodities is listed by mineral commodity in table 4.

Estimates for production of major mineral commodities for 2007 and beyond have been based upon supply-side assumptions, such as announced plans for increased production and new capacity construction and bankable feasibility studies. The outlook tables in this summary chapter show historic and projected production trends; therefore, no indication is made about whether the data are estimated or reported and revisions are not identified. Data on individual mineral commodities in tables in the individual country chapters are labeled to indicate estimates and revisions. The outlook segments of the mineral commodity tables are based on projected trends that could affect current (2005) producing facilities and on planned new facilities that operating companies, consortia, or Governments have projected to come online within indicated timeframes. Forward looking information, which includes estimates of future exploration, mine development, production, cost of capital projects, and lead times to start operations, are subject to a variety of risks and uncertainties that could cause actual events or results to differ significantly from expected outcomes. Projects listed in the following section are presented as an indication of industry plans and are not a USGS prediction of what will occur.

Metals

Aluminum.—Only four countries in Latin America and Canada produced primary aluminum in 2005. Of these, Canada was the leading producer in the region with 54% of the total. Brazil, the second leading producer, contributed 28% of the total. The other two producers were, in decreasing order of output, Venezuela and Argentina. Latin America and Canada, which from 2000 to 2005 increased its primary aluminum production by 16%, contributed 16% of the world output and was expected to increase its production by 57% by 2011 (tables 4, 6). Production capacity increases were planned in all producing countries in the region; Brazil led the growth with plans to double its production by 2011 by increasing its aluminum production capacity by 1.5 million metric tons per year (Mt/yr). Much of the new production in Brazil was expected to come from Alcoa Alumínio S.A. (Alcoa) as part of the expansions of the Alumar project, which included the proposed Juruti bauxite mine in the State of Para, the expansion of the Sao Luis alumina refinery and aluminum smelter in the State of Maranhao, and the rehabilitation of the Pocos de Caldas smelter in the State of Minas Gerais. The remaining planned expansion was by Companhia Brasileira de Alumínio (CBA) (Departamento Nacional de Produção Mineral, 2006, p. 50-51).

Bauxite and Alumina.—Latin America was a significant producer of bauxite, and the region's output increased by about 35% from 2000 to 2005 (table 5). Latin America produced 27% of the world total and two countries in the region (Brazil and Jamaica) ranked among the top five bauxite producers in the world. Brazil and Jamaica combined produced about 74% of Latin America's bauxite output. In addition, four other countries—Dominican Republic, Guyana, Suriname, and Venezuela—produced bauxite during the year (table 5). Jamaica's production increased by about 6% and production from Suriname increased by about 17% from that of 2004. Production from Venezuela was estimated to have increased slightly. The Dominican Republic, which was the smallest producer in Latin America, reported a significant increase in production to 534,555 t in 2005 from that of 2004 when production was 79,498 t. The country reported the resumption of bauxite production (6,481 t) in 2003; production had ceased in 1982. It was not clear if all of the production was from new mining or a combination of new production and production from stockpiled material.

Production of bauxite in Latin America was expected to increase significantly in the near future and into 2011. A large portion of the increase was expected to come from Brazil where three new mines were scheduled to begin production in the next 3 years. Paragominas [a new mine that was owned by a subsidiary of Companhia Vale do Rio Doce (CVRD)] was scheduled to come onstream in the State of Para in 2007 with a capacity of 4.5 Mt/yr. Alcoa was developing the Juruti project, which was also located in the State of Para, and was scheduled to begin commercial mining operations in 2008. Juruti's production capacity was expected to reach 10 Mt/yr. CBA was planning to develop a new mine in the State of Minas Gerais. This mine, which was scheduled to begin operating in 2006, was expected to have a capacity of 1 Mt/yr (Departamento Nacional de Produção Mineral, 2006, p. 50-51). Additional production also was expected in Jamaica, although the increase would be significantly lower than that of Brazil. Other countries in the region were expected to increase their bauxite output modestly.

Copper.—Mine production of copper in Latin America and Canada increased by less than 1% from that of 2004, but by about 21% from that of 2000. The reason for the small increase in 2005 was that production from Chile, which was the world's leading producer, decreased by almost 2%. Latin America's output represented 51% of the world's output, and Chile accounted for about 35% of the world's output (tables 4, 8). Against a background of strong copper prices and higher demand for copper, especially in China, copper production was expected to increase in Latin America and Canada at a rate of about 1.7% per year to 2011. Chile's production was anticipated to increase by about 3% by 2007, and to remain at the same level until 2011. For other copper producing counties in the region, mine production of copper was expected to increase at a higher rate. In Argentina, which is a country that has been producing copper for several decades, production of copper was expected to almost double with the opening of a new mine in the Province of Catamarca; the mine could come onstream in 2009. In Brazil, production was expected to almost double by 2007 and to triple by 2011 because CVRD planned to open two new projects—Alemao and Cristalino—in Carajas, State of Para, in 2007 and 2010, respectively, and Mineraçao Maracá Industria e Comercio S.A. was scheduled to open a new mine in the State of Alto Horizonte in 2006 (Companhia Vale do Rio Doce, 2006§).

Six countries in Latin America and Canada produced refined copper in 2005; most of it was primary. Chile, which was the world's leading producer of refined copper, contributed about 63% of the region's total and 17% of the world's output. Production of refined copper in Latin America and Canada

was expected to increase by 6% in 2007 and by 15% in 2009, respectively, from that of 2005. Production of refined copper in Chile was expected to increase by 6% in 2007 and by 10% by 2009 and to remain unchanged from 2009 to 2011. As with mine production, output of refined copper from Brazil was expected increase dramatically by 2011. The country's copper refining capacity was expected to increase following the completion of CVRD's Corpo 118 and Salobo copper projects, which were expected to produce a combined 36,000 t of copper cathode in 2008 and 200,000 t of copper cathode in 2010. Almost all other producing countries were expected to increase production, although at lower levels that those expected for Brazil.

Production of refined copper from Mexico was expected to increase by 15% in 2007 and by 27% in 2011 from that of 2005 as two new solvent extraction-electrowinning (SX-EW) producers come onstream. The Milpillas Mine of Industrias Peñoles, S.A. de C.V. and the Piedras Verdes Mine of Frontera Copper Corp. are located in the State of Sonora and were expected to begin production in 2006 (Industrias Peñoles, S.A. de C.V., 2007, p. 24; Frontera Copper Corporation, 2006§). Refined production from Peru was expected to increase slowly to 540,000 t in 2011. Peru's increase would result from capacity expansion in several refineries and SX-EW plants.

Gold.—Latin America and Canada produced 23% of the world's gold output, and more than 20 countries contributed to this production (tables 4, 10). Peru and Canada were the first and second ranked producers, respectively, in the region. In 2005, Peru and Canada were among the world's 10 leading producers, ranking fifth and eighth, respectively, and contributed almost 60% of the regional production (table 10; George, 2006§). Production from Peru was expected to grow moderately after almost quadrupling during the past decade. In Canada, where production was decreasing because new production was insufficient to replace output from large mines that had closed recently, production was expected to increase moderately as a result of recent increased interest in exploration that was encouraged by the continued strong price of gold (table 10; Chevalier, 2006, p. 21-23). In general, mine production of gold in Latin America and Canada was expected to increase by about 25% by 2010. The largest increases were expected to come from Argentina, Brazil, Chile, and Venezuela; in addition, the Pueblo Viejo Mine, which was located in the Dominican Republic, was expected to reopen after years of remaining idle.

A significant portion of the new regional gold production was expected to come from the Pascua-Lama binational project, which is located on the border between Argentina and Chile. Exploration activity had increased dramatically in recent years in Argentina and several gold projects, which included the Gualcamayo, the Manantial Espejo, the Pirquitas, and the San Jose, were expected to significantly increase national gold production. In Venezuela, official gold production in recent years increased modestly despite years of development work at Las Cristinas by several international companies. Although the future of the Las Cristinas project continues to be uncertain, production from the planned mine, which was awaiting the final environmental permit to begin construction, could double Venezuela's official gold production.

Iron Ore and Iron and Steel.—In terms of iron content of ore, Brazil was the world's leading producer with more than 185 Mt, which represented 79% of the Latin America and Canada total. Canada and Venezuela were the second and third ranked producing countries in the region. Together, these two countries produced about 14% of the region's total. In terms of gross weight, the region produced 23% of the world output (table 4). Production in Latin America and Canada, in terms of iron content, was expected to increase at a rate of about 3% per year though 2011; Brazil was expected to provide the largest potion of the increase owing to CVRD's expansion of Minas Carajas in the State of Para and the Brucutu Mine in the State of Minas Gerais, although the company was in the process of closing the Caue Mine in the State of Minas Gerais, which had produced more than 1 billion metric tons of ore during its 64 years of operation. The Brucutu Mine was expected to start production in 2006 at a rate of 12 Mt/yr of iron ore (almost 8 Mt/yr in terms of iron content). Production from the mine was scheduled to reach production rates of 23 Mt/yr of iron ore (15 Mt/yr in terms of iron content) in 2007 and 30 Mt/yr of iron ore (almost 20 Mt/yr in terms of iron content) when the mine reaches full capacity in 2008 (Companhia Vale do Rio Doce, undateda§, b§). In addition, Mineraçoes Brasileiras Reunidas S.A. (MBR), which was a subsidiary of CVRD, recently opened the Capao Xavier, the Capitao de Mato, and the Tamandua Mines in the State of Minas Gerais where production was expected to reach 32 Mt/yr sometime between 2006 and 2007. MBR's principal markets were China, Japan, and the Republic of Korea. Exports of iron ore to China were expected to continue to increase.

Companhia Siderúrgica Nacional, which was Brazil's third ranked producer of steel, had plans to increase the iron ore production capacity of the Casa de Pedra Mine to 40 Mt by 2007 from 15.5 Mt (20.4 Mt run-of-mine). The expansion was part of the company's $820 million investment plan, which included expansion of its iron pellet capacity and its coal port facilities (Companhia Siderúrgica Nacional, 2005, p. 11, 22, 25).

Production of iron ore in Canada decreased in 2005 as a result of a 14-week strike at the Wabush Mines. Aided by the ongoing rehabilitation of the eight processing lines of Iron Ore Co. of Canada's concentration plant, Canadian iron ore production capacity was expected to increase moderately though 2011.

In the past few years, the continued demand for iron ore resulted in significant international price increases. In Venezuela, C.V.G. Ferrominera del Orinoco, C.A., which was the Government-owned iron ore producer, renegotiated its export price with Ternium (a subsidiary of Grupo Techint); Ternium was the majority owner of Siderúrgica del Orinoco C.A., which was Venezuela's leading steel producer (The Techint Group, 2006). Ferrominera was working on expanding its production capacity to 30 Mt/yr of iron ore. The company was constructing a concentration plant that would produce 8 Mt/yr of high-grade ore, which would allow the company to produce and beneficiate iron ore that originated from some of its large low-grade mines (less than 55% iron) in the San Isidro region that were not in production. With these efforts, Venezuela's iron ore output could exceed Canada's output.

Latin America and Canada contributed about 8% of the world's production of crude steel (tables 4, 12). By far, the

leading producer in the region was Brazil with 11 producers, followed by Canada (estimated), Mexico, Argentina, and Venezuela. These countries produced 94% of the region's total. Production of steel in Latin America and Canada was expected to increase at an annual average rate of less than 3% between 2005 and 2011. The largest expansion was expected to come from Brazil with 23%, followed by Canada (18%), and Mexico (14%).

Brazil's production of steel was expected to increase by about 14% by 2007. One of the reasons for the increase was that the country's leading producer, Gerdau S.A., planned to construct a specialty steel mill in the State of Rio de Janeiro, which would more than double the company's capacity in the State to 2.6 Mt/yr. The new mill would supply steel mainly to the domestic automotive market. In addition, the company was planning to expand the capacity of its Consigua mill by 600,000 metric tons per year (t/yr) (Gerdau, S.A., 2004).

In 2005, Latin America was a net exporter of iron and steel. The region's apparent consumption of rolled steel products decreased slightly. The per capita apparent consumption of finished steel products averaged 92.2 kilograms (kg). The highest per capita consumption was in Mexico (168.1 kg) followed by Trinidad and Tobago (167.1 kg), Chile (127.6 kg), Costa Rica (106.4 kg), and Venezuela (101.6 kg) (Instituto Latinoamericano del Fierro y el Acero, 2006).

Lead.—Latin America and Canada produced about 17% of the world's mined lead in 2005 (table 4). Peru was the leading producer in the region with almost 10% of the world output and more than 50% of the regional production, followed by Mexico and Canada, which produced about 23% and 14% of the region's total, respectively. Production from Latin America and Canada continued to decrease when compared with the region's output of 1990, 1995, and 2000. Between 2000 and 2005, Canada's output decreased by almost 47%. The downward trend of the region was minimized, however, by increased lead production from Peru, which grew by almost 70% when compared with that of 1990 and by 18% when compared with that of 2000. The overall downward trend of region's mined lead production of the past 15 years was expected to be reversed with a projected increase in the lead production capacity in several countries that would result in a 25% increase in capacity by 2011. Production from Peru was expected to continue to increase, as well as was that from Canada and Mexico, although the production of Canada and Mexico was not expected to reach the levels achieved in the 1990s, particularly Canada.

In terms of individual country significance, Bolivia's lead production capacity was expected to increase by more than threefold with the opening of Apex Silver Mines Limited's San Cristobal Mine. Production from this mine in Southern Bolivia was expected to begin in 2007 and would more than double Bolivia's production of lead, compared with 2005 (Apex Silver Mines Limited, undated§).

Five countries in Latin America and Canada produced primary refined lead and six produced secondary refined lead. They contributed about 10% of the total world production of primary and secondary refined lead; 95% of the primary refined lead came from Peru, Canada, and Mexico, and 81% of the secondary production originated in (in decreasing order of output) Canada, Mexico, and Brazil (tables 14, 15). Production of refined metal in the region was expected to increase because of low world stock levels and expected increased demand (Teck Cominco Limited, 2007, p. 3).

Nickel.—Six countries mined nickel in Latin America and Canada and contributed to about 33% of world production (table 4). In the region, Canada and Cuba were the leading producing countries, although expansions in the production capacities of Brazil and Colombia brought their production levels up significantly so that their production exceeded that of Cuba in 2005; production from the Dominican Republic increased more modestly. Nickel production from Venezuela began in 2000. Canada was the world's third ranked producer of mine nickel; its production in 2005 was about 40% of Latin America and Canada's total (table 16). Colombia's production was estimated to account for 16% of the region's output and that of Brazil and Cuba, about 15% each. Brazil's production represented a 64% increase from that of 2000; most of the increase was in 2005. Production increases from Brazil and Canada were expected to result in a 20% increase in production from the region by 2011.

During 2005, the nickel market was tight. It was characterized by historically low inventories and a demand that outpaced supply (Anglo American plc, 2005b§).

In August, the highly anticipated Voisey's Bay project began producing nickel in Canada's Province of Newfoundland and Labrador. Production from this mine was expected to increase Canada's production by 31% in 2007. In the longer term, plans called for underground mining to begin by about 2018 (Voisey's Bay Nickel Company Limited, 2004§; Infomine Inc., 2006§).

Brazil's production of nickel was expected to increase with the development of Codemin S.A.'s two nickel projects, Barro Alto and Codemin II, which are located in Niquelandia in the State of Goias. Production from Barro Alto was scheduled to begin in 2010, with full capacity of 36,000 t/yr planned for 2011. In 2005, Barro Alto's feasibility study was being reviewed and was expected to be completed in 2006 (Anglo American plc, 2005a§; 2006§).

Platinum-Group Metals.—Only two countries, Canada and Colombia, produced platinum-group metals (PGM) in the Latin America and Canada region in 2005. Canada produced about 7% of the world's output of palladium and 3% of the world's output of platinum. Canada supplied about 90% of the region's estimated mine output of platinum and 100% of the reported mine production of palladium. Canada's production came from only one primary PGM mine and two byproduct producers. The country's PGM production capacity would increase with the planned development of an additional underground zone at the Lac des Iles Mine of North American Palladium Ltd. The deepening of the Lac des Iles Mine was expected to increase Canadian platinum output by about 35%. Production of platinum was expected to remain at the same level as that of 2005.

Zinc.—Latin America and Canada produced 29% of the world's mined zinc in 2005 (table 4). Peru was by far Latin America and Canada's leading producer of mined zinc, producing 43% of the region's total; it was the third ranked producer worldwide after China and Australia with 12% of total

production (table 19; Bi, 2007§). Since 2000, production in the region had increased by about 5% despite a large decrease in production from Canada (more than 30%), which was the second leading producer in Latin America and Canada. During the same 5-year period, production from Peru increased by 32% and Mexico, which was the third ranked producer in the region, recorded a 21% increase.

Mine production of zinc in Latin America was expected to increase to 3 Mt in 2007 with increases from Bolivia, Brazil, Canada, and Peru. Production capacity was expected to increase to 3.2 Mt by 2011. In Bolivia, mining was expected to increase despite concerns about the possibility of nationalization. Production increases were not expected from the active producers, however, but from Apex Silver's San Cristobal Mine, which was scheduled to begin operation in 2007. This new production would compensate in part for the decrease in production from Sinchi Wayra S.A. (a subsidiary of Glencore International AG), that was expected to result from a lack of investment in production and exploration owing to the uncertainty about the property's future. As a result of production from the San Cristobal mine, zinc production in Bolivia was expected to increase by about 39% from 2005 to 2011.

Although Brazil produced 6% of Latin America and Canada's zinc mine output, it was a net importer of zinc concentrates (tables 19, 20). The only zinc producer in Brazil was Votorantim Metais Zinco S.A., which was evaluating the potential of its Vazante deposit. Mine production from Brazil was expected to increase by 5% by 2007 and by 10% by 2011.

Canada produced about 24% of Latin America's mined zinc in 2005; however, the country's output was 16% lower than that of 2004 and 33% lower than that of 2000 (table 19). Despite the low production level in 2005, production from Canada was expected to return to the 2004 level and to remain at that level until 2011.

Mine production of zinc from Peru was expected to continue to increase at a slower pace than in recent years. Increased output from Volcán Minera S.A.A., which was the leading producer of mined zinc in Peru, was the reason for this increase. Production was expected to increase by 4% in 2007 and by 14% in 2011 compared with that of 2005.

Only five countries in Latin America and Canada produced refined zinc, and three of these countries produced only primary refined zinc. The region produced more than 30% of the world's production that was identified as primary refined zinc, but only a small amount of secondary refined zinc. Because a large amount of zinc production was not identified as primary or secondary, when all refined zinc production is accounted for, Latin America and Canada contributed only 14% of the world total (Bi, 2007§).

Production of refined zinc in Latin America and Canada was expected to increase by 2% per year to 2011. Peru, which was the region's leading producer of mined zinc, had the second lowest production of refined zinc in the region. Sociedad Minera Refinería de Zinc Cajamarquilla S.A., which was bought by Votorantim Metais Zinco of Brazil in 2004, was Peru's leading refined zinc producer and planned to double its refined zinc production capacity by 2008 (Bi, 2007§).

Industrial Minerals

Diamond.—Only four countries in Latin America and Canada produced diamond in 2005 (table 21). Regional production was estimated to be 13.1 million carats; of this, Canada produced almost 95%; Brazil, Guyana, and Venezuela produced the remainder. Canada was also the world's fourth ranked producer of natural diamond after Botswana, Russia, and Australia (Olson, 2006§). Canada's diamond production began in the late 1990s after the discovery of major kimberlite deposits in the 1980s. From 2000, diamond production in Canada has increased dramatically and was expected to continue to increase with three more mines coming into production in the near future. The Tahera Mine Corporation began construction of the Jericho Mine in the Territory of Nunavut in March 2005. By yearend, construction was nearly finished and commercial production was scheduled to begin in mid-2006. Production from the mine was expected to exceed 500,000 carats per year (Tahera Mine Corporation, 2006§, 2007§).

Two De Beers Canada mines were near production. The Snap Lake Mine, which is located 220 kilometers northeast of Yellowknife in the Northwest Territories, was to be the first De Beers mine outside of Africa and was expected to begin production in 2007. Production from this underground mine was expected to be 1.4 million carats per year. The other De Beers Canada project was the Victor project in James Bay, Ontario. Construction of the mine was expected to begin in 2006, and output from the open pit mine was expected to be 600,000 carats per year with a mine life of 12 years (De Beers Canada Inc., 2007a§, b§).

Diamond production in Brazil, which had significantly decreased since 2000 because of decreased production from garimpeiros, was expected to increase by 67% in 2007 and to more than triple by 2009 from that of 2005. Elkedra Diamonds NL had plans to begin production from the Chapada Alluvial Diamond Project in the State of Mato Grosso in 2006. The company planned eventually to produce 100,000 carats per year with an original mine life of 9 years, but continued its exploration program with the purpose of increasing reserves of the project (Elkedra Diamonds NL, undated§). Another company, Brazilian Diamonds Limited, was exploring properties that had previously been owned by De Beers. The company expected to reach a decision in 2007 on whether to begin large-scale dredging from one of these properties, Santo Antonio de Bonito (Brazilian Diamonds Limited, 2007§).

Estimated production from Guyana and Venezuela was expected to remain at the 2005 levels.

Phosphate Rock.—In terms of phosphorus pentoxide, the region of Latin America and Canada was a small producer (table 4). The leading producer in the region was Brazil, which produced 80% of the region's total; it was also the world's sixth ranked producer but produced only about 5% of the world's output. Canada was the second ranked producer in the region with 15% of the region's total and less than 1% of the world's total. Brazil's expansion was expected to increase by almost 13% by 2007 and by 22% by 2011. Fosfertil (which was the company that was formed from the merger of Fertilizantes Fosfatados S/A and Ultrafertil S/A in 2004) planned to expand

production capacity, and Bunge Brasil S.A. planned to increase its phosphate rock concentrate production capacity by 10% (table 21; Departamento Nacional de Produção Mineral, 2006, p. 165).

Production of phosphate rock from Canada was expected to decrease by 2007. This decrease was expected owing to the lower grade of the ore that was being mined from Kapuskasing Mine in Ontario (Agrium Inc., 2007, p. 4).

Peru was positioned to become a phosphate rock producer. In 2005, Brazil's CVRD won a bid to develop the Bayovar phosphate rock deposit in Piura, Peru. The terms of the concession called for a feasibility study to be completed in 2 years and for production to begin in 5 years. Under these terms, Peru would begin production in 2012. The company was considering an output of 3 Mt/yr of phosphate rock concentrate (Fertilizer Week, 2005).

Mineral Fuels and Related Materials

Coal.—Latin America and Canada produced only 2% of the world's coal production total (table 4). In the region, Canada was the leading producer of coal followed closely by Colombia. These two countries produced 83% of the region's total. Production from the region was expected to increase by less than 5% by 2007 but by 30% by 2011 (table 23). The majority of the increase was expected to come from Colombia and Venezuela where the expansion of mining capacity had been planned for years. Both the Colombian and the Venezuelan Governments proposed higher production-capacity expansions than those expected by coal industry analysts. Among the issues limiting the planned expansion was the infrastructure necessary to bring the coal to the export markets, which accounted for most of the coal produced in both countries.

Uranium.—Only two countries in Latin America and Canada produced uranium. Canada was by far the leading producer in the region with more than 99% of the total. The country was also the world leader in uranium production. Brazil was the other producer, although Argentina has produced uranium in the past and had announced plans to resume uranium production.

Production of uranium was expected to increase in Canada with the development of the Cigar Lake underground mine. Construction of the mine was approved in 2004 by the Canadian Nuclear Safety Commission. Production, which originally was planned to begin in 2007, was delayed until 2010 (Cameco Corporation, 2004§, 2007§).

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TABLE 1
THE AMERICAS: AREA AND POPULATION IN 2005[1]

	Area (square kilometers)	Estimated population (millions)
North America:		
Canada	9,984,670	32.3
Mexico	1,972,550	103
United States	9,826,630	296
Total	21,800,000	431
Central America and the Caribbean:		
Antigua and Barbuda	443	0.081
Aruba	193	0.101
Bahamas, The	13,940	0.323
Barbados	431	0.27
Belize	22,966	0.292
Bermuda	53	0.065
Costa Rica	51,100	4.33
Cuba	110,860	11.3
Dominica	754	0.072
Dominican Republic	48,730	8.895
El Salvador	21,040	6.88
Grenada	344	0.107
Guadeloupe	1,780	0.453
Guatemala	108,890	12.6
Haiti	27,750	8.59
Honduras	112,090	7.21
Jamaica	10,991	2.66
Martinique	1,100	0.436
Montserrat	102	0.009
Netherlands Antilles	960	0.183
Nicaragua	129,494	5.49
Panama	78,200	3.23
Saint Kitts and Nevis	261	0.048
Saint Lucia	616	0.166
Saint Vincent and the Grenadines	389	0.119
Trinidad and Tobago	5,128	1.31
Other[2]	16,385	4.07
Total	765,000	79.3
South America:		
Argentina	2,766,890	38.7
Bolivia	1,098,580	9.18
Brazil	8,511,965	186
Chile	756,950	16.3
Colombia	1,138,910	45.6
Ecuador	283,560	13.2
French Guiana	91,000	0.200
Guyana	214,970	0.751
Paraguay	406,750	6.16
Peru	1,285,220	28.0
Suriname	163,270	0.449
Uruguay	176,220	3.5
Venezuela	912,050	26.6
Total	17,800,000	375
Americas total	40,365,000	885
Share of world total	27	14
World total	149,000,000	6,438

[1]Table includes data available as of February 28, 2007. Population and totals are rounded to no more than three significant digits.

[2]Includes Anguilla, British Virgin Islands, Cayman Islands, Puerto Rico, Turks and Caicos Islands, and U.S. Virgin Islands.

Sources: U.S. Central Intelligence Agency, World Factbook 2006; World Bank,The, 2006 World Development Indicators database.

TABLE 2
THE AMERICAS: ECONOMY IN 2005[1, 2]

	Gross domestic product based on purchasing power parity		Real gross domestic product growth rate (percentage)
	Total (billion dollars)	Per capita (dollars)	
North America:			
Canada	$1,104.701	34,273	2.9
Mexico	1,072.563	10,186	3.0
United States	12,277.583	41,399	3.2
Total	14,500	XX	XX
Central America and the Caribbean:			
Antigua and Barbuda	0.938	11,523	5.0
Aruba	NA	NA	NA
Bahamas, The	6.524	20,076	2.7
Barbados	4.857	17,610	3.9
Belize	2.098	7,832	3.5
Bermuda	NA	NA	NA
Costa Rica	45.137	10,434	5.9
Cuba	NA	NA	NA
Dominica	0.468	6,520	3.4
Dominican Republic	65.042	7,627	9.3
El Salvador	31.078	4,518	2.8
Grenada	0.861	8,198	5.0
Guadeloupe	NA	NA	NA
Guatemala	57.000	4,155	3.2
Haiti	14.917	1,791	0.4
Honduras	21.740	3,009	4.2
Jamaica	11.657	4,381	1.4
Martinique	NA	NA	NA
Montserrat	NA	NA	NA
Netherlands Antilles	4.220	22,750	0.7
Nicaragua	20.996	3,636	4.0
Panama	23.495	7,283	6.4
St. Kitts and Nevis	0.609	14,649	6.7
Saint Lucia	1.062	6,444	5.4
Saint Vincent and the Grenadines	0.799	7,493	2.2
Trinidad and Tobago	18.352	14,258	7.9
Other[3]	NA	NA	NA
Total	332	XX	XX
South America:			
Argentina	533.722	14,109	9.2
Bolivia	25.684	2,724	4.1
Brazil	1576.728	8,561	2.3
Chile	193.213	11,937	6.3
Colombia	337.286	7,326	5.1
Ecuador	57.039	4,316	4.7
French Guiana	NA	NA	NA
Guyana	3.489	4,612	-3.0
Paraguay	28.342	4,888	2.9
Peru	167.212	5,983	6.4
Suriname	2.898	5,683	5.1
Uruguay	34.305	10,720	6.6
Venezuela	163.503	6,186	9.3
Total	3,120	XX	XX
Americas total	18,000	XX	XX
World total	61,028	XX	XX

NA Not available. XX Not applicable.

[1]Table includes data available as of February 28, 2007.

[2]Gross domestic product (GDP) based on purchasing power parity. Totals are rounded to no more than three significant digits.

[3]Includes Anguilla, British Virgin Islands, Cayman Islands, Puerto Rico, Turk and Caicos Islands, and U.S. Virgin Islands.

Source: International Monetary Fund, World Economic Outlook Database, September 2006.

TABLE 3
LATIN AMERICA AND CANADA: SELECTED EXPLORATION SITES IN 2005[1]

Location	Type[2]	Site	Commodity	Company	Resource[3]	Exploration[4]
Argentina	D	San Jose	Au, Ag	Minera Andes Inc.	288,000 oz Au, 15 Moz Ag	Extensive drilling.
Brazil	E	Araguaia	Ni	Falconbridge Ltd.	Data not released	Do.
Do.	E	Aripuanã	Zn	Karmin Exploration Inc.	Data not released	Do.
Do.	F	Jacobina	Au	Desert Sun Mining Corp.	2.3 Moz Au	Do.
Canada	E	Aviat	Diamond	Stornoway Diamond Corp.	Data not released	Extensive work program.
Do.	E	Bachelor Lake	Au	Halo Resources Ltd.	211,000 oz Au	Extensive drilling.
Do.	E	Black Fox	Au	Apollo Gold Corp.	457,000 oz Au	Do.
Do.	P	Casa Berardi	Au, Cu	Aurizon Mines Ltd.	1.7 Moz Au	Do.
Do.	E	Churchill	Diamond	Shear Minerals Ltd.	Data not released	Extensive work program.
Do.	E	Dundonald	Ni, Cu	First Nickel Inc.	22,000 t Ni, 14,000 t Cu	Extensive drilling.
Do.	D	East Amphi	Au	Richmont Mines Inc.	241,000 oz Au	Do.
Do.	E	Eleonore	Au	Virginia Gold Mines Inc.	Data not released	Extensive work program.
Do.	F	Fort a la Corne/Star	Diamond	Kensington Resources Ltd.	Data not released	Do.
Do.	F	Gahcho Kue	Diamond	De Beers Canada Exploration Inc.	Data not released	Do.
Do.	E	Galore Creek	Au, Ag, Cu	NovaGold Resources Inc.	5.9 Moz Au, 75 Moz Ag, 3 Mt Cu	Extensive drilling.
Do.	E	Gold Eagle	Au	Exall Resources Inc.	Data not released	Do.
Do.	F	Hope Bay	Au	Hope Bay Gold Corp.	2.1 Moz Au	Do.
Do.	P	Levack	Ni, Cu	FNX Mining Company Inc.	Data not released	Do.
Do.	E	McFinley	Au	Rubicon Minerals Corp.	do.	Do.
Do.	E	Meliadine West	Au	Comaplex Minerals Corp.	1.2 Moz Au	Do.
Do.	F	New Afton	Cu, Au, Ag	New Gold Inc.	742,000 t Cu, 1.8 Moz Au, 5.7 Moz Ag	Do.
Do.	E	Raglan South area	Ni, Cu, Co, PGM	Canadian Royalties Inc.	105,000 t Ni, 127,000 t Cu, 4,000 t Co, 1 Moz PGM	Do.
Do.	E	Rambler	Au, Cu	Rambler Metals and Mining plc.	Data not released	Do.
Do.	P	Red Lake	Au	Goldcorp Inc.	6.1 Moz Au	Do.
Do.	E	Renard area	Diamond	Ashton Mining of Canada Inc.	18 million carats diamond	Do.
Do.	F	Wolverine	Zn, Ag, Cu, Au, Pb	Yukon Zinc Corp.	544,000 t Zn, 51 Moz Ag, 52,000 t Cu, 244,000 oz Au, 71,000 t Pb	Extensive work program.
Chile	E	Sierra Gorda	Cu, Mo	Quadra Mining Ltd.	1.5 Mt Cu, 142,000 t Mo	Extensive drilling.
Colombia	F	Angostura	Au, Ag	Greystar Resources Ltd.	5.8 Moz Au, 24.6 Moz Ag	Do.
Ecuador	F	Mirador	Cu, Au, Ag	Corriente Resources Inc.	2.15 Mt Cu, 2.2 Moz Au, 18 Moz Ag	Do.
Do.	E	Quimsacocha	Au, Ag, Cu	Iamgold Corp.	2.8 Moz Au, 18 Moz Ag, 36,000 t Cu	Do.
French Guiana	F	Camp Caiman	Au	Cambior Inc.	1.1 Moz Au	Do.
Guatemala	E.	Cerro Blanco	Au, Ag	Glamis Gold Ltd.	1.27 Moz Au, 5.87 Moz Ag	Do.
Do.	F	Fenix	Ni	Skye Resources Inc.	154,000 t Ni	Do.
Do.	E	Sechol	Ni, Co	Jaguar Nickel Inc.	401,000 t Ni, 6,000 t Co	Do.
Guyana	E	Tassawini	Au	StrataGold Corp.	Data not released	Do.
Mexico	P	Bolivar	Zn, Ag, Au, Cu	Dia Bras Exploration Inc.	32,000 t Zn, 734,000 oz Ag, 4,700 oz Au, 9,000 t Cu	Do.
Do.	E	Campo Morado	Au, Ag, Cu, Pb, Zn	Farallon Resources Ltd.	962,000 oz Au, 60 Moz Ag, 83,000 t Cu, 211,000 t Pb, 522,000 t Zn	Do.
Do.	E	Cozamin	Cu, Ag	Capstone Gold Corp.	67,000 t Cu, 9.8 Moz Ag	Do.
Do.	P	Guanacevi	Ag	Endeavour Silver Corp.	4.8 Moz Au	Do.
Do.	D	Ocampo	Au, Ag	Gammon Lake Resources Inc.	2.8 Moz Au, 133 Moz Ag	Do.
Do.	P	Palmarejo	Au, Ag	Bolnisi Gold NL	495,000 oz Au, 70 Moz Ag	Do.
Do.	F	Peñasquito	Ag, Au, Zn, Pb	Western Silver Corp.	614 Moz Ag, 8.7 Moz Au, 4 Mt Zn, 1.7 Mt Pb	Do.
Do.	E	San Anton/Cerro del Gallo	Au, Ag, Cu	Kings Minerals NL	1 Moz Au, 44 Moz Ag, 117,000 t Cu	Do.

See footnotes at end of table.

TABLE 3--Continued
LATIN AMERICA AND CANADA: SELECTED EXPLORATION SITES IN 2005[1]

Location	Type[2]	Site	Commodity	Company	Resource[3]	Exploration[4]
Peru	E	Berenguela	Ag	Silver Standard Resources Inc.	66 Moz Ag	Extensive drilling.
Do.	E	Corani	Ag, Pb, Zn	Bear Creek Mining Corp.	44 Moz Ag, 220,000 t Pb, 64,000 t Zn	Do.
Do.	E	La Arena	Au, Cu	Cambior Inc.	536,000 oz Au	Do.
Do.	E	Las Bambas	Cu	Xstrata Copper Corp.	Data not released	Do.
Do.	E	Marcona/Mina Justa	Cu, Ag, Au	Chariot Resources Ltd.	2.5 Mt Cu, 50 Moz Ag, 428,000 oz Au	Do.
Do.	E	Morococha	Ag, Zn, Pb	Pan American Silver Corp.	11 Moz Ag, 65,000 t Zn, 30,000 t Pb	Do.
Do.	E	Toromocho	Cu, Ag, Mo	Peru Copper Inc.	8.6 Mt Cu, 400 Moz Ag, 293,000 t Mo	Do.
Suriname	P	Rosebel/Royal Hill	Au	Cambior Inc.	2.5 Moz Au (reserve)	Extensive work program.

[1]Abbreviations used in this table for commodities are as follows: Au, gold; Ag, silver; Co, cobalt; Cu, copper; Mo, molybdenum; Ni, nickel; Pb, lead; PGM, platinum-group metals; and Zn, zinc. Abbreviations used in this table for units of measurement are as follows: Moz, million troy ounces; Mt, million metric tons; oz, troy ounces; t, metric tons.
[2]D Approved for development; E Active exploration; F Feasibility work ongoing/completed; P Exploration at producing site.
[3]Based on 2005 data reported from various sources, values vary from measured reserves to identified resources. Data not verified by U.S. Geological Survey.
[4]Significance of activity defined by either quantity of drilling or investment expenditure for exploration work program.

TABLE 4
LATIN AMERICA AND CANADA: PRODUCTION OF SELECTED COMMODITIES IN 2005[1]

(Thousand metric tons unless otherwise specified)

	Metals									
	Aluminum		Copper, mine	Gold,	Iron and steel		Lead, mine	Nickel, mine	Silver,	Tin, mine output,
Country	Bauxite	Metal, primary	output, Cu content	Au content (kilograms)	Iron ore, gross weight	Steel, crude	output, Pb content	output, Ni content	Ag content (metric tons)	Sn content (metric tons)
Argentina	--	271	187	27,904	--	5,382	11	--	264	--
Bolivia	--	--	1	7,803	--	--	11	--	419	18,433
Brazil	21,000	1,498	133	41,154 [p]	280,862	31,631	16	74	81	11,739
Chile	--	--	5,321	40,447	7,862	1,534 [p]	1	--	1,400	--
Colombia	--	--	1	35,785	499	830 [e]	--	81 [e]	7	--
Costa Rica	--	--	--	150 [e]	--	--	--	--	(2) [e]	--
Cuba	--	--	--	500 [e]	--	245	--	74	--	--
Dominican Republic	535	--	--	--	--	60 [e]	--	46 [e]	--	--
Ecuador	--	--	(2)	5,416	--	85 [e]	--	--	(2)	--
El Salvador	--	--	--	--	--	51	--	--	--	--
French Guiana	--	--	--	1,955	--	--	--	--	--	--
Guatemala	--	--	--	740	--	197	--	--	7	--
Guyana	1,405	--	--	11,102	--	--	--	--	--	--
Honduras	--	--	(2)	3,600 [e]	--	--	10	--	54	--
Jamaica	14,118	--	--	--	--	--	--	--	--	--
Mexico	--	--	429	30,356	11,687	16,195	134	--	2,894	NA
Nicaragua	--	--	--	4,000 [e]	--	--	--	--	2 [e]	--
Panama	--	--	--	--	--	--	--	--	--	--
Paraguay	--	--	--	--	--	103	--	--	--	--
Peru	--	--	1,010	207,822	6,810	750	319	--	3,193	42,145
Suriname	4,757	--	--	10,619	--	--	--	--	--	--
Trinidad and Tobago	--	--	--	--	--	783 [e]	--	--	--	--
Uruguay	--	--	--	3,151	12	64	--	--	--	--
Venezuela	5,900 [e]	615	--	10,000 [e]	20,000 [e]	4,907	--	20 [e]	--	--
Other[3]	--	--	--	--	--	--	--	--	--	--
Total	47,700	2,380	7,080	443,000	328,000	62,800	503	295	8,320	72,300
Share of world total	28%	7%	47%	18%	21%	6%	15%	20%	40%	24%
Canada	--	2,894	595	119,225	28,343	17,000 [e]	79	198	1,122	--
Share of world total	--	9%	4%	5%	2%	2%	2%	13%	5%	--
United States	NA	2,481	1,140	261,000	54,400	93,300	426	--	1,230	--
Share of world total	NA	8%	8%	11%	4%	8%	13%	--	6%	--
Total Western Hemisphere	47,700	7,760	8,820	822,000	410,000	173,000	1,010	493	10,700	72,300
Share of world total	28%	24%	59%	33%	27%	15%	30%	33%	51%	24%
World total	172,000	31,900	15,000	2,470,000	1,530,000	1,130,000	3,360	1,500	20,800	303,000

See footnotes at end of table.

TABLE 4—Continued

LATIN AMERICA AND CANADA: PRODUCTION OF SELECTED COMMODITIES IN 2005[1]

(Thousand metric tons unless otherwise specified)

Country	Metals—Continued	Industrial minerals				Mineral fuels and related materials				
							Natural gas		Petroleum	
	Zinc, mine output, Zn content (metric tons)	Cement, hydraulic	Gypsum	Phosphate rock, P_2O_5 content	Salt	Coal, all grades	Dry (million cubic meters)	Plant liquids (thousand 42-gallon barrels)	Crude, including condensate (thousand 42-gallon barrels)	Refinery products (thousand 42-gallon barrels)
Argentina	30,227	7,595	1,050	--	1,700	320	41,000 e	18,000 e	242,743	200,288
Bolivia	158,582	1,440	--	--	45	--	12,536	4,600 e	15,417	10,400 e
Brazil	171,434	36,673	1,582	2,044	7,297	6,000 e	17,699	4,700	614,697	641,670
Chile	28,841	3,999	661	3	6,068	732	2,294	3,500 e	1,208	75,879
Colombia	-- e	9,959	700 e	8 e	474	59,064	6,708	2,600 e	191,990	109,213
Costa Rica	--	2,000 e	--	--	20 e	--	--	--	--	5,400 e
Cuba	--	1,567	--	--	173	--	704 e	--	26,400 e	6,300 e
Dominican Republic	--	2,779	370	--	50 e	--	--	--	--	12,000 e
Ecuador	--	3,000 e	(2)	--	75	--	262	458	194,169	47,179
El Salvador	--	1	6 e	--	31 e	--	--	--	--	6,300 e
French Guiana	--	62	--	--	--	--	--	--	--	--
Guatemala	--	2,400 e	350	--	60 e	--	1 e	--	6,728	--
Guyana	--	--	--	--	--	--	--	--	--	--
Honduras	42,698	1,800 e	60 e	--	42 e	--	--	--	--	--
Jamaica	--	845	302	--	19 e	--	--	--	--	11,600 e
Mexico	476,307	37,452	6,252	(2)	9,508	11,750	32,539	158,978	1,216,654	488,480
Nicaragua	--	600 e	30 e	--	52 e	--	--	--	--	6,000 e
Panama	--	820 e	--	--	18 e	--	--	--	--	--
Paraguay	--	650 e	5 e	--	--	--	--	--	--	2,660 e
Peru	1,201,671	4,600 p	150	14	250	22	857	9,724	34,500	63,640
Suriname	--	65 e	--	--	--	--	--	--	4,380	2,700
Trinidad and Tobago	--	686	--	--	--	--	31,348	9,889	52,740	55,219
Uruguay	--	1,050 e	1,130 e	--	--	--	--	--	--	15,000 e
Venezuela	--	10,000 e	--	110	500 e	8,200 e	34,000 e	58,400 e	1,110,000 e	401,000 e
Other[3]	--	1,062	--	--	2,019	--	13	--	380	164,800
Total	2,110,000	131,000	12,600	2,180	28,400	86,100	180,000	271,000	3,710,000	2,330,000
Share of world total	22%	6%	11%	5%	11%	1%	6%	12%	14%	9%
Canada	666,654	14,267	9,400 p	380 e	14,125	67,341	170,335	68,800 e	928,500	771,197
Share of world total	7%	1%	8%	1%	6%	1%	6%	3%	3%	3%
United States	748,000	101,000	17,200	10,400	46,500	1,030,000	537,000	627,000	1,890,000	5,690,000
Share of world total	8%	4%	15%	22%	4%	18%	19%	28%	7%	21%
Total Western Hemisphere	3,520,000	246,000	39,200	13,000	89,000	1,180,000	887,000	966,000	6,530,000	8,780,000
Share of world total	37%	11%	34%	28%	37%	21%	31%	44%	24%	33%
World total	9,560,000	2,310,000	116,000	46,900	249,000	5,740,000	2,820,000	2,210,000	27,300,000	26,600,000

See footnotes at end of table.

TABLE 4—Continued
LATIN AMERICA AND CANADA: PRODUCTION OF SELECTED COMMODITIES IN 2005[1]

[e]Estimated; estimated data, U.S. data, and world totals are rounded to no more than three significant digits. [p]Preliminary. NA Not available. -- Zero or zero percent.
[1]Totals may not add due to independent rounding. Percentages are calculated on unrounded data. Table includes data available as of March 2007.
[2]Less than 1/2 unit.
[3]Includes Aruba, Barbados, Belize, Guadeloupe, Haiti, Martinique, and the Netherlands Antilles.

TABLE 5
LATIN AMERICA AND CANADA: HISTORIC AND PROJECTED BAUXITE MINE PRODUCTION, 1990-2011

(Thousand metric tons)

Country	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Brazil	9,680	10,200	13,800	21,000	25,500	26,000	29,500
Dominican Republic	--	--	--	535 [1]	--	--	--
Guyana	1,420	2,020	2,470	1,405	1,500	2,000	2,000
Jamaica	10,900	10,900	11,100	14,118	14,250	15,600	15,600
Suriname	3,280	3,530	3,610	4,757	5,000	5,000	5,000
Venezuela	771	5,020	4,360	5,900	6,000	6,000	6,000
Other	85	--	--	--	--	--	--
Total	26,100	31,700	35,300	47,700	52,000	55,000	58,000

[e]Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown. --Negligible or no production.
[1]Sales from stockpiles.

TABLE 6
LATIN AMERICA AND CANADA: HISTORIC AND PROJECTED PRIMARY ALUMINUM PRODUCTION, 1990-2011

(Thousand metric tons)

Country	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Argentina	166	186	262	271	300	350	375
Brazil	931	1,180	1,280	1,498	2,000	2,000	3,500
Canada	1,570	2,170	2,370	2,894	3,000	3,000	3,500
Mexico	68	10	61	--	--	--	--
Suriname	32	28	--	--	--	--	--
Venezuela	590	630	571	615	630	840	880
Total	3,360	4,200	4,540	5,280	5,900	6,200	8,300

[e]Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown. --Negligible or no production.

TABLE 7
LATIN AMERICA AND CANADA: HISTORIC AND PROJECTED SECONDARY ALUMINUM PRODUCTION, 1990-2011

(Thousand metric tons)

Country	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Argentina	6	10	16	16	16	16	16
Brazil	60	92	210	253	300	300	300
Canada	83	NA	148	50	60	65	70
Mexico	60	129	287	574	600	600	600
Total	209	231	661	893	980	980	990

[e]Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown. NA Not available.

TABLE 8
LATIN AMERICA AND CANADA: HISTORIC AND PROJECTED COPPER MINE PRODUCTION, 1990-2011

(Metal content in thousand metric tons)

Country	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Argentina	--	--	145	187	200	200	350
Brazil	36	49	32	133	260	296	410
Canada	794	726	634	595	630	670	670
Chile	1,590	2,490	4,600	5,321	5,500	5,500	5,500
Mexico	294	335	365	429	450	490	500
Peru	318	444	554	1,010	1,030	1,050	1,060
Other	--	2	3	3	2	2	2
Total	3,030	4,050	6,330	7,680	8,100	8,200	8,500

[e]Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown. --Negligible or no production.

TABLE 9
LATIN AMERICA AND CANADA: HISTORIC AND PROJECTED REFINED COPPER PRODUCTION, 1990-2011

(Thousand metric tons)

Country	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Argentina[1]	11	16	16	16	16	16	16
Brazil	199	219	233	224	240	245	450
Canada	516	614	613	515	560	600	610
Chile[2]	1,190	1,490	2,670	2,824	3,000	3,100	3,100
Mexico	153	212	411	416	480	520	530
Peru[2]	318	444	452	510	520	530	540
Total	2,390	3,000	4,400	4,510	4,800	5,000	5,200

[e]Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.
[1]Secondary only.
[2]Primary only.

TABLE 10
LATIN AMERICA AND CANADA: HISTORIC AND PROJECTED GOLD MINE PRODUCTION, 1990-2011

(Metal content in kilograms)

Country	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Argentina	1,200	837	26,000	27,904	48,000	50,000	50,000
Belize	1	5	7	--	--	--	--
Bolivia	5,200	14,400	12,000	7,803	8,000	8,100	8,200
Brazil	102,000	63,300	50,400	41,154	49,000	50,000	50,500
Canada	169,000	152,000	156,200	119,225	120,000	125,000	135,000
Chile	27,500	44,600	54,100	40,447	40,000	50,000	63,000
Colombia	29,400	21,100	37,000	35,785	40,000	40,000	40,000
Costa Rica	460	400	50	150	1,800	2,600	3,400
Cuba	--	184	1,000	500	500	500	500
Dominican Republic	4,350	3,280	--	--	--	24,900	24,900
Ecuador	10,100	7,410	2,870	5,416	5,400	6,400	7,300
French Guiana	870	3,000	3,490	1,955	2,000	2,500	2,500
Guatemala	62	30	140	740	7,500	7,700	7,700
Guyana[2]	1,500	9,010	13,500	11,102	4,000	4,000	4,000
Honduras	156	111	878	3,600	3,500	2,600	1,000
Jamaica	--	--	--	--	--	--	--
Mexico	9,680	20,300	26,400	30,356	37,000	40,000	40,000
Nicaragua	1,200	1,320	3,670	4,000	3,000	2,200	2,200
Panama	85	1,100	--	--	--	--	1,500
Peru	10,400	56,000	139,000	207,822	210,000	215,000	220,000
Suriname	30	300	300	10,619	11,000	12,000	12,000
Uruguay	--	900	2,180	3,151	3,200	3,500	3,500
Venezuela	7,700	7,260	7,330	10,000	15,000	20,000	20,000
Total	381,000	407,000	537,000	562,000	610,000	670,000	700,000

[e]Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown. --Negligible or no production.

TABLE 11
LATIN AMERICA AND CANADA: HISTORIC AND PROJECTED IRON ORE PRODUCTION, 1990-2011[1]

(Iron content in thousand metric tons)

Country	Iron content	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Argentina	68%	680	--	--	--	30	30	30
Bolivia	65%	80	--	--	--	--	--	1,000
Brazil	66%	100,000	113,000	141,000	185,369	198,000	200,000	220,000
Canada	64%	22,000	24,600	22,700	19,500	20,000	20,500	21,000
Chile	61%	5,040	5,200	5,400	4,707	4,700	4,600	4,500
Colombia	55%	283	300	363	274	270	270	270
Guatemala	65%	4	1	10	--	--	--	--
Mexico	60%	7,110	5,630	6,800	7,012	7,000	7,000	7,000
Peru	68%	2,150	3,950	2,810	4,565	4,785	4,900	5,000
Uruguay	65%	3	3	4	8	8	8	8
Venezuela	65%	13,100	12,600	11,100	13,200	15,000	20,000	20,000
Total	XX	150,000	165,000	190,000	235,000	250,000	260,000	280,000

[e]Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown. XX Not applicable.
--Negligible or no production.
[1]Includes beneficiated and direct-shipping ore.

TABLE 12
LATIN AMERICA AND CANADA: HISTORIC AND PROJECTED CRUDE STEEL PRODUCTION, 1990-2011

(Thousand metric tons)

Country	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Argentina	3,o40	3,620	4,470	5,382	5,400	5,500	5,700
Brazil	20,600	25,100	27,900	31,631	36,000	37,500	39,000
Canada	12,300	14,400	15,900	17,000	18,000	19,000	20,000
Chile	800	1,010	1,350	1,534	1,600	1,500	1,400
Colombia	703	792	660	830	850	900	900
Cuba	270	207	327	245	250	250	250
Dominican Republic	36	--	36	60	60	60	60
Ecuador	20	35	58	85	88	90	90
El Salvador	21	28	41	51	78	80	80
Guatemala	21	NA	166	197	290	290	290
Jamaica	24	25	--	--	--	--	--
Mexico	8,710	12,100	15,600	16,195	18,000	18,200	18,500
Paraguay	48	96	77	103	105	105	105
Peru	284 [1]	515 [1]	749	750	750	750	750
Trinidad and Tobago	631	738	753	783	800	800	800
Uruguay	38	40	38	64	65	65	65
Venezuela	2,680	3,630	3,840	4,907	5,000	5,200	5,500
Total	50,800	62,300	72,000	79,800	87,000	90,000	93,000

[e]Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown. NA Not available.
-- Negligible or no production.
[1]Ingots and castings.

TABLE 13
LATIN AMERICA AND CANADA: HISTORIC AND PROJECTED LEAD MINE PRODUCTION, 1990-2011

(Metal content in metric tons)

Country	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Argentina	23,400	10,500	14,100	10,683	12,000	12,000	12,000
Bolivia	19,900	20,400	9,520	11,231	26,000	65,000	70,000
Brazil	9,300	11,600	8,830	16,063	16,800	17,000	18,000
Canada	241,000	211,000	149,000	79,252	81,200	85,000	90,000
Chile	1,120	944	785	878	1,200	1,200	1,200
Colombia	331	300	226	--	--	--	--
Ecuador	200	200	200	--	--	--	--
Honduras	5,790	2,620	4,810	10,488	9,000	8,900	8,800
Mexico	187,000	164,000	138,000	134,388	140,000	145,000	150,000
Peru	188,000	238,000	271,000	319,345	345,000	360,000	375,000
Total	676,000	660,000	596,000	582,000	630,000	690,000	730,000

[e]Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown. --Negligible or no production.

TABLE 14
LATIN AMERICA AND CANADA: HISTORIC AND PROJECTED PRIMARY REFINED LEAD PRODUCTION, 1990-2011

(Metric tons)

Country	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Argentina		2,430	8,700	10,200	11,500	11,500	11,500
Brazil	30,200	14,000	6,500	6,500	6,500	6,500	6,500
Canada	87,200	178,000	159,000	109,795	120,000	130,000	135,000
Mexico	167,000	166,000	143,000	103,691	120,000	125,000	125,000
Peru	69,300	221,000	116,000	122,079	125,000	125,000	125,000
Total	354,000	581,000	433,000	352,000	383,000	400,000	400,000

[e]Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown. --Negligible or no production.

TABLE 15
LATIN AMERICA AND CANADA: HISTORIC AND PROJECTED SECONDARY REFINED LEAD PRODUCTION, 1990-2011

(Metric tons)

Country	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Argentina	14,600	26,300	27,000	35,000	40,000	40,000	40,000
Brazil	45,300	65,000	50,000	104,904	140,000	145,000	150,000
Canada	96,500	103,000	125,000	119,613	125,000	130,000	140,000
Colombia	3,500	8,000	12,000	12,000	15,000	15,000	15,000
Mexico	65,000	10,000	110,000	110,000	110,000	110,000	110,000
Venezuela	14,000	16,000	30,000	30,000	30,000	30,000	30,000
Total	239,000	228,000	354,000	412,000	460,000	470,000	490,000

[e]Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 16
LATIN AMERICA AND CANADA: HISTORIC AND PROJECTED NICKEL MINE PRODUCTION, 1990-2011

(Metal content in metric tons)

Country	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Brazil	22,800	29,100	45,300	74,198	84,000	85,000	90,000
Canada	196,000	182,000	191,000	198,369	260,000	260,000	260,000
Colombia	22,400	24,200	59,000	81,000	80,000	80,000	80,000
Cuba	30,400	41,000	68,100	73,753	74,000	87,000	90,000
Dominican Republic	28,700 [1]	46,500	39,900	45,900	46,000	46,000	46,000
Venezuela	--	--	2,540	20,000	22,000	22,000	22,000
Total	300,000	323,000	406,000	493,000	570,000	580,000	590,000

[e]Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown. --Negligible or no production.
[1]Nickel content of ferronickel.

TABLE 17
LATIN AMERICA AND CANADA: HISTORIC AND PROJECTED PLATINUM MINE PRODUCTION, 1990-2011

(Metal content in kilograms)

Country	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Canada	5,000	7,000	5,700	9,000	9,000	9,000	9,000
Colombia	1,600	973	339	1,082	1,200	1,200	1,200
Total	6,600	7,970	6,040	10,100	10,000	10,000	10,000

[e]Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 18
LATIN AMERICA AND CANADA: HISTORIC AND PROJECTED PALLADIUM MINE PRODUCTION, 1990-2011

(Metal content in kilograms)

Country	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Canada	6,200	8,900	10,400	13,500	15,000	20,000	20,000

[e]Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 19
LATIN AMERICA AND CANADA: HISTORIC AND PROJECTED ZINC MINE PRODUCTION, 1990-2011

(Metal content in metric tons)

Country	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Argentina	38,700	32,100	34,900	30,227	33,000	40,000	40,000
Bolivia	104,000	146,000	149,000	158,582	190,000	200,000	220,000
Brazil	158,000	189,000	100,000	171,434	180,000	185,000	190,000
Canada	1,200,000	1,120,000	1,000,000	666,654	790,000	795,000	800,000
Chile	25,100	35,400	31,400	28,841	29,000	29,000	28,000
Colombia	356	--	40	--	--	--	--
Ecuador	100	100	100	--	--	--	--
Honduras	29,600	27,100	31,200	42,698	34,000	32,000	30,000
Mexico	307,000	364,000	393,000	476,307	475,000	475,000	475,000
Peru	598,000	692,000	910,000	1,201,671	1,250,000	1,300,000	1,370,000
Total	2,460,000	2,610,000	2,650,000	2,780,000	3,000,000	3,100,000	3,200,000

[e]Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown. --Negligible or no production.

TABLE 20
LATIN AMERICA AND CANADA: HISTORIC AND PROJECTED ZINC METAL PRODUCTION, 1990-2011

(Metric tons)

Country	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Argentina	31,500	35,800	39,300	40,634	43,000	45,000	45,000
Brazil	154,000	206,000	199,000	267,374	275,000	280,000	300,000
Canada[1]	592,000	720,000	780,000	722,951	750,000	800,000	850,000
Mexico[1]	199,000	223,000	235,000	327,205	330,000	350,000	350,000
Peru[1]	121,000	159,000	200,000	163,603	205,000	215,000	225,000
Total	1,100,000	1,340,000	1,450,000	1,520,000	1,600,000	1,700,000	1,800,000

[e]Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.
[1]Primary only.

TABLE 21
LATIN AMERICA AND CANADA: HISTORIC AND PROJECTED DIAMOND MINE PRODUCTION, 1990-2011

(Thousand carats)

Country	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Brazil	1,540	1,280	1,600	300	500	1,000	1,000
Canada	--	--	2,530	12,300	13,500	16,000	17,000
Guyana	18	52	82	340	350	350	350
Venezuela	333	296	110	115	100	100	100
Total	1,890	1,630	4,320	13,100	14,000	17,000	18,000

[e]Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown. --Negligible or no production.

TABLE 22
LATIN AMERICA AND CANADA: HISTORIC AND PROJECTED PHOSPHATE ROCK PRODUCTION, 1990-2011

(P_2O_5 content in thousand metric tons)

Country	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Brazil	625	1,360	1,690	2,044	2,300	2,400	2,500
Canada[1]	NA	NA	125	380	300	300	300
Chile	4	3	4	3	3	3	3
Colombia	10	10	8	8	10	10	10
Mexico	187	187	316	(2)	--	--	--
Peru	47	89	6	14	15	16	18
Venezuela	34	23	105	110	115	115	115
Total	907	1,670	2,250	2,560	2,700	2,800	2,900

[e]Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown. NA Not available. -- Negligible or no production.

[1]Sources: Natural Resources Canada and Jasinski, S.M., 2007, Phosphate rock, *in* Metals and minerals, U.S. Geological Survey Minerals Yearbook 2005, v. I, p. 56.1-56.10.

[2]Less than 1/2 unit.

TABLE 23
LATIN AMERICA AND CANADA: HISTORIC AND PROJECTED SALABLE COAL PRODUCTION, 1990-2011

(Thousand metric tons)

Country	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Argentina	270	305	246	320	400	600	800
Brazil	4,170	2,780	6,000	6,000	6,000	6,000	6,000
Canada[1]	68,300	75,000	69,200	67,341	68,500	70,000	75,000
Chile	2,730	1,490	509	732	230	220	210
Colombia	20,500	26,000	38,200	59,064	65,000	75,000	80,000
Mexico[1]	10,000	11,200	14,300	11,750	12,000	12,000	12,000
Peru[1]	175	80	27	22	25	25	25
Venezuela	2,190	4,260	7,910	8,200	12,000	22,000	25,000
Total	108,000	121,000	136,000	153,000	160,000	190,000	200,000

[e]Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

[1]Run of mine.

TABLE 24
LATIN AMERICA AND CANADA: HISTORIC AND PROJECTED URANIUM PRODUCTION, 1990-2011

(U_3O_8 content in metric tons)

Country	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Argentina	1	68	--	--	--	--	--
Brazil[1]	--	--	20	129	260	300	300
Canada	10,300	12,400	12,600	14,900	15,300	16,500	17,700
Total	10,300	12,500	12,600	15,000	16,000	17,000	18,000

[e]Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown. --Negligible or no production.

[1]Source: Anuário Mineral Brasileiro 2001-2006.

The Mineral Industry of Argentina

By Ivette E. Torres

Argentina's economy continued to grow at an accelerated pace, and the real gross domestic product (GDP) increased by 9.2%, which repeated the high performance levels achieved in 2003 and 2004. The country's nominal GDP was $182.5 billion[1] ($533.7 billion and about $14,800 per capita based on purchasing power parity). Inflation, however, increased by 9.6%. One of the issues that had burdened Argentina's economy in recent years was its external debt (the country had defaulted on its loans in 2002). In 2005, the country was able to reduce its debt by 70% and at yearend it announced that it would pay its debt to the International Monetary Fund in its entirety. Venezuela bought a portion of Argentina's debt through the purchase of Argentine bonds early in the year and announced further purchases later in the year (Venezuelanalysis.com, 2005§[2]; Economist, The, 2006§; International Monetary Fund, 2006§, Ministerio de Economía y Producción, 2006d§; Ríos, 2006§).

During the year, the value of the output of goods (in real terms) increased by 9.6%, and services, by 8.4%. The value of production in the construction sector (in real terms) increased by 20.4%; this sector was the leading performer in 2004. Mining and quarrying, which included petroleum and natural gas, once again decreased slightly (in real terms) despite strong prices that prevailed during the year (Ministerio de Economía y Producción, 2006b§).

Investment in Argentina's mining sector totaled $853 million in 2005; this was a more than $200 million[3] increase from that of 2004 and represented a fourfold investment increase in exploration and project development compared with that of 2003. A large portion of the investment was in the area of exploration, although investment in properties in operation reached a historic high of more than $458 million. Exploration, in terms of meters drilled, also reached a historic-high level, with a total of more than 400,000 meters in 250 projects, 50 of which were in 14 Provinces; this figure represented a 54% increase from that of 2004 and a fourfold increase since 2003. Direct employment in the mining sector increased to 32,000 from 27,000 in 2004 (Secretaría de Minería de la Nación, 2006, p. 6, 28; 2006a§, c§).

Government Policies and Programs

In September, the Governments of Argentina and Chile signed two protocols that would enable two new exploration projects in the frontier between the two countries to proceed. The protocols provide the legal and tax frameworks for the bi-national projects Vicuña and Amos Andres, which are located in the Provinces of San Juan and San Juan-La Rioja, respectively (Secretaría de Minería de la Nación, 2005c§).

In accordance with the agenda to increase mining activity in Argentina, the Government continued to work with international investors and foreign Governments to find areas of mutual interest. During 2005, several foreign delegations visited Argentina to explore such options; among them was a delegation from the Republic of Korea. During the visit, the two countries signed agreements in the areas of commercial relations, mining investment, and technical cooperation. Another delegation of Government official and private investors from the Republic of South Africa met with Argentine Government officials to discuss possible opportunities for investment in Argentina, mainly in metals (Panorama Minero, 2005a; Secretaría de Minería de la Nación, 2005e§).

In July 2005, the Province of Rio Negro passed Law 3981, which bans the use of cyanide and mercury in the production, processing, and/or industrialization of metallic minerals. This ban would mainly affect the production of gold in the Province. Law 3981 is similar to Law 5001 of the Province of Chubut, which was passed in 2003 and which prohibits open pit mining and the use of cyanide in the processing of metallic minerals (Diario de Madryn, 2006§).

Production

In 2005, the value of Argentina's nonfuel mineral production plus coal was $1.7 billion (Secretaría de Minería de la Nación, 2006a§). The country's mineral production was of regional importance. The country was an important producer of fuel and nonfuel minerals in Latin America (table 1). According to U.S. Geological Survey data, Argentina was one of only three producers of primary aluminum in Latin America and produced 11% of the regional total. The country was Latin America's third ranked producer of mine lead (after Peru and Mexico) and steel (after Brazil and Mexico) and the fourth ranked producer of mine copper (after Chile, Peru, and Mexico), primary iron (direct-reduced iron and pig iron) and silver (after Brazil, Mexico, and Venezuela). Argentina was one of six Latin American producers of mine zinc and was an important gold producer in the region.

Before the late 1990s, Argentina's nonfuel mineral production was focused on the production of industrial minerals. In 2005, Argentina ranked first in Latin America in the production of boron minerals and third worldwide, producing more than 10% of the world's output. The country was also one of only 3 producers of lithium in Latin America and one of the 10 countries that produced lithium in the world. The country also had a tradition of producing a variety of other industrial minerals and dimension stone.

Mineral fuels continued to be very important to Argentina's economy. In Latin America and the Caribbean, Argentina was the leading producer of natural gas and the fourth-ranked

[1]Where necessary, 2005 values have been converted from Argentine pesos (Arg$) to U.S. dollars (US$) at a rate of Arg$2.930=US$1.00.

[2]References that include a section mark (§) are found in the Internet References Cited section.

[3]Where necessary, 2004 values have been converted from Argentine pesos (Arg$) to U.S. dollars (US$) at a rate of Arg$2.946=US$1.00.

producer of crude petroleum (after Mexico, Venezuela, and Brazil) (BP p.l.c., 2006, p. 8, 24).

In 2005, about 89% of mineral production (excluding natural gas and petroleum) was from four Provinces. The leading producing Provinces were, in decreasing order of value, Catamarca, Buenos Aires, Santa Cruz, and San Juan. Catamarca was the sole producer of copper and lithium and the leading producer of gold. Buenos Aires' high ranking in production value was because of its important role in the production of industrial minerals and construction materials. Santa Cruz produced more than 80% of the country's silver, was an important producer of gold, and was the only producer of coal. San Juan's high ranking was because of the value of its production of gold and large production volumes of clays and limestone.

Trade

Argentina's exports of goods totaled $40.1 billion. The country's imports (cost, insurance, and freight) totaled $28.7 billion. The increase of trade in most categories was a result of increased economic activity and higher demand.

Argentina's main trading partners were, in order of value, the countries of the Mercado Común del Cono Sur (MERCOSUR), the countries of the European Union, and the countries of the North American Free Trade Agreement. Collectively, these three groups accounted for 83% of Argentina's imports and 51% of its exports. Individually, Brazil was Argentina's main trading partner. Brazil received 16% of Argentina's exports and provided 36% of its imports. The United States received 11% of Argentina's exports and provided 14% of its imports.

Exports of nonfuel minerals have increased significantly since 1991 when the value was only $10 million. In 2005, the value of Argentina's mineral exports totaled $1.6 billion. A large portion of this increase was owing to the production of copper, all of which was exported. The value of copper concentrate in 2005 was $762 million. Exports of manufactured goods of industrial origin totaled $11.9 billion; of this amount, metals (excluding precious metals) and their products accounted for $2.3 billion; precious metals and precious stones amounted to $149.3 million; and ceramic products, dimension stone, and gypsum were valued at $14.1 million. Exports of energy and fuels totaled $7.1 billion; of this amount, crude petroleum accounted for $2.5 billion (Ministerio de Economía y Producción, 2006e§; Secretaría de Minería de la Nación, 2006b§).

Structure of the Mineral Industry

Argentina's highest Government office with responsibility for the mining sector is the Secretaría de Minería de la Nación. After residing in the Ministerio de Producción since early 2002, the Secretaría was moved to the newly formed Ministerio de Planificación Federal, Inversión Pública y Servicios in 2003 by Decree No. 1142/2003. The Secretaría is responsible for developing the country's mineral policy, promoting the growth of the mineral sector, and creating the conditions to encourage investment in the area. It also has the authority to carry out norms and legislation relevant to the mineral sector and is the authority with the responsibility to negotiate national and international agreements on behalf of the Government. As the Government entity to which the Servicio Geológico Argentino (SEGEMAR) reports, the Secretaría also is responsible for promoting geologic and mining studies with the purpose of planning the use of the mineral resources of the country. SEGEMAR, which was formed by Decree No. 660/1996, is in charge of managing a variety of geological programs and services based on scientific studies. It coordinates and updates Argentina's geologic information, contributes to the discovery of resources, and offers technical assistance to the small- and medium-sized mining sectors.

The Dirección Nacional de Minería (DNDM) is responsible for administrating law No. 24.196 and its modifications. The DNDM coordinates and develops Argentina's short- and long-term strategic mining plans and serves as an advisor to the Secretariat on technical and legal matters that affect the mining sector. DNDM is responsible for promoting activities to maintain dynamic small- and medium-sized mining sectors. The Dirección processes and disseminates all mining statistics.

The Provincial governments are responsible for awarding mineral concessions in accordance with the Federal Mining Code. They ensure that the mining companies adhere to environmental protection laws and apply Provincial norms.

In the early 1990s, only seven international mining companies explored for or produced minerals in Argentina. This number increased to 50 companies in 2003. In 2005, more than 200 international mining companies were active in Argentina (Secretaría de Minería de la Nación, 2006c§). Some of the leading private mineral and manufacturing companies in the sector were Aluminio Argentino S.A.I.C. (ALUAR), Borax Argentina S.A., Cementos Loma Negra C.I.A.S.A., Cerro Vanguardia S.A., Cía. Minera Aguilar S.A. (a subsidiary of Glencore International AG of Switzerland), Cía. Minera Tea S.A.M.I.C.A.F., Cía. Sulfacid S.A.C.I.F., FMC Minera del Altiplano S.A., Minera Argentina Gold S.A. (a subsidiary of Barrick Gold Corporation of Canada), and Minera Alumbrera Ltd. (table 2). In 2005, direct employment in the mining sector was 32,000, which exceeded earlier projection figures by the Government (Secretaría de Minería de la Nación, 2006c§).

Commodity Review

Metals

Aluminum.—The only producer of aluminum in Argentina was ALUAR, which had one smelter and two semifabricated products facilities in Puerto Madryn in the Province of Chubut. The company, which also owned a lamination and extrusion plant in Abasto in the Province of Buenos Aires, had a total workforce of 1,800. In 2005, production of aluminum in Argentina decreased slightly to 270,714 metric tons (t) from 272,048 t in 2004. In the fiscal year that ended in June 2006, ALUAR produced 270,500 t, of which 153,600 t was primary aluminum, 26,500 t was finished products, and 90,400 t was semifinished products. Of the export total, 40% went to the domestic market and 60% was exported (Aluminio Argentino, S.A.I.C., 2006a§).

ALUAR, which had been producing near its production capacity of 275,000 metric tons per year (t/yr), announced plans to increase the production capacity of the smelter to 400,000 t/yr by mid-2007. The expansion would cost about $683 million (Aluminio Argentino, S.A.I.C., 2006b§).

Copper.—In April 2005, Wheaton River Minerals Limited of Canada, which owned a 37.5% equity share in the Bajo de la Alumbrera Mine in the Province of Catamarca, was acquired by Goldcorp Inc. of Canada. Bajo de la Alumbrera was Argentina's sole copper producer and was also an important producer of gold and silver. Xstrata plc of Switzerland, which had a 50% ownership and was the operator of the mine, announced that the capacity of the concentrator was to be expanded by 8%, which would increase mill throughput to 40 million metric tons per year (Mt/yr) at a cost of $15.5 million. The expansion was planned for completion and commissioning by yearend 2006. During 2005, the company continued with in-pit exploration encouraged by recent work that had increased reserves by 170,000 t of contained copper and about 15,600 kilograms (kg) (reported as 0.5 million troy ounces) of contained gold. Proven and probable reserves of Bajo de la Alumbrera totaled 390 million metric tons (Mt) of ore at a grade of 0.47% copper and 0.51 gram per metric ton (g/t) gold (Goldcorp Inc., 2005; Xstrata plc, 2005). Bajo de la Alumbrera increased mine production of copper during the year by 6% to about 187,300 t.

During the year, Northern Orion Resources Inc. of Canada, which was a minority partner (12.5%) in Bajo de la Alumbrera, continued to work on its Agua Rica copper, gold, and molybdenum property, which is located only 34 kilometers (km) from Bajo de la Alumbrera. Work in Agua Rica included a bankable feasibility study, that was begun in 2004 and was scheduled to be completed in 2006. The company was looking at financing options to construct a $1.9 million open pit mine to produce 150,000 t of copper and byproduct gold and molybdenum. Construction of the mine would require significant external financing or third-party participation. According to Northern Orion, the Agua Rica had reserves of 730.7 Mt of ore at grades of 0.5% copper, 0.23 g/t gold, and 0.03% molybdenum. The company estimated that production could begin within 3 years after all necessary permits were obtained (Northern Orion Resources Inc., 2006a§, b§).

Gold and Silver.—Production of gold in Argentina decreased slightly in 2005 to about 27,900 kg. The Province of Catamarca, where Bajo de la Alumbrera is located, produced 66% of Argentina's gold. The company produced almost 18,000 kg (reported as 577,298 troy ounces) of gold in concentrate and in doré, which was a 9% decrease from that of 2004 because of the lower grade of gold in the ore (Xstrata plc, 2006, p. 41, 44). The Province of Santa Cruz was another important producer and accounted for 26% of the country's output. Most if not all gold produced in the Province of Santa Cruz was by the Cerro Vanguardia Mine, which was 92.5% owned by AngloGold Ashanti Limited of South Africa. Small amounts were produced in the Provinces of Neuquen, Rioja, and San Juan. Production in the Province of Catamarca decreased by 12% during the year. This decrease was largely offset by new production from the Veladero Mine in the Province of San Juan.

Production of silver in Argentina increased by 53% to 263,766 kg. This increase was mainly owing to a significant increase in production in the Province of Santa Cruz, which produced about 85% of Argentina's silver. A portion of the increase in the Province was attributed to increased production from the Martha silver and gold mine, which had an output of about 65,000 kg (reported as 2.1 million troy ounces) of silver; this was a 24% increase from that of 2004. Despite this significant output, the Martha Mine had very small reserves. The company continued to explore the property and at yearend, the life of the mine was estimated to be 3.5 years (Coeur d'Alene Mines Corporation, 2006, p. 23-24).

The Veladero gold and silver open pit mine, which is located in the Frontera District, Province of San Juan, was owned by Minera Argentina Gold (a subsidiary of Barrick Gold). The mine, which is located 320 km northwest of the city of San Juan and had been constructed at a cost of $547 million, began production in September, ahead of the original schedule. Production at the mine was about 1,700 kg (reported as 56,000 troy ounces) of gold between September and December (Barrick Gold Corporation, 2006§). Measured and indicated reserves totaled 386 Mt of ore that contained about 393,000 kg (reported as 12.641 million troy ounces) of gold, which included about 20,200 kg (reported as 648,660 troy ounces) of byproduct silver (Barrick Gold Corporation, 2006, p. 127, 129). The company expected to produce an average of 21,000 kilograms per year (kg/yr) (reported as 700,000 troy ounces per year) of gold during the first 3 full years of operation. The life of the mine was expected to be 17 years (Barrick Gold Corporation, 2005).

In August 2005, Silver Standard Resources Inc., which owned the Pirquitas project in the Province of Jujuy, assigned Hatch Ltd. and Mines Development Associates Inc. to update the feasibility study of the project that had been completed in 2000. The new study, which was completed in April 2006, estimated that the project would be completed in about 2 years at a cost of $146 million plus value added tax and was expected to produce about 280,000 kg/yr (reported as 9 million troy ounces per year) of silver, 2,500 t/yr of tin, and 6,600 t/yr of zinc (Silver Standard Resources Inc., 2006a). The project had proven and probable reserves of more than 3.3 million kg (reported as 107.1 million troy ounces) of silver (Silver Standard Resources Inc., 2006b). Construction of the mine infrastructure began during 2005 (Secretaría de Minería de la Nación, 2005d§).

Viceroy Exploration Ltd. of Canada, which owned the three main deposits that make up the Gualcamayo Project (the Amelia Inés, the Magdalena, and the Quebrada del Diablo deposits) commissioned a prefeasibility study of the Quebrada del Diablo deposit that was completed in January 2005 by AMEC Americas Ltd. Based on the study, AMEC recommended that Viceroy Exploration proceed with a feasibility study in 2005, further explore and evaluate the other deposits, and complete all necessary work to begin production in early 2007. Quebrada del Diablo had measured and indicated resources of 37.1 Mt, at a grade of 1.04 g/t gold and inferred resources of 11.3 Mt at a grade of 1.2 g/t gold and an estimated cut-off grade of 0.5 g/t gold. The study proposed an operation that would consist of open pits and a heap-leaching facility that would have a recovery rate of 80% and a doré plant that would produce about

2,990 kg/yr (reported as 96,195 troy ounces per year) of gold at a cash cost of $133 per troy ounce; the mine life of the proposed operation was 10 years (AMEC Americas Ltd., 2005, p. 1, 3, 5, 16, 155-156; Viceroy Exploration Ltd., 2006§).

The feasibility study of Manantial Espejo silver and gold project in the Province of Santa Cruz was nearly complete at yearend 2005. In 2005, the project was a joint venture between Pan American Silver Corp. and Silver Standard Resources Inc. through Minera Triton Argentina (Silver Standard sold its share of Manantial Espejo to Pan American Silver in 2006). The project was scheduled to begin construction in early 2006; the planned investment was $120 million and anticipated production was 115,000 kg/yr (reported as 3.7 million troy ounces) of silver and about 1,740 kg/yr (reported as 56,000 troy ounces per year) of gold beginning in 2008 (Secretaría de Minería de la Nación, 2005a§). The environmental impact study was completed and submitted to the authorities in November 2005 (Cámara Argentina de Empresarios Mineros, 2006).

In October 2005, another company, Minera Andes Incorporated, announced the completion of the feasibility study of its 49% owned San Jose project in the Province of Santa Cruz. The San Jose project was a joint venture between Minera Andes and Minera Hochschild & Cía. to be operated by their subsidiary Minera Santa Cruz S.A. According to the study, the project, which includes the Frea and the Huevos Verdes veins, had proven and probable mineral reserves of 1.2 Mt at grades of 7.7 g/t gold and 406 g/t silver, although the study did not include the company's recent resource discoveries. The planned underground mine was projected to have a life of 4.3 years (Minera Andes Inc., 2005). Production from the San Jose project was scheduled to begin in 2007 (Minera Andes Inc., 2006§).

Iron and Steel.—Production of iron (direct-reduced iron and pig iron) increased by almost 8% to about 4.5 Mt. The leading steel producer was Siderar S.A.I.C.; its plant had a production capacity of 2.6 Mt/yr. Production of steel increased by 5% mainly because of the growth in the domestic construction and industrial sectors, especially the dynamic growth in the automotive sector. During the year, Siderar's production increased to 2.57 Mt, or 99% of its production capacity. The company's shipments during the year reached a record-high level, not only because of an increase in domestic demand but also a strong overseas market. Domestic shipments and exports increased by 4% (1.6 Mt) and 9% (612,000 t), respectively. The company's earnings, however, were lower than those of 2004 because of the high cost of such imported raw materials as iron ore and coal (Siderar S.A.I.C., 2006, p. 2, 4, 7).

Acindar Industria Argentina de Aceros S.A. was Argentina's second ranked producer of steel. In 2005, Acindar produced 1.38 Mt of steel, which was slightly more than its production capacity. This output was a 3% increase from that of 2004 and a historical high level. The company's shipments totaled about 1 Mt; of this amount, 79% went to the domestic market and 21% was exported. Almost 60% of Acindar's domestic shipments went to the construction sector. The company's financial situation improved during the year when it was able to pay off about 85% of its restructured debt. In view of the strong economic growth in Argentina, Acindar was investing $100 million to increase its crude steel production capacity by 25% to 1.7 Mt/yr by the second half of 2007. The company was investing an additional $45 million in other facilities (Acindar Industria Argentina de Aceros S.A., 2006).

Uranium.—Consolidated Pacific Bay Minerals Limited of Canada was exploring for uranium in Argentina. The company had the concession Cueva del Chacho, which is located near Los Colorados Mine in the Province of La Rioja; Los Colorados is a uranium mine that operated between 1992 and 1996 and that reportedly produced 55,000 kg of uranium concentrate. Consolidated Pacific also reported that it found analytical traces of uranium in its Regalo gold property in the Province of Chubut, including an outcrop sample that contained 225 parts per million. The company acquired an additional concession area to expand its uranium prospecting in the area. The Regalo property is located near the Cerro Solo uranium deposit, which is a property that the Government, through the Comisión Nacional de Energía Atómica (CNEA), was trying to bring into production with the private sector (Consolidated Pacific Bay Minerals Limited, 2006§). Another company exploring for uranium in Argentina was Urex Energy Corporation of the United States (formerly Lakefield Ventures Inc.), whose Rio Chubut project is located adjacent to Cerro Solo in the Province of Chubut (Urex Energy Corporation, 2006§). CNEA was also attempting to reopen the Sierra Pintada Mine in the Province of Mendoza, which had been in production between 1979 and 1995.

Interest in uranium exploration in Argentina was due partly to the Government's need to address the country's energy requirements and partly to the private sector's desire to take advantage of high prices in a tight market. Global demand was expected to increase significantly; this increase was driven by planned increased capacity of nuclear power, especially in Asia, where a number of nuclear reactors were under construction (Merrill Lynch, 2005§; Urex Energy Corporation, 2006§; Uranium Exploration Australia Limited, 2007§).

Industrial Minerals

Boron.—Despite a decrease of 23% in the production of crude boron minerals, Argentina remained Latin America's leading producer of boron minerals. During the year, there was a decrease in production from the three provinces that produced boron minerals—Catamarca (40%), Jujuy (34%), and Salta (4%). The sharpest decrease in terms of volume was from Jujuy where production decreased to 316,030 t in 2005 from 481,192 t in 2004. Even with the decrease, the total production level was higher than that of 2002 and 2003 and was similar to the output achieved in 2001 (table 1).

La Brava mining cooperative in the Province of Jujuy was set to begin production of ulexite from an inactive mine (La Ilusión) in the Salinas de Jama, Department of Susques. The mine had been closed in 1998 (Central de los Trabajadores Argentinos, 2006§).

Cement.—Argentina produced about 7.6 Mt of cement, which was a 21% increase from that of 2004 and the third consecutive increase. This increased production was in response to significant growth in the construction sector and, to a certain extent, to increased sales to the export market, which had

declined in 2004 because of increased demand in the domestic market. Domestic shipments in 2005 increased by 22.6% and exports increased by 9.6%. Preliminary data indicate that consumption of cement increased to 7.4 Mt from about 6.1 Mt in 2004. The per capita consumption also increased to 194 kg, or by 19% compared with that of 2004. In Latin America, only Chile and Mexico had higher per capita consumption of cement. Brazil's per capita consumption was the same as that of Argentina. The per capita consumption in Argentina in 2005, however, was slightly lower than that in 1997 though 1999 and in 1990, when per capita consumption was 264 kg (Asociación de Fabricantes de Cemento Portland, 2006§).

Potash.—Rio Tinto Limited of Australia, which exercised its option to acquire 100% of the Potasio Rio Colorado project in the Provinces of Mendoza and Neuquen, was completing the prefeasibility study of the project at yearend 2005. The feasibility study for the project was scheduled to start in 2006. Based on the results of the feasibility study, construction could begin in 2007, with production beginning in 2009. Potash production could range from 1.6 to 2.4 Mt/yr (Panorama Minero, 2005c). Possible markets for the potash would be Brazil, China, and the United States.

Mineral Fuels

Coal.— Argentine coal production in 2005 almost tripled to 320,000 t. The entire production was from Yacimientos Carboníferos de Río Turbio (YCRT), which is located in the Province of Santa Cruz. During the year, the Government signed an agreement with Kopex S.A. of Poland to supply all equipment necessary to increase production and improve the safety of the mine. Reportedly, Government plans for YCRT called for production of coal to increase to 600,000 t/yr in 2008, after improvements to the mine are completed. The plans also called for construction of a thermal plant that would consume 180,000 t/yr of coal and service the energy needs of El Calafate, the Rio Gallegos, the Rio Turbio, and the 28 de Noviembre areas. Investment in the mine included improvements in cars and train tracks, the opening of a new production area, replacement of equipment, and installation of a new industrial safety system with gas measurement capability. The Government plans for investment in the project progressed with the approval of the general terms for construction of a thermal plant by the Technical Commission in September (Panorama Minero, 2005d; Organismo de Control de Energía Eléctrica de Buenos Aires, 2005§; Secretaría de Minería de la Nación, 2005b§). Part of the production, which could be further expanded to exceed 1 Mt/yr of coal, was planned for the export market.

Natural Gas.—Argentina was one of Latin America's leading gas producers. In 2005, production of natural gas decreased by about 2% to 51,329 million cubic meters. Production was from five basins (the Austral, the Cuyana, the Golfo San Jorge, the Neuquina, and the Noroeste). The Province of Neuquen was the leading producer with 53% of the total. By company, Repsol YPF S.A., and Total Austral S.A. were the two leading producers with 30% and 23% of the national total, respectively. Low reserves and low investment in the natural gas sectors created a shortage and a crisis during 2004. As a result, Argentina began to import natural gas from Bolivia and to explore for other sources to meet its increasing demand and fulfill its export agreements with Chile, which receives the vast majority of Argentina's natural gas exports. The Government of Argentina expressed its desire to enter into a long-term contract with Bolivia to import natural gas from that country. Such a contract, which could be extended for another 30 years and would import as much as 30 million cubic meters per day of natural gas, would require the construction of a pipeline between the two countries (Secretaría de Energía, 2006§).

Petroleum.—Argentina was Latin America's fourth ranked producer of crude petroleum after Mexico, Venezuela, and Brazil (BP p.l.c., 2006, p. 8). The country was a net exporter of petroleum; production of crude petroleum, however, decreased by 4.5% from that of 2004. This was not a single year decline, but a downward trend that began in 1997, with the exception of 2001 when production increased slightly (Ministerio de Economía y Producción, 2006a§).

Outlook

Argentina's real GDP is expected to increase by 7.3% and 4.0% in 2006 and 2007, respectively. These growth rates would outpace the increases expected for Latin America as a region. If the construction sector continues to grow at the levels seen in recent years, production of cement and other construction-related commodities are expected to increase accordingly. There is plenty of room for this growth because cement production in Argentina is significantly below its production capacity of 16.6 Mt. In the steel market, although companies are producing at near capacity, they are positioning themselves to increase their production capacity to meet the domestic needs while keeping their position in the international markets (Ministerio de Economía y Producción, 2006c§).

In early 2005, the Government of Argentina estimated that mineral production could double by 2010 and that its mineral exports could reach $2.5 billion. Early Government estimates for investment for 2006 were more than $330 million.[4] A number of metal projects were in the feasibility of construction phase and production of several of them was planned for between 2007 and 2010. As a result, production of copper, gold, and silver are expected to increase (Panorama Minero, 2005b; Secretaría de Minería de la Nación, 2006b§).

The Government of Argentina is planning to revitalize its nuclear sector by extending the life of its two active nuclear plants—Atucha I and Embalse—by completing the construction of the Atucha II plant by 2010, and by resuming uranium production. As the price of petroleum remains high and the country's demand for energy increases, the Government seeks to develop a nuclear strategic plan and to update regulations by the appropriate Federal authorities. Although the Government has expressed its intention to revitalize this sector in the past, recent increased energy demand in an environment of decreased energy production could be enough incentive to move this plan forward. According to some industry sources, at the

[4]Where necessary, 2006 values have been converted from Argentine pesos (Arg$) to U.S. dollars (US$) at an estimated rate of Arg$3.00 =US$1.00.

present rate of exploration, the country could become a net importer of petroleum by 2008 or 2010 (Alexander's Gas & Oil Connections, 2006a§, b§)

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TABLE 1
ARGENTINA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2001	2002	2003	2004	2005
METALS						
Aluminum:						
Primary		245,052	268,805	272,369	272,048	270,714
Secondary[e]		16,000	16,000	16,000	16,000	16,000
Cadmium:						
Mine output, Cd content		160	153	126	111	124
Refined		34	--	25	39	3
Copper:						
Mine output, Cu content		191,677	204,027	199,020	177,143	187,317
Refined[e]		16,000	16,000	16,000	16,000	16,000
Gold, mine output, Au content	kilograms	30,632	32,506	29,744	28,466	27,904
Iron and steel:						
Metal:						
Pig iron	thousand metric tons	1,916	2,180	2,402	2,392	2,644
Sponge iron (direct reduction)	do.	1,276	1,476	1,736	1,755	1,823
Total	do.	3,192	3,656	4,138	4,147	4,467
Ferroalloys, electric furnace:						
Ferrosilicomanganese		5,150	5,000 [e]	5,000 [e]	24,000 [r,e]	25,000
Ferrosilicon		2,740	2,700 [e]	2,700 [e]	10,000 [r,e]	10,000
Total		7,890	7,700 [e]	7,700 [e]	34,000 [r,e]	35,000
Steel, crude	thousand metric tons	4,107	4,363	5,033	5,131 [r]	5,382
Semimanufactures[2]	do.	3,859	3,821	4,680	4,799	4,925
Lead:						
Mine output, Pb content		12,334	12,011	12,079	9,551	10,683
Smelter, primary[e]		12,300	12,000	12,100	11,000 [r]	10,200
Refined:						
Primary		9,473	10,567	11,011	11,111 [r]	10,200
Secondary		25,960	33,000	30,300	48,000 [r]	35,000 [e]
Total		35,433	43,567	41,311	59,111 [r]	45,200 [e]
Silver, mine output, Ag content	kilograms	152,802	125,868	133,917	172,387	263,766
Tin, refined		100	100	100	120	120 [e]
Zinc:						
Mine output, Zn content		39,703	37,325	29,839	27,220	30,227
Metal, smelter:						
Primary		39,727	38,699	39,221	35,300	37,460
Secondary		3,180	3,098	3,139	2,837 [r]	3,174
Total		42,907	41,797	42,360	38,137 [r]	40,634
INDUSTRIAL MINERALS						
Asbestos		203	155	166	267	290
Barite		6,955	3,048	6,934 [r]	2,762	3,910
Boron materials, crude		631,519	515,555	512,167	821,031	632,792
Cement, hydraulic	thousand metric tons	5,545	3,911	5,217	6,254	7,595
Clays:						
Bentonite		104,335	120,006	146,845	163,028	243,590
Common		1,515,002	1,506,146	1,682,158	2,297,634	6,025,841
Foundry earth[e]		-- [r]	-- [r]	-- [r]	-- [r]	--
Fuller's earth (decolorizing clay)[e]		-- [r]	-- [r]	-- [r]	-- [r]	--
Kaolin		13,584	13,865	19,219	27,883	54,705
Diatomite		17,090	23,314	35,518	8,180	29,495
Feldspar		48,522	82,642	90,857	125,684 [r]	151,307
Fluorspar		9,075	5,168	5,422	6,189	6,962
Gypsum, crude		371,527	365,556	489,805	674,935 [r]	1,050,193
Lithium:[3]						
Carbonate		--	906	2,850	4,970	7,300
Chloride		4,512	4,729	4,700	6,303	8,400

See footnotes at end of table.

TABLE 1--Continued
ARGENTINA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2001	2002	2003	2004	2005
INDUSTRIAL MINERALS--Continued						
Mica		2,120	1,770	1,894	2,518 r	4,101
Nitrogen, N content of ammonia		603,456 r	635,430 r	726,751 r	707,034 r	656,379
Perlite		17,916	17,152	21,480	21,193	21,991
Phosphate rock:						
Gross weight		--	--	--	70	225
P_2O_5		--	--	--	21	67
Pumice		2,097	3,070	3,531	9,188	9,969
Salt		1,269,815	1,080,346	1,667,851	1,371,969 r	1,699,539
Sand and gravel:						
Sand:						
Construction		10,516,803 r	9,342,924 r	11,978,789 r	17,022,020 r	19,617,088
Silica sand (glass sand)		891,127	280,065	300,707	847,767	461,244
Gravel		4,067,117	4,666,257	6,565,097	11,004,680 r	7,996,358
Stone:						
Basalt		436,947	177,090	334,542	615,412	620,727
Calcareous:						
Calcite, nonoptical		96,269	85,299	91,270	104,960	49,700
Calcium carbonate, chalk[e]		-- r	-- r	-- r	-- r	--
Dolomite		303,695	278,361	318,913	375,123 r	413,126
Limestone		6,073,902	7,060,763	8,147,901	10,525,343 r	12,514,933
Crushed, unidentified		9,744,301 r	8,449,517 r	11,030,714 r	16,258,773 r	17,612,199
Marble, onyx, travertine		38,228	40,397	44,411	49,725 r	146,172
Flagstone		146,909	155,079	390,350	521,837 r	209,330
Granite, in blocks		41,317	40,450	48,156	55,690 r	62,466
Quartz, crushed		49,720	93,614	99,097	88,334	170,668
Quartzite, crushed		386,336	247,394	284,503	384,079	517,100
Rhodochrosite		17	22	24	109	118
Gemstones (agate, amethyst, and so forth)	kilograms	10,200	1,250	43,288	50,599	70,326
Sandstone		20,000 r	21,313 r	3,612 r	25,980 r	69,001
Serpentine, crushed		--	826	950	1,200	1,302
Shell, marl		177,587	169,577	195,014	263,269	443,000
Tuff (tosca)	thousand metric tons	4,627	2,721	3,129	3,717	4,005
Strontium minerals, celestite		3,655	2,595	4,300	6,727	7,233
Sulfates, natural:						
Magnesium (epsomite)		6,900	6,900	7,383	8,490	1,440
Sodium (mirabilite)		11,856	10,081	10,787	12,405	51,190
Talc and related materials:						
Pyrophyllite		2,155	2,341 r	4,525 r	12,594 r	8,470
Steatite[e]		300	300	300	300	300
Talc		1,665	1,643	1,700	7,620	11,492
Total		4,120	4,284	6,525 r	20,514 r	20,262
Vermiculite		1,110	1,050	1,124	1,293	1,403
MINERAL FUELS AND RELATED MATERIALS						
Asphalt and bitumen:						
Natural (asphaltite)		--	--	--	521	923
Byproduct of refinery		393,386	318,290	478,991	645,181	665,593
Coal, bituminous	thousand metric tons	150	56	118	120	320
Coke, all types, including breeze	do.	1,545	1,582	1,621	1,546	1,496
Gas, natural:						
Gross	million cubic meters	45,916	45,770	50,576 r	52,317	51,329
Marketed	do.	37,145	36,468	41,119	45,000 e	41,000 e
Natural gas liquids[e]	thousand 42-gallon barrels	18,000 [4]	18,000	18,000	18,000	18,000
Peat, agricultural (turba)		1,067	8,208	8,782	9,110 r	11,447

See footnotes at end of table.

TABLE 1--Continued
ARGENTINA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2001	2002	2003	2004	2005
MINERAL FUELS AND RELATED MATERIALS--Continued						
Petroleum:						
Crude	thousand 42-gallon barrels	284,054	275,355	270,336	254,202	242,743
Refinery products:[5]						
Liquefied petroleum gas	do.	13,025	12,208	13,236	12,652	11,624
Motor gasoline	do.	59,655 r	55,825 r	55,378 r	53,828	53,642
Aviation gasoline	do.	(6)	--	(6)	--	22
Jet fuel	do.	10,715 r	10,826 r	8,949 r	9,560 r	9,980
Kerosene	do.	570 r	305 r	218 r	231 r	191
Distillate fuel oil	do.	77,446 r	71,045 r	75,835 r	76,969 r	74,386
Residual fuel oil	do.	9,428 r	11,628	12,551	15,276	18,026
Lubricants	do.	2,549	2,570	3,357	3,003	2,247
Other	do.	30,755 r	27,432 r	28,842 r	30,087 r	30,170
Total	do.	204,143 r	191,839 r	198,366 r	201,606 r	200,288

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

[1]Table includes data available through October 31, 2006.

[2]Hot-rolled semimanufactures only; excludes castings and cold-rolled semimanufactures produced from imported hot-rolled semimanufactures.

[3]New information was available from Argentine sources that prompted major revisions in how lithium production is reported.

[4]Reported figure.

[5]Excludes asphalt and coke production, which are reported separately.

[6]Less than 1/2 unit.

TABLE 2
ARGENTINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity[1]
Aluminum		Aluminio Argentino S.A.I.C. (Government, 52.1%, and private, 47.9%)	Puerto Madryn, Chubut Province	275.
Boron		Borax Argentina S.A. (Rio Tinto Borax, 100%)	El Porvenir Mine and plant, Jujuy Province; Sije and Tincalayu Mines and plants, Campo Quijano refinery, Salta Province	615.[2]
Do.		Procesadora de Boratos S.A. (Ferro Corp., U.S.A., and JEM Resources, Canada)	Loma Blanca, Jujuy Province, and plant at Papala	36.
Do.		Ulex S.A. (private, 100%)	Pastos Grandes, Salta Province	2.[2]
Do.		Norquímica S.A.	Salta Province	5 boric acid.
Cement		Cementos Loma Negra C.I.A.S.A. (private, 100%)	Buenos Aires, Cordoba, Corrientes, Salta, Salta Juan, Mendoza, and Jujuy Provinces	6,000.
Do.		Cementos Avellaneda, S.A. (Corporación Uniland S.A. and C. Molins International S.A.)	La Caldera plant, San Luis Province and Olavarria plant in Buenos Aires Province	2,800, 220 lime.
Do.		Juan Minetti S.A. (Holcim Ltd., 100%)	Cordoba, Jujuy, and Mendoza Provinces	1,700.
Coal		Yacimientos Carbonífero Río Turbio S.A. (private, 100%)	Rio Turbio, Santa Cruz Province	210.
Copper and gold[3]		Minera Alumbrera Ltd. (Xstrata plc, 50%; Golcorp Inc., 37.5%; Northern Orion Resources Inc., 12.5%)	Bajo de la Alumbrera Mine, Belen Department, Catamarca Province	200 Cu, 22,000 Au.
Gold and silver	kilograms	Cerro Vanguardia S.A. (AngloGold Limited, 92.5%, and Government of Santa Cruz Province, 7.5%)	Cerro Vanguardia Mine, Santa Cruz Province	100,000 Ag, 10,000 Au.
Do.	do.	Minera Argentina Gold (Barrick Gold Corporation, 100%)	Veladero Mine, San Juan Province	21,000 Au, Ag, NA.
Do.	do.	Yacimientos Mineros de Agua de Dionisio (Government, 100%)	Farallon Negro, Hualfin, and Belen, Catamarca Province	4,600 Au, 50,000 Ag.
Do.	do.	Small mines (private, 100%)	Various in Jujuy Province	5,000 Ag.
Iron and steel		Siderar S.A.I.C. (Techint Group, 53%; Inversora Siderúrgica Argentina, S.A., 11%; Usiminas, 5%; Companhia Vale do Rio Doce, 5%)	7 kilometers from San Nicolas de los Arroyos, Buenos Aires Province	2,600 steel, 1,100 pig iron.
Do.		Acindar Industria Argentina de Aceros S.A. (private, 100%)	Plant Nos.1 and 3, Buenos Aires Province; Plant No. 2, near Rio Parana, Santa Fe Province	1,370 steel, 1,000 DRI.
Do.		Siderca S.A.I.C. (Techint Group)	Buenos Aires Province	900 steel, 670 DRI.
Lead and silver refinery[4]		Cía. Minera Aguilar S.A. (Glencore International AG, 100%)	Refineria Aguilar, Palpala Industrial Park, Jujuy Province	15 Pb, 18,000 Ag.
Lead, silver, and zinc[4]		do.	Estacion Tres Cruces, El Aguilar, Jujuy Province	49,800 Ag, 24 Pb.
Lithium	metric tons	Minera del Altiplano S.A. (FMC Corporation)	Salar del Hombre Muerto, Salta Province	7,260 chloride, 11,350 carbonate.
Natural gas	million cubic meters	Repsol YPF S.A.	Neuquen, Santa Cruz, Tierra del Fuego, Salta, and Rio Negro Provinces	18,000.
Petroleum	million barrels	do.	Chubut, Santa Cruz, Neuquen, Rio Negro, Mendoza, Salta, Tierra del Fuego, Jujuy, La Pampa, and Formosa Provinces	366.
Uranium (ore)[5]		Empresa Nuclear Mendoza (subsidiary Nucleoélectrica Argentina S.A.)	Sierra Pintada, San Rafael, Mendoza Province	160.
Zinc refinery		Cía. Sulfacid S.A.I.C. and Cía Minera Aguilar S.A.	Near Rosario on the Parana River, Santa Fe Province	40.

NA Not available.
[1]Abbreviations used in this table for commodities include the following: Ag, silver; Au, gold; Cu, copper; DRI, direct-reduced iron; Pb lead.
[2]Crude minerals.
[3]Gold data reported in kilograms.
[4]Silver data reported in kilograms.
[5]Inactive.

The Mineral Industry of Bolivia

By Steven T. Anderson

The mineral industry has a long history in the Republic of Bolivia, where the country has been a globally significant producer of antimony, cadmium, gold, lead, silver, tin, tungsten, and zinc. In the mid-1980s, however, international tin prices decreased precipitously, and the prices of Bolivia's other important metal export commodities also declined. Natural gas replaced combined metals and industrial minerals as the country's leading export, and promoting natural gas exports has been the focus of the Bolivian Government's economic development strategy since the late 1990s. This strategy proved to be very lucrative, and the natural gas sector attracted substantial foreign direct investment (FDI) until 2003. From 2003 through 2005, however, uncertainty surrounding the implementation of the 1996 hydrocarbons law and risk of increased control of the country's major gasfields and oilfields by the Government served to deter reinvestment in the mineral fuels sector by foreign owners. Net FDI in the Bolivian economy was estimated to be about –$280 million compared with +$63 million in 2004, which indicates that there was a net loss in foreign capital formation in 2005.[1] FDI in the mineral fuels sector was estimated to have decreased by 12.5% compared with that of 2004 and was expected to decrease even more in 2006 (Banco Central de Bolivia, 2006; Federal Research Division, U.S. Library of Congress, 2006, p. 9-10, 12-13; Petroleum Economist, 2006).

Governmental proposals for increased taxation on production and export of mineral fuels, including popular proposals for reestablishing at least majority control of mineral fuel production facilities by the state-owned mineral fuels company Yacimientos Petrolíferos Fiscales Bolivianos (YPFB), had been ongoing in Bolivia since at least 2000, but until 2005 were always rejected in favor of plans to support FDI and expand exports of natural gas. In 2003, popular demonstrations were held to protest private (foreign) ownership of the rights to exploit fields (which had been controlled by YPFB before approval of a new hydrocarbons law in 1996 led to their privatization) and the lack of a satisfactory Government plan to increase transfers of the benefits of increased natural gas exports to the wider Bolivian populace. These protests resulted in the resignation of the President of Bolivia in 2003 and led to a precipitous drop in FDI in the exploration and development of new fields and to reduced reinvestment in maintaining production in existing fields. Total FDI in the mineral fuels sector of Bolivia was about $463 million in 2002 but decreased to $250 million in 2003, $120 million in 2004, and an estimated $105 million in 2005. Although there was some concern that increased political risk in the mineral fuels sector might affect FDI in the mining sector as well, there was not much apparent spillover through 2005. In 2002, annual FDI in the mining sector was already at its lowest level ($11.56 million) since at least 1996, but in 2003, FDI in the mining sector nearly doubled to $20.46 million; it increased again to $44 million in 2004 and was estimated to have increased to about $183 million in 2005. The mining projects that were primarily responsible for this upward trend in FDI were, in order of importance, the San Cristobal and San Bartolome silver projects. On May 19, 2005, the Government approved a new hydrocarbons law that effectively imposed a 50% royalty on mineral fuel production by foreign companies operating in Bolivia. During the latter half of 2005 and through the first half of 2006, the Government made repeated announcements to reassure investors in the mining sector that proposed increases in taxes on mine production would not be approved at a similar level (Banco Central de Bolivia, 2006; Olson, 2006; Kosich, 2006§[2]).

The most important metals mined in Bolivia were, in decreasing order of value, zinc, tin, gold, silver, lead, antimony, and tungsten. The most significant (in terms of value) industrial minerals were ulexite (boron compounds), amethyst, and barite. In 2005, total mine output of metallic ores and concentrates and crude industrial minerals was valued at about $616 million, of which about 89% was exported in the form of crude ores and concentrates. Mineral imports mainly consisted of mineral fuels, especially petroleum refinery products, and imports of mineral fertilizers and cement clinker. In 2005, the country's mineral trade surplus was about $1.44 billion compared with $1.01 billion in 2004 (Instituto Nacional de Estadística, 2006e, p. 32; Ministerio de Minería y Metalurgia, Bolivia, 2006, p. 1-2, 17).

In 2005, the annual average price for most metals and industrial minerals produced in Bolivia remained high or increased relative to previous record levels in 2004. The higher prices served to maintain the annual value of production of the mining and mineral processing sector despite a decrease of about 2.6% in the total annual tonnage produced during this timeframe. This sector contributed about 4.1% of the real gross domestic product (GDP) in 2005 compared with 3.8% in 2004. The value of production of mineral fuels (predominantly natural gas) contributed about 6.8% of the value of the real GDP compared with 6.1% in 2004. Bolivia's GDP based on purchasing power parity was $25.68 billion, which amounted to an increase of 6.5% compared with that of 2004. The rate of inflation was about 5.4% (table 1; Instituto Nacional de Estadística, 2006b, p. 411; International Monetary Fund, 2006§).

At the beginning of 2005, Bolivia's proven reserves of natural gas were estimated to rank a distant second to those of Venezuela in Latin America and were estimated to be about 40% greater than those of either Argentina or Trinidad and Tobago. Bolivia's resources were estimated to be sufficient to enable the country to become a hub for trade of mineral fuels in South America, given its own natural gas production capacity, its network of pipelines, and its strategic location in the center of the continent next to Chile, which is becoming

[1]All values are nominal, at current prices, unless otherwise stated.

[2]References that include a section mark (§) are found in the Internet References Cited section.

increasingly dependent on imports of natural gas. Bolivia's estimated reserves of petroleum were much less significant than the country's natural gas reserves. Bolivian copper, gold, iron ore, silver, tin, and zinc resources have been estimated by private exploration companies to be globally significant. Accurate figures concerning the country's leading mineral resources, however, are mostly not publicly available. Bolivia was still considered underexplored for nonfuel minerals, especially in the Pre-Cambrian shield area where some explorers have indicated that significant deposits of nickel, palladium, platinum, and other valuable metals might exist. In addition, foreign investment in exploration has been frequently deterred by uncertainty concerning the mining law, taxation, and rights to exploit existing reserves, as well as civil unrest directed against foreign investment in the mining sector. In 2005, the primary minerals of interest for exploration and development of production in Bolivia were antimony, boron materials, gold, lead, lithium, magnesium compounds, potassium, semiprecious stones, silver, tin, and zinc (Economist, The, 2005; BP p.l.c., 2006, p. 22; Crenwelge, 2006; U.S. Energy Information Administration, 2006).

Government Policies and Programs

During the second half of 2005 and continuing into 2006, many Bolivians demonstrated to express dissatisfaction with the new hydrocarbons law and publicly demanded full nationalization of the mineral fuels sector. The Bolivian Congress continued to support a bill for full nationalization and argued that accurate assessment and complete collection of the taxes and royalties mandated in any new hydrocarbons law would not really be feasible without at least majority operational control by state-run YPFB. Foreign owners of facilities for the production and export of mineral fuels also expressed dismay with the new law, and most of the major companies placed a hold on investment in exploration, new production capacity, and planned capacity expansions during the second half of the year. During the first half of 2005, investment flows were estimated already to be at or below levels that the Bolivian Hydrocarbons Chamber thought would be necessary just to maintain production at contractual levels. In the first quarter of 2006, Repsol YPF S.A. announced a reevaluation of the company's proven oil and natural gas reserves in Bolivia as of 2005 that included careful consideration of the economic effects of implementation of the May 2005 hydrocarbons law. This revised accounting reduced the company's proven reserves by 52.5% compared with estimates at the end of 2004. Total investment in exploration for new deposits of natural gas and petroleum in the country decreased by about 47% compared with that of 2004, although total investment in immediate extraction of mineral fuels from existing wells was estimated to have increased slightly during this same timeframe (Olson, 2005; Instituto Nacional de Estadística, 2006a, p. 6; International Monetary Fund, 2006, p. 29; Repsol YPF S.A., 2006b, p. 28).

The tax and royalty provisions of the new hydrocarbons law were actually not implemented throughout the year because no private foreign-owned company with mineral fuel interests in Bolivia finished renegotiating its foreign investment contract(s) to comply with the new law. Almost all the leading producers met with the Bolivian Government to request the 6-month period of negotiation allowed under the new law before adjusting their contracts with the State; this negotiation period was set to expire in June 2006. By the end of October 2005, three U.S. companies with oil and gas interests in Bolivia threatened to sue the Bolivian Government, citing provisions of the United States-Bolivia Bilateral Investment Treaty, and at least four other companies from other countries were considering similar action according to their respective countries' bilateral investment treaties with Bolivia. Many of these same companies were also considering filing complaints with the International Center for Settlement of Investment Disputes (World Bank) if scheduled negotiations with the Bolivian Government did not achieve a satisfactory resolution. The President (who allowed the bill to become law) resigned in July 2005, but the interim President that succeeded him still signed the law and even issued a decree for its immediate implementation. The interim Government issued another decree, however, that a system needed to be established to enable officials to audit the foreign-owned operations and verify production levels for royalty and tax purposes. Full nationalization of the mineral fuels sector became the top political issue leading up to the national elections on December 18, 2005, and public demonstrations against the new hydrocarbons law continued throughout the year (Oil & Gas Journal, 2005; Wertheim, 2005; Asociación Nacional de Mineros Medianos, 2006, p. 10; Repsol YPF S.A., 2006a, p. 28; U.S. Commercial Service, 2006, p. 11).

Throughout 2005, the country's mining reactivation plan that was approved on January 31, 2004, was still not fully implemented. The reactivation plan was aimed at redirecting as much of expected revenues from new mining projects (primarily owing to expectations of continuing higher prices for most metals and industrial minerals) toward broader economic development efforts, especially in the areas surrounding the proposed mining operations. In looking forward to 2006, foreign mining companies that planned to operate in Bolivia still faced a high level of uncertainty concerning potential renegotiation of investment contracts, higher taxes and royalties, and potential nationalization following the national elections on December 18, 2005. As with the mineral fuels sector, congressional leaders argued that enforcement of any new (or old) provisions of the mining law would require at least majority control of current and future mining operations by the Government through reestablishment of direct control of mining activities by Corporación Minera de Bolivia (COMIBOL) (Mesa Gisbert, 2004; Asociación Nacional de Mineros Medianos, 2006, p. 11-14; Los Tiempos, 2006a§).

Structure of the Mineral Industry

In 2005, the modern metal mining sector in Bolivia consisted of 11 medium-scale mining companies affiliated through the Asociación Nacional de Mineros Medianos (ANMM), some of which did not produce during the year. Together, these companies employed about 7,500 people, including administrative staff, executives, mine workers, and technicians. The company membership in ANMM remained basically the

same in 2005 as it was in 2004, except that a new company, REXMA S.A., became a member. REXMA was primarily exploring for gold and nonferrous mineral deposits in the Department of Santa Cruz. Also, Apex Silver Mines Limited of Toronto, Ontario, Canada, transferred operation of its San Cristobal lead-silver-zinc project to its new subsidiary Empresa Minera San Cristobal S.A. from the company's development-stage subsidiary Andean Silver Corporation to oversee the construction phase of the San Cristobal Mine. Glencore International AG of Baar, Switzerland, acquired Compañía Minera del Sur S.A. (COMSUR) at yearend 2004 and changed the new subsidiary's name to Sinchi Wayra S.A. at yearend 2005 (Asociación Nacional de Mineros Medianos, 2006, p. 75, 77, 81).

In 2005, the leading mining company in Bolivia was COMSUR. The company's principal mineral commodity was zinc in concentrate, although COMSUR was also the country's leading individual producer of lead and silver. COMSUR owned and operated about five mines in the Oruro and the Potosi Departments. COMSUR also controlled a majority interest in the medium-scale tin and antimony smelting complex Complejo Metalúrgica de Vinto S.A. through COMSUR's majority interest in another medium-scale mining company, Compañía Minera Colquiri S.A. (CMC). The country's leading medium-scale producer of gold was Empresa Minera Paititi S.A. (Paititi), which was a subsidiary of Orvana Minerals Corporation of Toronto, Ontario, Canada. Empresa Minera Unificada S.A. (EMUSA) was a privately owned Bolivian mining company and accounted for all Bolivia's medium-scale mine production of antimony. Empresa Minera Inti Raymi S.A. (Inti Raymi) was a medium-scale mining company that still produced some gold and silver at its plant associated with the closed Kori Kollo Mine. The material processed at the Kori Kollo facilities was mined at the Kori Chaca Mine, which was located adjacent to Kori Kollo, and included some tailings recovered from material left over from the Kori Kollo Mine. Inti Raymi was mostly owned by Newmont Mining Corporation of Denver, Colorado. Empresa Minera La Solución S.A. was the only other medium-scale mining company with notable production in 2005; La Solución Mine produced small amounts of lead, silver, and zinc. In July 2005, Apogee Minerals Ltd. of Toronto, Ontario, Canada, acquired a 51% interest in La Solución from a private holding company and entered an option contract to fully acquire the company and mine if the conditions of the contract are satisfied (table 2; Apogee Minerals Ltd., 2005, p. 29; Asociación Nacional de Mineros Medianos, 2006, p. 24; Glencore International AG, 2005§; Newmont Mining Corporation, 2005§).

In 2005, small-scale, artisanal, and cooperative (SMACA) mining operations accounted for all the country's mine production of bismuth, copper, and tungsten. They also accounted for about 84% of the mine production of antimony; 63%, tin; 52%, silver; 43%, lead; 32%, gold; and 26%, zinc. Most cooperatives were small and consisted of individual miners organized by mine or by specific mineral. Most mining cooperatives in Bolivia relied chiefly on artisanal mining methods. Cooperatives were more involved in the production of base metals, and less-organized small-scale and individual miners in the country were mostly involved in alluvial gold mining. Mining cooperatives were loosely organized under the Federación Nacional de Cooperativas Mineras (FENCOMIN), which also helped represent them legally and provided assistance in managing their extensive claims. Many small-scale miners were previously employed by COMIBOL, but most of them had not been formally employed in mining since being laid off in the late 1980s. Small-scale miners who did not belong to a cooperative were associated under the Bolivian Government's Cámara Nacional de Minería (CANALMIN), but a great many more unassociated miners were estimated to be actively mining in the country (Asociación Nacional de Mineros Medianos, 2006, p. 102-106; Crenwelge, 2006; Federal Research Division, U.S. Library of Congress, 1989§).

The leading producer of natural gas and petroleum in Bolivia was Petróleo Brasileiro S.A. (Petrobrás) of Rio de Janeiro, Brazil. The other leading producers were, in decreasing order of level of natural gas production in 2005, Repsol of Madrid, Spain (including combined production of direct operations and ownership interest in Empresa Petrolera Andina S.A.); BG Group plc of Reading, United Kingdom; BP p.l.c. of London, United Kingdom (through its ownership interest in Empresa Petrolera Chaco S.A. and some of Repsol's operations via majority ownership of Pan American Energy LLC); BRIDAS Corporation of Buenos Aires, Argentina (also through its minority ownership interest in Pan American); and Pluspetrol Bolivia Corporation S.A. of Buenos Aires, Argentina, which became a significant producer following the startup of commercial production at its Tacobo field in 2005 (table 2; BG Group plc., 2006§; BP p.l.c., 2006§, Ministerio de Hidrocarburos y Energía, Bolivia, 2006b§).

In terms of reserves, Repsol controlled about 34% of Bolivia's proven and probable natural gas reserves and did not expand reserves or production capacity in the country during the year. Although Repsol nominally owns just 50% of Andina, four of the seven members of Andina's Board of Directors are nominated by Repsol; the Bolivian pension funds have only three members on the Board. Therefore, Repsol could fully consolidate all physical aggregates and income from operations, including control of all rights to reserves owned by Andina, and Repsol had the greatest vested interest in rights to natural gas reserves in the country. Petrobrás's ownership interests were vested more in pipelines and transportation of natural gas and not as much in rights to actual reserves as Repsol, although Petrobrás had purchasing contracts with every other major natural gas producer in Bolivia to supply the Brazilian market. Through the end of 2005, the proven and probable reserves of natural gas and petroleum controlled by Petrobrás in Bolivia accounted for 2.7% of the company's total reserves and about 18% of Bolivia's total reserves of natural gas. BG Group controlled about 14% of Bolivian proven and probable reserves of natural gas (including partial ownership of the Repsol-operated Caipipendi exploration and exploitation concession block); Total S.A. of Courbevoie, France, controlled about 13%, BP, 6.6%; Exxon Mobil Corp., 5.1% (through its nonoperational equity interest in the Itau exploration concession that was being explored by Total); and Bridas, 4.4%. Similar to the ownership situation with Andina, the pension funds that nominally owned

50% of Chaco did not actively control any of the rights to the reserves owned by Chaco; instead the BP-Bridas joint venture controlled all Chaco's reserves and part of the Caipipendi concession, which included the large (about 2.6 trillion cubic meters of proven and probable natural gas reserves) Margarita field (Ministerio de Hidrocarburos y Energía, Bolivia, 2005; Petróleo Brasileiro S.A., 2006, p. 15; Repsol YPF S.A., 2006a, p. 28).

Although natural gas has supplanted silver and tin as the country's most valuable mineral resource, Bolivia has had trouble establishing itself as the energy hub in South America. The country has also not been able to find a way to realize the potentially large gains that could result from liquefying its natural gas and exporting it to such lucrative markets as the United States. Bolivia does not consume a significant amount of natural gas domestically, and the country has not succeeded in effectively reinvesting tax revenues from its natural gas exports to aid the country's wider economic development. By the end of 2005, Bolivia had not made much progress toward these objectives because its pipeline infrastructure exports natural gas in crude form only to Argentina and Brazil, and because of disagreement about the Bolivian Government's role in controlling mineral resources, including fuels (Economist, The, 2005; Federal Research Division, U.S. Library of Congress, 2006, p. 6-7, 11-13, 16, 20, 22).

Exploration

The location of the major mining investment projects already approved or budgeted for Bolivia, the potential project development budget as of the end of 2005, and ownership information of these projects are provided in table 3. The most valuable of these projects, by far, was expected to be San Cristobal. This project had been put on hold since early 2001 in anticipation of a recovery in the price of silver despite a favorable bankable feasibility study that was completed in 1997. In 2005, estimated reserves at San Cristobal remained at about the same levels as those of 2004, which were about 3.6 million metric tons (Mt) of zinc, 1.3 Mt of lead, and 14,500 metric tons (t) of silver. The proposed mine was expected to begin producing at an average of 165,000 metric tons per year (t/yr) of zinc, 64,000 t/yr of lead, and 53 t/yr of recoverable silver by the end of 2007. The next most valuable project was expected to be the San Bartolome silver project, which was owned (operated) by Coeur d'Alene Mines Corporation of Coeur d'Alene, Idaho. The estimated reserves of recoverable silver at San Bartolome were revised upward to about 4,730 t in 2004 compared with about 3,820 t in 2003; the estimate remained unchanged in 2005. The proposed mine, which was expected to produce between 190 t/yr and 250 t/yr of payable silver, was previously scheduled to start in 2007, but Coeur d'Alene decided to extend the construction phase of the mine until political uncertainty in Bolivia becomes more resolved (Centro de Documentación e Información, Bolivia, 2004; Apex Silver Mines Limited, 2006, p. 4-6, 8; Coeur d'Alene Mines Corporation, 2006, p. 27-28).

In 2005, almost all the oil and gas companies that were established in Bolivia postponed or cancelled plans to invest in exploration and development of new mineral fuel production capacity, which resulted in a net loss of proven, probable, and especially potential reserves during the year. Since 2003, primarily owing to ongoing uncertainty concerning changes to the country's hydrocarbons law, political turnover, and public demonstrations, the most heavily invested companies mostly have made limited investments just to maintain production levels at existing wells. During the first 10 months of 2005, these companies (except Pluspetrol, which was still trying to establish itself as a significant producer in Bolivia during 2005) cut their total combined investment in exploration for new mineral fuel deposits in the country to $14.5 million compared with $71.9 million during the same period in 2004. Repsol drilled only one exploratory well in 2005 in the Marmore Block, which did not indicate sufficient potential for further development, and planned to drill one other well in 2006 in the Caipipendi Block. Since commercial production began at its Sabalo Field in the San Antonio Block in 2003, Petrobrás has not been as heavily invested in exploration in Bolivia as some of the other major investors in the country. Petrobrás did not drill any exploration wells in 2004; drilled only one exploration well in 2005, which was found to be not commercially feasible for further development; and did not plan to drill any additional wells in 2006. Although Petrobrás decreased its proven reserves in Bolivia by only about 4.4% at the beginning of 2006 compared with the beginning of 2005, the company was expected to announce a significant reduction in its reserves of oil and natural gas in Bolivia by the end of 2006 (International Monetary Fund, 2006, p. 39; Petróleo Brasileiro S.A., 2006, p. 15; Repsol YPF S.A., 2006a, p. 28).

From January through October 2005, Andina (Repsol) cancelled enough planned exploration projects to actually record a net disinvestment of –$116,220 in natural gas exploration activities in Bolivia compared with a positive investment of about $15.4 million during the same period in 2004. Similarly, BG Group invested only $52,730 compared with $823,500, and Chaco (BP and Bridas), $705,020 compared with $17.55 million, during the same comparative timeframes. BG Group's ongoing reduction of investment in Bolivia involved postponing development of the already explored Itau and Tarija fields and further exploration of the Caipipendi and the Charagua Blocks until economic and political uncertainty in Bolivia decreases sufficiently, which the company did not expect to take place before 2010 at the earliest. In total, Repsol was credited with investing about $9.09 million in exploration in Bolivia from January through October 2005, compared with $12.5 million during the same time period in 2004; Total S.A. invested $4.37 million compared with about $25 million during the same timeframes. Petrobrás remained roughly consistent in its relatively low exploration investment in mineral fuels in Bolivia in 2004 and 2005, investing about $400,000 during the first 10 months of each year (BG Group plc., 2006§; Ministerio de Hidrocarburos y Energía, Bolivia, 2006a§).

Pluspetrol actually increased investment in exploration in Bolivia during the first 10 months of 2005 to about $19 million compared with only about $1 million during the same period in 2004. This unique (for this sector of the Bolivian mineral industry in 2005) exploration investment strategy could be justified by the country's increased direct exports of natural gas

to Argentina during the year, by both countries' agreement in August to extend the purchasing contract under which Bolivia would supply natural gas to the Argentine market through at least 2007, and by another agreement between the countries for Argentina to pay 47% more for Bolivian gas in 2006 than it paid in 2005. Also, discussions to further increase exports of natural gas to Argentina by constructing a new direct pipeline continued to progress, and the Bolivian Government was expected to negotiate another price increase for natural gas exports to Argentina in 2007 (U.S. Energy Information Administration, 2006; Ministerio de Hidrocarburos y Energía, Bolivia, 2006a§).

Bolivian reserves of natural gas had been decreasing since about the end of 2003, and it was estimated that there were about 1.4 trillion cubic meters of proven and probable reserves of natural gas in 2005 compared with about 1.5 trillion cubic meters in 2004. The decreased investment in exploration and development of new natural gas production capacity was most noticeable in the level of potential reserves of natural gas in Bolivia. In 2005, potential reserves of natural gas were approximately 430 billion cubic meters compared with about 682 billion cubic meters in 2004. Almost none of this loss of natural gas production potential was the result of potential reserves being upgraded to probable or proven status (Ministerio de Hidrocarburos y Energía, Bolivia, 2005).

Production

According to the preliminary figures of the Government's Ministerio de Minería y Metalurgia in current prices, the total value of mine production of metals and industrial minerals in Bolivia increased to about $616 million in 2005 compared with a revised value of about $517 million in 2004. Although mine production of metals and industrial minerals combined continued to decrease in 2005, production of metallic minerals recovered somewhat after decreasing in 2004 compared with production levels in 2003. The most important metals were, in order of decreasing nominal value of production in 2005, zinc, tin, gold, and silver; production of each of these metals (except silver) increased significantly in 2005 compared with that of 2004. In addition, production of antimony increased substantially during this timeframe. In 2005, SMACA miners controlled a greater share of the quantity of mine production of copper, silver, and zinc than in 2004, although medium-scale production (mostly foreign-owned) was beginning to reestablish its share in the mining of metals in Bolivia, especially in gold mining. The SMACA share of gold mine production decreased to 32% in 2005 compared with 62% in 2004; this decrease was mostly owing to increased production by Inti Raymi at the Kori Chaca Mine and increased production by Paititi from the lower mineralized zone at the Don Mario Mine (Orvana Minerals Corporation, 2005, p. 8-9; Asociación Nacional de Mineros Medianos, 2006, p. 102-106; Ministerio de Minería y Metalurgia, Bolivia, 2006, p. 4; Newmont Mining Corporation, 2006, p. 21-22).

In terms of production levels and the annual nominal value in 2005, zinc continued to lead mine production of metals and industrial minerals. Glencore increased production to 95,195 t of zinc in concentrate from 90,779 t in 2004 at mines operated by COMSUR (Sinchi Wayra), and to 13,116 t from 12,034 t at mines operated by CMC. SMACA miners, however, accounted for a majority of the increase in zinc production in 2005. Although medium-scale firms have not controlled a majority of Bolivia's mine production of tin at least since COMIBOL stopped operating the state-run company's last tin mine in 2000, CMC did increase the company's mine production of tin to 2,940 t in 2005 from 2,545 t in 2004. The majority of the increase was owing to increased production by SMACA miners, particularly by mining cooperatives operating in the Caracoles and the Huanuni tin mines (Asociación Nacional de Mineros Medianos, 2006, p. 24, 85, 103, 106; Ministerio de Minería y Metalurgia, Bolivia, 2006, p. 4).

In 2005, EMUSA increased the company's mine production of antimony to 1,100 t from 485 t in 2004 at small operations in the Bolivian Altiplano and Eastern Cordillera. Some of these operations were joint ventures with local mining cooperatives, to which 287 t of EMUSA's production in 2005 was attributed. The remainder of the increase in mine production of antimony was accounted for by other autonomous SMACA mining operations (Asociación Nacional de Mineros Medianos, 2006, p. 23-25, 102).

In 2005, extraction of barite (mostly as a byproduct of zinc mining) increased by almost 100% compared with that of 2004, mostly owing to increased mine production of zinc. The barite was recovered by SMACA miners mostly from piles of material extracted as a result of lead and zinc mining activities in Cochabamba and Oruro Departments (Asociación Nacional de Mineros Medianos, 2006, p. 86-87, 96).

Production of ulexite decreased slightly in 2005 after decreasing precipitously in 2004 compared with that of 2003 following the Government withdrawal of the ulexite mining concessions of Quimica e Industrial del Borax Limitada (Quiborax) of Santiago, Chile, in June 2004. These mining concessions were operated by Quiborax through its wholly owned Bolivian subsidiary Non-Metallic Minerals S.A., which was located in the Salar de Uyuni, Potosi Department; the concessions were primarily responsible for the increases in the production of ulexite through 2003. In 2005, Quiborax was still attempting to obtain compensation from the Bolivian Government through a petition with the International Centre for Settlement of Investment Disputes (ICSID) of the World Bank for damages to the company's business as a result of the withdrawal of these concessions. Production of boric acid from material mined in Salar de Uyuni was officially reported for 2005 after no production was reported for 2003 or 2004, but it was not clear what companies were responsible for this production. Complejo Industrial de Recursos Evaporíticos del Salar de Uyuni (CIRESU) was the company formed by the Government in 1985 to form joint ventures to explore the Salar de Uyuni and develop greater mining production capacity there (table 1; Industrial Minerals, 2005, 2006).

In 2005, production of cement in the country also increased substantially (by slightly less than 13%) compared with that of 2004. Nonetheless, Bolivia imported about 163,000 t of cement clinker in 2005 compared with approximately 72,000 t in 2004 to help meet domestic demand. The combination of the cement production capacities listed in table 2 accounted

for approximately 70% of the total estimated for the entire country. In September 2005, Grupo Cementos de Chihuahua S.A. de C.V. (GCC) acquired a 47% ownership interest in Sociedad Boliviana de Cemento S.A. (SOBOCE), including a proportional ownership share in La Fábrica Nacional de Cemento (FANCESA). GCC reported that Bolivian demand for cement grew at a compounded annual rate of 4.7% from 2001 through 2005, and the company expected FANCESA to expand capacity to produce clinker in 2006. In 2005, however, FANCESA reported declining mine production out of the three quarries that it operated to provide mineral raw materials for clinker production, and imports of clinker may have to increase still more in 2006 in order to meet demand in Bolivia. In 2005, SOBOCE produced slightly more than 641,200 t of cement at its El Puente, EMISA, VIACHA, and WARNES plants, combined, and had a controlling ownership interest in the 399,700 t of cement produced by FANCESA during the year. In 2005, FANCESA was able to produce above the listed design capacity of its cement plant by converting a grinding facility to produce cement from clinker that was transported to the the plant from elsewhere, but reliable data concerning the proportion of production from imported clinker was not readily available (tables 1, 2; Fábrica Nacional de Cemento S.A., 2006, p. 20, 23-24; Grupo Cementos de Chihuahua S.A. de C.V., 2006, p. 4, 14, 22-23, 32; Instituto Nacional de Estadística, 2006d, p. 252; Sociedad Boliviana de Cemento S.A., 2006, p. 8, 13, 15; Los Tiempos, 2006a§).

In 2005, a 22% increase in the annual production of natural gas was partly owing to increased reinvestment in exploitation of existing wells compared with that of 2004 (table 1). Total investment in immediate extraction of natural gas and petroleum during the first 10 months of 2005 was $113 million compared with $98 million during the same period in 2004. From January through October 2005, BP and Bridas combined to invest about $34 million to boost the immediate production of natural gas by Chaco compared with $7.5 million during the same period in 2004. Similarly, Petrobrás invested $21 million compared with $10 million, and BG Group invested $10 million compared with $1 million during the same relative time periods. Petrobrás had operational control of approximately 58% of Bolivia's production of natural gas during the year, but income from international sales of this production was shared with other investment partners who did not necessarily participate directly in productive operations. Thus, Petrobrás counted sales of only about 26% of Bolivia's total production of natural gas toward company revenues. Repsol had ownership rights to about 20% of the total revenue from the sale of Bolivia's natural gas production during the year followed by Bolivian pension and other investment funds, about 12% (through their ownership interests in Andina and Chaco); Total, about 10%; BG Group, 7.6%; BP, 5.7%; Bridas, 3.8%; and other companies, such as Pluspetrol, 1.6% (table 2; Petróleo Brasileiro S.A., 2006, p. 15, 57; Ministerio de Hidrocarburos y Energía, Bolivia, 2006a§, b§).

Trade

In current prices, exports of natural gas accounted for 35% of the total value of exports and 10.5% of the nominal GDP in 2005 compared with 27.4% and 7.1%, respectively, in 2004. During the year, exports of crude petroleum began to become more significant economically and accounted for 11.2% of the nominal value of total exports and 3.35% of the value of the nominal GDP compared with 7.62% and 1.97%, respectively, in 2004. Also in current prices, exports of nonfuel minerals, mostly in the form of ores and concentrates, accounted for 12.7% of total exports and 3.7% of the nominal GDP compared with about 20% and 5.2%, respectively, in 2004 (Instituto Nacional de Estadística, 2006c, p. 26, 89-90; International Monetary Fund, 2006§).

In 2005, Bolivia exported 83.25%, by volume, of the marketable natural gas that it produced during the year to Brazil and 16.75% to Argentina. Imports of Bolivian gas by Petrobrás accounted for about 53% of the company's total sales of natural gas to the Brazilian market. Although Petrobrás did not hold direct ownership rights to some of this natural gas, the company was able to secure this vital supply for Brazil through joint contracts with the other major producers together with the approval of YPFB. Petrobrás continued to comply with its 20-year (beginning in 1996) agreement to purchase natural gas from YPFB, and YPFB was required by the Bolivian Government to be an intermediary in any export contracts, including between a foreign producer, such as Petrobrás, and another foreign producer. In 2005, Petrobrás paid about $799 million to the Bolivian Government through state-run YPFB for Bolivian exports of natural gas to Brazil compared with approximately $544 million in 2004. All the natural gas produced by BG Group in Bolivia was designated for export to Brazil through two contracts, one with Petrobrás and YPFB and one with Companhia de Gás de São Paulo (Comgás), of which BG Group was also the majority shareholder (72.74%). In 2005, about 75% of Comgás's total distribution of natural gas to the Brazilian market was produced in Bolivia, and the company had a contract with Petrobrás and YPFB to purchase about 2.8 trillion cubic meters of natural gas imported from Bolivia for distribution within the State of Sao Paulo, Brazil. This contract was set to last through 2019 and to be expanded to require purchases of about 3.2 trillion cubic meters of natural gas imports from Bolivia (Companhia de Gás de São Paulo, 2006, p. 4, 16, 31; Instituto Nacional de Estadistica, 2006c, p. 26, 89-90; Petróleo Brasileiro S.A., 2006, p. 15, 57; BG Group plc., 2006§).

On July 2, 2004, Repsol and other companies operating in Bolivia restarted exporting natural gas directly to Argentina in response to shortages of natural gas in that country. Repsol's contractual supply portion (through YPFB) of the export agreement, which was renegotiated between the Government of Argentina and the Government of Bolivia in November 2004 and applicable throughout 2005, was 4.4 million cubic meters per day (about 1.6 billion cubic meters per year). The remainder of the 7.7 million cubic meters per day that was agreed upon to be exported to Argentina from Bolivia was supplied by other producers. Prior to this new export contract, Repsol had exported almost all its natural gas production in Bolivia to Brazil but was still able to supply the Cuiaba powerplant and other areas in Brazil through 2005 at full contractual levels. The reopening of the direct export market in Argentina was the primary reason for Repsol to increase its production of

natural gas in Bolivia by 22.5% in 2005 compared with that of 2004. Total's minority shares of Andina, the fields operated by Petrobrás, and the Gasryg pipeline meant that while most of the company's share of Bolivian production was exported to Brazil, some was transported to Argentina. Production of natural gas by Chaco in Bolivia was also exported to Argentina and Brazil, so BP's and Bridas's shares were exported to both countries as well (Repsol YPF S.A., 2006b, p. 20-21, 26-27, 43).

In 2005, the total nominal value of Bolivia's exports of mineral ores and concentrates was about $547 million, and that of the country's exports of refined metals was about $193 million. The leading export destination for ores and concentrates was, by value, Japan followed by Switzerland, the United States, and the Republic of Korea; the United States was the leading destination for refined metals followed closely by Switzerland and distantly by the United Kingdom and Brazil. In terms of both tonnage and nominal value, Bolivia's leading nonfuel mineral export commodity in 2005 was zinc ore and concentrate, of which the country exported about 150,000 t during the year (about 52% of which was shipped to Japan). Total tin exports ranked second in terms of value at current prices, but only 3,180 t was in the form of ore and concentrate, and about 13,200 t was in the form of refined tin metal. The United States was the leading destination for tin metal (accounting for 79% of the total tonnage exported by Bolivia) and was also the leading destination for refined antimony (combined metal and trioxide). Exports of silver in ore and concentrate were ranked third in nominal value, and Bolivia shipped out 382 t in this form (plus about 17 t in refined silver). Bolivia's exports of silver in ore and concentrate were distributed more evenly across recipient countries, and the principal destinations were the Republic of Korea (24% of the total), Japan (19%), Peru (18%), Switzerland (11%), and Canada and Mexico (about 9% million each). Gold bullion was ranked fourth in nominal value of exports, and 5,354 kilograms of this commodity was exported (98% to Switzerland). The other notable nonfuel mineral exports for Bolivia, in decreasing order of total export value, were lead in concentrates (10,840 t), antimony trioxide (2,500 t), antimony in concentrates (2,260 t), tungsten in ore (670 t), ulexite (63,500 t), boric acid (13,600 t), amethyst (89 t), and refined antimony metal (460 t) (Ministerio de Minería y Metalurgia, Bolivia, 2006, p. 8, 12-13, 17, 22).

Outlook

In 2005 and looking forward, foreign investors appear to have a high level of interest in the mineral industry of Bolivia, owing to continuing high prices for many mineral commodities and Bolivia's estimated untapped mineral resources for these same commodities. Estimates of extensive unexplored and undeveloped mineral wealth in Bolivia will probably continue to attract some foreign investment to truly new mineral exploration projects and restarts, although ongoing political uncertainty concerning both the mining law and the hydrocarbons law is likely to deter future investment. Government proposals for nationalization of the mining and mineral fuels sectors and the problems that the Government repeatedly has had with enforcing the policies that do exist (especially in more-remote areas) are likely to continue to deter many investments that would otherwise have proceeded at the price levels experienced throughout 2005. If increasing the effective tax and royalties burden on production of natural gas to 50% is not enough and a new hydrocarbons bill that imposes majority ownership of the mineral fuels sector by state-run YPFB is effectively imposed, foreign firms interested in other sectors of the Bolivian economy, including mining, will be confronted with a fresh example of the full potential of risk inherent in FDI in the country. In 2005, foreign natural gas and petroleum companies did not wait to see if nationalization was to become a reality before reducing investment in exploration and development of new production capacity while attempting to extract as much mineral fuel from existing wells as possible. This was expected to lead to continuing decreases in reserves of mineral fuels in the country until the investment climate improves significantly or until the Government otherwise secures the funds and expertise to effectively invest in further development of the sector.

Bolivia had widespread poverty, and the Government had hoped that the new mining reactivation plan would stimulate the development of the mining sector of the Bolivian economy. In 2005, the mining reactivation plan was approved but not fully implemented. This was similar to the case with the new hydrocarbons law that was approved in May 2005, and may be explained by another change of Government during the year. Historically, however, taxation and redistribution schemes that have attempted to extract economic surplus from foreign investors and to reinvest the revenue to the economic benefit of the broader Bolivian populace have not been very effective. In 2005, many Bolivians continued to demonstrate for actual public ownership of mineral fuel and nonfuel mineral resources in the country and argued that the mining reactivation plan and new hydrocarbons law could not get past the critical step of effective tax collection to even begin real implementation. This argument was politically popular and the new President was elected at the end of 2005 on a platform that advocated nationalization as the only way to assure that Bolivians acquire the share of revenues from mineral exploitation that they desire. Depending on the success of this type of policy within the mineral fuels sector, nationalization of the mining sector was expected also to be proposed by the Government and to garner popular support. If this proves to be the case, many mining investment projects could be further delayed. Already in 2005, at least one company with a major mining investment project in the construction phase decided to extend this phase (delaying eventual production) in response to political unrest and a perceived increase in risk for the project (Coeur d'Alene Mines Corporation, 2006, p. 31).

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TABLE 1
BOLIVIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2001	2002	2003	2004	2005[p]
METALS[3]						
Antimony:						
Mine output, Sb content		2,264	2,346 [r]	2,585 [r]	2,633 [r]	5,098
Metal, including Sb content of trioxide		1,992	195	310 [r]	386 [r]	2,941
Arsenic, mine output, arsenic trioxide, arsenic sulfide		847 [r]	237	276	168	120
Bismuth:						
Mine output, Bi content		8	20	72	62	44
Metal, smelter		66	88	51 [r]	33	--
Copper:						
Mine output, Cu content		18	120 [r]	182	576 [r]	714
Metal, smelter, primary		20 [r]	--	--	441	--
Gold, mine output, Au content[4]	kilograms	12,395	11,256	9,362	6,951	7,803
Lead:						
Mine output, Pb content		8,857	9,893	9,740	10,267	11,231
Metal, smelter, primary		106	100 [r, e]	50 [r]	84 [r]	33
Silver:						
Mine output, Ag content	kilograms	407,998 [r]	450,311	465,309	406,925 [r]	418,506
Refined[5]	do.	32,603	31,871	28,045 [r]	10,768 [r]	18,221
Tantalum, tantalite	do.	11,992	10,823	10,070	-- [r]	4,080
Tin:						
Mine output, Sn content		12,298 [r]	15,242	16,755	17,569	18,433
Metal, smelter		11,292	10,976	12,836 [r]	13,627	13,841
Alloys, Sn-Pb alloyed metal		139	257	471 [r]	480 [r]	498
Tungsten, mine output, W content		532	399	441	403	531
Zinc, mine output, Zn content		141,226 [r]	141,558	144,985	145,906	158,582
INDUSTRIAL MINERALS						
Barite		6,253	1,556 [r]	1,851	5,774	11,379
Bentonite		159	216	227	548	590
Borax		1,750	940	--	--	--
Boric acid		140	6,486	--	--	13,584
Cement, hydraulic	thousand metric tons	983	1,010	1,138	1,276	1,440
Gemstones, rough						
Amethyst	kilograms	65,197 [r]	3,789 [r]	144,354 [r]	199,615 [r]	89,092
Ametrine	do.	360	--	6	5	20,011
Quartz, pink	do.	7,027 [r]	2,764 [r]	11,422	49,323	49,210
Emerald	do.	47	--	--	--	7,742
Salt, natural, all types[e]		45,000	45,000	45,000	45,000	45,000
Of which, rock salt		308	3,834	2,271	869	552
Stone, natural:						
Flint		64	(6)	--	2	4
Granite		79	126	58	--	368
Limestone as dimension stone		--	--	--	21	--
Marble		374	374	281	327	102
Slate, pizarra		202 [r]	306	228	314	297
Sulfur, native		250	2	--	--	--
Ulexite		32,477	40,479	109,545	68,031	62,604
MINERAL FUELS AND RELATED MATERIALS				1,017,921	988,384	962,651
Gas, natural:						
Gross	million cubic meters	7,155	8,901	10,202	12,673 [p]	14,672
Marketable	do.	5,275	6,421	7,398	10,257 [p]	12,536
Natural gas liquids[e]	thousand 42-gallon barrels	3,800	3,900	4,100	4,500	4,600
Petroleum:						
Crude	do.	11,424	11,338	12,223	14,192 [p]	15,417

See footnotes at end of table.

TABLE 1--Continued
BOLIVIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2001	2002	2003	2004	2005[p]
MINERAL FUELS AND RELATED MATERIALS--Continued						
Petroleum--Continued:						
Refinery products:						
Liquefied petroleum gas	thousand 42-gallon barrels	528	612	695	791 [p]	864
Gasoline:						
Aviation	do.	25	16	21	23	25
Motor	do.	3,439	3,449	3,450	3,867 [p]	3,726
Jet fuel	do.	854	909	944	946 [p]	1,104
Kerosene	do.	156	162	166	150 [p]	151
Distillate fuel oil	do.	2,955	3,198	3,488	4,419 [p]	4,450
Lubricants:						
Oil, automotive	do.	53	61	62	78 [p]	80 [e]
Oil, industrial	do.	2	2	2	5 [p]	5 [e]
Greases[7]	do.	2	2	2	3 [p]	3 [e]
Asphalt[7]	do.	12	13	13	14 [p]	14 [e]
Paraffin oil[7]	do.	6	6	6	5 [p]	5 [e]
Other[e]	thousand 42-gallon barrels	5	28	--	-- [p]	-- [e]
Total	do.	8,037	8,458	8,849	10,301 [p]	10,400 [e]

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [p]Preliminary. [r]Revised. -- Zero.

[1]Table includes data available through November 2006.

[2]In addition to the commodities listed, a variety of industrial minerals (clays, crushed and broken stone, dimension stone, and sand and gravel) are produced, but available information is inadequate to make reliable estimates of output.

[3]Unless otherwise specified, data represent actual production by Corporación Minera de Bolivia and small- and medium-sized mines.

[4]Includes production of metallic gold.

[5]Includes production of metallic silver.

[6]Less than 1/2 unit.

[7]Reported figures were converted from metric tons to equivalent barrels.

TABLE 2
BOLIVIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Antimony		Empresa Minera Unificada S.A. (EMUSA) (private, 100%)	Caracota, Chilcobija, and Espiritu Santo Mines, Potosi Department	1,100.
Do.		Small-scale mining operations and cooperatives (private, 100%)	San Jose Mine, Oruro Department; Mines in Caracota District, Nor Chichas, Quijarro, and Sud Chichas Provinces, Potosi Department	4,300.
Antimony, refined		Complejo Metalúrgica Vinto S.A. (Compañía Minera Colquiri S.A., 100%)	Vinto antimony smelter, Carretera Vinto, Oruro Department (no official production in 2005)	60.
Do.		Fundestaño de Oruro S.A. (Empresa Minera Unificada S.A., 100%)	City of Oruro, Oruro Department	1,100.
Antimony trioxide		Empresa Minera Bernal Hermanos S.A. (private, 100%)	Palala smelter, Tupiza, Potosi Department	1,900.
Bismuth, refined		Complejo Metalúrgica Vinto S.A. (Compañía Minera Colquiri S.A., 100%)	Vinto smelting complex on the Carretera Vinto, Oruro Department	35.
Cement	thousand metric tons	Sociedad Boliviana de Cemento S.A. (SOBOCE) (Grupo Cementos de Chihuahua S.A. de C.V., 47.02%, and other private, 52.98%)	El Puente (near city of Tarija), EMISA (near city of Oruro), VIACHA (near city of La Paz), and WARNES (near city of Santa Cruz) plants.	865 cement; 640 clinker.
Do.	do.	Fábrica Nacional de Cemento S.A. (Sociedad Boliviana de Cemento S.A., 33.34%; Municipal Government of Sucre, 33.33%; Universidad San Francisco Xavier de Chuquisaca, 33.33%)	Cal Orcko industrial complex near city of Sucre, including grinding plant, and FANCESA cement plant near city of Chucquisaca	375 cement; 360 clinker.
Do.	do.	Cooperativa Boliviana de Cemento Ltda. (COBOCE)	Irpa Irpa Plant, near city of Cochabamba	330 clinker.
Gold	kilograms	Empresa Minera Paititi S.A. (Orvana Minerals Corp. [Fabulosa Mines Limited (Minera S.A., 100%), 52.5%, and other private, 47.5%], 100%)	Don Mario Mine, Chiquitos Province, Santa Cruz Department	2,500
Do.	do.	Golden Eagle International Inc. (private, 100%)	Cangalli Mine, Santa Cruz Department	150.
Do.	do.	Grupo Minero La Roca S.A. (private, 100%)	La Paz Department	200.
Do.	do.	Mining Cooperatives (private, 100%)	Tipuani, Guanay, Mapiri, Huayta, Kaka and Teoponte Rivers, La Paz Department	4,350.
Gold-silver doré, bullion	do.	Empresa Minera Inti Raymi S.A. (Newmont Mining Corporation, 88%, and Empresa Minera Unificada S.A., 12%)	Kori Chaca open pit mine and Kori Kollo leaching plant, near city of Oruro	3,200 gold; 4,500 silver.
	do.			
Lead		Compañía Minera del Sur S.A. (COMSUR) (Glencore International AG, 100%)	Bolívar, Colquechaquita, Don Diego, Porco, and San Lorenzo Mines, Oruro and Potosi Departments	15,000.
Do.		Empresa Minera La Solución S.A. (Apogee Minerals Ltd., 51%, and other private, 49%)	Asientos and Monserrate lead-silver-zinc mines, Cochabamba Department	610.
Do.		Small-scale mining operations and cooperatives (private, 100%)	Cerro Rico Mine and in the areas immediately surrounding the San Cristobal Mine (under construction), Potosi Department	4,700.
Lead, metal		Complejo Metalúrgica Vinto S.A. (Compañía Minera Colquiri S.A., 100%)	Vinto smelting complex on the Carretera Vinto, Oruro Department	35.
Do.		Empresa Metalúrgica de Karachipampa (Atlas Minerals Inc., 65%, and Corporación Minera de Bolivia, 35%)	Karachipampa lead-silver smelter, and zinc refinery, Potosi Department (inactive since completion in 1984)	30,000.
Natural gas	million cubic meters	Operated by Empresa Petrolera Andina S.A. (Repsol YPF S.A., 50%; Previsión and Futuro Pension Funds, 24.46% each; other Bolivian Pension Funds, 1.08%), and owned by Empresa Petrolera Andina, S.A., 50%; Petróleo Brasileiro S.A., 35%; Total S.A., 15%	Los Sauces, Rio Grande, Sirari, Vibora, and Yapacani Fields, Santa Cruz Department	2,700.
Petroleum	thousand 42-gallon barrels	do.	do.	2,100.

See footnotes at end of table.

TABLE 2--Continued
BOLIVIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Natural gas	million cubic meters	Operated by Petróleo Brasileiro S.A. (Petrobras) (Brazilian Government, 32.2%, and private, 67.8%), and owned by Empresa Petrolera Andina S.A., 50%; Petróleo Brasileiro S.A., 35%; Total S.A., 15%	Sabalo Field, San Antonio Block; San Alberto Field and Block, Tarija Department	7,200.
Petroleum	thousand 42-gallon barrels	Operated by Petróleo Brasileiro S.A. (Petrobras) (Brazilian Government, 32.2%, and private, 67.8%), and owned by Empresa Petrolera Andina S.A., 50%; Petróleo Brasileiro S.A., 35%; Total S.A., 15%	Sabalo Field, San Antonio Block; San Alberto Field and Block, Tarija Department	7,500.
Natural gas	million cubic meters	Operated by Empresa Petrolera Chaco S.A. (Pan American Energy LLC [BP p.l.c., 60%, and BRIDAS Corporation, 40%] 100%), and owned by Empresa Petrolera Chaco S.A., 50%, and BBVA and Futuro de Bolivia pension funds, 50%	Vuelta Grande Field, Chuquisaca Department; Bulo Bulo, Carrasco and Kanata Fields, on the border of Cochabamba and Santa Cruz Departments	2,200.
Petroleum	thousand 42-gallon barrels	do.	do.	2,900.
Natural gas	million cubic meters	Operated by Repsol YPF S.A., and owned by BG Group plc., 37.5%; Repsol YPF S.A., 37.5%; Pan American Energy LLC, 25%	Margarita Field, Caipipendi Block, Tarija Department; Paloma Field, Mamore Block, Cochabamba and Santa Cruz Departments	1,300.
Petroleum	thousand 42-gallon barrels	do.	do.	5,000.
Natural gas	million cubic meters	Operated and owned by BG Group plc., 100%	La Vertiente, Escondido and Taiguati fields, La Vertiente Block; Los Suris field and block, all in Tarija Department	630.
Petroleum	thousand 42-gallon barrels	do.	do.	610.
Natural gas	million cubic meters	Operated by Pluspetrol Bolivia Corporation S.A. (owned by Pluspetrol S.A., 100%)	Bermejo and Madrejones fields, Tarija Department; Tacobo field, Santa Cruz Department	520.
Petroleum	thousand 42-gallon barrels	do.	do.	160.
Silver		Small-scale mining operations and cooperatives (private, 100%)	Candelaria and other mines, Cerro Rico deposit, as well as in areas immediately surrounding the San Bartolome Mine (under construction), Oruro and Potosi Departments.	220.
Do.		Compañía Minera del Sur S.A. (COMSUR) (Glencore International AG, 100%)	Bolivar, Colquechaquita, Don Diego, Porco, and San Lorenzo Mines, Oruro and Potosi Departments	200.
Do.		Empresa Minera La Solución S.A. (Apogee Minerals Ltd., 51%, and other private, 49%)	Asientos and Monserrate lead-silver-zinc mines, Cochabamba Department	2.
Silver, metal		Empresa Metalúrgica de Karachipampa (Atlas Minerals Inc., 65%, and Corporación Minera de Bolivia, 35%).	Karachipampa lead-silver smelter, and zinc refinery, Potosi Department (inactive since completion in 1984)	2,500.
Do.	kilograms	Complejo Metalúrgica Vinto S.A. (Compañía Minera Colquiri S.A., 100%)	Vinto smelting complex on the Carretera Vinto, Oruro Department	150.
Tin		Corporación Minera de Bolivia (COMIBOL) (Government, 100%)	Huanuni Mine, Dalence Province, Oruro Department	3,000.
Do.		Compañía Minera Colquiri S.A. (Compañía Minera del Sur S.A., 51%, and Actis Capital LLP, 49%)	Colquiri tin and zinc mine, Inquisivi Province, La Paz Department	3,000.
Do.		Empresa Minera Barrosquira Ltda. (private, 100%)	Caracoles Mine, Inquisivi Province, La Paz Department	500.
Do.		Small-scale mining operations and cooperatives (private, 100%)	Caracoles, Huanuni, Viloco, and other current or former COMIBOL mines, in Oruro, Potosi, and La Paz Departments	11,100.
Tin, refined		Fundestaño de Oruro S.A. (Empresa Minera Unificada S.A., 100%)	City of Oruro, Oruro Department	3,000.
Do.		Complejo Metalúrgica Vinto S.A. (Compañía Minera Colquiri S.A., 100%)	Vinto smelting complex on the Carretera Vinto, Oruro Department	12,000.
Tin-lead alloys		do.	do.	200.

See footnotes at end of table.

TABLE 2--Continued
BOLIVIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Tungsten, W content	Small-scale mining operations and cooperatives (private, 100%)	Bolsa Negra, Enramada, Reconquistada Mines, near the former International Mining Company's Chojilla Mine, Sud Yungas Province; Chambilaya and Chicote Grande Mines, Inquisivi Province; Mercedes, San Antonio, Ucumarini Mines, Larecaja Province, La Paz Department	580.
Zinc	Compañía Minera del Sur S.A. (COMSUR) (Glencore International AG, 100%)	Bolivar, Colquechaquita, Don Diego, Porco, and San Lorenzo Mines, Oruro and Potosi Departments	230,000.
Do.	Small-scale mining operations and cooperatives (private, 100%)	Cerro Rico Mine and in the areas immediately surrounding the San Cristobal Mine (under construction), Potosi Department	36,100.
Do.	Compañía Minera Colquiri S.A. (Compañía Minera del Sur S.A., 51%, and Actis Capital LLP, 49%)	Colquiri tin and zinc mine, Inquisivi Province, La Paz Department	14,000.
Do.	Empresa Minera La Solución S.A. (Apogee Minerals Ltd., 51%, and other private, 49%)	Asientos and Monserrate lead-silver-zinc mines, Cochabamba Department	1,300.
Zinc, refined	Empresa Metalúrgica de Karachipampa (Atlas Minerals Inc., 65%, and Corporación Minera de Bolivia, 35%).	Karachipampa lead-silver smelter, and zinc refinery, Potosi Department (inactive since completion in 1984)	40,000.

[e]Estimated; estimated data are rounded to no more than three significant digits.

TABLE 3

BOLIVIA: ESTIMATED MAJOR MINERAL INVESTMENTS ONGOING OR BUDGETED IN 2005[1]

(Million dollars)

Department	Project Name	Commodities	Ownership	Total investment	Planned startup date
La Paz	La Solucion Mine (expansion)	Silver, lead, and zinc in concentrates	Empresa Minera La Solución S.A. (Apogee Minerals Ltd., 51%, and other private, 49%)	2 [2]	NA
La Paz	Colas de Colquiri concentration plant (modernization)	Tin and zinc in concentrates	Compañía Minera Colquiri S.A. (CMC) (Glencore International AG, 51%, and Actis Capital LLP, 49%)	30 [2]	NA
La Paz	Laurani	Copper, gold, and silver in concentrates	General Minerals Corporation, 100%	NA	NA
Oruro	Kori Chaca (extension of Kori Kollo Mine)	Gold in concentrate and gold-silver doré	Empresa Minera Inti Raymi S.A. (Newmont Mining Corporation, 88%, and Empresa Minera Unificada S.A., 12%)	27	end-2005
Oruro	Kori Kollo (reclamation)	do.	Empresa Minera Inti Raymi S.A. (Newmont Mining Corporation, 88%, and Empresa Minera Unificada S.A., 12%)	12	2006
Oruro	Poopo	do.	Compañía Minera del Sur S.A. (COMSUR), (Glencore International AG, 100%)	18	NA
Potosi	San Bartolome	Silver and tin in concentrate	Compañía Minera Manquiri S.A. (Coeur d'Alene Mines Corporation, 100%)	135	2008
Potosi	San Cristobal	Silver, lead, and zinc in concentrate	Compañía Minera San Cristóbal S.A. (Apex Silver Mines Limited, 100%)	600	end-2007
Potosi	San Vicente (expansion)	Silver and zinc in concentrate	Pan American Silver Corp., 55%; Empresa Minera Unificada S.A., 40%; local mining cooperative and Trafigura S.A., 5%)	35 [2]	2008
Potosi	Pailoviri II (Cerro Rico de Potosi)	do.	Franklin Mining Inc., 50%, and Corporación Minera de Bolivia (Government, 100%), 50%	NA	NA
Potosi	Salar de Uyuni	Potash, salts, NaCl, and boron materials	Corporación Minera de Bolivia (COMIBOL), 100% (Government, 100%)	100	NA
Potosi	Malku Khota	Gold and silver in concentrate	General Minerals Corporation, 100%	11 [2]	NA
Potosi	Amayapampa	Gold	Luzon Minerals Ltd., 100%	26 [2]	NA
Potosi	Karachipampa smelter (modernization and installation of zinc roaster and refinery)	Silver, lead, zinc metal	Atlas Precious Metals Inc., 65%, and Corporación Minera de Bolivia (Government, 100%), 35%	130 [2]	NA
Santa Cruz	El Mutun	Iron ore, pellets, sponge iron, steel	Jindal Steel & Power Ltd., 100%	2,300 [2]	2011 [3]
Santa Cruz	Don Mario Mine (expansion)	Copper cathodes; copper, gold, silver concentrates	Empresa Minera Paititi S.A. (Orvana Minerals Corp., 100%)	65 [2]	end-2010
Santa Cruz and Beni	San Simon	Gold concentrates	Eaglecrest Exploration Bolivia S.A. (Eaglecrest Explorations Ltd., 100%)	26	2010 [3]

NA Not available.

[1]Estimated data are rounded to no more than three significant digits; may not add to totals shown.

[2]If approved.

[3]Not before this date.

The Mineral Industry of Brazil

By Alfredo C. Gurmendi

In 2005, Brazil occupied a leading position in the global production of the following mineral commodities: bauxite (second after Australia), columbium (niobium), graphite (third after China and India), iron ore (second after China), manganese (third after South Africa and Australia), and tantalum (third after Australia and Mozambique) (Departamento Nacional de Produção Mineral, 2006, p. 10; Corathers, 2006; Jorgenson, 2006; Magyar, 2006a, b; Olson, 2006b; Plunkert, 2006).

Brazil's total land area is 8,511,965 square kilometers, which is smaller than the United States, and its population was almost 186.4 million in 2005. Brazil was the leading economy in Latin America and a member of the Mercado Común del Cono Sur (MERCOSUR), which is the second largest trade association in the Americas and the eighth worldwide. Its gross domestic product (GDP) based on purchasing power parity was $1.536 trillion.[1] The per capita income increased to $4,319 in 2005 from $3,324 in 2004. In 2005, Brazil's GDP grew by 2.3% (Departamento Nacional de Produção Mineral, 2006b§[2]; International Monetary Fund, 2006§; U.S. Central Intelligence Agency, 2006§; World Bank, The, 2006§). The country has undergone significant change during the past decade on the macroeconomic front and, at the end of 2005, Brazil was on the threshold of a positive macroeconomic cycle in both domestic consumption and exports because of increased global trade, a high level of liquidity of international financial resources, higher confidence of foreign and domestic investors, and economic recovery in 2005. The country's foreign exchange reserves increased slightly to $53.8 billion from $52.9 billion in 2004. Brazil's total debt burden decreased to $169.5 billion from $201.4 billion in 2004. Exports were valued at $118.3 billion, and imports, $73.6 billion compared with $96.5 billion and $62.8 billion, respectively, in 2004. Brazil's minerals sector had a trade surplus of $9.7 billion compared with a revised $4.2 billion in 2004 (Banco Central do Brasil, 2006§; Departamento Nacional de Produção Mineral, 2006b§, c§).

In 2005, Brazil's economic turnaround was positive owing to floating exchange rates and increased interest rates by the Banco Central do Brasil to fight inflationary pressures. The International Monetary Fund supported Brazil's move to a system of inflation targets and currency devaluation to guide its monetary policy. This action allowed the country to restore confidence in the Government's macroeconomic management and created conditions for lower inflation and interest rates. Inflation was 5.7% compared with 7.6% in 2004. The financial system benefited from foreign direct investment (FDI) inflows, high capitalization, and the strengthening of fiscal and monetary discipline, which helped maintain the country's positive economic growth in 2005 (Banco Central do Brasil, 2006§; International Monetary Fund, 2006§; World Bank, The, 2006§).

While FDI inflows increased in Latin America and the Caribbean to $68.0 billion in 2005 from $61.5 billion in 2004, or by 10.6%, inflows in South America increased to $44.5 billion from $37.7 billion in 2004, or by 18.0%, and in the Andean Community, to $16.9 billion from $7.7 billion in 2004, or by 119.5%. FDI inflows in MERCOSUR, however, decreased to $20.4 billion in 2005 from $22.8 billion in 2004, which represented a decrease of almost 17%. Nevertheless, Brazil maintained a large share (74%) of MERCOSUR's FDI as reflected mainly in the high international prices of several commodities, such as, in order of value, petroleum, copper, gold, and soybeans (Banco Central do Brasil, 2006§; Economic Commission for Latin America and the Caribbean, 2006§; World Bank, The, 2006§).

In 2005, Brazil produced 46 industrial minerals, 30 metals, and 4 fuel minerals and exported them to the global marketplace. Among those produced were bauxite, chromite, coal, columbium (niobium), copper, gemstones, gold, iron ore, kaolin, manganese, tantalum, and tin from large deposits. In Latin America, and particularly within MERCOSUR, Brazil continued to be the leading producer of aluminum, cement, ferroalloys, gold, iron ore, manganese, steel, and tin. Brazil's reportedly large mineral reserves and other identified resources help make it one of the most dynamic markets in the world. Brazil represents 65% of the South American economy (Departamento Nacional de Produção Mineral, 2006, p. 10-11; 2006a§).

In 2005, Brazil continued with its petroleum exploration program to expand reserves and reduce its dependence on oil imports. Nearly 15% of Brazil's demand for crude oil was met by oil imports in 2005. To achieve self-sufficiency for the country, Brazil's Petróleo Brasileiro S.A. (Petrobrás) budgeted about $54 billion in investments to 2010; about 90% this capital would be invested in Brazil. Brazil's petroleum and mining industries and utilities attracted investors' interest because of the country's diversified mineral endowment, the Government's macroeconomic policies, and the country's skilled labor force. Major international mining, petroleum, and steel companies were notably interested in, in order of importance, oil and gas, iron ore, steel, coal, gold, copper, and diamond. Brazil's Companhia Vale do Rio Doce (CVRD) and China's Metal Company of Baoshan, which were leading companies in Brazil and the city of Shanghai, respectively, continued to explore for, in order of value, iron ore, manganese, bauxite, gold, and other mineral commodities in Brazil (Petróleo Brasileiro S.A., 2006, p. 7, 59-61; Departamento Nacional de Produção Mineral, 2006c§).

More than 500 transnational corporations (TNC) established operations in Brazil between 1990 and 2005 via mergers, joint ventures, and privatizations. Since 1990, the TNCs brought in about $150 billion in registered investment through the Banco

[1]Where necessary, values have been converted from Brazilian reals (R$) to U.S. dollars (US$) at the rate of R$2.340=US$1.00.

[2]References that include a section mark (§) are found in the Internet References Cited section.

Central do Brasil; of that total, about $36 billion, or almost 25%, was invested by such major companies as Anglo American plc, BHP Billiton plc, De Beers Group, and Gencor Ltd. In 2005, CVRD and the TNCs invested $500 billion; of that total, about $227 billion, or about 45%, was invested by TNCs BHP Billiton and Rio Tinto plc of the United Kingdom and Anglo American and Alcoa Inc. of the United States. The Banco Central do Brasil (2006§) also reported that, since 1996, the accumulated net FDI amounted to more than $151 billion equity capital, of which $35 billion was used for acquisitions of state-owned assets and more than $116 billion was used for direct investment and joint ventures with the private sector (Banco Central do Brasil, 2006§; Departamento Nacional de Produção Mineral, 2006b§).

As of December 2005, the active international mining and oil companies in Brazil included Alcan Aluminum Ltd., Barrick Gold Corp., INCO Limited, and Teck Cominco Inc. of Canada; Shanghai Baosteel Corp. of China; Royal Dutch/Shell Group of the Netherlands; EDP Limited of Portugal; Iberdrola S.A. and Repsol YPF of Spain; BHP Minerals International Exploration Inc. (BHP Billiton, 100%), Anglo American, and Rio Tinto of the United Kingdom; and Chevron Corp. (ChevronTexaco Brasil S.A.), Dow Chemical Co., Exxon Mobil Corp. (Esso Brasileira de Petróleo Ltda.), Newmont Mining Corp., Placer Dome U.S. Inc., and Phelps Dodge Co. of the United States (Departamento Nacional de Produção Mineral, 2006b§).

Government Policies and Programs

The fundamental principles governing the use of mineral resources in Brazil are defined and consolidated in the current Federal Constitution (Article 20), which was enacted on October 5, 1988, and in Constitutional Amendments Nos. 6 and 9 dated August 15, 1995, which allow the participation of the private sector by means of joint ventures and/or privatization investment in the sectors of mining, natural gas, and petroleum and in the deregulated sectors of coastal and river shipping, telecommunications, and transportation. The Government monopolies of the oil and gas industries and fuel price subsidies were rescinded in 1999 after 45 years; this allowed Petrobrás to enter into joint ventures with foreign investors. The Agencia Nacional do Petróleo regulates the petroleum industry (Departamento Nacional de Produção Mineral, 2006a§-c§).

Since 2001, the Government reduced the Brazilian import tax for minerals; the rates vary from 3% to 9%—ores and concentrates are 5%, and other mineral derivatives, 7%. The export tax does not apply to exported mineral products, although there is a value-added tax. In most cases, the basis for assessment for corporate income taxes is the net profit for the fiscal year; the tax rate ranges between 10% and 15% and is levied on net gross profit. Profits can be expatriated. Equity ownership, which is allowed by means of privatization or by direct acquisition, can be as high as 100%. The Concessions Law created additional opportunities for the private sector in public utilities previously reserved for the Government. All the above actions, which were undertaken by the Government to open the Brazilian economy to international competition, have continued to create an environment that attracts domestic and foreign investments equally (Departamento Nacional de Produção Mineral, 2006a§).

The exploration and exploitation of mineral resources in Brazil are defined and regulated by the 1967 Mining Code (Executive law No. 227 of February 28, 1967). The Brazilian Constitution and the amended Mining Code, law No. 9314 of January 1997, provide greater flexibility for investment in the Brazilian mining sector. Article 7 of the amended law stipulates that the exploitation of mineral deposits will depend upon an Exploration Authorization Permit granted by the General Director of the Departamento Nacional de Produção Mineral (DNPM) and a Development Concession issued by the Ministro do Minas e Energia. Licensing is a restricted system applicable exclusively to the exploitation of industrial minerals. The DNPM is responsible for enforcing the 1997 Mining Code and implementing its legal provisions (Departamento Nacional de Produção Mineral, 2006a§).

The DNPM reported an investment of $162 million in mineral exploration compared with $200 million in 2004. The Companhia de Pesquisa de Recursos Minerais (CPRM) (the Brazilian Geological Survey) is developing programs for basic geologic mapping, metallogenetic and hydrogeologic mapping, and prospecting in areas of potential development. The CPRM is also creating and maintaining geologic and economic databases (particularly for coal, copper, diamond, gold, kaolin, nickel, peat, and zinc) to assist investors in the minerals sector (Departamento Nacional de Produção Mineral, 2006b§).

The Brazilian Financial Compensation for Exploiting Mineral Resources—Federal Royalty (CFEM), which was established by the Brazilian Constitution of 1988, was instituted by law No. 7990 in 1989 to compensate municipalities, States, and the Federal Government. The CFEM rate is no more than 3% of the net revenue of mineral sales. The prevailing rates are 3% for bauxite, manganese ore, potassium, and rock salt; 2% for coal, fertilizers, iron ore, and other minerals; 1% for gold (gold produced during prospecting is exempt); and 0.2% for other precious minerals and precious stones. The collected royalties are allocated among the municipalities, States, and the Federal Government in the proportion of 65%, 23%, and 12%, respectively. In July 2000 (law No. 9993/2000), the Federal Government decided to share its 12% CFEM fund with the DNPM (9.8%); the Fondo Nacional de Desarrollo Cientifico y Tecnologico (FNDCT), which is an instrument for technological innovation for the benefit of all Brazil's productive sectors (2%); and the Brazilian Environment Agency (IBAMA) (0.2%). The CFEM collection was very successful and increased to $173.5 million in 2005 from $139.4 million in 2004, or by 24.5% (Departamento Nacional de Produção Mineral, 2006a§-c§).

In 2005, the States of Minas Gerais (50.1%), Para (29.6%), and Goias (3.7%) were the major collectors of CFEM; the main municipalities were Parauapebas (56.5%) and Oriximina (8.5%) in the State of Para and Itabira (10.8%), Nova Lima (6.5%), and Mariana (6.2%) in the State of Minas Gerais. Both States and their respective municipalities were the main producers of iron ore. The main mineral contributors to the CFEM were iron ore (49.9%), aluminum (8.9%), kaolin (4.2%), calcite (3.7%), and gold (3.2%). The State of Minas Gerais produced mainly, in order of value, iron ore, nickel, gold, and zinc, and the State of

Para produced mainly bauxite, iron ore, kaolin, copper, and others (Departamento Nacional de Produção Mineral, 2006b§, c§).

Environmental Issues

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

•Federal law No. 6938 of August 31, 1981, and its amendments (Acts Nos. 7804 of July 18, 1989, and 8028 of April 12, 1990) provide the purpose and mechanism for formulation of the National Environmental Policy,

•Federal law No. 9605 of February 12, 1998, provides sanctions against harmful activities to the environment,

•Federal Decree No. 97632 of April 10, 1989, deals with rehabilitation of areas degraded by mining,

•Federal Decree No. 99274 of June 6, 1990, regulates law No. 6938, and

•Resolutions of the National Council for the Environment (CONAMA): (1) Resolution No. 1 of January 23, 1986, provides basic criteria and general guidelines for the Report on Environmental Impact (RIMA); (2) Resolution No. 009 of December 6, 1990, regulates environmental licenses for mineral extraction; (3) Resolution No. 010 of December 6, 1990, regulates environmental licenses for mineral extraction used in civil construction; (4) Resolution No. 2 of April 18, 1996, provides for compensation for environmental damages; and (5) Resolution No. 237 of December 19, 1997, provides the procedures and guidelines used in environmental licensing.

The Brazilian Environmental Policy (BEP) is executed at three levels—Federal, State, and municipal. The coordination and formulation of the BEP is the responsibility the municipal governments. The coordination and formulation of the BEP is the responsibility of the Ministério de Meio Ambiente (MMA). Linked to the MMA is the Conselho Nacional de Meio Ambiente, which grants the environmental licenses that are required for all mining activities in Brazil. Law No. 88351 of 1986 established the National System for the Environment, which is made up of representatives of the Federal, State, and municipal governments and private foundations involved in environmental protection and improvement. Article 225 of the Brazilian Constitution of 1988 stipulates that mining operators must reclaim areas that they have environmentally degraded.

In Brazil, the environmental legislation that is applied to mining is basically consolidated in the following environmental requirements: an environmental impact study (EIA), environmental licensing (LA), and a plan for recovery of degraded areas (PRAD). An EIA applies to mining projects of any mineral substance; an LA is mandatory for the installation, expansion, and operation of any mining activity in Brazil; and a PRAD requires suitable technical solutions to rehabilitate the soil and other aspects of the environment that might be degraded by mining operations (Departamento Nacional de Produção Mineral, 2006a§, b§).

The Ministério de Minas e Energia enforces Decree No. 97632 of April 10, 1989, which prohibits the use of cyanide and mercury in the mining of gold unless approved by local Brazilian environmental agencies and offers technical assistance on producing gold without affecting the environment to small-scale independent miners (garimpeiros), in particular. Environmental impacts are expected to be reduced in the long run. Resolution No. 010 of December 6, 1990, requires that all mining operations obtain LAs prior to the granting of mineral rights by the DNPM. As environmental problems have increased because of cyanide use in in situ leaching, mercury use in gold placers, and underground acidic water discharges, antipollution measures have been enacted to eliminate the sources of pollutants and mitigate their effects on the environment (Departamento Nacional de Produção Mineral, 2006a§).

Production

In 2005, the total value of minerals produced was about $36.0 billion, or more than 4.3% of the GDP. The value of minerals-based industries amounted to almost $90 billion, or about 10.9% of the GDP. That of crude oil and natural gas amounted to almost $6.1 billion. Mineral extraction contributed 2.3% of the GDP in 2005 compared with 2.1% in 2004. Depletion of shallow gold and tin deposits and environmental constraints on garimpeiros affected their output of gold and tin (Departamento Nacional de Produção Mineral, 2006, p. 9-10, 65, 91; Banco Central do Brasil, 2006§).

The major integrated steelworks were the structural steel and rail producer Gerdau Açominas Gerais, S.A.; Latin America's leading integrated steelmaker, Companhia Siderúrgica Nacional (CSN); the carbon steel sheet and plate producer Companhia Siderúrgica Paulista; the slab producer Companhia Siderúrgica de Tubarão; and Brazil's second ranked steel mill, Usinas Siderúrgicas de Minas Gerais, S.A. In 2005, these companies produced about 25.6 million metric tons (Mt), or about 81% of the total Brazilian steel production of 31.6 Mt; Brazil was the second ranked iron ore producer in the world after China with a flat (gross weight) output of 281 Mt; CVRD produced almost 87.5% of Brazil's iron ore (Departamento Nacional de Produção Mineral, 2006, p. 57-62; Companhia Vale do Rio Doce, 2006§). 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 almost 83% of the country's total bauxite production, which amounted to about 21 Mt in 2005. The four major aluminum smelters—Albras-Alumínio Brasileiro S.A. (Albras) (30%), Companhia Brasileira de Alumínio (CBA) (23%), Alcoa Alumínio S.A. (Alcoa) (21%), and Billiton Metais S.A. (Billiton) (12%), produced 86% of the primary aluminum production of 1.5 Mt in 2005 (table 1; Departamento Nacional de Produção Mineral, 2006, p. 21-22; Instituto Brasileiro de Mineração, 2006, p. 25-27).

Trade

Brazil's trade balance increased substantially to a new peak level of $44.8 billion surplus compared with $33.7 billion in 2004, or by almost 32.9%. Brazil was the leading open market in the economic center of MERCOSUR. In 2005, the member countries of MERCOSUR had about 250 million people, or 27.6% of the Western Hemisphere's population, and a combined

purchasing power parity of more than $2.2 trillion, or about 79% of South America's total purchasing power parity. Brazil accounted for almost 70% of MERCOSUR's population and about 65% of its purchasing power parity (Banco Central do Brasil, 2006§; Departamento Nacional de Produção Mineral, 2006b§, c§; International Monetary Fund, 2006§; U.S. Central Intelligence Agency, 2006§). Most multinational companies considered this growing trade bloc, which followed the North America Free Trade Agreement (NAFTA) and the European Union (EU) in size and the amount of trade that takes place, to be extremely important. In 2005, Brazil's total trade with NAFTA increased to $43.5 billion from $38.6 billion in 2004. Most of this trade was with the United States, trade with which increased to $35.6 billion from $31.9 billion in 2004. MERCOSUR had an impact on intraregional total trade, which increased to about $37 billion in 2005 from $29.7 billion in 2004; intra-MERCOSUR total trade increased to $24.1 billion in 2005 from $19.2 billion in 2004 (Banco Central do Brasil, 2006§; Departamento Nacional de Produção Mineral, 2006b§).

The exports of the Brazilian minerals sector were valued at $31.6 billion in 2005, which was an increase of 34.5% from the value of $23.5 billion in 2004. Exports of primary products were valued at $13.1 billion, which was a significant increase of 11% compared with the value in 2004. The minerals having the highest export values in 2005 were iron ore, $7.2 billion; copper, $303 million; and aluminum, $229 million. Exports of semimanufactured commodities were valued at $7.9 billion in 2005, which was an increase of 20% compared with the value of $6.6 billion in 2004; the most valuable exports were iron pellets, $4.4 billion; aluminum, $1.9 billion; gold, $458 million; and columbium (niobium), tantalum, and vanadium, $423 million. Exports of manufactured products were valued at $9.9 billion in 2005, which was an increase of almost 29% from the value of $7.7 billion in 2004; the most important export was iron commodities, which increased in value by 17% to $4.2 billion from the value of $3.6 billion in 2004. Petroleum exports also increased in value to $2.9 billion in 2005, which was an increase of 53% from the value of $1.9 billion in 2004. Exports of chemical products were valued at $612 million in 2005, which was an increase of almost 6% from the value of $580 million in 2004; the most valuable export was phosphate rock, which increased in value by 1% to $240 million in 2005 from the value of $239 million in 2004. In 2005, the Brazilian minerals sector recorded a trade surplus of $9.7 billion compared with a surplus of $4.2 billion in 2004 (a very significant increase of 131%) and $2.8 billion in 2002 when the surpluses started. The total bilateral trade between Argentina and Brazil (which were the major players of MERCOSUR) increased to $16.2 billion in 2005 from $12.9 billion in 2004. Total minerals trade between Brazil ($3.5 billion) and Argentina ($3.0 billion) amounted to $6.5 billion (Banco Central do Brasil, 2006§; Departamento Nacional de Produção Mineral, 2006b§).

In 2005, Brazil's total trade surplus amounted to $20.9 billion; the surpluses with its leading trade partners were, in order of value, the United States ($4.7 billion), China ($2.6 billion), Japan ($1.3 billion), the Republic of Korea ($1.1 billion), the Netherlands ($784 million), Italy ($576 million), and Belgium ($466 million). Brazil's trade surpluses with the United States represented 22.5% of the total surplus of $20.9 billion and almost 48.5% of the surplus of Brazil's minerals sector ($9.7 billion). Exports to Europe and Japan consisted mostly of raw materials, which were, in order of volume, iron ore, crude oil, manganese, marble, granite, and agricultural commodities. Brazil's leading raw materials trading partners were China ($781 million), Germany ($411 million), Japan ($392 million), France ($212 million), the Republic of Korea ($175 million), and Belgium ($159 million). Bilateral trade between Brazil and China included exports of, in order of value, soybean, iron ore, steel, airplanes, buses, auto parts, pulp, tobacco, and timber. China's main exports to Brazil included, in order of value, coke, coal, electronic parts, equipment for energy transmission, and products and material for audiovisual equipment (Banco Central do Brasil, 2006§; Departamento Nacional de Produção Mineral, 2006b§).

Brazil's wealth of mineral resources and China's needs for raw materials appeared to be strengthening the Sino-Brazilian trade partnership (Departamento Nacional de Produção Mineral, 2006, p. 57-58, 76-77; 2006a§, b§; Instituto Brasileiro de Mineração, 2006, p. 35; Companhia Vale do Rio Doce, 2006§).

Structure of the Mineral Industry

The mineral industry of Brazil was large by world standards. Brazilian corporations, private Brazilian investors, and foreign companies partially or wholly owned the major portion of the industry. The exceptions were the natural gas and petroleum industries, which were 100% Government owned through Petrobrás, which comprised five subsidiaries. Petrobrás Distribuidora S.A. distributed petroleum products; Petrobrás Gás S.A. produced, traded, and distributed natural and liquefied natural gas and fertilizers; Petrobrás Internacional, S.A. operated in foreign countries; Petrobrás Química, S.A. was the integrated refining-petrochemical operations company; and Petrobrás Transporte S.A. constructed and operated the pipelines, terminals, vessels, and facilities needed for the transportation and storage of oil and derivatives, natural gas, and bulk products (Petróleo Brasileiro S.A., 2006, p. 10-29). The structure of the Brazilian mineral industry continued to transition to a privately owned, Government-regulated regime from one that was Government owned and Government operated. In the country, 40 cement companies operated 64 cement plants and 7 grinding plants with a clinker capacity of 45 Mt in 22 States, and 28 iron ore mining companies operated 53 mines and 44 processing plants. According to the DNPM, there were nearly 2,000 mines in Brazil; these were classified according to their run-of-mine (ROM) outputs: large mines—between 1 million and 3 million metric tons per year (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, 2006, p. 37-38, 52, 70; Instituto Brasileiro de Mineração, 2006, p. 25).

In 2005, Brazil's total labor force was more than 90 million. Of this total, services represented 66%; agriculture, 20%; and industry, 14%. According to the Banco Central do Brasil's (2006§) monthly employment survey (MES), the unemployment rate remained at 10.5%. The minerals sector employed about

5% (1,000,000) of the industry total (20 million); this did not include the nearly 500,000 active garimpeiros. In 2005, according to the MES, 1.8 million jobs were created in the country and employment in the mining sector (90,000) also continued its upward trend as a result of Brazil's economy recovery and the increases of efficiencies and productivities in the private sector that resulted from capital flows into new technologies, expansions, and joint ventures and mergers, particularly in the mining, oil and gas, and steel sectors (table 2; Banco Central do Brasil, 2006§).

Commodity Review

Metals

Aluminum and Bauxite and Alumina.—Alumina production remained at about the same level as that of 2004 (5.3 Mt). Alumínio do Norte do Brasil S.A. (Alunorte) produced 51%; Alcoa Alumínio S.A. (Alcoa), 21%; Companhia Brasileira de Alumínio (CBA), 12%; BHP Billiton, 11%; and Alcan Alumínio do Brasil S.A., 5%. Exports of aluminum totaled 964,000 metric tons (t) and were valued at $1.9 billion. Exports of alumina totaled 2.3 Mt and were valued at $563 million. Primary aluminum production increased slightly to 1.50 Mt in 2005 from 1.46 Mt in 2004, or by about 2.7%. Albras (CVRD, 51%, and Nippon Amazon, 49%) produced 30% of the primary aluminum; CBA, 23%; Alcoa, 21%; BHP Billiton, 12%; Alcan, 8%; and Aluvale, 6%. In 2005, CBA was planning to invest an additional $350 million to produce 470,000 t/yr of aluminum by 2007. In 2005, Brazil's imports of all forms of aluminum totaled 185,000 t and were valued at $394 million; exports were 964,000 t and had a value of $1.9 billion. Bauxite production remained at about the same level as that of 2004 (21.0 Mt). The MRN joint venture, which was owned by CVRD (40%), BHP Billiton (14.8%), Alcoa (13.2%), Alcan (12%), CBA (10%), Norsk Hydro (5%), and Reynolds Alumínio do Brasil (5%), accounted for about 83% of the total bauxite production for 2005. Exports amounted to 7.5 Mt of bauxite and were valued at $229 million (Departamento Nacional de Produção Mineral, 2006, p. 21-22; Instituto Brasileiro de Mineração, 2006, p. 33; Associação Brasileira do Alumínio, 2006§).

Mineradora Vera Cruz S/A (CVRD, 100%) was planning to initiate bauxite operations at the Paragominas Mine in 2006 and to produce 4.5 Mt/yr in 2007 with an investment of $271 million. Alcoa was planning a new operating hub, with an investment of $1.4 billion, in Juruti, State of Para, where it was carrying out a geologic study of a bauxite resource of 350 Mt. The annual production would be 4 Mt of bauxite, 2 Mt of alumina, and 1 Mt of aluminum. To implement this hub, Alcoa could invest an additional $1 billion in the construction of the required hydroelectric plant to produce aluminum in Belomonte, State of Para. Latapack-Ball Embalagens, Ltda. (Ball Corporation, 100%) invested $5 million to increase its aluminum cans plant capacity in Jacarei, State of Sao Paulo, to 2 billion aluminum cans in 2005 from 1.7 billion 2004. Brazil recycled 93% of all the aluminum cans, which was equivalent to 136,080 t of aluminum cans, or about 10.1 billion units; this was an increase of 2.3% compared with that of 2004. During 2005-06, China Aluminum Group and China MinMetals, both, were planning to invest a combined total of $3 billion in joint ventures, mostly with CVRD and others, in the aluminum and bauxite and alumina sectors (Departamento Nacional de Produção Mineral, 2006, p. 22; Instituto Brasileiro de Mineração, 2006, p. 33; Associação Brasileira do Alumínio, 2006§; Companhia Vale do Rio Doce, 2006§).

Copper.—Brazil's copper concentrate production increased to 133,325 t from 103,153 t in 2004, or by 29.2%. CVRD produced 106,692 t of the concentrate, or 80%, in Carajas, State of Para; Mineração Caraíba S/A, 23,985 t, or 18%, at its deposit in Jaguarari, State of Bahia; Companhia Niquel Tocantins S/A, 2,008 t, or 1.5%, in Niquelandia, State of Goias; and Mineração Santa Blandina S/A, 640 t, or 0.5%, in Itapeva, State of Sao Paulo. In 2005, Caraiba Metais S/A (CMSA) of Camacari, State of Bahia, which was the only electrolytic copper producer in Brazil, produced 199,043 t of primary copper metal; this was a decrease of about 4.3% from the 208,020 t produced in 2004. The feed for this electrolytic copper output included 402,366 t of copper concentrates (132,780 t of contained metal) imported from Chile (86%), Argentina (8%), and Portugal (6%). To meet Brazil's metal copper demand of 311,933 t/yr, CMSA imported 160,461 t of copper cathode mostly from Chile (85%) and Peru (15%) in 2005. CMSA was planning to produce between 450,000 and 500,000 t/yr of electrolytic copper in D'Avila, State of Bahia, by 2010 (Departamento Nacional de Produção Mineral, 2006, p. 39-40; Instituto Brasileiro de Mineração, 2006, p. 32, 34; Companhia Vale do Rio Doce, 2006§).

In 2005, CVRD's copper project portfolio included the sulfide ore resources of, in order of resource amount, Sossego, Salobo, Alemao, and Cristalino, and the oxidized ore deposit of Corpo 118, all of which are located in the mineral province of Carajas, State of Para. The Sossego copper mine (CVRD, 100%), which contained 200 Mt of sulfide ore grading 1.0% copper, started operations in January 2004 at a rate of 140,000 t/yr of copper in concentrates. The feasibility studies for the Salobo project [Salobo Metais S/A (CVRD, 100%)], which was Brazil's leading copper project, estimated copper resources to be 986 Mt at grades of 0.82% copper and 0.49 gram per metric ton (g/t) gold, at a cutoff grade of 0.5% copper and associated molybdenum and silver. The Cobre Salobo, which is located in Maraba, State of Para, could support a mill of 140,000-t/yr capacity. The Alemao deposit [CVRD, 67.0% and Banco Nacional de Desenvolvimento Econômico e Social (BNDES), 33.0%] contained 161 Mt of copper resources at grades of 1.3% copper and 0.86 g/t gold. A prefeasibility study for Cristalino (BNDES and CVRD, 50.0% each) estimated reserves of 312 Mt grading 0.77% copper and 0.13 g/t gold. CVRD continued conducting intensive geological prospecting to identify new copper areas in the Carajas region. Also, a feasibility study for Mineração Maracá S.A.'s Chapada copper project in Alto Horizonte, State of Goias, estimated that its ore reserves amounted to 434.5 Mt containing 1.3 Mt of copper and 9.6 t of gold. This project would start operations in early 2008 (Departamento Nacional de Produção Mineral, 2006, p. 39-40; Instituto Brasileiro de Mineração, 2006, p. 32-33; Companhia Vale do Rio Doce, 2006§).

Brazil's refined copper production was used primarily in the automobile and construction industries. Exports amounted to 112,520 t of copper metal at a value of $413.6 million, which went to the United States (56%), Argentina (16%), Canada (12%), and others (16%). By 2010, should the positive market conditions continue, Brazil could become self-sufficient and diminish its external dependency on copper (Departamento Nacional de Produção Mineral, 2006, p. 40; Instituto Brasileiro de Mineração, 2006, 36-37).

Gold.—Gold production decreased by 19.5% to 38.3 t from 47.6 t in 2004; mining companies produced 29.9 t (78.1%), and garimpeiros, 8.4 t (21.9%). Gold production by companies increased by 1.4 t and that by garimpeiros decreased by 10.7 t compared production in 2004; the garimpeiros' output decreased because of higher production costs and more stringent environmental standards. In 2005, AngloGold Ashanti Mineração Ltda. was the leading producer and accounted for 5.8 t, or 19.4% of the country's total (38.3 t); Mineração Serra Grande S.A. (AngloGold Ashanti and Kinross Gold Corp., 50% each) produced almost 6 t, or 15.6%; Rio Paracatu Mineração S/A (Kinross, 100%) produced 5.6 t, or 14.7%; and others produced 12.5 t, or 32.6%. The States with garimpeiros gold operations were Para (with 41.2% of the garimpeiros' operations), Mato Grosso (17.5%), Amapa (15.9%), Rondonia (14.8%), and others (10.6%) (Departamento Nacional de Produção Mineral, 2006, p. 88-90).

Refined gold from the Sao Bento Mine was extracted by a combination of pressure oxidation and bioleaching (the Biox process, which had been developed by Gold Fields Ltd. and Mintek Ltd. of South Africa). The Canadian group Yamana Gold Inc. (CYG) intended to invest $120 million to produce 3.1 t/yr of gold from the Sao Francisco project and and 1.9 t/yr of gold from the Sao Vicente project (both of which are located in the State of Mato Grosso) by 2006. Similar investment was planned for CYG's Chapada and Fazenda Nova projects, which are located in the State of Goias; the projects would produce a combined 1.2 t/yr of gold by 2007 and 3.7 t/yr of gold by 2008. CYG's Cumaru project, which is located in Carajas, State of Para, has reserves of 17 t at a grade of 4.8 g/t gold and was in the feasibility stage. AngloGold Ashanti intended to invest $150 million to produce 9.3 t/yr of gold from the Cuiaba Mine in Sabara, State of Minas Gerais, by 2006 (Departamento Nacional de Produção Mineral, 2006, p. 89-90; Instituto Brasileiro de Mineração, 2006, p. 30, 34).

Iron Ore.—Brazil produced 280.9 Mt of beneficiated iron ore in 2005 compared with 261.7 t in 2004. Almost 96.1% of that production was from the following four major iron ore companies: CVRD, 203.3 Mt; Minerações Brasileiras Reunidas S/A (MBR) (BHP Billiton, 50% and Mitsui & Co. Ltd. of Japan, 50%), 48.8 Mt; SAMARCO Mineração S/A., 15.1 Mt; and Cia. Siderúrgica Nacional (CSN), 13.7 Mt. In 2005, Brazil exported 177.0 Mt of iron ore and 47.2 Mt of pellets valued at $7.2 billion and $4.4 billion, respectively (Departamento Nacional de Produção Mineral, 2006, p. 57-58; Instituto Brasileiro de Mineração, 2006, p. 26, 34; Companhia Vale do Rio Doce, 2006§).

Total iron ore exports increased by 9.5% from those of 2004 and were shipped to 40 countries worldwide. Total export revenues increased by 53.3% to $7.3 billion from $4.8 billion in 2004. The leading importers of Brazilian iron ore were China (24%), Japan (13%), Germany (12%), and France and South Korea (6% each). The customized (varied chemical characteristics) commercial products sold were sinter feed and pellet feed (69%), pellets (22%), and lump ore (9%) (Departamento Nacional de Produção Mineral, 2006, p. 57; Instituto Brasileiro de Mineração, 2006, p. 38).

CVRD acquired the following companies, listed here by order in which the acquisition was completed (percentage): Mineração Socoimex Ltda. (100%), which had the capacity to produce 7 Mt/yr of iron ore, for $48 million; SAMITRI (51%), for $711 million; Gulf Industrial Company of Brazil (50%), which was the owner of a pellet plant in Bahrain with a 4-Mt/yr capacity, for $92 million; and Caemi Mineração e Metalurgia S.A. (Caemi and CVRD, 50% each), for $279 million. Caemi was a nonoperational holding firm. CVRD started up its 12th iron ore pellet plant in the Port of Ponta de Madeira, State of Maranhao, which had a capacity to produce 6 Mt/yr. CVRD planned to inject about $6 billion into the mining sector by 2007 to consolidate its leading position in the global iron ore market (Departamento Nacional de Produção Mineral, 2006, p. 58; Companhia Vale do Rio Doce, 2006§).

Iron and Steel.—*Ferroalloys.*—Ferroalloys production increased slightly to 1,250,000 t in 2005 from 1,240,000 t in 2004. Brazil's Prometal Produtos Metalúrgicos S.A. took Norway's Elkem A/S, which was one of the world's leading manganese alloy producers, as a partner and produced 480,000 t of ferromanganese in 2005; the project, in which Elkem will hold a 40% share, was located in Maraba, State of Para. The manganese came from the nearby Prometal Mine, and the iron ore came from the Carajas District (Departamento Nacional de Produção Mineral, 2006, p. 60).

Pig Iron.—Brazil produced 34.4 Mt of pig iron, which was about the same amount as that of 2004 (34.6 Mt). The almost 7.1 Mt of exports, which was valued at $1.8 billion, was approximately one-third of the pig iron traded in the world (Departamento Nacional de Produção Mineral, 2006, p. 60; Instituto Brasileiro de Siderurgia, 2006, p. 46).

Steel.—Raw steel production decreased by 3.9% to 31.6 Mt in 2005 from 32.9 Mt in 2004. Brazil was the eighth ranked producer and exporter of steel worldwide (Departamento Nacional de Produção Mineral, 2006, p. 60; Instituto Brasileiro de Siderurgia, 2006, p. 8). Brazil exported 12.5 Mt of steel valued at $6.5 billion, which represented an increase of 4.2% in volume (0.5 Mt) and an increase of almost 22.6% in value ($1.2 billion) compared with exported steel in 2004. The major recipients of Brazil's exports were the United States (14%), China (13%), and Argentina, Chile, and Mexico (5% each). Apparent domestic consumption of steel was about 20.0 Mt, which represented a decrease of almost 7.0% compared with that of 2004. The Instituto Brasileiro de Siderurgia (IBS) stressed that the Brazilian steel industry had become more efficient because privatization and the inflow of new investments had fundamentally improved efficiency levels in the Brazilian steel industry. The IBS believed that vertical integration was evident as customers and suppliers of the steel companies participated in direct acquisitions and joint-venture processes

(Departamento Nacional de Produção Mineral, 2006, p. 59-60; Instituto Brasileiro de Siderurgia, 2006, p. 16). CVRD and Nucor Corp. signed a nonbinding memorandum of cooperation to advance their interests in potential iron and steel business opportunities in the Americas, which may become available as a result of the restructuring of the North American steel industry. Baovale Company (Baosteel of China, 50% and CVRD, 50%) was planning to invest $1.4 billion in an integrated mill that would produce 4 Mt/yr of steel slabs (Instituto Brasileiro de Mineração, 2006, p. 44; Companhia Vale do Rio Doce, 2006§).

Manganese.—In 2005, Brazil produced 3.2 Mt of manganese concentrate, which was about 3.2% more than in 2004. Rio Doce Manganês S.A.'s (RDM) manganese mines in the States of Bahia and Minas Gerais, accounted for 75% of metallurgical manganese production. CVRD's RDM, which was the leading producer of manganese concentrate (2.5 Mt), in conjunction with Minérios Metalúrgicos do Nordeste S/A, Sociedade Mineira de Mineração Ltda., and Urucum Mineração S.A. accounted for 95% of Brazil's manganese concentrate production in 2005. Exports of manganese high grade ore amounted to 1.8 Mt at a value of $139.7 million; this was almost 40.5% more than that of 2004 and was due to a higher demand for steel in Brazil and by MERCOSUR. Manganese ferroalloys exports increased by almost 13%, which amounted to 175,000 t at a value of $122.8 million (Departamento Nacional de Produção Mineral, 2006, p. 76-77; Instituto Brasileiro de Mineração, 2006, p. 34; Companhia Vale do Rio Doce, 2006§).

Nickel.—Brazil produced about 4.8 Mt of nickel ore in 2005 compared with 3.9 Mt in 2004. Production of electrolytic nickel increased to 20,714 t in 2005 from 19,742 t in 2004; production of nickel in ferronickel alloys increased to 9,596 t in 2005 from 6,493 t in 2004; that of nickel in matte decreased to 6,005 t in 2005 from 6,708 t in 2004; and that of nickel in carbonates increased to 21,116 t in 2005 from 19,897 t in 2004 (table 1). Mineração Serra da Fortaleza, which was owned by Grupo Votarantim (GV) in Fortaleza de Minas, State of Minas Gerais, produced 603,406 t of nickel ore, 7,657 t of nickel content, and 6,005 t of nickel contained in matte. Companhia Niquel Tocantins, which was owned by GV and located in Niquelandia, State of Goias, produced 3.3 Mt of nickel ore and 44,785 t of nickel contained in carbonates obtained by ammoniacal leaching (a hydrometallurgical process). In the same district, CODEMIN S.A., which was owned by Anglo American, produced 26,340 t of nickel contained in ferronickel alloy (Departamento Nacional de Produção Mineral, 2006, p. 86-87; Instituto Brasileiro de Mineração, 2006, p. 34).

Owing to the increase in world consumption of stainless steel and to higher nickel prices, CVRD intended to invest $600 million to produce 40,000 t/yr of nickel metal from its Vermehlo project in Carajas, State of Para, which contained reserves of 290 Mt at a grade of 0.8% nickel. Anglo American planned to develop the Barro Alto nickel project in the State of Goias by investing $750 million to produce 40,000 t/yr of nickel from a deposit that contained 117 Mt of reserves at a grade of 1.5% nickel by 2007. In December, CVRD acquired Canico Resources Corporation, which was a Canadian junior resource company focused on the development of the Onca Puma nickel laterite project in the State of Para, and was planning to invest $1.1 billion (Departamento Nacional de Produção Mineral, 2006, p. 86-87; Companhia Vale do Rio Doce, 2006§).

Zinc.—Brazil produced 171,434 t of zinc content in concentrates, which was about 7.8% more than that of 2004. GV's Votarantim Metais Zinco S/A (VMZ), which was located in Vazante, Minas Gerais, was the only producer of zinc ore in Brazil. Primary metal production increased to 267,374 t in 2005 from 265,987 t in 2004, and represented 97.2% of the installed annual metal capacity of 275,000 t. The concentrates were processed in VMZ's refineries in Tres Marias (180,000 t) and GV's Juiz de Fora Complex (95,000 t), both located in the State of Minas Gerais (Departamento Nacional de Produção Mineral, 2006, p. 119-120; Instituto Brasileiro de Mineração, 2006, p. 34).

To meet Brazil's demand for zinc, which was 220,404 t of metal, the country imported 122,165 t of zinc concentrates (valued at $102.6 million) and 24,683 t of metal (valued at $33.4 million). Peru supplied 98.5% of the concentrates and 48% of the metal; additional zinc metal was supplied by Argentina (42%) (Departamento Nacional de Produção Mineral, 2006, p. 119-120; Instituto Brasileiro de Mineração, 2006, p. 36).

Industrial Minerals

Asbestos.—In 2005, Brazil produced 236,047 t of asbestos fiber, which was about 6.4% less than that of 2004. Brazil's significant asbestos deposits are located in Cana Brava, Minacu, State of Goias; Goias was the only producing State in the country. Sociedade Anônima Mineração de Amianto supplied 73.4% of Brazil's asbestos to manufacture specialized cement products, which were, in order of importance, ceiling tiles, protective screens, water and sewer pipes, water tanks, and molded electrical insulators. Other uses were, in order of importance, thermal insulators, paper and cardboard, slabs, decorations, insecticide, asphalt for highways and airport runways, and the automobile industry (Departamento Nacional de Produção Mineral, 2006, p. 41-42; Instituto Brasileiro de Mineração, 2006, p. 34).

Brazil exported almost 65.0% of its zinc production mainly to Thailand (31.4%), India (18.2%), Indonesia (14.2%), and Iran (11.5%); these exports increased by 13.3% compared with those of 2004. The State of Sao Paulo was the country's leading consumer followed by the States of Parana and Rio Grande do Sul. Asbestos mining and consumption have been highly regulated in most industrialized nations, thus forcing the countries to reduce production and consumption. Industry experts expected asbestos use in the industrial nations to continue to decline. In contrast, the world's developing economies were expected to increase their collective asbestos consumption by large margins. Brazilian asbestos reserves (15.1 Mt) were considered to be adequate to meet demand in the short to medium term; the average grade of ore from the Cana Brava Mine in Minacu was 5.2%; it had reserves (fiber content only) of 3 Mt, which, at a production rate of about 200,000 t/yr, represented a 15-year mine life (Departamento Nacional de Produção Mineral, 2006, p. 41-42; Instituto Brasileiro de Mineração, 2006, p. 34).

Cement.—The country produced 36.7 Mt of cement in 2005 compared with 34.4 Mt in 2004. Among the 26 Brazilian States

and Brasilia, DF, only five of them (Acre, Amapa, Rondonia, Roraima, and Tocantins) were not producers. Thirty-nine facilities in 7 states and Brasilia, DF, produced 75% of Brazil's total output. Minas Gerais was the most important with 23.9% of the total followed by Sao Paulo (14.4%), Parana (10.9%), Rio de Janeiro (6.3%), Brasilia (6.2%), Sergipe (5.2%), Paraiba (4.4%), Rio Grande do Sul (4%), and other States (24.7%). The leading producers were GV's Companhia Cimento Portland Itau (39.5%) and Grupo João Santos (13.6%); other producers included Companhia Cimento Portland Rio Branco (10.4%), Camargo Correia S.A. (8.1%), Grupo Swiss Holderbank's Holder Cimento S.A. (8.0%), and Grupo Lafarge's Companhia Cimento Portland Paraiso (6.8%). The exported cement (1.32 Mt valued at $42.8 million) went mainly to the United States (43%), Paraguay (14%), and Bolivia (11%). Brazil imported 323,494 t of cement valued at $20.7 million from the United States (27%), Cuba (24%), Uruguay (19%), Thailand (12%), China (6%), and other countries (12%). Brazil has an installed capacity of 60 Mt/yr and current (2005) production equaled more than 61% of that capacity (Departamento Nacional de Produção Mineral, 2006, p. 37-38).

Gemstones.—In the Americas, Canada and Brazil (in order of the amount produced) were the leading producers and traders of mostly alluvial diamond followed by Guyana and Venezuela. The country continued to be one of South America's leading gemstone producers and exporters. Many different varieties of gemstones are found in the Araxa, the Bambui, and the Canastra Groups; these include, in order of value (US$/carat), diamond, emerald, aquamarine, topaz, tourmaline, opal, chrysoberyl, amethyst, citrine, and agate. Brazil is the world's only source of some quality gemstones, such as imperial topaz and Paraiba tourmaline (Instituto Brasileiro de Mineração, 2005, p. 5, 8).

According to the DNPM's Mineral Summary Statistics for 2002-05, Brazil's diamond production from year to year has been uncertain, and annual production has been declining since 2000. In both 2005 and 2004, Brazil produced 300,000 carats valued at about $30.0 million compared with 400,000 carats valued at $38.1 million in 2003; 500,000 carats valued at almost $31 million in 2002; 700,000 carats valued at $43.8 million in 2001; and 1,000,000 carats valued at $56 million in 2000. In 2005, the entrepreneurial sector produced almost 37% of the total, or 110,643 carats compared with almost 10%, or 30,000 carats, in 2004; 5%, or 20,000 carats, in 2003; 8%, or 40,000 carats, in 2002; almost 3.3%, or 23,000 carats, in 2001; and 8%, or 80,000 carats, in 2000. The leading producers were Mineradora S/A, which was located in Juina, Mato Grosso, and which produced 92,062 carats, and Mineração Rio Novo S/A, which was located in Diamantina, Minas Gerais, and which produced 18,581 carats. These data (carats produced and reported) conform to the Kimberley Process Certification Scheme's (KPCS) guidelines (table 1; Departamento Nacional de Produção Mineral, 2006, p. 46-47; Olson, 2006a).

Production by garimpeiros (189,000 carats) continued to decline because garimpos' reserves were depleting and environmental restrictions were increasing. Since 2004, when the Government closed high-content gem placers in indigenous reserves to exploration, the jewelry industry's gemstone consumption has been unknown, and the high taxation rate has affected the domestic sales of jewelry. Taking into consideration these factors, Brazil's gemstone reserves were almost impossible to quantify. Brazil, however, may have great potential because it has 1,000 million cubic meters of sedimentary rocks that contain diamond that grades between 0.01 and 0.1 carat per cubic meter, or about 44.6 million carats (Departamento Nacional de Produção Mineral, 2005, p. 46; Instituto Brasileiro de Mineração, 2006, p. 32, 34; Olson, 2006a).

In 2005, total exports of uncut gemstones totaled about 280,000 carats valued at $19.1 million compared with 243,298 carats valued at $21.8 million in 2004 and 244,925 carats valued at $23.4 million in 2003. The major markets for Brazilian rough diamond were the EU (61.2%), the United Arab Emirates (20.9%), the United States (11.2%), and Ireland (6.7%). According to the DNPM and conforming to the KPCS' guidelines, 75 certificates were provided in 2005 of which the EU received 38 certificates; the United States, 24; the United Arab Emirates, 8; Israel, 4; and Canada, 1. Imports of uncut stones amounted to 16,475 carats valued at $287,647 and the main sources were the EU (39.8%), India (36.7%), and the United Arab Emirates (7.4%) (Departamento Nacional de Produção Mineral, 2006, p. 46).

Phosphate Rock.—Production of phosphate rock concentrate decreased by 3.5% to about 5.5 Mt in 2005 from 5.7 Mt in 2004. The three leading mining companies—Fosfértil S.A. (Grupo Fertifós) (44.8%) in Minas Gerais, Fertilizantes Serrana S.A. (Bunge Ltd.) (24.7%) in Goias, and Copebras S.A. (Anglo American) (20.2%) in Sao Paulo contributed almost 90% of the total production in 2005. The reported domestic consumption of concentrates was about 5.5 Mt in 2005 compared with 6.6 Mt in 2004. Of the total phosphoric acid produced, 73% was used in the fertilizer industry; 25%, in the chemical industry; and 2%, for other uses; these usages remained almost unchanged from those of 2004. Imports of phosphates were 1.2 Mt valued at $60 million in 2005 compared with 1.6 Mt valued at $75 million in 2004 (Departamento Nacional de Produção Mineral, 2006, p. 63-64; Instituto Brasileiro de Mineração, 2006, p. 28, 34).

Mineral Fuels

In 2005, Brazil produced almost 17.7 billion cubic meters of natural gas and 628.8 million barrels of petroleum, which was 4.3% and almost 11.4% higher, respectively, than that of 2004. The country produced, in order of economic importance, crude oil, natural gas liquid, natural gas, coal, and shale oil; production totaled 630 million barrels of oil equivalent. In 2005, Petrobrás' average production of crude oil, which included condensate and liquid natural gas, was about 2.217 million barrels per day (Mbbl/d), and was 9.8% higher than that of 2004. Petrobrás was planning to increase its daily output rate to 2.3 Mbbl by 2010 and to produce about 75% of this output from deepwater zones (Departamento Nacional de Produção Mineral, 2006, p. 91-92; Petróleo Brasileiro S.A., 2006, p. 59). In 2005, the supply of natural gas totaled about 64.1 million cubic meters per day, of which 24.2 million cubic meters per day, or almost 37.8%, was imported from Bolivia. Of the total daily supply, 32.1 million cubic meters, or 50.1%, was used by Petrobrás; 21.1 million cubic meters, or 32.9%, was consumed in Brazil; and the remaining

10.9 million cubic meters, or 17%, was used by thermoelectric powerplants. Gas usage grew by about 1.8% per year during the period 1980-2005 (Departamento Nacional de Produção Mineral, 2006, p. 66; Petróleo Brasileiro S.A., 2006, p. 58).

Coal.—In 2005, Brazil produced 6.0 Mt of energy-generation-type coal compared with 5.4 Mt in 2004. The Brazilian coal industry's mine operations were concentrated in the three southernmost States of Santa Catarina (64.9%), Rio Grande do Sul (32.8%), and Parana (2.3%). The leading producers of ROM coal were Copelmi Mineração Ltda. (15%), Carbonífera Circiúma S.A. (14%), and Indústria Carbonífera Rio Deserto Ltda. (13%). Coal demand increased mainly because the thermoelectric plants were operating at full capacity in these three States (Departamento Nacional de Produção Mineral, 2006, p. 31-32).

To meet Brazil's coal demand, 17.3 Mt was imported in 2005 compared with 18.5 Mt in 2004. Imports came from Australia (28%), the United States (21%), China (19%), Canada (9%), South Africa (5%), and other countries (18%). The steel industry consumed 64% of metallurgical-grade coal; thermoelectric generation, 33%; and the petrochemical and pulp and paper industries, 3% (Departamento Nacional de Produção Mineral, 2006, p. 32).

Brazil was planning a priority thermoelectric generating program based mostly on natural gas and coal that would involve 49 new power stations based mainly on natural gas. Three new coal-fired powerplants would be built in the State of Rio Grande do Sul. These new powerplants were part of the Government's 17-gigawatt emergency plan (supplied largely by Electrobrás S.A.) to cope with the increased demand for electricity. Most Brazilian coals have a lower content of carbon and a higher content of ash compared with the Colombian coals in the Guajira area. Total Brazilian coal reserves were estimated to be 10,113 Mt (table 3; Departamento Nacional de Produção Mineral, 2006, p. 31).

Natural Gas and Petroleum.—Brazil produced natural gas at a rate of 48.5 million cubic meters per day in 2005, which was and increase of 4.3% from that of 2004. The gas pipeline that links the Enchova platform in the offshore Campos Basin to Macae, State of Rio de Janeiro, added 5 million cubic meters per day of gas flow to the Rio de Janeiro and the Sao Paulo markets; offshore gas production accounted for 57% of the total. Petrobrás signed two agreements, one with Repsol YPF of Spain's subsidiary in Argentina and the other one with YPF de Bolivia, to supply natural gas to Brazil. The Argentina-Brazil gas pipeline linked Aldeia Brasileira in Argentina to Porto Alegre in the State of Rio Grande do Sul. In 2005, the $2 billion, 3,150-kilometer (km) Bolivia-Brazil gas pipeline started operation and it could increase the flow of natural gas along the 1,970 km of pipeline between Santa Cruz de la Sierra, Bolivia, and Porto Alegre, Brazil, to supply, in order of volume, the States of Mato Grosso do Sul, Sao Paulo, Parana, Santa Catarina, and Rio Grande do Sul with 24 million cubic meters per day in 2005 and 30 million cubic meters per day starting in 2010—nearly 40% of domestic demand. The natural gas share of the country's energy mix was 6% in 2004 and could conceivably be 12% in 2010. Petrobrás continued to produce natural gas in the Gulf of Mexico and recovered gas from the Frederick Field, which is located 27 km off the Louisiana coast. In 2004, Petrobrás discovered the Mexilhao gasfield in the Santos Basin off the coast of Sao Paulo State; the gasfield contained 72 billion cubic meters of natural gas. Brazil's potential for offshore gas supply has improved because of expected new discoveries in the Santos Basin (Departamento Nacional de Produção Mineral, 2006, p. 66; Petróleo Brasileiro S.A., 2006, p. 46).

In 2005, Petrobrás's total international production of oil and liquid natural gas amounted to 35,800 barrels per day, and natural gas output was almost 4.2 million cubic meters per day, which totaled 58,900 barrels per day of oil equivalent. According to Petrobrás, exploration and production took place in, in order of economic importance, Angola, Argentina, Bolivia, Venezuela, Colombia, Peru, Ecuador, and the United States (Petróleo Brasileiro S.A., 2006, p. 58). According to Petrobrás, Brazil produced 1.8 Mbbl/d of petroleum, which was almost 6.0% more than in 2004 (1.6 Mbbl/d). Imports of crude oil and derivatives were valued at $10.6 billion compared with almost $6.9 billion in 2004. The main sources were Nigeria (48.7%), Algeria (22.3%), Saudi Arabia (14.0%), Iraq (7.9%), and Argentina (3.5%) (Departamento Nacional de Produção Mineral, 2006, p. 91-92; Petróleo Brasileiro S.A., 2006, p. 58).

In 2005, the partnership of Royal Dutch Shell plc (RDS) of the Netherlands (80%) and Petrobrás (20%) on the Bijupira and the Salema Projects in Campos Basin produced a combined 50,000 barrels per day of crude oil and more than 480,000 cubic meters per day of gas; the fields have reserves of about 190 million barrels of oil and 1.8 billion cubic meters of natural gas. Other companies involved in exploration included Statoil ASA of Norway, Repsol YPF SA of Argentina, and Chevron Corporation of the United States (U.S. Energy Information Administration, 2006§).

Reserves

Brazil was among the world leaders in reserves of some mineral commodities. According to the DNPM, the country's world ranking in mineral reserves was as follows: first, columbium (niobium); second, iron ore, manganese, tantalum, and aluminum; third, asbestos, magnesite, graphite; fourth, vermiculite; and fifth, kaolin and tin (table 3; Departamento Nacional de Produção Mineral, 2005, p. 30-32; 2006, p. 10-12).

Infrastructure

Brazil's railroads comprised a total of 29,412 km (1,567 km electrified), of which 4,907 km was 1.600-m gauge (908 km electrified), 194 km was 1.440-m gauge (630 km electrified), and 23,915 km was 1.000-m gauge (581 km electrified). In addition, three rails had dual gauge—396 km of 1.000- and 1.600-m gauge (78 km electrified). The country had a total of almost 2 million kilometers of roads—94,871 km was paved and 1.6 million kilometers was gravel and dirt. Brazil had 50,000 km of navigable inland waterways. The major shipping ports were Belem, Fortaleza, Ilheus, Manaus, Paranagua, Porto Alegre, Recife, Rio de Janeiro, Rio Grande, Salvador, Santos, and Vitoria. Among the merchant marine's 271 ships, 82 were bulk vessels; 56, tankers; 15, chemical tankers; 14, combination

ore and oil vessels; 10, liquefied gas tankers; and 2, combination bulk vessels. Brazil had 4,136 airports; 698 had paved runways and 3,047 had unpaved runways (U.S. Central Intelligence Agency, 2006§).

In 2005, Brazil's installed electrical generating capacity was 52,865 megawatts (MW). Total production of electric power for the year was 339,000 gigawatthours, which translated into 1,370 kilowatt-hours per capita. Brazil's primary domestic energy supply encompassed the following: hydroelectric, 83%; petroleum and natural gas, 8%; nuclear energy, 4%; and others, 5% (U.S. Central Intelligence Agency, 2006§). The Bolivia-Brazil pipeline, which was owned by a consortium of Petrobrás and Royal Dutch Shell, was the leading of the various cross-border energy projects. Argentina supplied gas to the State of Rio Grande do Sul's new thermoelectric plant; two additional pipelines were to take Argentine gas to Brazil's southern market, and another project was to supply energy to Brazil from a powerplant in Uruguay. The total pipeline network was 30,346 km long, of which 12,857 km consisted of crude oil and petroleum products, and 17,489 km, of gas, which excluded the Brazilian side (2,600 km) of the Bolivia-Brazil gas pipeline. In northern Brazil, a transmission line supplied energy to the State of Roraima from Venezuela. The majority of these projects was being developed by the private sector as a result of globalization, liberalization, and privatization. State-owned corporations entered into partnerships with private domestic and foreign investors (Petróleo Brasileiro S.A., 2006, p. 58).

Negotiations were completed between the Brazilian Government and five companies, four of which were foreign subsidiaries. The companies involved were Alcan, Alcoa, BHP Billiton, Camargo Corréa Industrial S.A. (Brazil), and Dow Chemical, USA. Brazil and the five companies planned to build a 1,200-MW dam, which would be named Tucurui, on the Tocantins River on the border between the States of Maranhao and Tocantins. Construction of the dam would cost an estimated $1.2 billion; BHP Billiton pledged $350 million (Vale, 2006, p. 23).

This new dam appeared to be necessary because demand for hydroelectricity was growing at a faster rate than that of supply. The supply of subsidized electricity in the Tocantins area was exceeded by the industrial and mining activities in 2005. The 10% electrical subsidy was phased out in 2004. Alcoa acquired ownership of one concession as part of a consortium, and Alcan obtained the right to build three hydroelectric power stations (Departamento Nacional de Produção Mineral, 2006, p. 92).

The aluminum companies won the right to build new hydroelectric plants in the auction of the Agência Nacional de Energia Elétrica (ANEEL). They secured eight concessions that would demand a total investment of more than $1 billion. In the auction of ANEEL, Alcan secured the right to build hydroelectric plants at Barra dos Coqueiros and Cacu in the State of Goias, and at Traira II in the State of Minas Gerais. Alcan planned to invest $180 million in their construction. Alcan will pay $1.3 million per year for the concession of the 60-MW Traira I plant (Vale, 2006, p. 3-4).

Constran S.A. and Construção e Comércio of Grupo Itamaraty planned to construct an additional 1,718 km of railroad to be 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 that runs through Vitoria, State of Espirito Santo; Belo Horizonte, State of Minas Gerais; Santos, State of Sao Paulo; and Chapadao do Sul, State of Mato Grosso do Sul. This new railroad system will run from Chapadao do Sul to Cuiaba, Mato Grosso and Santarem, State of Para, and branch from Cuiaba to Porto Velho, State of Rondonia (Vale, 2006, p. 22).

Outlook

Brazil, which has a strong economy in Latin America and MERCOSUR and is one of the world's leading producers of bauxite, columbium (niobium), graphite, iron ore, manganese, tantalum, and tin, will continue to attract FDI inflows. According to the Banco Central do Brasil (2006§) and the Economic Commission for Latin America and the Caribbean (2006§), more than 350 leading transnational companies were planning to invest worldwide, which could position Brazil behind, in order of investment volume, China, the United States, and India. In Brazil, the main vehicles for FDI inflows in the short and medium terms will be via joint ventures and acquisitions in new projects with CVRD, Petrobrás, and others. Investments in hydroelectric and thermoelectric powerplants coming onstream are expected to meet Brazil's future energy needs. As a result of the Administration's staying on course with fiscal austerity policies, reforms of the country's complex tax code, trimming of the civil service pension system, and continued fight against inflation, the Brazilian real is likely to remain strong. As an exporter of mineral commodities, the country is poised to gain from the continued FDI inflows into its economy, which represented an almost 75% share ($15.1 billion) of MERCOSUR's total FDI ($20.4 billion) in 2005 (Economic Commission for Latin America and the Caribbean, 2006§).

Brazil's Federal tax exemptions on imports of equipment for crude oil exploration, development, and production will continue into 2007, and the Agência Nacional do Petróleo was planning to extend them into 2020. Oil 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. Deferment of major investment decisions has not been reported by the Brazilian Government. Even firms that have financed with borrowed capital, such as CVRD, have the natural hedge provided by their mineral resources and exports. CVRD is planning to invest about $13 billion in a low-cost and profitable project pipeline to be developed during 2006-10. The significance of the investment would be to increase CVRD's market capitalization to $70 billion from its current (2005) level of about $55 billion (Banco Central do Brasil, 2006§; Companhia Vale do Rio Doce, 2006§).

The various sectors of the Brazilian economy have recorded diverse rates of growth— industrial, 6.3 %; minerals, 4.1%; services, 3.8%; and agriculture, 3.0% (Departamento Nacional de Produção Mineral, 2006, p. 1; Banco Central do Brasil, 2006§). The positive rate of economic growth in the minerals sector is likely to be sustained into 2006 and beyond if expansion in the demand for mineral exports and fabricated steel

goods continues. MERCOSUR has undergone dramatic changes in the natural gas and power markets owing to the increase in cross-border energy investment opportunities, domestic gas consumption, and regionalization of the energy sector. Brazil has become the center of an increasingly rapid process of energy integration in South America owing to the country's gas market, which is evolving rapidly with an unsatisfied energy demand and a great potential for growth. Petrobrás will be an integrated energy company with a strong international presence and a leader in Latin America (Petróleo Brasileiro S.A., 2006, p. 31-33).

Investments in the Brazilian mining industry are expected to continue to enhance exploration and mine development activities, particularly in, in order of importance, iron ore, gold, copper, diamond, and emerald. This trend is expected to continue because several transnationals have been forming consortiums and acquiring exploration properties, mining prospects, and permits particularly for, in order of importance, oil and gas, iron ore, gold, diamond, and base metals.

Brazilian gold production could increase significantly in the foreseeable future because of the growth of Brazilian copper production and increased interest by domestic and foreign investors in largely unexplored areas. More than 2,500 gold occurrences, which are mostly Precambrian vein deposits and alluvial placers, are known (Departamento Nacional de Produção Mineral, 2006, p. 88).

Brazil's dynamic and diverse economy coupled with its sizable consuming market and its membership in MERCOSUR is expected to continue to attract the interest of domestic and international investors. Brazil's joint ventures with such growing economies of East Asia as China, Japan, and the Republic of Korea are expected to enhance its minerals trade with the United States, the EU, and Latin America. Brazil has a strong industrial base that is capable of supplying most of the required mining and oil and gas equipment; the country has modern mining and oil technologies and an efficient network of supporting services, and can provide skilled labor. Modern and reliable transportation and communication infrastructures are needed, however, because in the short and medium terms, a bottleneck could affect Brazil's ability to augment its output of minerals competitively and in a sustainable way.

The aluminum, automobile, petrochemical, pulp and paper, and steel industries, which depend heavily on energy and exports, will likely benefit most from a new power-generating infrastructure. The 52 powerplants to be built in the foreseeable future (49 based on natural gas and 3 on coal) will become the major drivers for growth in mineral fuels demand. Since 2002, the Government eliminated all price controls and import tariffs on petroleum and derivatives to motivate private investment and to increase competition that would benefit the Brazilian economy. Petrobrás is expected to build additional refineries with the participation of new partners from the private sector (Petróleo Brasileiro S.A., 2006, p. 34).

The Amazon region continued to offer potential for major undiscovered mineral resources in addition to the large reserves of, in order of value, iron ore, manganese, bauxite, gold, and tin. A factor that may place constraints on mineral development over the longer term, however, is the concern over biodiversity in the Amazon Rainforest, which comprises 30% of the world's remaining tropical forests, provides shelter to 10% of the globe's plant and animal species, and removes excess carbon dioxide from the atmosphere. Much will depend, however, on the approaches and technologies to be used for economic and social development while protecting the environment in a sustainable way (Departamento Nacional de Produção Mineral, 2006, p. 7; U.S. Energy Information Administration, 2006§).

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Comissão Nacional de Energia Nuclear
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Companhia de Pesquisa de Recursos Minerais
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22290-Rio de Janeiro-RJ-Brasil
Conselho de Não-Ferrosos e de Siderurgia
Esplanados dos Ministerios-Bloco 6-5° Andar
70053-Brasilia-DF-Brasil
Conselho Nacional do Petróleo
SGAN-Q.603 Modulos J, I e H
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20035-Río de Janeiro-RJ-Brasil
Rio Doce Geológica e Mineração, S.A.
Avenida President Wilson 11° Andar
22030-Rio de Janeiro-RJ-Brasil

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TABLE 1
BRAZIL: PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity		2001	2002	2003	2004	2005
METALS						
Aluminum:						
Bauxite, dry basis, gross weight		13,032,000	12,602,000	17,363,000	20,914,000 r	21,000,000
Alumina		3,445,000	3,962,000	5,111,000	5,300,000 r	5,300,000
Metal:						
Primary		1,140,000	1,318,400	1,381,000 r	1,457,000 r	1,498,000
Secondary		200,000	215,000	235,000	246,000 r	253,000
Total		1,340,000	1,533,400	1,616,000 r	1,703,000 r	1,751,000
Beryllium, beryl concentrate, gross weight		--	7	6	6	6
Cadmium, metal, primary[3]		120	151	189	187	200
Chromium:						
Crude ore		419,049	283,991	376,862 r	593,476	615,904
Concentrate and lump, Cr_2O_3 content		178,013	113,811	155,063 r	253,002	252,102
Marketable product[3]		38,472	11,186	12,000 e	12,000 e	12,000 e
Cobalt:						
Mine output, Co content of hydroxide[e]		1,100	1,200	1,300	1,400 4	1,500 p
Metal, electrolytic[5]		889	960	1,097	1,155	1,200 p
Columbium (niobium)-tantalum ores and concentrates, gross weight:						
Columbite and tantalite[e]		330	231 r	249 r	277 r, 4	456 p
Djalmaite concentrate[e]		10	10	10	10	10
Pyrochlore concentrate, Nb_2O_5 content		39,039	41,303	36,992 r	34,016 r	56,021
Copper:						
Mine output, Cu content		32,734	32,711	26,275 r	103,153	133,325
Metal, refined:						
Primary		212,243	189,651	173,378	208,020	199,043
Secondary		36,000	23,000	20,000	24,000	25,000
Total		248,243	212,651	193,378	232,020	224,043
Gold:						
Mine output	kilograms	37,810	32,912	26,066	28,508	29,941 p
Garimpeiros, independent miners	do.	5,074	8,750	14,350	19,088	8,351 p
Total	do.	42,884	41,662	40,416	47,596	38,292 p
Iron and steel:						
Iron ore and concentrate, marketable product:[6]						
Gross weight	thousand metric tons	210,000 r	214,560	230,707	261,675	280,862
Fe content	do.	139,440 r	142,468	153,190	173,752	185,369
Metal:						
Pig iron	do.	27,623	29,667	32,036	34,579	34,382
Ferroalloys, electric arc furnace:						
Chromium metal		NA	NA	NA	NA	NA
Ferrocalcium silicon		NA	NA	NA	NA	NA
Ferrochromium		110,468	164,140	204,339	216,277	197,653
Ferrochromium silicon		5,899	10,522	10,500	11,560	11,600
Ferrocolumbium		37,411	36,450	24,875	25,169	38,819
Ferromanganese		276,000	339,000	438,000	466,000 r	480,000
Ferromolybdenum		NA	NA	NA	NA	NA
Ferronickel		17,966	19,874	19,900 e	19,900 e	21,200 e
Ferrophosphorus		NA	NA	NA	NA	NA
Ferrosilicon		159,345	145,910	146,000 e	146,000 e	146,000 e
Ferrosilicon magnesium		11,032	14,552	14,600 e	14,600 e	14,600 e
Ferrosilicon zirconium		--	NA	NA	NA	NA
Ferrotitanium		NA	NA	NA	NA	NA
Ferrotungsten		NA	NA	NA	NA	NA
Ferrovanadium		NA	NA	NA	NA	NA
Inoculant		14,684	11,100	11,100 e	11,100 e	11,100 e
Silicomanganese		180,235	182,731	180,200	180,000 e	180,200 e
Silicon metal		112,123	133,390	133,400	133,000 e	133,400 e
Other ferroalloys		16,623	25,300	25,300 e	19,054	19,500
Total		941,786	1,082,969	1,208,214	1,240,000 e	1,250,000 e

See footnotes at end of table.

TABLE 1–Continued
BRAZIL: PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity		2001	2002	2003	2004	2005
METALS–Continued:						
Iron and steel--Continued:						
Crude steel, excluding castings	thousand metric tons	26,718	29,604	31,150	32,918	31,631
Semimanufactures, flat and nonflat	do.	18,006	17,460	17,500 e	17,500 e	17,500 e
Lead:						
Mine output, Pb content in concentrate		10,725	9,253	10,652	14,737 r	16,063
Metal, secondary		47,000	50,000	128,610 r	137,121 r	104,904
Manganese:						
Ore and concentrate, marketable:[3]						
Gross weight		1,970,000	2,529,000	2,544,000	3,143,000 r	3,200,000
Metal content		988,000	1,095,000	1,286,000	1,346,000 r	1,370,000
Metal:						
Primary		7,290 r	10,950 r	12,860 r	13,460 r	13,500
Secondary[e]		1,600	1,600	1,600	1,600	1,600
Nickel:						
Mine output, ore		3,916,210	3,873,474	3,893,095	3,794,868	4,845,695
Ni content in ore		45,958	45,456	44,928	51,886	74,198
Ni content in carbonate		17,063	18,100	18,406	19,897	21,116
Ni content in matte		10,183	6,274	5,950	6,708	6,005
Ni, electrolytic		17,663	17,676	18,155	19,742	20,714
Ferronickel, Ni content		5,768	6,011	6,409	6,493	9,596
Rare-earth metals, monazite concentrate, gross weight[e]		200	--	--	731 r	730
Silver[7]						
Primary	kilograms	46,046	33,000	31,440	35,497	38,134
Secondary[e]	do.	50,000	50,000	50,000	45,000 [4]	43,000 p
Total	do.	96,046	83,000	81,440	80,497	81,134
Tin:						
Mine output, Sn content		13,016	12,023	12,217	12,202 r	11,739
Metal, smelter:						
Primary		12,168	11,675	10,761	11,512	8,986
Secondary[e]		250	250	250	250	250
Total		12,418	11,925	11,011	11,762	9,236
Titanium:						
Ilmenite:						
Gross weight		144,644	177,027	120,160	133,000	127,142
TiO_2 content		68,135	71,746	94,000 r	90,000 r	90,000
Rutile, TiO_2 content		2,270	1,878	2,303	2,117	2,069
Tungsten, mine output, W content		22	24	30	262	458
Zinc:						
Mine output, Zn content		111,432	136,339	152,822	158,962	171,434
Metal, smelter:						
Primary		197,037	247,692	262,998	265,987	267,374
Secondary[e]		7,000	7,000	NA r	NA r	NA
Total		204,037	254,692	262,998	265,987	267,374
Zirconium, zircon concentrate, gross weight[8]		20,553	20,000	27,198 r	25,263 r	25,657
INDUSTRIAL MINERALS						
Asbestos:						
Crude ore[e]		3,950,000	3,950,000	3,950,000	3,950,000	3,950,000
Fiber		172,695	194,732	231,117 r	252,067 r	236,047
Barite:						
Crude		63,882	63,953	67,842 r	72,320 r	58,579
Beneficiated		54,790	53,098	57,452	59,612	44,041
Marketable product[e, 3]		65,000	65,000	65,000	65,000	65,000
Calcite[e]		35,000	35,000	35,000	35,000	35,000
Cement, hydraulic	thousand metric tons	38,927	38,027	34,010	34,413	36,673
Clays:						
Bentonite, beneficiated		178,610	184,909	198,981	226,874	221,035

See footnotes at end of table.

TABLE 1–Continued
BRAZIL: PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity		2001	2002	2003	2004	2005
INDUSTRIAL MINERALS–Continued:						
Clays--Continued:						
Kaolin:						
Crude		4,082,024	3,924,158	5,205,513	5,958,057	6,150,000
Beneficiated		1,734,359	1,757,488	2,081,039	2,381,000 r	2,410,000
Marketable product[3]		1,437,399	1,444,159	1,852,376	2,149,000 r	2,074,000
Diamond, gem and industrial:[e]						
Private sector	thousand carats	23	40	20	30 r	111
Garimpagem	do.	677	460	380	270 r	189
Total[9]	do.	700	500	400	300 r	300
Diatomite:						
Crude		10,010	8,679	10,293	8,847	7,549
Beneficiated		6,730	5,835	6,920	7,200	7,670
Marketable product[e, 3]		13,100	13,100	13,100	13,100	13,100
Feldspar:						
Crude[e]		150,000	150,000	102,077 r	280,293 r	196,419
Marketable product:[3]						
Feldspar		75,000	39,694	53,476 r	115,952 r	117,387
Leucite[e]		5,000	5,000	5,000	5,000	5,000
Sodalite, crude[e]		500	500	500	500	500
Total		80,500	45,194	58,976	121,452	122,887
Fluorspar:						
Crude ore		124,021	131,975	164,208	181,991	201,435
Concentrates, marketable product:						
Acid-grade		31,263	32,774	34,462	40,948	42,043
Metallurgical-grade		12,471	15,125	21,884	16,824	24,469
Total		43,734	47,899	56,346	57,772	66,512
Graphite:						
Crude[e]		650,000	650,000	650,000	650,000	650,000
Marketable product:[3]						
Direct-shipping ore		NA	NA	NA	NA	NA
Concentrate		70,091	60,922	70,739	76,332	75,515
Total		70,091	60,922	70,739	76,332	75,515
Gypsum and anhydrite, crude		1,506,619	1,633,311	1,592,015 r	1,474,911 r	1,582,248
Kyanite:[e]						
Crude		750	750	750	750	750
Marketable product[3]		600	600	600	600	600
Lime, hydrated and quicklime	thousand metric tons	6,300 e	6,500	6,600	6,900	6,900
Lithium, concentrates		9,084	12,046	9,755	9,064	8,924 p
Magnesite:						
Crude		1,079,207	1,084,786	1,134,385	1,339,441	1,342,754
Beneficiated		265,749	302,230	306,444	366,174	386,759
Mica, all grades[e]		4,000	4,000	4,000	4,000	4,000
Nitrogen, N content of ammonia		769,400 r	1,021,100 r	938,800 r	1,077,400 r	950,000
Phosphate rock including apatite:						
Crude:						
Mine product	thousand metric tons	26,740	31,494	34,700	35,000	34,000
Of which sold directly[e]	do.	35	35	35	35	35
Concentrate:						
Gross weight	do.	4,805	5,084	5,584	5,690 r	5,488
P_2O_5 content	do.	1,707	1,831	2,005	2,181	2,044
Pigment, mineral, other, crude[e]		2,000	2,000	2,000	2,000	2,000
Potash, marketable (K_2O)		318,585	337,266	415,549	403,080	404,871
Potassium (KCl)		594,930	627,310	657,750	638,020	638,020 p

See footnotes at end of table.

TABLE 1–Continued
BRAZIL: PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity		2001	2002	2003	2004	2005
INDUSTRIAL MINERALS–Continued:						
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		4,350	4,300	7,420	18,116	17,860
Salt:						
Marine	thousand metric tons	4,370	4,835	5,144	5,206	5,738
Rock	do.	1,208	1,274	1,420	1,442	1,559
Silica, silex[e]		1,600	1,600	1,600	1,600	1,600
Sodium compounds:[e]						
Caustic soda		1,050,000	1,050,000	1,050,000	1,050,000	1,050,000
Soda ash, manufactured (barilla)		200,000	200,000	200,000	200,000	200,000
Stone, sand and gravel:[e]						
Dimension stone:						
Marble, rough-cut	cubic meters	200,000	200,000	200,000	200,000	200,000
Of which sold directly		50,000	50,000	50,000	50,000	50,000
Crushed and broken stone:						
Basalt	cubic meters	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
Calcareous shells		450,000	450,000	450,000	450,000	450,000
Dolomite	thousand metric tons	3,500	3,500	3,500	3,500	3,500
Gneiss	cubic meters	1,100,000	1,100,000	1,100,000	1,100,000	1,100,000
Granite	thousand cubic meters	60,000	60,000	60,000	60,000	60,000
Limestone	thousand metric tons	60,000	60,000	60,000	60,000	60,000
Quartz[10]		250,000	250,000	250,000	250,000	250,000
Quartzite:						
Crude		400,000	400,000	400,000	400,000	400,000
Processed		200,000	200,000	200,000	200,000	200,000
Sand, industrial		2,700,000	2,700,000	2,700,000	2,700,000	2,700,000
Sulfur:						
Frasch		24,468	22,620	19,246	20,000	20,000
Byproduct:						
Metallurgy		280,079	284,184	285,821	286,000	286,000
Petroleum		80,125	77,185	90,332	90,400	91,000
Total		384,672	383,989	395,399	396,000	397,000
Talc and related material:						
Talc:						
Crude		370,500	348,000 [r]	369,000 [r]	417,716 [r]	401,124
Marketable product[e, 3]		2,000	2,000	2,000	2,000	2,000
Pyrophyllite, crude[e]		189,500 [4]	200,000	200,000	200,000	200,000
Vermiculite:						
Concentrate		21,464	22,577	26,055 [r]	25,103 [r]	24,191
Marketable product[e, 3]		3,100	3,100	3,100	3,100	3,100
MINERAL FUELS AND RELATED MATERIALS						
Coal, bituminous:						
Run-of-mine	thousand metric tons	13,800 [e]	5,046	4,643	5,077	6,050
Marketable[e, 3]	do.	6,000	6,000	6,000	6,000	6,000
Coke, metallurgical, all types	do.	50 [e]	98	159	294	300
Natural gas, gross	million cubic meters	13,988	15,525	15,792	16,971	17,699
Natural gas liquids	million 42-gallon barrels	5,860	3,914	4,284	4,667	4,700

See footnotes at end of table.

TABLE 1–Continued
BRAZIL: PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity		2001	2002	2003	2004	2005
MINERAL FUELS AND RELATED MATERIALS–Continued						
Petroleum:						
Crude	thousand 42-gallon barrels	487,640	547,135	562,137	544,799	614,697
Refinery products:[11, 12]						
Liquefied petroleum gas (LPG)	do.	14,112	13,274	13,503	13,652	13,889
Gasoline	do.	144,691	136,108	138,452	139,975	142,405
Jet fuel	do.	598	562	576	582	592
Kerosene	do.	28,112	26,444	26,900	27,196	27,668
Distillate fuel oil	do.	222,221	209,040	212,640	215,052	218,786
Lubricants	do.	6,315	5,941	6,043	6,109	6,215
Residual fuel oil	do.	127,482	119,920	121,985	123,327	125,468
Other	do.	108,359	101,931	103,686	104,827	106,647
Refinery fuel and losses	do.	NA	NA	NA	NA	NA
Total	do.	1,139,530	1,160,355	1,185,922	1,175,519	641,670

[e]Estimated; estimated data are rounded to no more than thee significant digits; may not add to totals shown. [r]Revised. [p]Preliminary. NA Not available. -- Zero.

[1]Table includes data available through July 2006.

[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.

[3]Direct sales and/or beneficiated (marketable product).

[4]Reported figure.

[5]Source: Cobalt Development Institute.

[6]Includes sponge iron, in metric tons, as follows: 2001-05–270,000 (estimated).

[7]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: 2001-03–50,000 and 2004-05–45,000.

[8]Includes baddeleyite-caldasite.

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

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

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

[12]Minerals Questionnaire, 2001-04, and Petrobrás Magazine, 2003-06.

TABLE 2
BRAZIL: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
METALS			
Aluminum	Albras-Alumínio Brasileiro S.A. (Albras) [Companhia Vale do Rio Doce (CVRD), 51%, and Nippon Amazon Aluminio Co. (NAAC), 49%]	Belem and Vila do Conde, Para State (two smelters)	440 (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%)	Lamininacao de Pindamonhangaba, Sao Paulo State (smelter)	280 (metal).
Do.	Alcan Alumínio Poços de Caldas (Alucaldas) (Alcan Alumínio do Brasil S.A., 100%)	Pocos de Caldas, Minas Gerais State (mine)	1,000 (bauxite).
Do.	Alcoa Alumínio S.A. [Aluminum Co. of America (Alcoa), 54%; BHP Billiton plc, 36%; Alcan Aluminum Ltd. (Alcan), 10%]	Pocos de Caldas, Minas Gerais State (mine)	400 (bauxite).
Do.	do.	Sao Luiz, Maranhao State (refinery)	550 (alumina).
Do.	do.	Sao Luiz, Maranhao State (smelter)	239 (metal).
Do.	Alumínio do Brasil Nordeste S.A. [Alcan Aluminum Ltd. (Alcan), 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. [Aluminum Co. of America (Alcoa), 54%; BHP Billiton plc, 36%; Alcan Aluminum Ltd. (Alcan), 10%]	Sao Luis, Maranhao State (refinery)	2,000 (alumina).
Do.	Alumar Consortium S.A. [Aluminum Co. of America (Alcoa), 53.66%; BHP Billiton plc, 46.34%]	Sao Luis, Maranhao State (smelter)	1,000 (metal).
Do.	Alumínio do Norte do Brasil S.A. (Alunorte) (private, 100%)	Barcarena, Para State (refinery)	2,400 (alumina).
Do.	Companhia Brasileira de Alumínio (CBA) (private, 100%)	Pocos de Caldas, Minas Gerais State (mine)	1,000 (bauxite).
Do.	do.	Sorocaba, Sao Paulo State (refinery)	500 (alumina).
Do.	do.	Sorocaba, Sao Paulo State (smelter)	340 (metal).
Do.	Companhia Geral do Minas (Aluminum Co. of America, 79%; Others, 21%)	Pocos de Caldas, Minas Gerais State (refinery)	275 (alumina).
Do.	do.	Pocos de Caldas, Minas Gerais State (smelter)	95 (metal).
Do.	Mineração Rio do Norte S.A. (MRN) [Companhia Vale do Rio Doce (CVRD), 40%; BHP Billiton plc, 14.8%; Aluminum Co. of America (Alcoa), 13.2%; Alcan Empreendimentos Ltda., 12%; Companhia Brasileira de Alumínio (CBA), 10%; Norsk Hydro Comercio e Industria, 5%; Reynolds Aluminio do Brasil, 5%]	Oriximina, Para State (mine)	14,500 (bauxite).
Do.	do.	Papagalo, Para State (mine)	2,000 (bauxite).
Do.	do.	Trombetas, Para State (mine)	2,000 (bauxite).
Do.	Vale do Sul Alumínio S.A. (Aluvale) (Government, 27%; private, 25%; Shell do Brasil S.A., 44%)	Santa Cruz, Rio de Janeiro State (smelter)	86 (metal).
Do.	Aluvale [Companhia Vale do Rio Doce (CVRD), 54.5%, and Billiton Metais S.A., 45.5%]	do.	93 (metal).
Do.	Reynolds Internacional do Brasil (Reynolds International Inc., 42.5%; Bradesco Bank, 42.5%; J.P. Morgan, 15%)	Sorocaba, Sao Paulo State (smelter)	5.4 million (cans).
Do.	Consortium Paragominas S.A. [Companhia Vale do Rio Doce (CVRD), 48.7%; Mineração Rio do Norte S.A. (MRN), 24.6%; Nippon Amazon Aluminum Co., 12.2%; Companhia Brasileira de Alumínio (CBA), 5.7%; others, 8.8%]	Jabuti, Para State (mine)	4,500 (bauxite).
Do.	do.	Jabuti, Para State (alumina)	1,200 (alumina).
Chromite	Coitezeirio Mineração S.A. (COMISA) (private, 75.4%, and Bayer do Brasil S.A., 24.6%)	Campo Formosa, Bahia State (mine)	50 (ore).
Do.	Companhia de Ferro Ligas da Bahia (FERBASA) (private, 100%)	Campo Formoso, Bahia State (mine)	370 (ore).
Do.	do.	Campo Formoso, Bahia State (beneficiation plant)	292 (concentrate).

TABLE 2--Continued
BRAZIL: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
METALS--Continued				
Columbium (niobium)		Companhia Brasileira de Metalurgia e Mineração (Grupo Moreira Sales S.A., 55%, and Molycorp, Inc., 45%)	Araxa, Minas Gerais State (mine)	120 (ore).
Do.		do.	Araxa, Minas Gerais State (beneficiation plant)	60 (pyrochlore).
Do.		Mineração Catalão de Goiás Ltda. (MCGL) (Bozzano Simosen S.A., 68.5%, and Anglo American plc, 31.5%)	Ouvidor and Catalao I, Goias State (mines)	70 (ore).
Do.		do.	Ouvidor, Goias State (plants)	24 (pyrochlore).
Copper		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) (private, 100%)	Camacari, Bahia State (refiney)	220 (metal).
Do.		Companhia Vale do Rio Doce (CVRD), 100%	Sossego Mine, Carajás, Pará State	140 (concentrate).
Ferroalloys		Companhia Brasileira Carbureto de Calcio (private, 100%)	Santos Dumont, Minas Gerais State (plant)	54.
Do.		Prometal Produtos Metalúrgicos S.A., 60%, and Elkem A/S, 40%	Maraba, Para State (plant)	500.
Do.		Nova Era Silicon S.A. [Companhia Vale do Rio Doce (CVRD), 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;	326.
Do.		Companhia Vale do Rio Doce (CVRD) (CVRD-Companhia Siderúrgica Nacional, 100%)	Gold mines in the States of Minas Gerais, Bahia, and Para	200.
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. [Companhia Vale do Rio Doce (CVRD), 100%]	Bahia, Mato Grosso do Sul, and Minas Gerias States (six plants of manganese iron alloys)	600
Gold	kilograms	Companhia Vale do Rio Doce (CVRD) (CVRD-Companhia Siderúrgica Nacional, 100%)	Gold mines in the States of Minas Gerais, Bahia, and Para	18,000.
Do.	do.	AngloGold Ashanti Ashanti Mineração Ltda.	Novo Lima, Raposos, and Sabara, Minas Gerais State; and Jacobina, Bahia State (four mines)	7,000.
Do.	do.	Mineração Serra Grande S.A. (AngloGold Ashanti Minerção 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., 100%)	Paracatu Mine, Minas Gerais State (mine)	7,500.
Do.	do.	Mineração Maracá S.A. (MMSA) (private, 100%)	Sao Vicente Mine, Mato Grosso State (mine)	1,500.
Do.	do.	Desert Sun Mining Ltd., 50%, and Williams Resources Ltd., 50%	Jacobina Mine, Bahia State (mine)	3,000.
Iron ore		Companhia Siderúrgica Nacional (CSN) (private, 100%)	Volta Mine, Minas Gerais State	12,000.
Do.		Itaminas Comércio de Minérios S.A. (private, 100%)	Itaminas, Minas Gerais State	5,000.
Do.		Companhia Vale do Rio Doce (CVRD) (CVRD-Companhia Siderúrgica Nacional, 100%)	Serra dos Carajas, Para State	70,000.
Do.		do.	Itabira, Ouro Preto, Santa Barbara, Xavier, Tamandua, Capao, and Mato, Minas Gerais State (seven mines)	100,000.
Do.		do.	Ponta de Madeira, Maranhao State (pellet plant)	6,000.
Do.		Ferteco Mineração S.A. (FERTECO) (Exploration Bergbau GmbH, 100%)	Ouro Preto and Brumadinho, Minas Gerais State (two mines)	12,800.
Do.		S.A. Mineração da Trindade (SAMITRI) (private, 100%)	Mariana, Rio Piracicaba, Itabira, Ouro Preto, and Sabara, Minas Gerais State (five mines)	9,300.
Do.		Minerações Brasileiras Reunidas S/A (MBR) (BHP Ltd., 50%, and Mitsui Co. Ltd., 50%)	Capao Xavier, Tamandua, and Capitao do Mato, Minas Gerais State (three mines)	32,000.
Do.		Samarco Mineração S.A. [S.A. Mineração da Trindade (SAMITRI), 51%, and BHP Ltd., 49%]	Alegria, Minas Gerais State (mine)	13,500.
Do.		SOCOIMEX S.A. [Companhia Vale do Rio Doce (CVRD), 100%]	Mato, Minas Gerais State (mine)	7,000.

TABLE 2--Continued
BRAZIL: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
METALS--Continued				
Lead		Companhia Mineira de Metais (CMM) (private, 100%)	Paracatu, Minas Gerais State (mine)	25 (ore).
Do.		do.	Paracatu, Minas Gerais State (plant)	15 (concentrate).
Manganese		Rio Doce Manganês S.A. [Companhia Vale do Rio Doce (CVRD), 100%)]	Morro da Mina, Minas Gerais State	1,500.
Do.		do.	Mina do Azul, Carajas, Para State	1,500.
Do.		do.	Mina Mineiros, Bahia State	1,500.
Do.		Urucum Mineração S.A. [Companhia Vale do Rio Doce (CVRD), 100%]	Corumba and Ladario, Mato Grosso do Sul State (two mines and plant)	1,500 (ore), 800 (concentrate).
Do.		Construtora Polares Ltda. (CPL) (private, 100%)	Corumba Minas Gerais State (mine)	200 (ore).
Nickel		Companhia Niquel Tocantins (Grupo Votarantim, 100%)	Niquelandia, Goias State (mine)	20 (ore).
Do.		do.	Niquelandia, Goias State (refinery plant)	10 (electrolytic nickel).
Do.		Mineração Serra da Fortaleza (Grupo Votarantim, 100%)	Fortaleza, Minas Gerais State (mine)	19 (nickel matte).
Do.		CODEMIN S.A. (Anglo American plc, 100%)	Niquelandia, Goias State (refinery)	20 (metal).
Steel		Aço Minas Gerais S.A. (AÇOMINAS) (private, 100%)	Rodovia, Minas Gerais State	3,900.
Do.		Companhia Aços Especiais Itabira (Government, 90.9%, and 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 Tubarão (private, 100%)	Serra, Espirito Santo State	3,000.
Do.		Companhia Siderúrgica Nacional (CSN) (private, 100%)	Volta Redonda, Rio de Janeiro State	4,600.
Do.		Companhia Siderúrgica Paulista (COSIPA) (private, 100%)	Cubatao, Sao Paulo State	3,900.
Do.		Usinas Siderúrgicas de Minas Gerais, S.A. (USIMINAS) (private, 100%)	Ipatinga, Minas Gerais State	4,400.
Tantatum	metric tons	Mineração Taboca/AM (private, 100%)	The Pitinga Mine, Amazonas State (mine)	180 (concentrate).
Do.	do.	Companhia Industrial Fluminense (private, 100%)	Fluminense Mine, Minas Gerais State (mine)	25 (concentrate).
Tin		Mineração Jacunda Ltda. (MJL) (private, 100%)	Santa Barbara, Novo Mundo, and Potosi, Rondonia State (six mines)	108 (ore).
Do.		do.	Santa Barbara, Novo Mundo, and Potosi, Rondonia State (three beneficiation plants)	450 (concentrate).
Do.		Grupo PARANAPANEMA (private, 100%)	Aripuana, Mato Grosso State; Ariquemes, Rondonia State; Novo Aripuana, Pitinga, and Presidente Figueiredo, Amazonas State; and Sao Felix do Xingu, Para State (five mines and two plants)	5,420 (ore).
Do.		do.	Piraporada Bom Jesus, Sao Paulo State (refinery)	1,400 (concentrate), 25 (metal).
Do.		Marmoré S.A. (Grupo PARANAPANEMA, 100%)	Juiz de Fora, Minas Gerais State (mine)	20 (ore).
Do.		Grupo PARANAPANEMA (private, 100%)	Aripuana, Mato Grosso State; Ariquemes, Rondonia State; Novo Aripuana, Pitinga, and Presidente Figueiredo, Amazonas State; and Sao Felix do Xingu, Para State (five mines and two plants)	5,420 (ore).
Do.		do.	Piraporada Bom Jesus, Sao Paulo State (refinery)	1,400 (concentrate), 25 (metal).
Do.		Marmoré S.A. (Grupo PARANAPANEMA, 100%)	Juiz de Fora, Minas Gerais State (mine)	20 (ore).
Titanium		Rutilo e Ilmenita do Brasil S.A. (RIBSA) (private, 100%)	Mataraca, Paraiba State (mine)	4,200 (ore).
Do.		do.	Mataraca, Paraiba State (two beneficiation plants)	120 (concentrate).
Zinc		Votarantim Metais Zinco S.A (Grupo Votarantin, 100%)	Vazante, Minas Gerais State (mine)	800 (ore).
Do.		do.	Vazante, Minas Gerais State (beneficiation plant)	175 (concentrate).
Do.		do.	Paracatu, Minas Gerais State (mine)	400 (ore).
Do.		do.	Tres Marias, Minas Gerais State (refinery)	180 (metal).
Do.		do.	Juiz de Fora, Minas Gerais State (refinery)	95 (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).
Do.		do.	Prado, Bahia State (mine)	90 (ore).
Do.		do.	Prado, Bahia State (three beneficiation plants)	123 (concentrate).
Do.		do.	Prado, Bahia State (three separation plants)	90 (concentrate).

TABLE 2--Continued
BRAZIL: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
INDUSTRIAL MINERALS			
Asbestos	Sociedade Anônima Mineração de Amianto (private, 100%)	Cana Brava and Minacu, Goias State (mines)	9,000 (ore).
Do.	do.	Cana Brava and Minacu, Goias State (beneficiation plant)	230 (concentrate).
Cement	Cimento Santa Rita S.A. (CSSA) (private, 50%, and Holder Cimento S.A., 50%)	Itapevi and Salto de Pirapora, Sao Paulo State (two plants)	2,200.
Do.	Companhia Cimento Portland Itau (Grupo Votorantim, 100%)	Itau de Minas, Minas Gerais State (three plants)	2,400.
Do.	Companhia de Cimento Portland Paraiso (CCPP) (CCPP, 50%, and Lafarge Group, 50%)	States of Espirito Santo, Goias, Minas Gerais, and Rio de Janeiro (five plants)	4,000.
Do.	Companhia de Cimento Portland Rio Branco (Grupo Votarantin, 100%)	Rio Branco do Sul, Parana State (two plants)	5,000.
Do.	Camargo Correia Cimentos S.A. (CCSA) (private, 100%)	Ijaci, Minas Gerais State (plant)	1,600.
Diamond	Mineração Tejucana S.A. (MTSA, 100%)	Diamantina, Minas Gerais State (mine)	100.
Fluorspar	Mineração Nossa Senhora do Carmo Ltda. (private, 100%)	Cerro Azul, Parana State (two mines)	180 (ore).
Do.	Mineração Santa Catarina Ltda. (MSCL) (private, 100%)	Morro da Fumaca, Santa Rosa de Lima, Rio Fortuna, Santa Catarina State; and Tangua, Rio de Janeiro State (three mines and beneficiation plant)	100 (ore), 120 (concentrate).
Graphite	Nacional de Grafite Ltda. (NGL) (private, 100%)	Itapecerica, Pedra Azul, Salto da Divisa, Minas Gerais State (three mines)	80 (ore).
Do.	do.	Itapecerica, Pedra Azul, Salto da Divisa, Minas Gerais State (three beneficiation plants)	60 (concentrate).
Do.	Grafita MG Ltda. (GML) (private, 100%)	Mateus Leme, Zerra Azul, Minas Gerais State (two mines)	20 (ore).
Do.	Marmoré Mineração e Metalurgia Ltda. (MML) (Grupo PARANAPANEMA, 100%)	Maiquinique, Bahia State (mine)	10 (ore).
Gypsum	Companhia Brasileira de Equipamento (private, 100%)	Codo, Maranhao State, and Ipubi, Pernambuco State (two mines)	100.
Do.	Companhia de Cimento Portland Paraiso (private, 100%)	Ipubi, Pernambuco State (mine)	50.
Kaolin	Caulim da Amazônia S.A. (CADAM) (private, 100%)	Mazagao, Amapa State (mine)	720 (ore).
Do.	do.	Mazagao, Amapa State (beneficiation plant)	360 (concentrate).
Do.	do.	Adam Mine, Rio Jari, Amazonas State	660 (concentrate).
Do.	Pará Pigmentos S.A. (PPSA) (private, 100%)	Para Mine, Para State	500 (concentrate).
Do.	Ymerys Rio Capim Caulim S.A. (RCCSA) (private, 100%)	Rio Capim Mine, Para State	500 (concentrate).
Do.	Empresa de Mineração Horii Ltda. (EMHL) (private, 100%)	Biritiba and Mogi das Cruzes, Sao Paulo State (two mines)	200 (ore).
Do.	do.	Biritiba and Mogi das Cruzes, Sao Paulo State (two beneficiation plants)	180 (concentrate).
Limestone	Companhia de Cimento Portland Paraiso (CCPP) (private, 100%)	States of Goias, Minas Gerais, and Rio de Janeiro (five mines)	2,000.
Do.	Companhia de Cimento Portland Rio Branco (CCPRB) (private, 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	Fertililizantes Serrana S.A. (Bunge International Group, 100%)	Araxa, Minas Gerais State (mine)	5,000.
Do.	Copebras S.A.(Copebras) (Anglo American plc, 100%)	Ouvidor, Goias State (mine)	4,400.
Do.	Fosfértil S.A. [Grupo Fertifós, 81.54%, and Companhia Vale do Rio Doce (CVRD), 10.96%]	Tapira, Minas Gerais State (two mines)	10,500.
Do.	Ultrafértil S.A. [Grupo Fertifós, 81.54%; Companhia Vale do Rio Doce (CVRD), 10.96%; public, 7.5%]	Araxa, Minas Gerais State (mine)	5,000.

TABLE 2--Continued
BRAZIL: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
INDUSTRIAL MINERALS--Continued				
Quartz		Telequartzo Exportação S.A. (TESA) (private, 100%)	Cristal, Minas Gerais State (mine)	6.0.
Salt, rock		Frota Oceânica Brasileira S.A. (FOBSA) (private, 100%)	Jacupiranga, Sao Paulo State (mine)	6,000.
Do.		Dow Química do Nordeste Ltd. (DQNL) (Dow Chemical Co., 100%)	Vera Cruz, Bahia State (mine)	1,000.
Do.		Cia. Nacional de Alcalis S.A. (CNA) (private, 100%)	Alcalis Grupo, Rio Grande do Norte State	1,500.
Do.		Salgema Mineração e Química S.A. (SMQ) (private, 100%)	Salgema, Maceio, Alagoas State (mine)	1,000.
MINERAL FUELS				
Coal		Carbonífera Circiúma S.A. (CCSA) (private, 100%)	Circiuma and Sideropolis, Santa Catarina State (two mines)	1,600.
Do.		Companhia Carbonífera Metropolitana S.A. (private, 100%)	Circiuma, 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.		Companhia Riograndense de Mineração S.A. (private, 100%)	Circiuma and Urussanga, Santa Catarina State (two mines)	2,600.
Petroleum	thousand 42-gallon barrels	Petróleo Brasileiro, S.A. (Petrobrás) (Government, 81.4%; private, 11.8%; public, 6.8%)	Fields in the States of Alagoas, Amazonas, Bahia, Ceara, Espirito Santo, Rio de Janeiro, Rio Grande do Norte, Para, Maranhao, and Sergipe (99)	220,000.
Petroleum products	do.	do.	Refineries in the States of Amazonas, Bahia, Ceara, Minas Gcrais, Parana, Rio de Janeiro, Rio Grande do Sul, and Sao Paulo	608,000.
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.

TABLE 3
BRAZIL: RESERVES OF MAJOR MINERAL COMMODITIES IN 2005[1]

(Thousand metric tons unless otherwise specified)

Commodity		Reserves	World ranking	World percentage
Asbestos, fiber		15,400		NA
Bauxite, ore		2,730,000	3	8.3
Chromite, Cr_2O_3		7,100		0.1
Coal, all types		10,113,000		1.1
Columbium (niobium), pyrochlore, and columbite ore		4,300	1	97.0
Copper, metal content		17,400		1.8
Fluorspar, ore		3,100		1.0
Gold, metal	metric tons	2,000		2.0
Graphite, ore		95,000	2	26.0
Gypsum		1,269,000		NA
Iron ore, 60% to 65% Fe content		21,000	5	6.5
Kaolin		4,050,000	3	29.0
Lead, metal content		1,000		0.7
Magnesite		180,000	4	8.2
Manganese, metal content		152,000	4	3.0
Natural gas[2]	million cubic meters	220,000		0.1
Nickel, metal content		6,000		4.0
Petroleum[2]	million 42-gallon barrels	12,000		0.9
Phosphate rock		260,000		0.8
Talc and pyrophyllite		156,000	3	17.0
Tantalum		89,000	1	52.0
Tin, metal content		2,500	2	22.0
Titanium, TiO_2		7,200		0.7
Vermiculite		23,000	3	10.0
Uranium, U_3O_8	metric tons	163,000		NA
Zinc, metal content		5,200		1.2
Zirconium, ore		2,000		2.8

NA Not available.

[1]Summário Mineral 2004-2005.

[2]Petróleo Brasileiro, S.A., Annual Report 2004-05; Petroleum Economist, July 2006.

The Mineral Industry of Canada

By Alfredo C. Gurmendi

Canada, a nation rich in mineral resources, was one of the leading mining countries in the world. In 2005, it continued to supply minerals to satisfy global demand. The values of coal, metal, and nonmetals production increased by 45.9%, 7.7%, and 3.6%, respectively, compared with those of 2004 (Birchfield, 2006, p. 1-2; Natural Resources Canada, 2006b). Canada remained among the leading world producers of such mineral commodities as potash followed by, in order of tonnage, Russia, Belarus, and Germany; diamond following, in order of output, Botswana, Russia, and Australia; nickel following, in order of output, Russia and Australia; selenium following Japan; columbium (niobium) following Brazil; and zinc following, in order of output, China, Australia, and Peru (Gabby, 2006b; George, 2006c; Kostick, 2006; Kuck, 2006; Magyar, 2006; Olson, 2006).

Canada had a population of more than 32.5 million in 2005, and had a gross domestic product (GDP) based on purchasing power parity of $1.13 trillion.[1] Canada's GDP growth was moderate at about 2.9%. In 2005, in spite of the appreciation of Canada's currency relative to the U.S. dollar, which was equivalent to 7.3%, the consumer price inflation remained subdued at 3.3% owing to higher world demand for Canadian mineral exports and higher mineral commodity prices, which contributed to the upturn in the country's economic growth. In 2005, in order of value, Canada's energy products, metals, and industrial minerals production was equivalent to 5% of the GDP. Unemployment decreased to 6.4% from 7.2% in 2004 (Department of Finance Canada, 2006§[2]; Government of Canada, 2006§; Statistics Canada, 2006d§; U.S. Central Intelligence Agency, 2006§).

In 2005, Canadian coal, metals, and industrial minerals production[3] was valued at almost $23 billion (CAN $26.4 billion), which was 8.6% higher than that of $18.6 billion (CAN $24.3 billion) in 2004. The Canadian nonfuel mineral production was valued at $20.9 billion (CAN $24 billion), which was 5.8% higher than that of $17.3 billion (CAN $22.7 billion) in 2004 (Birchfield, 2006, p. 1-2; Natural Resources Canada, 2006b).

The output and value of mineral production in 2005 increased significantly for a number of mineral commodities. Among those commodities, uranium output increased by 9.1% and its value increased by 65.4%; potash (K_2O content) output increased by 1.6% and its value increased by 31.3%; and copper ore output increased by 4.8% and its value increased by 20.9%. Although iron ore output decreased by 0.9%, its value increased by 13.5%. In terms of value, the leading mineral commodities produced were nickel, the value of which increased to $2.9 billion in 2005 from $2.5 billion in 2004; potash, to $2.4 billion from $1.5 billion; copper, to $2.2 billion from $1.5 billion; coal, to $2.0 billion from $1.2 billion; gold, to $1.7 billion from $1.6 billion; iron ore, to $1.3 billion from $1.1 billion; sand and gravel, to $1 billion from $850 million; stone, to $960 million from $770 million; and zinc, to $960 million from $770 million (Natural Resources Canada, 2006b).

In 2005, according to the Prospectors & Developers Association of Canada's (PDAC) president, the "Super" Flow-Through Shares—Mineral Exploration Tax Credit (METC) program was a boon to Canada's exploration sector. Since its introduction in 1999, this federal tax credit program has kept investment in Canada and has provided an incentive for Canadian investors to continue to invest in exploration for mineral resources despite fierce global competition for exploration investment. The METC has allowed Canada to capture exploration investment and maintain its position as the leading country in the world for mineral exploration spending (Dillon, 2006).

Exploration and deposit appraisal spending amounted to $1.18 billion in 2004, a remarkable increase of 71.8% compared with the $686.7 million spent in 2003. Final figures for 2005 indicated an increase of 12.7% to $1.33 billion compared with spending in 2004, and revised spending intentions were expected to reach $1.72 billion in 2006. To that effect, the Voisey's Bay nickel-copper-cobalt deposit (in Newfoundland and Labrador) and the diamond deposits at Ekati, Diavik, and Snap Lake (in the Northwest Territories), and Jericho (in Nunavut) are successes, which make an impressive case for more exploration in Canada, no matter how attractive and lucrative the opportunities may be in Asia, Australia, and/or Latin America. Because of the Voisey's Bay's development and the Diavik and the Ekati diamond mines' production, which amounted to about 15% of the world's supply of rough diamond by value, exploration activity is being driven by the continuing exploration interest for diamond and encouraged by the significant recent diamond findings, such as at the Jericho Project in Nunavut and the Victor Project in Ontario. Across Canada, diamond exploration will continue in, in order of economic importance, the Northwest Territories, Nunavut, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, and Newfoundland and Labrador (Birchfield, 2006).

In 2005, the number of Canadian mining companies, both senior (large) and junior (small), that were active in exploration and deposit appraisal increased by an additional 16% following a dramatic 72% increase in 2004. This increase was owing, in part, to higher mineral and metal commodity price increases during 2004 and 2005, which rose in response to increased

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[1]Where necessary, values have been converted from Canadian dollars (CAN$) to U.S. dollars (US$) at an average rate of CAN$1.1468=US$1.00 for 2005. All values in this report, unless otherwise specified, are expressed in U.S. dollars.

[2]References that include a section mark (§) are found in the Internet References Cited section.

[3]For more detailed information on the mineral production in Canada, see the Canadian Minerals Yearbooks for 1998 and 1999, prepared by the Mining Sector, Natural Resources Canada, Ottawa, Canada, which were used extensively as source material for this report. The U.S. Department of the Interior has arranged to have these Canadian publications placed in selected depository libraries of the 50 States and Puerto Rico.

global demand that was driven by the rapidly growing economies of China and India. Copper, coal, iron ore, and uranium were sold at record high prices, and gold traded at its highest level since the early 1980s.

Spending by the active mining companies increased to $1.1 billion (CAN $1.4 billion) from $960 million (CAN $1.2 billion) in 2004 and $550 million (CAN $1.2 billion) in 2003. Mineral exploration accounted for 81% of these expenditures, and deposit appraisal, 19%. Spending by junior firms, which overtook spending by senior companies during the 2004-05 timeframe, accounted for 58% of the 2005 total. Junior firms spent $632 million in 2005 compared with $375 million in 2004. Senior companies spent $468 million in 2005 compared with $377 million in 2004 (Canadian Intergovernmental Working Group on the Mineral Industry, 2005, p. 2-3, 5; Natural Resources Canada, 2006a).

In 2005, Ontario continued to lead in exploration and deposit appraisal spending (24.7%) followed by British Columbia (16.3%), Quebec (16.1%), Nunavut (13.1%), Saskatchewan (10.0%), and the Northwest Territories (7.2%), which together accounted for 87.4% of exploration and deposit appraisal expenditures in Canada. Expenditures were equally apparent in Yukon (3.8%), Newfoundland and Labrador (3.5%), and Manitoba (3.3%) (Canadian Intergovernmental Working Group on the Mineral Industry, 2005, p. 2, 6; Bouchard, 2006, p. 7-10; Natural Resources Canada, 2006a).

In 2005, other factors that contributed to revitalize mineral exploration ventures in Canada—besides metal prices at record high levels, gold trading at its highest level since the early 1980s, and strong demand for most mineral commodities driven by increased consumption by the industrial sectors of the United States, China, and India—were Canada's timely tax incentives, positive exploration results, and better access to the capital markets (Bouchard, 2006, p. 7-10).

In 2005, Canada's larger mining companies remained internationally active by continuing to spend almost 75% of their exploration budgets for precious and base metals or diamond in, by domicile of company in order of spending, Australia, Africa-Middle East, Europe-Commonwealth of Independent States (CIS), the United States, Latin America and the Caribbean, and the Asia and the Pacific region (Canadian Intergovernmental Working Group on the Mineral Industry, 2005, p. 159-161). The increase in spending reflected the rapid response by the Canadian companies to a better metal price outlook during the 2003-04 timeframe accompained by generous Government tax and nontax incentives and a steady stream of positive exploration news. Such discoveries as the Voisey's Bay copper-nickel project, the Kelex Nickel Zone, and the Sudbury Basin's platinum-group metals (PGM)-rich deposits, and the Diavik, the Jericho, and the Snap Lake diamond projects confirmed that Canada is still rich in mineral resources (Canadian Intergovernmental Working Group on the Mineral Industry, 2005, p. 2-5, 17-18).

According to the Canadian Intergovernmental Working Group of the Mineral Industry's projections for exploration and deposit appraisal, expenditures in Canada, by type of company and mineral commodity, will continue to dominate the Canadian mining sector because of still-favorable base metals, precious metals, uranium, and diamond market conditions. Uranium also appears to be headed for a stronger exploration program beyond 2005. The globalization of diamond demand has introduced unprecedented levels of volatility into the diamond supply and the pricing of rough and polished diamond (Canadian Intergovernmental Working Group on the Mineral Industry, 2005, p. 160; Natural Resources Canada, 2006a).

Exploration is a vital component of Inco Limited's Voisey's Bay project in the Province of Newfoundland and Labrador. Inco spent $5 million to continue its exploration program on the project in 2005, and the company expected to spend an additional $80 million to further investigate the underground resource to establish minable reserves (Voisey's Bay Nickel Company Limited, 2006a§). At the end of 2005, the Voisey's Bay Ovoid deposit contained estimated open pit proven and probable reserves of 32 million metric tons (Mt) at grades of 2.75% nickel, 1.59% copper, and 0.14% cobalt. In addition, the deposit contained an underground estimate of 40 Mt of indicated mineral resource grading 1.89% nickel, 0.90% copper, and 0.12% cobalt and 6 Mt of inferred mineral resource grading 2.3% nickel, 1.0% copper, and 0.2% cobalt (Inco Limited, 2006b§; Voisey's Bay Nickel Company Limited, 2006b§).

According to the Voisey's Bay Nickel Company Limited (VBNC), construction of a 6,000-metric-ton-per-day (t/d) integrated mine and concentrator at the Voisey's Bay site in the Province of Newfoundland and Labrador was completed in November 2005. The estimated investment in these facilities was $828 million (CAN $950 million). These facilities will support the mining and processing of ore from the Voisey's Bay deposits and will produce two types of concentrate: a copper concentrate and a nickel-cobalt-copper concentrate (Voisey's Bay Nickel Company Limited, 2006c§).

Environmental concerns continued to influence mineral exploration and development activities throughout Canada, and mineral exploration criteria seemed to have become increasingly subject to legal and community influences in much of Canada. Land use, which had never been given much attention in the past, had become an issue. First Nation rights, for instance, were receiving much consideration. The Minister of Natural Resources stated that Federal and Provincial Governments were working on legislative reforms that were expected to afford a better regulatory climate.

The Investment Tax Credit for Exploration (ITCE) that was introduced in October 2000 was extended during the 2003-04 period in the Federal budgets and was due to be phased out at the end of 2005; issuing companies, however, will be able to continue to incur eligible expenses to the end of 2006. The Canadian Intergovernmental Working Group on the Mineral Industry (IGWG) subworking group on taxation concluded that the ITCE had been successful in maintaining access to exploration financing and, with the aid of a stronger metal prices and interesting diamond discoveries, that Canada had achieved higher exploration levels. The ITCE and related tax incentives acted as catalysts for mineral exploration investment in Canada, and the PDAC was asking the Federal Government to extend the program for an additional 3 years (Canadian Intergovernmental Working Group on the Mineral Industry, 2005, p. 30-31; Prospectors & Developers Association of Canada, 2006§).

In 2004 (the latest year for which data were available), according to Natural Resources Canada, almost $8.7 billion (CAN $11.4 billion) in equity financing was available for international exploration and development projects. About 50% of that total was raised for companies listed on the Canadian stock exchanges of, in order of stocks volume, Toronto, Ontario, British Columbia, and Vancouver. In 2004, worldwide exploration budgets for, in order of importance, precious metals, base metals, and diamond increased by almost 40% to $3.8 billion (CAN $5.0 billion) from $1.5 billion in 2003. The number of companies that reported exploration programs (defined here as those with budgets of at least $100,000) increased to 1,138 in 2004, or by 24%, from 917 companies in 2003. Of those 1,138 firms, 680, or 60%, were based in Canada and the remaining were based around the world. In 2004, more mining companies were based in Canada than anywhere else and 105 of the world's 213 leading firms (or 49%, up from 45 firms in 2003) were located in the country followed by the Asia and the Pacific region, with 23%; Europe and the CIS, 10%; the United States, 8%; Africa and the Middle East, 6%; and Latin America and the Caribbean, 4%. Canadian companies are likely to continue, for at least the near future, to dominate minerals exploration worldwide (Canadian Intergovernmental Working Group on the Mineral Industry, 2005, p. 159-161).

Government Policies and Programs

The Canadian Provinces exercise the primary jurisdiction over mineral resources. Through their mining acts, the Provincial governments regulate most aspects of exploration and mining in Canada. The exceptions are the Northwest Territories, Nunavut, and the Yukon Territory, which are still under the resource-management control of the Canadian Federal Government, although they were slowly accumulating more independent powers. For instance, the Federal, the Territorial, and the First Nation negotiators, via the Devolution Transfer Agreement, transferred the Federal Government's current responsibilities for managing most of Yukon's natural (mineral and energy) resources to the Government of Yukon, effective April 1, 2003.

The ITCE program was given super flow-through-shares (FTS) status. This Federal and Provincial tax credit boosted the FTS' financing process and continued to encourage new investment and stimulate Canada's exploration program. The credit is in addition to the existing 100% deduction of eligible exploration expenditures from the Federal portion of investors' income tax and is equivalent to a 136.7% exploration expense deduction. The two types of FTS investments are the super flow-through, which includes additional Federal tax credits for grassroots exploration, and the regular flow-through plus Provincial and Territorial harmonization initiatives.

According to the IGWG's 2005 report, the Provinces and Territories continued to offer tax incentives for grassroots exploration and deposit appraisals. The Province of Newfoundland and Labrador's mineral incentive program was in its second year of a 3-year plan. The Province's combined assistance for 2005 was about $1.7 million, most of which was matched by the recipients (junior exploration companies and prospectors) (Canadian Intergovernmental Working Group on the Mineral Industry, 2005, p. 44-45).

New Brunswick's exploration incentives make up a threefold program to stimulate exploration activities: 1) A junior mining assistance program to attract exploration investment into the Province, which provided $270,000 in grants to 10 junior firms in 2005; 2) A comprehensive prospector development program to encourage grassroots exploration, which provided $225,200 in grants to 23 prospectors in 2005; and 3) An advanced exploration program to identify potential mineralization at greater depth than was previously possible via advanced exploration technology (Canadian Intergovernmental Working Group on the Mineral Industry, 2005, p. 53-54).

Quebec's refundable FTS tax credit for mineral resources will continue to allow a tax credit of up to 60% of exploration expenditures, for both senior and junior companies, until 2007. An additional deduction of 50% of qualifying exploration expenses, such as surface exploration and underground drilling on land that is not under a mining lease or mining concession and/or has had no production in the previous 5 fiscal years, may also be granted under the Mining Duties Act up to a limit of 50% of annual profit (Canadian Intergovernmental Working Group on the Mineral Industry, 2005, p. 59-60).

The Mineral Exploration Assistance Program (MEAP) provides financial assistance of up to 25% of eligible exploration expenditures to a maximum of $300,000 per year and recipient to companies or individuals undertaking mineral exploration in Manitoba. Companies and/or individuals may qualify for up to 35% of eligible exploration expenditures to maximum of $400,000 per year and recipient in remote areas of the Province, such as in Bissett, Far North, and Lynn Lake/Leaf Rapids. In April 2005, Manitoba renewed the MEAP program and will provide an additional $7.4 million funding during a 3-year period (Canadian Intergovernmental Working Group on the Mineral Industry, 2005, p. 81).

The Saskatchewan Mineral Exploration Tax Credit (SMETC) was introduced in December 2001. Saskatchewan also had in place a temporary 10% tax credit for eligible FTS investors in mineral exploration firms active in the Province where the targeted commodities were diamond and uranium. The SMETC program parallels the Federal 15% ITCE. In September 2002, the Province announced a 6-year $12.6 million package of mineral exploration incentives, such as 1) the corporation exploration incentive program, which offers reimbursement of up to 25% of approved eligible expenditures to a maximum of $100,000 per year and recipient, and 2) the prospectors incentive program, which offers reimbursement of up to 50% of approved eligible expenditures to a maximum of $7,500 per year and recipient (Canadian Intergovernmental Working Group on the Mineral Industry, 2005, p. 98-99).

During 2005, British Columbia provided a 10-year extension of the METC, which is a 20% refundable tax credit to companies undertaking eligible grassroots exploration in the Province. The METC program, in combination with the Federal Government's 15% mining tax credit, was considered to be one of the best exploration tax credit programs in Canada (Canadian Intergovernmental Working Group on the Mineral Industry, 2005, p. 107).

The Yukon Territory offered the Yukon Mining Incentives Program (YMIP), which offers reimbursement of up to 25% of approved eligible expenditures for individuals and companies. In 2005, funding was offered to 63 of 75 applicants for a total of more than $1.0 million; 12 of the successful applicants were in the grassroots prospecting stage, 21 were in the focused regional stage, and 33 were in the target evaluation stage. Of the successful YMIP applicants, 70% were exploring for gold, which included 20% for alluvial gold; of the remaining, 27% were exploring mainly for copper, and 3%, for gemstones and other commodities. In 2005, mineral exploration expenditures increased to $50 million from $22 million in 2004. About 70% of the expenditures was in the exploration of base metals, 20% was for precious metals, and 10% was for gemstones and coal (Canadian Intergovernmental Working Group on the Mineral Industry, 2005, p. 117, 121).

The Northwest Territories Geoscience Office (NTGO) is a partnership of, in order of economic importance, the Indian and Northern Affairs Canada (INAC), the Northwest Territories' Geology Division of the Department of Resources, the Wildlife and Economic Development Program, and the Geological Survey of Canada (GSC). The purpose of the NTGO is to contribute to a prosperous and sustainable resource-based economy, make a significant contribution to Canada's energy supply, and increase the informed use of geosciences for land claims, land use, and resource management policy (Canadian Intergovernmental Working Group on the Mineral Industry, 2005, p. 136).

The Canada-Nunavut Geoscience Office (C-NGO) is a partnership between the Government of Nunavut, the INAC, and the GSC (Department of Economic Development and Transportation). The mandate of the C-NGO is to provide accessible geosciences information in support of sustainable development of mineral and energy resources. In 2005, a total of 1,136 prospecting permits encompassing 48 million hectares were granted by the Mining Recorder's office (Canadian Intergovernmental Working Group on the Mineral Industry, 2005, p. 141).

Federal, Provincial, and Territorial policies, although not entirely consistent among Provinces, are generally stable and have traditionally supported the research and information services that relate to the mining industry. The Federal Government has negotiated multiyear Mineral Development Agreements with Provincial Governments to fund initiatives intended to strengthen the mining industry in Canada. The Canadian Securities Administrators' National Instrument 43-101, which pertains to the "Standards of Disclosure for Mineral Projects," was enacted into law in early 2001. This instrument continued to be applied to all technical public disclosure on mineral projects and to require that all technical disclosure be based on the work of a qualified person. The qualified person continued to be responsible for scientific and technical matters, which included not only exploration, development, definitions of resources and reserves, and mining matters, but also quality-control standards for analytical laboratories, the form of technical reports, professional supervision, corporate governance practices, regulatory oversight of the mining industry, and enforcement of securities laws (Canadian Intergovernmental Working Group on the Mineral Industry, 2005, p. 1-2, 180, 183-187).

Environmental Issues

Canada is a federation of 10 provinces and 3 territories and the authority to make laws is divided between the Parliament of Canada and the Provincial legislatures. The municipal governments are created under Provincial law and can make bylaws addressing a variety of local matters, such as zoning regulations and the issuance of construction permits. Certain arrangements have been developed for Aboriginal governments to exercise a range of governmental powers over reserve lands and other territories covered by specific arrangements negotiated with the Federal and Provincial governments (Natural Resources Canada, 2006a§).

The Canadian Environmental Assessment Act (CEAA) is a Federal environmental assessment process that provides the means of integrating environmental factors into planning and decisionmaking processes. The Government of Canada, through CEAA, seeks to achieve sustainable development and to promote economic development that conserves and enhances environmental quality. The Government of Canada is committed to ensuring that the administration of the CEAA results in a timely and predictable environmental assessment process that produces high quality environmental assessments so Federal decisions about projects safeguard the environment and promote sustainability. In Canada, based on the CEAA results, the Provincial and Territorial governments support and promote exploration and deposit appraisal activities in their respective jurisdictions via various initiatives, such as fiscal incentives, resolution of land access issues, and the provision of state-of-the-art geoscientific data (Canadian Environmental Assessment Agency, 2006§; Department of Justice Canada, 2006§).

The PDAC's total landscape management (TLM) is a multiple-use concept to achieve conservation, environmental protection, and resource development objectives. It has thus far produced unsatisfactory results, because the complex and changing needs of the TLM requires a more comprehensive and integrated approach for mining activities with environmental protection in a sustainable way. The TLM acknowledges, however, that access to land and certainty of title are crucial to resource development and that biological diversity, wilderness protection, and the preservation of unique and exceptional areas are fundamental to conservation objectives. The TLM also recommends management of entire ecological landscapes by employing the principal of conservation diversity; a system of "floating reserves" designed to accomplish protection in a constantly changing, dynamic landscape; adaptive management that allows the flexibility to accommodate new information, evolving ecosystems, and natural disturbances; and comanagement that ensures the provision of local community input (Canadian Intergovernmental Working Group on the Mineral Industry, 2005, p. 185-187).

Production

Mineral production took place in every Province and Territory in Canada. In 2005, the mineral and metal commodity prices continued to increase in response to the buoyant global demand. Canadian metals production was valued at $10.1 billion (CAN $13.3 billion) compared with $9.4 billion (CAN $12.4 billion) in 2004; industrial minerals production was valued at $8.2 billion (CAN $10.7 billion) compared with $7.9 billion (CAN $10.3 billion) in 2004; and coal production was valued at $1.8 billion (CAN $2.3 billion) compared with $1.2 billion (CAN $1.6 billion) in 2004. Production increased for, in order of value, nickel, potash, copper, coal, gold, cement, and diamond. Ontario's mineral output amounted to 27.4% of the total value followed by British Columbia, 18.4%; Saskatchewan, 15.5%; Quebec, 13.7%; the Northwest Territories, 6.5%; Alberta and Manitoba, 4.8% each; Newfoundland and Labrador, 4.3%; New Brunswick, 3.3%; Nova Scotia, 1.1%; and the Yukon Territory, 0.1%. Although the production of fuels tended to be concentrated in the Western Plains provinces, the output of nonfuel mineral commodities was characterized by a much wider distribution throughout Canada (Natural Resources Canada, 2006b; 2006b§).

Trade

As the world's leading exporter of minerals and metals, Canada enjoyed economic benefits from its mineral industry that included a significant contribution to its trade balance. In 2005, Canada's total exports, imports, and trade balance amounted to $395.1 billion, $338.5 billion, and $56.5 billion, respectively, compared with those of 2004, which were $330.7 billion, $279.0 billion, and $51.7 billion, respectively (Statistics Canada, 2006b§).

In 2005, Canada exported energy products ($75.8 billion), which included crude petroleum ($26.5 billion), natural gas ($31.4 billion), and coal and others ($17.9 billion); industrial goods and materials ($73.8 billion), which included crude minerals and ores ($7.8 billion), chemicals and fertilizers ($26.4 billion), metals and alloys ($23.6 billion), and industrial minerals ($16.0 billion) (Statistics Canada, 2006a§). Canada imported energy products ($29.4 billion), which included crude petroleum ($18.8 billion) and others ($10.6 billion), and industrial goods and materials ($68.5 billion), which included crude minerals and ores ($20.9 billion), chemicals ($25.0 billion), and industrial minerals ($22.6 billion) (Statistics Canada, 2006c§).

Prominent among the crude minerals exported in 2005 were iron ore, potash, and sulfur to the United States; copper concentrates to Japan; and iron ore and zinc concentrates to the EU. Exports of smelted and refined metals included aluminum, copper, gold, iron and steel, nickel, silver, and zinc to the United States; aluminum and gold to Japan; and copper and nickel to the EU. Coal exports went mostly to Japan. Total trade between Canada and the United States exceeded that of any other two countries in the world. In 2005, almost 81% of Canadian exports ($321.4 billion) and 67% of Canadian imports ($226.5 billion) were with the United States followed by, in order of value, Japan, the United Kingdom, the EU, Mexico, and other countries (Statistics Canada, 2006b§).

Structure of the Mineral Industry

The Canadian mineral industry comprised about 3,000 domestic and about 200 foreign companies; more than 9% of these companies were actively engaged in actual mining. Senior and junior companies were engaged in exploration, some of which were in advanced stages of mine development and expansions. Companies whose corporate voting rights were at least 50% non-Canadian were considered to be foreign, although other distinctions could apply for some large companies. More than 2,500 mine sites, which included coal, were active (Giancola, 2005, p. 13-19). Another 3,000 mines and quarries produced sand and gravel and other construction materials. About 40 smelters and refineries and other processing plants were operating in the cement, sodium chlorate, and sulfuric acid industries. Foreign companies were subject to the same taxes as domestic companies, and repatriation of earnings was allowed.

The Canadian mineral industry was privately owned with shares trading publicly on various exchanges in Canada and, in many cases, the United States. Overall, the mineral industry in Canada consisted of underground and open pit mines, leaching operations, concentrators, smelters, and refineries, as well as drilling and production operations characteristic of the petroleum industry. Table 2 lists the main commodities, leading companies, and major equity owners of the Canadian mineral industry.

In 2005, employment in the Canadian mineral industry declined to 388,000 from 390,000 in 2004, which was equivalent to almost 2.4% of the national employment level of 16.2 million. In the other sectors, employment in metal mining decreased by 4.8% to 21,519, nonmetal increased by 1.1% to 18,537, and coal increased by 11.3% to about 4,833 in 2005. About 1,500 people were also employed in diamond drilling (Birchfield, 2006, p. 2; Natural Resources Canada, 2006c§).

Commodity Review

Metals

Aluminum.—Canada produced more than 2.9 Mt of primary aluminum, which was an increase of almost 12% compared with the 2.6 Mt produced in 2004 and ranked Canada third after China and Russia and first, with Russia second and Venezuela third, in amount exported to the United States. The increase was owing to the Alouette smelter expansion and the restarting of the Aluminerie Bécancour smelter idle capacity in Quebec. In 2005, the value of Canadian production increased to $5.8 billion in 2005 from $5.1 billion in 2004, or by almost 14%; this increase was a result of increases in production and metal prices, which countered the increase of the Canadian dollar with respect to the U.S. dollar (Plunkert, 2006; Wagner, 2006, p. 11-12; Natural Resources Canada, 2006b§).

Alcan Inc. owned 51.9% of the total Canadian primary aluminum smelter capacity of about 2.7 million metric tons per year (Mt/yr), or almost 1.4 Mt/yr, followed by Alcoa Inc.

(25.2%), and others (23.7%) (Alcan Inc., 2006§; Alcoa Inc., 2006§). Alcan's 277,000 metric-ton-per-year (t/yr) smelter in Kitimat, British Columbia, operated at full capacity in 2005. Alcan announced the construction of an 80,000-t/yr facility in the Saguenay-Lac-Saint region of Quebec in 2006; this plant would use the first commercial application of Alcan's new low-caustic leaching and liming process. Alcan had completed the sale of Novelis Inc., which was the world's leading aluminum rolled-products firm, and opened packaging and automotive structures plants in Quebec (Wagner, 2006, p. 11; Alcan Inc., 2006§).

Alcoa was planning to expand its Lauralco-Deschambault smelter near Quebec City to 570,000 t/yr from 250,000 t/yr. Construction would start in 2006, initial production would begin in 2008, and full capacity would be reached in 2013. Alcoa was negotiating with Nova Pb Ltd. and St. Lawrence Cement Inc. for a long-term agreement to recycle Nova's spent potliner at its secondary lead smelter facility near Montreal and to recycle spent aluminum potliner produced by Alcoa's Quebec smelters to produce a new product called "CALSiFrit" to be used in cement production by St. Lawrence's Joliette plant (Wagner, 2006, p. 12; Alcoa Inc., 2006§). Alcoa and the Province of Quebec continued negotiating on the capacity upgrade of the Baie-Comeau smelter, which would increase the smelter's capacity to 547,000 t/yr from 437,000 t/yr by 2010 at an investment of about $1 billion (Alcoa Inc., 2006§).

Aluminerie Alouette Inc. [which is jointly owned by Alcan (40%), Aluminium Austria Metall Quebec (20%), Hydro Aluminum (20%), Société Générale de Finacement du Quebec (13.33%), and Marubeni Quebec Inc. (6.67%)] completed the more than $1.2 billion expansion of its smelter capacity near Sept-Îles, Quebec, from 245,000 t/yr to 550,000 t/yr. Preliminary work started in early 2003, and the metal output was expected in January 2006. Aluminerie de Bécancour Inc. restarted production at the 409,000-t/yr Bécancour smelter, which was owned by Alcoa (75%) and Alcan (25%) after its takeover of Pechiney SA of France (Wagner, 2006, p. 11; Alcan Inc., 2006§; Alcoa Inc., 2006§).

Bauxite and Alumina.—Production of alumina (Al_2O_3) totaled more than 1.2 Mt, which was an increase of 3.8% compared with that of 2004, and alumina (hydrate) was about 1.4 Mt, which was an increase of 5.4% compared with that of 2004 (table 1). In 2005, Alcan owned 100% of the total Canadian alumina refinery capacity of almost 1.2 Mt/yr. This capacity included Alcan's smelter-grade alumina refinery in Vaudreuil, Quebec, and two specialty alumina refineries in Brockville, Ontario (18,000 t/yr) and in Vaudreuil (160,000 t/yr). Canada imported about 2.2 Mt of bauxite from Brazil in 2005. Bauxite ore can be refined into two grades of alumina—smelter grade and specialty chemical grade; the former is used in the production of primary aluminum, and the latter is used in various products, such as absorbents, ceramics, fire retardants, and refractory bricks (Departamento Nacional de Produção Mineral, 2006; Alcan Inc., 2006§).

Copper.—Mine output of copper content increased to 594,812 t in 2005 from 562,795 t in 2004. Canada ranked seventh as world producer of copper following, in order of tonnage output, Chile, the United States, Indonesia, Peru, Australia, and Russia (Edelstein, 2006). Refined metal production decreased to 515,223 t from 526,955 t in 2004; the value of metal production, however, increased to $2.1 billion from $2.0 billion, or by about 5.0%, owing to the world copper price increase. Canada exported $2.5 billion worth of copper during 2004 (the latest year for which data were available) (Coulas, 2006, p. 15-16; Natural Resources Canada, 2006b).

In Canada, four Provinces accounted for the majority (96.4%) of copper production. In 2005, British Columbia was the leading copper producing Province. Its share amounted to about 44.5%; Ontario's, 32.5%; Quebec's, 12.1%; and Manitoba's, 7.3%. Teck Cominco Limited announced that the life of the Highland Valley Copper Mine will be extended by about 5 years to September 2013 at a cost of $40 million. The mine, which is located near Kamloops in British Columbia, was owned by Teck Cominco, 63.9%; BHP Billiton Ltd., 33.6%; and others, 2.5%. The Mount Polley copper gold mine restarted operations in March 2005 owing to the discovered Northeast Zone and improved metal prices. The proven and probable reserves in the Bell, the Springer, and the Wight open pits totaled 44 Mt containing 0.45% copper and 0.30 gram per metric ton (g/t) gold, which is equivalent to about 198,000 t of copper and 13.5 t of gold. The mine's life as of February 2005 was about 7 years. Inco and Falconbridge Limited signed a 10-year agreement under which Inco would send copper anodes produced at its Sudbury copper smelter to Falconbridge's Canadian Copper Refinery (CCR) in Montreal to refine copper and precious metals; the refined copper and precious metals would be purchased by Falconbridge, less treatment and related charges, and Inco would receive back the nickel and PGM recovered from the anodes. Inco was expected to ship between 104,000 t/yr and 122,000 t/yr of copper anode to CCR.

Inco announced in early 2005 that it would be closing its copper refinery in Sudbury, Ontario, citing as the major factors the facility's size and high operating costs. Ontario owed much of its past importance to the Sudbury and the Timmins regions where copper was recovered in conjunction with nickel.

Large-scale copper mining in Quebec was centered mostly on, in order of tonnage output, Falconbridge's Raglan, BHP Billiton's Selbale, Noranda's Bell Allard, and TeckCominco's Louvicourt copper mines. Campbell Resources Inc. brought the Copper Rand Mine back into production in March 2005 at a cost of almost $60 million. The copper gold mine is located in the Chibougamau area of Quebec. Noranda announced that it would increase output at the Horne smelter in Quebec to 170,000 t/yr from 140,000 t/yr of anode by the end of 2005.

Manitoba's importance revolved around Inco's Thompson and Hudson Bay's Chisel and Trout Lake mines and smelter in Flin Flon. Aur Resources Inc. announced that its Duck Pond copper zinc deposit in Quebec would come into production in late 2006. The Aur Mine would produce about 18,600 t/yr of copper, 16 t/yr of silver, and 128 kg/yr of gold. Inco's Voisey's Bay Mine and concentrator became operational in November 2005. Planned production in the first phase of the project would be about 50,000 t/yr of nickel and 38,550 t/yr of copper (Coulas, 2006, p. 15-16; Voisey's Bay Nickel Company Limited, 2006b§).

Gold.—Gold output decreased to 119 t in 2005 from 131 t in 2004, or by 9.2%. As a result, the value of gold production decreased by 22.7% ($1.7 billion) in 2005 compared with that of 2004 ($2.2 billion). The annual average gold prices have increased from $363 per ounce in 2003 and $409 per ounce in 2004 to $430 per ounce in 2005. World gold demand decreased by 7% owing mostly to the change from implied investment to disinvestment, and world gold production decreased to 2,340 t from 2,460 t, or by almost 5%. Additional production from several new mines was not enough to balance with the mine closures in, in order of production importance, Quebec and Nunavut. The sharp increase in gold value at the end of 2005 and into 2006, however, sparked renewed exploration and development operations across the country (Chevalier, 2006, p. 21-23; Natural Resources Canada, 2006c§).

Ontario produced about 60% of Canada's total gold production in 2005 followed by Quebec, 20%; British Columbia, 14%; and other Provinces and Territories, 6%. Operating gold mines accounted for 92.5% of Canada's output, 19 base-metal mines (gold as byproduct) accounted for 6%, and numerous gold placers contributed 1.5%. Canada was the eighth ranked gold producer worldwide following South Africa, Australia, the United States, China, Peru, Russia, and Indonesia. Canada exported $3.8 billion worth of gold in various forms during 2005 compared with $3.1 billion in 2004 (Chevalier, 2006, p. 21; George, 2006a; Natural Resources Canada, 2006b).

Iron Ore.—Output of iron ore decreased to 28.3 Mt from 28.6 Mt in 2004, or by almost 1%, and the value of production increased to $1.3 billion from $1.2 billion in 2004, or by 8.3% (Natural Resources Canada, 2006b). The output of iron content was composed of concentrates, pellets, and sinter from hematite and siderite ores. Canada's production came from its major iron ore producing companies, which included Iron Ore Company of Canada, Quebec Cartier Mining Co., and Wabush Mines Ltd. The remaining production was from the byproduct recovery of magnetite from two base-metal smelters in British Columbia. Labrador and Newfoundland produced 62%; Quebec, 37%; and British Columbia, 1% of a total output of iron ore in 2005. Canada shipped 28.1 Mt of iron ore to stockpiles, which was a decrease of 15.4% compared with the previous year. Canada exported 22.5 Mt of iron ore from stockpiles; of that amount, 4.5 Mt went to the United States in 2005 (Jorgenson, 2006; Natural Resources Canada, 2006b; 2006b§).

Lead and Zinc.—Canada was the world's fourth ranked mine producer of zinc in concentrate at 666,700 t and the world's sixth ranked producer of lead in concentrate at 79,300 t. Zinc mine output showed a decrease of almost 16% in 2005 compared with that of 2004; lead production, however, increased by 3.3% compared with that of 2004. Increased prices for zinc continued because of the shortfall in supply in the markets worldwide. Canada is an important producer and exporter of zinc and zinc products. Hudson Bay Mining and Smelting Co., Limited was acquired by HudBay Minerals Inc. from Anglo American plc. on December 21, 2004 (HudBay Minerals Inc., 2005§). Canada had a zinc smelting capacity of about 800,000 t/yr in four smelters—Falconbridge's Kidd Creek in Ontario, Hudson Bay's Flin Flon in Manitoba, Noranda's Valleyfield in Quebec, and Teck Cominco's Trail in British Columbia—and produced about 10% of the world's total supply of zinc (Gabby, 2006a, b; Natural Resources Canada, 2006b; 2006b§).

In 2005, Noranda's mine and mill operation at the Brunswick Mine near Bathurst, New Brunswick, was the leading lead producer with a capacity of 74,000 t/yr. Teck Cominco's Trail operation in southern British Columbia was the world's leading fully integrated smelter and refinery complex and had a zinc production capacity of 290,000 t/yr. HudBay Minerals was expanding its Chisel North underground zinc mine at Chisel Lake, Manitoba, which is located near Snow Lake. HudBay was planning to invest $260 million in the 777 zinc deposit, which contains approximately 14.5 Mt of estimated proven and probable zinc reserves. HudBay planned to spend an additional $21 million for the refurbishment of the Snow Lake mill. Snow Lakes' concentrates would be trucked 200 kilometers (km) southwest to the Flin Flon smelter. The 777 deposit was expected to enter into full production by 2006. The construction of a $65 million electrolytic tankhouse and work on a new zinc tankhouse at the Flin Flon smelter increased capacity by 35% to 115,000 t/yr from 85,000 t/yr. The Kidd Creek complex's zinc production capacity was 145,000 t/yr. The Valleyfield facility's production capacity near Montreal had increased steadily to 260,000 t/yr from its original 64,000 t/yr in 1962 (Natural Resources Canada, 2006b§).

In 2005, Canadian exports and imports of lead were 211,781 t valued at $247.1 million and 151,838 t valued at $161.2 million, respectively. Exports and imports of zinc were 965,277 t valued at $965 million and 318,647 t valued at $311 million, respectively (Natural Resources Canada, 2006b§).

Nickel.—Canadian nickel mine production increased to 198,369 t of nickel content in 2005 compared with 186,694 t in 2004, or by about 6.3%. Higher prices caused the value of nickel to increase by 15.2%, or $2.9 billion, compared with that of 2004. Nickel was the most valuable mineral commodity produced in Canada during the year followed by, in order of value, potash, copper, coal, gold, cement, diamond, and iron ore. Traditionally, the Sudbury Basin in Ontario and the Thompson nickel belt in Manitoba were the most significant nickel production areas in Canada (McCutcheon, 2006, p. 27; Natural Resources Canada, 2006b; Inco Limited, 2006a§).

In 2005, Falconbridge's Raglan Mine in the northern Ungave Peninsula, Quebec, processed 0.9 Mt of ore and produced concentrates containing 22,200 t of nickel, 5,800 t of copper, and 350 t of cobalt. Falconbridge operated three mines in Sudbury and produced concentrates containing 19,700 t of nickel, 23,400 t of copper, and 354 t of cobalt after processing 2.2 Mt of ore. Falconbridge's smelter produced a record 63,100 t of nickel in matte. The matte, which contained about 54% nickel from the smelter, was shipped to Falconbridge's Nikkelverk refinery in Norway where cobalt, copper, nickel, and precious metals were recovered. The Raglan operation produced concentrates of 26,552 t of nickel and 6,867 t of copper. Raglan concentrates were shipped from Deception Bay, which is located 100 km north of the mine, to Quebec City to continue by rail to Falconbridge's Sudbury smelter in Ontario. Falconbridge's exploration at the Nickel Rim South near Sudbury resulted in an increased resource of 13.4 Mt at grades of 1.8% nickel, 3.3% copper, 0.04% cobalt, 1.8 g/t platinum, 2.0 g/t palladium, and

0.8 g/t gold by late 2004; production was expected to start in 2009 (McCutcheon, 2006, p. 28; Falconbridge Limited, 2006§).

In 2005, Inco's seven underground mines produced 8.75 Mt of ore containing 1.28% nickel and 1.38% copper, and its Sudbury's refinery produced 60,000 t of metal. About 37,500 t of nickel from the Sudbury smelter was sent to Inco's U.K. refinery for final processing. Smelting of Voisey's Bay concentrates at Inco's Sudbury smelter was expected to produce about 19,500 t on nickel in 2006 (McCutcheon, 2006, p. 28; Inco Limited, 2006a§).

Sherritt International Corp. and the Cuban Government each owned 50% equity of Metals Enterprise Inc. (MEI), which operated a refinery in Fort Saskatchewan, Alberta, and a laterite mine and leach plant in Cuba. MEI produced 31,900 t of refined nickel and 3,390 t of refined cobalt in 2005 compared with 31,800 t of refined nickel and 3,320 t of refined cobalt in 2004. MEI announced a 50% expansion of its nickel-cobalt production capacity at an estimated cost of $500 million by 2008 (McCutcheon, 2006, p. 29).

Platinum-Group Metals.—Mine production of PGM increased by about 12.5% compared with that of 2004 as a result of the 22% and the 15% increase in the prices of platinum and palladium, respectively, in 2005. PGM use increased by almost 7% owing to higher demand in the autocatalyst and the electronic industries in 2005. Platinum alloys tended to be used in jewelry; platinum, palladium, and copper-gold-silver alloys were used in dentistry. North American Palladium Limited produced PGM as its main product from the Lac des Iles open pit, which is located west of Thunder Bay in Ontario. Most production of PGM has been as byproducts from Inco's and Falconbridge's nickel-cobalt operations in Sudbury, Ontario. Falconbridge also recovered PGMs from its Raglan Mine in Quebec. Inco's Sudbury operation accounted for the majority of primary PGM output, although a small amount came from its Birchtree and Thompson operations in Manitoba as well (Chevalier, 2005a, p. 41.1-3, 41.11; Inco Limited, 2006a§).

The nickel sulfide ores yield creditable byproducts, such as, in order of value, copper, cobalt, gold, silver, PGM, selenium, tellurium, sulfuric acid, and liquid sulfur dioxide. Falconbridge shipped its PGM, which were contained in copper-nickel matte, to the firm's Nikkelverk refinery in Norway. Inco's PGM refinery in Acton, United Kingdom, processed primary and secondary materials from its Ontario ores. Canada ranked third behind South Africa and Russia in world platinum production and fourth after Russia, South Africa, and the United States in world palladium production (Chevalier, 2005a, p. 41.2; George, 2006b).

Silver.—Canada ranked sixth in world silver production after Peru, China, Mexico, Australia, and Chile (Brooks, 2006). Canadian silver production has been largely a byproduct of base-metal and gold mining and, therefore, subject to whatever mining incentive applied to the principal product, whether copper, gold, and/or lead and zinc. Accordingly, silver output suffers when mines close or suspend operations for reasons that involve supply, demand, and pricing for the major product. In 2005, silver-in-concentrate production from base-metal mines accounted for 51% of the total output and gold mines contributed the remaining 49%.

According to the Natural Resources Canada and the Silver Institute, the annual average price for silver increased to $7.31 per ounce from $6.66 per ounce in 2004, or by 9.8%. Furthermore, prices were driven by strong investment demand, higher industrial demand, and lower net Government silver stockpile sales. An increase in industrial demand in developing countries, such as China, and the rest of the world as economic conditions continue to improve coupled with an expected decline in the value of the U.S. dollar and higher oil prices could lead to better prices in 2006 (Chevalier, 2005b, p. 48.1-3).

Titanium.—Mine production of ilmenite increased by about 10% compared with that of 2004 and ranked third following Australia and South Africa (Gambogi, 2006). QIT-Fer et Titane, Inc. (QIT) (a wholly owned subsidiary of the British-Australian Rio Tinto Group) operated an ilmenite mine at Lac Tio, which is located near Havre-Saint-Pierre, Quebec (QIT-Fer et Titane, Inc., 2006§). In 2005, QIT produced 3 Mt of ilmenite ore, which it crushed onsite (Lac Tio) and transported to the QIT metallurgical complex in Sorel-Tracy, Quebec. At this facility, which was the only one of its kind in the world, the crushed ore was mixed with high-quality coal and smelted in electric arc furnaces to produce SORELMETAL iron ingots, which is a premium-quality iron, and titanium-dioxide rich titanium slag known as SORELSLAG. The quality iron went to the steelworks to produce SORELSTEEL and ATOMET as iron and steel powders. The primary product was a titanium dioxide feedstock to make, in order of value added, pigments for paints, surface coatings, plastics and paper, and iron and zircon byproducts. QIT's proprietary process technology had the production capacity to supply sulfate (1.1 Mt/yr of SORELSLAG titanium slag) and chloride (250,000 t/yr of UGS titanium slag) pigments. SORELSLAG had a titanium dioxide content of about 80% and was sold to pigment producers that used the sulfate process. UGS titanium slag, which was QIT's newest product, contained 94.5% of titanium dioxide and was supplied to the growing market of pigment producers that used the chloride process. To meet future potential demand, the UGS titanium slag plant could be expanded to 600,000 t/yr from its current (2005) capacity of 250,000 t/yr (QIT-Fer et Titane, Inc., 2006§).

Industrial Minerals

Asbestos.—Canadian asbestos production increased by less than 10% compared with that of 2004. The asbestos industry continued to be affected by competition for market share with, in order of tonnage supplied, Russia, China, and Brazil, and by liability issues because of the adoption of governmental regulations by a number of countries owing to human health concerns (Gaëtan, 2005, p. 18.4). Chrysotile is the only form of asbestos in the serpentine group. The amphibole group consists of actinolite, amosite, anthophyllite, crocidolite, and tremolite forms. Of these minerals, chrysotile is the least hazardous to human health and is the only form of asbestos produced in Canada. After Russia, China, and Kazakhstan, Canada was the fourth ranked producer of asbestos and supplied about 93% of the U.S. demand. Total exports for 2004 were estimated to be 240,000 t at a value of $145 million, which represented a

23.7% decrease compared with that of 2003 (Gaëtan, 2005, p. 18.12; Virta, 2006). China produced almost exclusively short-fiber asbestos for asbestos cement and replaced Canada as the second ranked producer; China could eventually threaten Russia's leading position. As a result of the ban on movement in Europe and regulatory changes in other developed countries, asbestos use was expected to remain low in the foreseeable future. In some developing countries, the benefits and safety of chrysotile-cement products continued to be recognized despite increasing competition from substitute fibers, PVC, and galvanized steel. The chrysotile-cement pipes are essential for water transportation and irrigation in the developing countries because the abruptness of terrain and economic conditions, but are not yet conducive to substitute products, such as PVC types (Gaëtan, 2005, p. 18.3).

The introduction of new chrysotile-containing products to address current health concerns and the gradual recognition by regulatory bodies of the potential toxicity of the substitute fibers may increase use of chrysotile asbestos products in the medium term. Marginal gains were expected in Latin American consumption of Canadian chrysotile; Asia, which was already a significant market (taking more than 50% of exports), was seen as expanding the demand for longer Canadian fibers (Gaëtan, 2005, p. 18.3).

The Canadian chrysotile industry is concentrated in Quebec. Production comes from the Bell underground mines and the Lac d' Amiante du Quebec, Ltée open pit, which was owned and operated by LAB Chrysotile, Inc. and is located near Thetford Mines, and the Jeffrey Mine, which was operated by Jeffrey Mine Inc. and is located near the town of Asbestos (table 2; Gaëtan, 2005, p. 18.1).

Cement.—Production of cement increased to 14.3 Mt in 2005 from 14.0 Mt in 2004 with a corresponding increase in value of about 5.1% to $1.44 billion in 2005 from $1.37 billion in 2004. Cement producers in Canada, on the basis of preliminary data, shipped an estimated 14.3 Mt of portland cement valued at $1.7 billion in 2005 compared with 14.0 Mt valued at $1.6 billion in 2004 (Panagapko, 2005, p. 15.1; Natural Resources Canada, 2006b; 2006b§). The continued demand for raw materials in China has caused a dramatic increase in shipping rates that has been affecting the imports of cement to the Americas from Asia. U.S. imports of cement and clinker totaled 31.8 Mt in 2005 (van Oss, 2006). Canadian and U.S. trade of cement and clinker varies from year to year depending on construction activity. In 2005, cement exports to the United States amounted to 4.3 Mt, which was a decrease of 7.8% from the previous year and represented almost 45% of total Canadian production (Panagapko, 2005, p. 15.4). This implies that for the immediate and perhaps the foreseeable future, the success of Canadian cement producers could be based significantly on exports to the United States and, hence, on U.S. economic growth. Canadian growth and construction, particularly in Ontario, which was the leading domestic cement market, will play the key role in determining the balance between domestic and U.S. consumption (Panagapko, 2005, 15.3-15.4).

According to the Canadian Construction Association and the Minerals and Metals Sector of Natural Resources Canada, cement production was expected to be marginally higher as a result of an increase of about 10% in the expenditures on infrastructure to about $90 billion. Also, the "Infrastructure Canada Program (ICP)," which involves Federal, Provincial, Territorial, and municipal governments, will contribute about $4 billion to ICP across Canada in the coming decade. An increase in mortgage interest rates, however, could affect residential construction and cause increases in the cost of new homes, and ease the demand for cement for other components, such as nonresidential and engineering construction programs (Panagapko, 2005, p. 15.7).

The fact that Canada has been the major exporter to the United States has kept Canadian cement kilns operating at high rates throughout the past decade and has allowed for gains in pricing. During 2001-04, the United States' main import sources for hydraulic cement and clinker were Canada (22%), Thailand (14%), China (9%), Venezuela (7%), and others (48%) (Panagapko, 2005, p. 15.4; van Oss, 2006).

Diamond.—Production of diamond decreased by about 2.4% to 12.3 million carats from that of 2004 (12.6 million carats) with a corresponding value decrease of 19% to $1.7 billion in 2005 compared with that of 2004 ($2.1 billion). The decreases in output and value resulted from the processing of low-grade ores at the Diavik and the Ekati diamond mines as part of their mine plans. In 2005, Canada's diamond mining sector completed its seventh full year of production, and was the country's fifth ranked nonfuel mineral commodity after nickel, potash, copper, and coal.

Canada's first open pit and underground diamond mine and commercial producer of diamond was the Ekati Mine. It was a joint venture between BHP Billiton Diamonds Inc. (80%), which was owned by BHP Billiton Group of Australia, and Charles Fipke and Stewart Blussom (10% each). The Ekati Mine is located near Lac de Gras about 300 km northeast of Yellowknife in the Northwest Territories. The Panda underground project part of Ekati started production in April 2005 and was expected to produce about 4.7 million carats per year during the next 6 years.

The second Canadian diamond mine, the Diavik Mine, which is located about 35 km southeast of Ekati and 300 km northeast of Yellowknife in the Northwest Territories, began production in January 2003. The Diavik Mine was an unincorporated joint venture between Diavik Diamond Mines Inc. (DDMI) (60%) (a wholly owned subsidiary of Rio Tinto plc of the United Kingdom) and Aber Diamond Mines Ltd. (40%) (a wholly owned subsidiary of Aber Diamond Corporation of Toronto, Ontario, Canada); DDMI was the operator of the mine. By yearend 2004, Diavik's reserves included 29.8 Mt of ore at 3.2 carats per metric ton, and its diamond production in 2005 amounted to 8.3 million carats, which was an 8.4% increase compared with that of 2004. In 2005, Canada's diamond output contributed almost 13.5% of the world's production of natural rough diamond, which was estimated to total 162.3 million carats valued at about $162.3 billion, and made Canada the third ranked producer by value following Botswana and Russia. With the planned opening of the Jericho Mine in 2006, the Snap Lake Mine in 2007, the Victor Mine in 2008, and the Gahcho

Kue Mine in 2011, however, Canada's share of world diamond production was expected to increase to more than 20% from 13.5% in 2005 (Natural Resources Canada, 2006b; Perron, 2006, p. 17).

BHP Billiton Diamonds reported that the quality of diamond recovered to date from the five kimberlite pipes at their Lac de Gras property compared favorably with the best pipes in other parts of the world. The five pipes were located under, in order of value, the Panda, the Koala, the Misery, the Fox, and the Leslie lakes and would be mined during a 30-year period. The centralized processing plant, which was located southwest of the Koala pit, was to receive 9,000 t/d of ore during the first 9 years of operation and 18,000 t/d thereafter. The cutoff grade would be 0.01 carat per metric ton. Processing was expected to involve mainly crushing, scrubbing, and dense-media separation, as well as high-intensity magnetic separation, X-ray concentration, and sorting. Future output was projected to be 4.5 million carats per year, or about 5% of world diamond production. Capital investment was expected to be at least $4 billion in association with the five pipes (BHP Billiton Diamonds Inc., 2006§).

The Snap Lake underground mine, which was 100% owned by De Beers Canada Inc. (part of the De Beers Group, which is headquartered in South Africa), is located 220 km northeast of Yellowknife in the Northwest Territories. On June 1, 2004, De Beers Canada was granted its final permit to proceed with the development and full construction of the Snap Lake Mine at a cost of about $560 million. This project would be De Beers' first mine outside of Africa and the first time that a kimberlite dike (tabular-shaped strueture) would be mined on a large scale. The Snap Lake project contains more than 18.3 Mt at an average grade of 1.46 carats per metric ton of diamond as defined (minable) reserves. The Snap Lake project was expected to produce about 1.5 million carats per year by early 2007 and to have a mine life of more than 20 years with an investment of $1 billion. The average value per carat was estimated to be $76. In October 2005, Dc Beers reccived final environmental approval for the development and full construction of its Victor project in northern Ontario at a cost of about $860 million. At the end of 2008, when operating at full capacity, Victor was expected to produce about 600,000 carats per year during a 12-year open pit mine life (Perron, 2006, p. 18; Antwerp Facets Online, 2006§; De Beers Canada, 2006§).

The Jericho diamond project, which is located in Nunavut about 420 km northeast of Yellowknife, was wholly owned by Tahera Diamond Corporation, which was based in Toronto, Ontario. Tahera planned to develop the project as Nunavut's first diamond mine. In June 2004, Tahera received Federal approval for its Jericho diamond project, followed by the water license and land lease in early 2005. Open pit development was completed by the end of 2005, and full production was to begin in April 2006 at a rate of 500,000 carats per year. Tahera's base plan indicated that more than 4.7 million carats would be produced during a 9-year mine life. The Jericho project contains defined (minable) reserves of more than 2.6 Mt at an average grade of 1.2 carats per metric ton and total diamond resources of 5.5 Mt at an average grade of 0.84 carat per metric ton. Tahera had in place a diamond purchasing and marketing agreement with a wholly owned subsidiary of Tiffany & Co. of the United States. Under the agreement, a portion of the production would be used in jewelry and the balance would be sold on behalf of Tahera on the international market for a fee (Perron, 2006, p. 18; Tahera Diamond Corporation, 2006§).

On January 1, 2003, the Kimberley Process Certification Scheme (KPCS) was implemented internationally. Under the KPCS, all Government participants agreed that all imports and exports of rough diamond would be accompanied by a certificate, and trade would take place only between participants, each of which must have adequate legislation to enforce the terms and conditions of the KPCS. Canada and 45 other countries were current (2005) members of the KPCS. On October 12, 2002 (Bill C-14), Canada's Parliament passed the Export and Import of Rough Diamond Act and regulations, which provided the Government with the authority to control trade of rough diamond, which must be reported to the Ministcr of Natural Resources Canada, who is Canada's export and import authority for rough diamond. Bill C-14 was to be modified by Bill S-36, which was introduced on November 25, 2005. The provisions of the New Act were to be published in the Canada Gazette in 2006 (Natural Resources Canada, 2006b; Perron, 2006, p. 20-23).

Potash.—The dominant potash product is potassium chlorite (KCl), which is rcported as potassium oxide/oxide of potash (K_2O) equivalent. Potash production totaled about 10.6 Mt; this was an increase of almost 3% compared with that of 2004 (10.3 Mt). The value of production increascd to about $2.5 billion in 2005 from $1.5 billion in 2004. Most of the output came from mines in Saskatchewan, but about 5% came from New Brunswick. Canada has probably the world's largest identified potash resource, which was estimated to be about 60 billion metric tons, and a reserve base of almost 10 billion metrie tons (Natural Resources Canada, 2006b; Stone, 2006b, p. 31).

Canada was the world's lcading produccr and exporter of potash. Canadian potash exports amounted to 15.8 Mt in 2005 compared with 16.5 Mt in 2004. The United States remained Canada's leading market, with a volume of 9.2 Mt, or a 58.2% share of the total exports, and was followed by China, with 2.4 Mt, or 15.2%; Brazil, with 1.2 Mt, or 7.6%; and others, with the remaining 3.3 Mt, or 19%. In 2005, exports to the United States increased by 3.2% compared with 8.9 Mt in 2004. Exports to Asia, which climbed owing to an increase in shipments to China, increased by 28% compared with 1.9 Mt in 2004. Exports to Brazil declined to 1.2 Mt in 2005 compared with 1.6 Mt in 2004. The outlook for potash demand in 2006 was positive (Stone, 2006b, p. 31-32).

Potash Corporation of Saskatchewan Inc. (PotashCorp), which was based in Saskatoon, Saskatchewan, was one of the world's leading publicly owned potash producers. It had the following divisions, in order of production: Allan, Cory, Lanigan, New Brunswick, Rocanville, and Patience Lake (a solution mine). PotashCorp owned 25% of the reserves at Esterhazy, Saskatchewan, which were mined by IMC Esterhazy Canada Limited Partnership under a long-term agreement. PotashCorp's production capacity was 12.1 Mt/yr of KCl equivalent, which was equal to about 56.5% of Canada's total potash annual capacity of 21.4 Mt (Stone, 2006b, p. 32).

Coal.—At the end of 2005, Canada's coal reserves amounted to almost 6.6 billion metric tons (table 3). Canada produced 67.3 Mt of coal in 2005 compared with 66.5 Mt in 2004. Coal production was still declining from the record high of about 78.9 Mt in 1997. The total value of production was $2 billion, which was an increase of almost 43% compared with that of 2004 ($1.4 billion). In 2005, owing to higher prices and stronger demand, the coal sector in western Canada continued to prosper. For example, in northeastern British Columbia, Western Canadian Coal Corp.'s Wolverine/Perry Creek Mine received the necessary regulatory approvals to start mine development in April 2005, to start coal production at a rate of 2.4 Mt/yr in July 2006, and to reach a full capacity of 3 Mt/yr by 2007. Northern Energy and Mining Inc. completed construction of its Trend Small Mine at the end of 2005 and production was to start in January 2006 at a capacity of 1 Mt/yr of coking coal. Twenty-four coal mines were operating in Canada by the end of 2005; most large-scale coal mines were located in western Canada. In 2005, Canada accounted for only about 2% of the world's coal production; it exported less than one-half of that production, thus making it the world's fifth ranked exporter after Australia, the United States, China, and South Africa (Natural Resources Canada, 2006b; 2006b§; Stone, 2006a, p. 13-14).

Canada exported 28.2 Mt of coal, which included 26.7 Mt of coking coal and 1.5 Mt of thermal coal. Canada's export volume increased by 8% in 2005 compared with that of 2004. Canada's exports to Asia, which was the leading market for Canadian coal, increased to 15 Mt in 2005 from 12 Mt in 2004; exports to Japan increased to 7.5 Mt from 5.4 Mt, and exports to South Korea increased to 4.9 Mt from 3.6 Mt; exports to Europe increased to 8.8 Mt from 8.3 Mt; and exports to Latin America increased to 2.3 Mt from 2.0 Mt. Exports to the members of the North America Free Trade Agreement (NAFTA), however, declined by 40% in 2005 owing to domestic supplies, mostly, in Mexico and the United States. Canada imported 21 Mt of coal in 2005 compared with 19 Mt in 2004, or almost an 11% increase. Of the total imports, 17 Mt was thermal coal, mainly for coal-fired electricity generation in the Provinces of, in order of amount consumed, Ontario, Nova Scotia, and New Brunswick. In 2005, the United States supplied 17.7 Mt of coal, which was 1.1 Mt more than in 2004, and Colombia supplied 2.6 Mt compared with 1.5 Mt in 2004. Domestic coal consumption remained high at about 60 Mt, and much of the eastern Canadian demand was supplied by imports. Electricity generation consumed about 56 Mt of thermal coal, of which 39 Mt was supplied domestically and 17 Mt was imported. Canada's cement, steel, and other sectors consumed 4 Mt (Stone, 2006a, p. 13-14; Statistics Canada, 2006a§, c§).

In 2005, Elk Valley Coal Partnership operated the Coal Mountain, the Elkview, the Fording River, the Greenhills, and the Line Creek mines in British Columbia and the Cardinal River Mine in Alberta. The Elk Valley, which was the second ranked metallurgical coal operating unit in the world, was established by the joint venture of Consol Energy Inc., Fording Inc., and Luscar Energy Partnership (59%) and Teck Cominco (41%). Luscar Coal Ltd., which was owned by the Luscar Energy Partnership (Canada's leading coal producer) operated the following surface mines (listed here in order of tonnage produced): the Coal Valley, the Obed Mountain, the Highvale, the Paintearth, the Sheerness, the Whitewood, and the Genesee in Alberta and the Poplar River, the Boundary Dam, and the Bienfait in Saskatchewan. These coal mines have a combined production capacity of 40 Mt/yr of bituminous, subbituminous, and lignite thermal coal used mainly for domestic electric power generation. In eastern Canada, the Nova Scotia government selected Xtrata plc in December 2005 to develop coal resources at the Donkin Mine on Cape Breton Island (Stone, 2006a, p. 14; Elk Valley Coal Partnership, 2006§; Teck Cominco Limited, 2006§).

After Canada ratified the Kyoto Protocol (2002) to limit greenhouse gas emissions and the production of particulate associated with the burning of coal, the Government and the private sector invested in the development of clean coal technologies. These technologies are designed to enhance both the efficiency and the environmental acceptability of coal development, production, and consumption (Stone, 2006a, p. 13).

Crude Oil.—Production of crude oil (petroleum) totaled 928.5 million barrels (Mbbl) in 2005, which was a decrease from a record high of 940.1 million barrels (Mbbl) in 2004 and an increase of about 2.2% compared with the 908.2 Mbbl produced in 2003. The value of the production was $51 billion in 2005 compared with $36 billion in 2004; the oil prices in 2005 were the highest of the past 30 years (average $54.52 per barrel). Canada, which in 2005 had a projected 22% share of world production, maintained its position as America's third ranked producer of crude oil after, in order of volume, the United States and Mexico and followed by Venezuela and Brazil. The country remained a leading exporter with a more than 16% share of U.S. crude oil imports (BP p.l.c., 2006§; Statistics Canada, 2006a§).

In 2005, petroleum exports and imports increased by 2.5% and 2.4%, respectively, compared with those of 2004. Exports amounted to almost 65% (600 Mbbl) of the total petroleum production, which was a result of the strong demand from the United States. Canadian imports amounted to 341 Mbbl; a significant volume (more than 98%) was supplied by the United States and Europe (BP p.l.c., 2006§; Statistics Canada, 2006a§, c§).

Natural Gas.—Production of natural gas totaled about 196,000 million cubic meters; this was an increase of almost 1% compared with that of 2004 (195,815 million cubic meters). The value of production increased to $15.2 billion in 2005 from $14.6 billion in 2004. Natural gas byproducts were valued at $2.3 billion, which was an increase of 9.5% compared with that of 2004. Both products, however, responded to supply-and-demand imbalances and increased prices. Canada ranked third in the world after Russia and the United States in the output of natural gas. Increasingly, the production of natural gas has played a major role in the mineral economy of Canada and has had a palpable effect on the GDP. Natural gas consumption in the United States, which was the world's leading consumer, decreased to about 633.5 billion cubic meters from 645.0 billion cubic meters in 2004, or by almost 2% because of higher prices and industrial restructuring; this had some effect on the

Canadian marketed gas (Natural Resources Canada, 2006b; BP p.l.c., 2006§).

Canada remained the leading foreign supplier of natural gas to the United States. About 104.2 billion cubic meters of natural gas, which was more than 16% of the U.S. consumption, was exported to the United States in 2005. These exports were expected to increase to about 105 billion cubic meters by 2006 in anticipation of the increasing inability of U.S. domestic production to meet its demand. In 2005, Canada's natural gas proven reserves were estimated to be about 1.6 trillion cubic meters, which remained about the same level as that of the preceding year (table 3; BP p.l.c., 2006§; Statistics Canada, 2006a§, c§; U.S. Energy Information Administration, 2006§).

Exploration for new discoveries of natural gas continued in Alberta and Saskatchewan. Exploration activities in both provinces began at least two decades ago. Chevron Canada Resources Ltd. (a subsidiary of ChevronTexaco Corp. of the United States) had one of the largest natural gas strikes in recent history near Fort Laird, Northwest Territories, where projections by the company showed "between 11 billion and 17 billion cubic meters (400 billion and 600 billion cubic feet) of gas in place in more than 400 meters (1,200 feet) of pay zone" (Natural Resources Canada, 2006c§). Accessing Canada's abundance of fuels, particularly oil in northern Alberta and natural gas in the Northwest Territories, has become economically feasible because of new technology and rising fuel prices (BP p.l.c., 2006§; Natural Resources Canada, 2006c§).

Opposition to natural gas exploration, production, and transmission, however, has grown in recent years. Environmental groups opposed to the construction of proposed pipelines to feed demand in the United States, and the Rocky Mountain Ecosystem Coalition attempted to slow the expansion of natural gas exploration and production activities in northern Alberta. A National Energy Board report, which assessed supplies and demand to 2025, put known natural gas reserves in Canada's northern frontier at 680 billion cubic meters (24 trillion cubic feet) and estimated reserves at 4.8 trillion cubic meters (170 trillion cubic feet) (BP p.l.c., 2006§).

Uranium.—Production of uranium (U content) in 2005 amounted to 12,597 t U and increased by more than 9.1% compared with that of 2004 (11,548 t U), mainly because the uranium spot market prices continued to increase in 2005 and into 2006. In 2005, the value of uranium production increased by almost 65.4% compared with that of 2004. Canada's two largest high-grade uranium (U content) deposits to date are McArthur River, which contains 160,000 t U at an average grade of 22% U, and Cigar Lake, which contains 90,000 t U at an average grade of 16% U. The McArthur River Mine began production in late 1999. Development of the Cigar Lake deposit was proceeding, and production was expected to start at full production capacity of 7,000 t/yr in late 2007. The Rabbit Lake Mine produced 2,317 t U in 2005 compared with 2,310 t U in 2004. The McClean Lake Mine production decreased to 2,112 t U in 2005 from 2,310 t U in 2004 owing to lower-grade mill feed (table 2; Natural Resources Canada, 2006b; Vance, 2006, p. 37-38).

Concerns about cleaner air and climate change have stimulated public debate on energy policy and created a more-favorable attitude towards nuclear power. In general, Canadian uranium producers in northern Saskatchewan remained well-positioned to capitalize on current market conditions and prospects for further nuclear power development in, for example, France, Japan, and the United States. As the world's leading supplier of uranium, Canada was well-placed in terms of resources, reserves, mining labor experience, and technology to maintain this position considering expected improvement on longer term world demand. The Athabasca Basin of Saskatchewan remained the focus for uranium exploration. Uranium exploration has also been reported in, in order of tonnage of resources, the Northwest Territories, Yukon, Nunavut, Quebec, Newfoundland and Labrador, Ontario, Manitoba, and Alberta. As many as 90 junior exploration firms have been involved. As of January 1, 2006, Canada's identified recoverable uranium resources totaled 431,000 t U, which was almost a 3% decrease compared with that of January 1, 2005 (444, 000 t U). In Canada, the transition to new production was being centered on tapping high-grade and low-cost uranium ore deposits, such as the Cigar Lake Mine, which would ensure that Canada remains the world's leading U supplier. The Cigar Lake Mine was expected to begin production in 2007 once the necessary licenses are obtained and provided the market conditions are favorable (Vance, 2006, p. 38).

Reserves

According to Natural Resources Canada, reserves of selected minerals were estimated based on responses by mining companies to the annual Federal, Provincial, and Territorial survey of operating mines and Corporate Canada's annual reports. Table 3 lists the levels of Canadian reserves of copper, gold, lead, molybdenum, nickel, silver, zinc, and other selected mineral commodities as of June 2006. Data are shown in terms of metal contained in ores for the base and precious metals or recoverable quantities of other mineral commodities, which included industrial minerals and mineral fuels. These mineral reserves represent "proven" and "probable" categories and exclude quantities reported as "possible." Reserves were defined as being well-delineated and economically minable ore from mines committed to production (Reed, 2005).

Yearly changes in the assessment of reserves are, in simplest terms, the arithmetic result of additions to reserves, deletions from reserves, and production. A complication is that, in Canada, a large number of mines produce more than one metal, thus necessitating close attention to market price and processing costs for two or possibly several mineral commodities simultaneously to enable production as coproducts to share costs and/or byproducts as credits.

Four Provinces dominated the reserves position in terms of proven and probable (minable) reserves of major metals—Ontario had 56% of the nickel reserves, about 57% of the gold, 55% of the copper, 29% of the zinc, and 26% of the silver; British Columbia had 100% of the molybdenum reserves, about 28% of the copper, 26% of the silver, 15% of the gold, 8% of the zinc, and 6% of the lead; New Brunswick had 88% of the lead reserves, 28% of the zinc, and 20% of the silver; and Quebec had 29% of the zinc reserves, 28% of the silver, 24% of the gold, 11%

of the nickel, and 6% of the copper. Manitoba had the smallest shares of reserves, such as 16% of the nickel, 6% of the zinc, 2% of the copper, and 1% each of gold and silver (Reed, 2005).

Infrastructure

Canada's total area of about 9.985 million square kilometers includes land area of 9.094 million square kilometers and freshwater area of 891,163 square kilometers. This total area is slightly larger than the United States. Canada has networks of highly developed infrastructure and vast areas of trackless wilderness. The country has 1.409 million kilometers of roads that comprise 497,300 km of paved highway, which included 16,900 km of expressways and 911,500 km of unpaved gravel or other loose-surface roads. Bulldozed temporary roads have been established for mining exploration in many remote places, but these deteriorate readily where not maintained (Natural Resources Canada, 2006b§; U.S Central Intelligence Agency, 2006§).

A total of 48,910 km of standard-gauge railroads included two main systems—the Canadian National and the Canadian Pacific. The country also had about 3,000 km of inland waterways plus the 3,770-km Saint Lawrence Seaway (one of the busiest in the world), which includes the 3,060-km Saint Lawrence River that leads into the Great Lakes and is shared with the United States. Principal ports and harbors were Becancour (Quebec), Churchill (Manitoba), Halifax (Nova Scotia), Montreal (Quebec), Prince Rupert (British Columbia), Quebec (Quebec), Saint John (New Brunswick), Saint John's (Newfoundland), Sept Isles (Quebec), Sydney (Nova Scotia), Trois-Rivieres (Quebec), Thunder Bay (Ontario), Toronto (Ontario), Vancouver (British Columbia), and Windsor (Ontario). Canada's merchant marine comprised about 169 ships of 1,000 or more gross registered tons (Natural Resources Canada, 2006c§; U.S Central Intelligence Agency, 2006§).

The country had 1,337 airports. Among these, 509 had permanent-surface runways;18 had runways that were between 2,438 and 3,047 meters (m) in length; 15 had runways that were between 1,524 and 2,437 m in length; 150 had runways that were between 914 and 1,523 m in length; and 245 had runways that were less than 914 m in length. Canada had about 828 major transport aircraft; Air Canada was the major carrier (Natural Resources Canada, 2006c§; U.S. Central Intelligence Agency, 2006§).

Canada generated electrical power from coal, natural gas, nuclear fuel, and massive hydroelectric facilities. Total capacity was roughly 114 gigawatts. About 566.3 net terawatt hours, which was significantly less than capacity, was produced in 2004 (the latest year for which complete data were available). Hydroelectric plants generated 57% of Canada's electricity; coal and fossil fuel, 28%; nuclear reactors, about 13%; and other renewables, 2%. Quebec and Ontario produced the most electricity (154 and 141 terawatt hours, respectively). Nearly 97% of Quebec's electricity came from hydroelectric plants, and the remaining 3% was produced mainly by nuclear facilities. In contrast, about 61% of Ontario's electric power was derived from nuclear plants, and the remainder, from hydroelectric and coal-fired plants. Most of Canada's electricity exports originated in New Brunswick, Ontario, and Quebec and were sold to consumers in New England and New York. British Columbia and Manitoba also exported large amounts of electricity, mainly to California, Minnesota, Oregon, and Washington. Except for Alberta, all Canadian Provinces that border the United States had transmission links to the neighboring systems. Canada was a net exporter of, in order of value, crude oil, natural gas, coal, uranium, and hydropower, and was the main source of U.S. energy imports (Statistics Canada, 2006a§; U.S. Central Intelligence Agency, 2006§; U.S. Energy Information Administration, 2006§).

An extensive system of pipelines connected oil- and gas-producing and consuming areas in Canada and the United States. The system was dominated by the Interprovincial Pipe Line, which delivered oil from Edmonton east to Montreal, Quebec, and the U.S. Great Lakes region, and the TransMountain Pipe Line, which delivered oil mainly from Alberta west to refineries and terminals in the Vancouver area and to the Puget Sound area of Washington. Canadian natural gas was transported largely by TransCanada Pipe Lines Ltd. of Calgary, which owned 13,600 km of mainline gas pipelines in Canada and 56 compressor stations that linked western Canadian gas producers with consumers in eastern Canada and the United States. The Canadian pipeline network included about 24,000 km for crude oil and refined products and 75,000 km for transmission of natural gas. Alberta's network represented the greatest length for any Province (18,900 km, or almost 20% of the total pipeline network) (U.S. Central Intelligence Agency, 2006§; U.S. Energy Information Administration, 2006§).

Outlook

Canada continued to be a very important trading partner of the United States; this partnership enhanced investment and trade among the members of NAFTA. The United States absorbed more than 68% of Canadian total minerals and mineral product exports, which were valued at $43.8 billion in 2005. Canada's economic growth in 2006 is likely to remain at about the same level as or to decline slightly relative to the 2005 rate of 2.9%. The combination of favorable factors, such as continued consumer price inflation subdued, high demand for Canadian mineral exports, high mineral commodity prices driven by strong global economy, and importers' continued economic growth could maintain the Canadian mining industry sustained in 2006 and into 2007. The duration of the current cycle in mineral commodity prices and continued access to financing will remain essential factors in the success of the Canadian minerals exploration and development operations in 2006 and beyond. Exploration is key to assuring a long-term supply of Canadian minerals (Birchfield, 2006; Dillon, 2006).

Canada's mineral industry is encouraged by the Federal Government to work towards the improvement of the permitting process. The goal is to enable exploration and mining companies to comply with the regulatory requirements in a timely and efficient way and, at the same time, to operate within high environmental and social standards. The Government and industry are enthusiastic about the concept of a Northern Mines Ministers Conference to be held each year to report on progress, to identify challenges, and to network with all stakeholders to

reestablish an attractive investment climate and to reverse any economic difficulties, such as the costs of socioeconomic and impact benefit agreements with local aboriginal groups being deductible from royalties and eligible as exploration investment (Andrews, 2005; Dillon, 2006).

In 2005, major mergers and acquisitions were underway and they continued into 2006 and beyond. The merger and acquisition activity and continuous diamond development highlighted operations in the Canadian minerals sector. The high energy consumption regionally and globally and the high energy prices will continue to encourage new developments, such as the White Rose oilfields in the Jeanne d'Arc Basin and expansions of the Hibernia and the Terra Nova oilfields in the near future. Comparisons between the Canadian offshore oil resources and the development of the now legendary North Sea fields continue to be made. Canadian uranium companies are effectively positioning themselves at the forefront of uranium producers worldwide as they seek to discover additional uranium resources to meet the growing domestic and global demand for nuclear energy.

The concerted effort to reconcile conflicting interests in the formulation of policy concerning ownership, aboriginal issues, mining development, environmental constraints and remediation, social responsibilities, and economic necessity in furthering the concept of sustainable development will continue to be difficult to assess or predict. Active engagement of these issues among the private sector, Government, and communities (stockholders and stakeholders) will probably provide outcomes that support a sustained future of the Canadian mining industry.

Canada is expected to continue to be well-positioned in terms of its metals and mineral fuel resources base and its access to, in order of economic importance, the NAFTA, China, Europe, Japan, and other global markets. Canada's mineral industry is primarily export oriented; as much as 93% of the production of some mineral commodities goes to world markets. The United States will continue to be a major market for Canada's minerals. In this regard, the industry's export capability is enhanced significantly by a lower exchange rate for the Canadian dollar.

Canada's continuous challenge is expected to be facing the realities of globalization and internationalization, especially with respect to developing countries that have more-competitive mineral resources and that are more avidly open to attract foreign investment. Canada's greatest long-term asset may be the achievement of a popular consensus in support of sustainable development that respects the interests of mining companies, First Nation peoples' rights, and the preservation of the environment.

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Natural Resources Canada
580 Booth St.
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Canada
Minerals and Metals Sector
Earth Sciences Sector
Canada Centre for Mineral and Energy Technology (CANMET)
Geological Survey of Canada
601 Booth St.
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Statistics Canada
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Indian and Northern Affairs Canada
Terrasses de la Chaudiere
10 Wellington St., North Tower
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The Mining Association of Canada
1105-350 Sparks St.
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Provincial Sources

Ministry of Energy, Mines, and Petroleum Resources
Parliament Buildings
Victoria, British Columbia V8V 1X4
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Department of Energy
Petroleum Plaza, North Tower, 9945 108 St.
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Chamber of Mineral Resources of Nova Scotia
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Canada

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TABLE 1
CANADA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2001	2002	2003	2004	2005[p]
METALS						
Aluminum:						
Alumina:						
Al_2O_3		1,036,000	1,125,400	1,108,500	1,169,836	1,214,405
Hydrate		1,196,470	1,283,000	1,269,600	1,328,842	1,400,340
Metal:						
Primary		2,582,746	2,708,910	2,791,915	2,592,160	2,894,204
Secondary		180,000	180,000	51,964	49,701	50,000
Total		2,762,746	2,888,910	2,843,879	2,641,861	2,944,204
Antimony[2]		278	173	153	105 r	96
Bismuth:						
Mine output, Bi content[2]		258	189	145	185	185
Metal, refined[e]		250	250	250	250	250
Cadmium:						
Mine output, Cd content[2]		1,098	1,027	814	848 r	671
Metal, refined		1,493	1,706	1,759	1,880 r	1,703
Calcium[e]	kilograms	133,200 [3]	135,000	135,000	135,000	135,000
Cobalt:						
Mine output, Co content[2]		5,326	5,148	4,327	5,060 r	5,533
Metal:						
Shipments[4]		2,112	2,065	1,842	2,085 r	2,105
Refined, including oxide		4,378	4,625	4,233	5,144	5,079
Columbium (niobium) and tantalum:						
Pyrochlore concentrate:						
Gross weight		7,070	7,410	7,270	7,670	7,700
Nb content		3,180	3,333	3,270	3,450	3,500
Tantalite concentrate:						
Gross weight		308	232	220	276	300
Ta content		77	58	55	69	70
Nb content		15	12	11	10	10
Copper:						
Mine output, Cu content[2]		633,531	603,498	557,082	562,795 r	594,812
Metal:						
Smelter:						
Primary, blister		601,359	513,934	430,116	446,209 r	450,000
Secondary and scrap		41,640	24,761	26,789	29,982	30,525
Total		642,999	538,695	456,905	476,191 r	480,525
Refined:						
Primary		524,920 r	469,761 r	428,077 r	495,835 r	484,123
Secondary		42,800	24,761 r	26,789 r	31,100 r	31,100
Total		567,720 r	494,522 r	454,866 r	526,955 r	515,223
Gold:						
Mine shipments, all forms	kilograms	158,875	151,904	140,861	129,478 r	118,528
Mine output, Au content	do.	160,200 r	152,059 r	141,589 r	130,727 r	119,225
Iron and steel:						
Iron ore and concentrate:						
Gross weight	thousand metric tons	27,119	30,902	33,322	28,596 r	28,343
Fe content	do.	17,186	19,684	20,993	17,801	17,900
Metal:						
Pig iron	do.	8,780	8,800	8,800 e	8,800 e	8,800
Direct-reduced iron[e]	do.	920	920	920	920	920
Ferroalloys, electric arc furnace:[e]						
Ferrosilicon	do.	56	56	56	56	56
Silicon metal	do.	30	30	30	30	30
Ferrovanadium	do.	1	1	1	1	1
Total	do.	87	87	87	87	87
Crude steel	do.	16,300	16,300 e	17,000	17,000 e	17,000

See footnotes at end of table.

TABLE 1—Continued
CANADA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2001	2002	2003	2004	2005[p]
METALS—Continued						
Lead:						
Mine output, Pb content		153,932	97,178	81,264	76,730 r	79,252
Metal, refined:						
Primary		127,007	136,896	118,506	131,717 r	109,795
Secondary		103,921	114,664	104,927	109,453 r	119,613
Total		230,928	251,560	223,433	241,170 r	229,408
Lithium, spodumene[e]		22,500	22,500	22,500	22,500	22,500
Magnesium, metal, primary		83,400 r	80,000 r	78,000 r	54,000 r	50,000
Molybdenum, mine out, Mo content		8,233	8,043	9,092	9,519 r	7,910
Nickel:						
Mine output, Ni content[2]		194,058	189,297	163,244	186,694 r	198,369
Refined[5]		140,591	144,476	124,418	151,518	139,683
Platinum-group metals, mine output:						
Palladium	kilograms	8,972 r	12,210 r	12,808 r	12,000 r	13,500
Platinum	do.	7,733 r	9,202 r	6,990 r	7,000 r	9,000
Others (irridium/rhodium/ruthenium)	do.	3,989	2,960	1,730	7,364	5,000
Total	do.	20,694 r	24,372 r	21,528 r	26,364 r	27,500
Selenium, refined[6]	do.	238,000	175,000	253,000	277,000	300,000
Silver:						
Mine output, Ag content	do.	1,320,030	1,407,558	1,310,153	1,337,465 r	1,121,500
Refined	do.	1,623,140	1,855,979	1,558,105	1,837,724	1,547,326
Tellurium, refined[5]	do.	51,000	39,000	40,000	69,000	75,000
Titanium, Sorel slag[7]		1,014,000	890,000 e	873,000	863,000	860,000
Tungsten, mine output, W content		--	2,295	3,636	--	450 p
Zinc:						
Mine output, Zn content		1,064,744	916,220	788,063	791,373 r	666,654
Metal, refined, primary		661,172	793,410	761,199	805,438 r	722,951
INDUSTRIAL MINERALS						
Asbestos		276,790 r	242,241	240,500	200,500 r	243,000
Barite		23,000	17,000	23,000	21,000	21,000
Cement, hydraulic[8]	thousand metric tons	12,793 r	13,079 r	13,425 r	14,017 r	14,267
Clay and clay products[9]	value, thousands	$194,580	$233,244	$234,000	$229,971	$230,000
Diamond	carats	3,716,000	4,936,616	10,755,654	12,618,080	12,299,733
Diatomite[e]		10,000	10,000	10,000	10,000	10,000
Gemstones, amethyst and jade		148	246	114	105	105
Graphite[e]		35,000 [3]	25,000	25,000	28,000	28,000
Gypsum and anhydrite	thousand metric tons	7,821	8,809	8,378	9,339 r	9,400
Lime[8]	do.	2,213	2,248	2,221	2,410	2,410
Magnesite, dolomite, brucite[e]		180,000	180,000	180,000	180,000	180,000
Mica, scrap and flake[e]		17,500	17,500	17,500	17,500	17,500
Nepheline syenite		710,000	717,000	697,000	702,000	702,000
Nitrogen, N content of ammonia		3,438,700	3,699,900 r	3,661,800 r	4,106,600 r	4,100,000
Potash, K_2O equivalent	thousand metric tons	8,181 r	8,515 r	9,104 r	10,100 r	10,596 [3]
Pyrite and pyrrhotite, gross weight[e]		5,000	5,000	5,000	5,000	5,000
Salt	thousand metric tons	13,725	12,736	13,718 r	14,125	14,500
Sand and gravel	do.	236,486	238,120	235,574	248,159	248,159
Silica, quartz[10]	do.	1,613	1,540	1,581	1,690	1,600
Sodium compounds, n.e.s.:[e]						
Sodium carbonate, soda ash	do.	100	--	--	--	--
Sodium sulfate, natural[11]	do.	305	305	305	305	305
Stone[12]	do.	124,758	124,746	119,356	127,559	127,559
Sulfur, byproduct:						
Metallurgy	do.	762	703	614	621	620
Petroleum	do.	8,154	7,671	7,891	8,271	8,300
Total	do.	8,916	8,374	8,505	8,892	8,920
Talc, pyrophyllite, soapstone[e]	thousand metric tons	90	90	90	90	90

See footnotes at end of table.

TABLE 1—Continued
CANADA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2001	2002	2003	2004	2005[p]
MINERAL FUELS AND RELATED MATERIALS						
Carbon black[e]		165,000	165,000	165,000	165,000	165,000
Coal, run-of-mine:						
Bituminous and subbituminous	thousand metric tons	59,042	55,408	50,929	55,393	56,141
Lignite	do.	11,319	11,200	11,200	11,200 [e]	11,200
Total	do.	70,361	66,608	62,129	66,593	67,341
Coke, high-temperature[e]	do.	3,300 [3]	3,300	3,300	3,300	3,300
Natural gas:						
Gross	million cubic meters	200,709	200,890	194,487	195,815	196,000
Marketed	do.	171,388	171,348	166,072	167,360 [r]	170,335
Natural gas liquids:[e]						
Pentanes plus	thousand 42-gallon barrels	66,000 [3]	66,000	66,000	66,000	66,000
Condensate	do.	2,800 [3]	2,800	2,800	2,800	2,800
Total	do.	68,800 [3]	68,800	68,800	68,800	68,800
Peat	thousand metric tons	1,319	1,385	1,341	1,180	1,350
Petroleum:						
Crude[13]	thousand 42-gallon barrels	816,505	861,730	908,213	940,100 [r]	928,500
Refinery products:						
Propane, butane, and naphtha	do.	16,375 [r]	17,231 [r]	16,358 [r]	15,422 [r]	14,954
Gasoline:						
Aviation	do.	766 [r]	774 [r]	722 [r]	663 [r]	672
Motor	do.	284,163 [r]	296,845 [r]	297,704 [r]	290,796 [r]	281,361
Petrochemical feedstocks	do.	30,623 [r]	32,778 [r]	32,079 [r]	36,613 [r]	28,018
Jet fuel	do.	31,781 [r]	29,515 [r]	31,134 [r]	34,496 [r]	31,593
Kerosene	do.	3,655 [r]	2,862 [r]	3,381 [r]	3,324 [r]	3,560
Diesel and light fuel oil	do.	218,445 [r]	218,513 [r]	233,913 [r]	236,530 [r]	236,651
Lubricants including grease	do.	8,204 [r]	8,261 [r]	8,271 [r]	8,885 [r]	8,102
Heavy fuel oil	do.	52,086 [r]	53,223 [r]	56,046 [r]	62,560 [r]	60,934
Asphalt	do.	26,658 [r]	27,600 [r]	26,990 [r]	29,803 [r]	28,021
Petroleum coke	do.	12,042 [r]	10,639 [r]	11,983 [r]	10,206 [r]	10,449
Other petroleum products	do.	15,200 [r]	14,702 [r]	22,183 [r]	25,803 [r]	30,765
Refinery fuel and losses[14]	do.	26,055 [r]	33,690 [r]	35,698 [r]	39,185 [r]	36,117
Total	do.	726,053 [r]	746,633 [r]	776,462 [r]	794,286 [r]	771,197
Uranium oxide, U content		12,487	11,607	10,456	11,548 [r]	12,597

[e]Estimated data are rounded to no more than three significant digits; may not add to totals shown. [p]Preliminary. [r]Revised. -- Zero.

[1]Table includes data available through November 2006.

[2]Metal content of concentrates produced.

[3]Reported figure.

[4]Cobalt content of all products derived from Canadian ores, which include cobalt oxide shipped to the United Kingdom for futher processing and nickel-cobalt matte shipped to Norway for refining.

[5]Nickel contained in products of smelters and refineries in forms that are ready for use by consumers. Natural Resources Canada has revised all refined nickel figures to conform with International Nickel Study Group (INSG) guidelines.

[6]From all sources, which includes imports and secondary sources. Excludes intermediate products exported for refining.

[7]Refined Sorel slag has been upgraded to 95% titanium oxide.

[8]Producers' shipments and quantities used by producers.

[9]Includes bentonite products from common clay, fire clay, stoneware clay, and other clays. Values are in current Canadian dollars.

[10]Producers' shipment of quartz.

[11]Excludes byproduct production from chemical plants.

[12]Crushed, building, ornamental, paving, and similar stone.

[13]Includes synthetic crude, from oil shale and/or tar sands.

[14]Refinery fuel represents total production of still gas, which includes a small amount sold.

TABLE 2
CANADA: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity[2]
Alumina	Alcan Inc.	Refinery in Vaudreuit, Quebec	1,169 (smelter-grade).
Aluminum	Alcan Inc.	Smelter in Laterriere, Quebec	219.
Do.	do.	Smelter in Beauharnois, Quebec	50.
Do.	do.	Smelter in Shawinigan, Quebec	91.
Do.	do.	Smelter in Grande-Baie, Quebec	198.
Do.	do.	Smelter in Arvida, Jonquiere, Quebec	163.
Do.	do.	Smelter in Kitimat, British Columbia	275.
Do.	do.	Smelter in Alma, Quebec	400.
Do.	Aluminiere de Bécancour Inc. (Alcoa Inc., 75%, and Alcan Inc., 25%)	Smelter in Beacancour, Quebec	403.
Do.	Canadian Reynolds Metals Co. Ltd. (Alcoa, 100%)	Smelter in Baie-Comeau, Quebec	438.
Do.	Aluminerie Alouette Inc. (Alcan, 40%; Aluminium Austria Metall Québec, 20%; Hydro Aluminum, 20%; Société Générale de Financement du Québec, 13.33%; Marubeni Québec Inc., 6.67%)	Smelter in Sept-Iles, Quebec	244.
Do.	Aluminerie Lauralco Inc. (Alcoa, 100%)	Deschambault, Quebec	249.
Asbestos	LAB Chrysotile, Inc. (private, 100%)	Lac d' Amiante du Quebec, Ltee, Quebec	160 (fiber).
Do.	do.	Bell Mine, near Thetford Mines, Quebec	70 (fiber).
Do.	Jeffrey Mine Inc.	Jeffrey Mines at Asbestos, Quebec	250 (fiber).
Cement	Lafarge Canada Inc.	Bath, Ontario	1,176 (dry-process).
Do.	do.	Woodstock, Ontario	814 (wet-process).
Do.	do.	Exshaw, Alberta	1,422 (dry-process).
Do.	do.	Kamloops, British Columbia	324 (dry-process).
Do.	do.	Richmond, British Columbia	1,319 (wet-process).
Do.	do.	St. Constant, Quebec	1,157 (dry-process).
Do.	do.	Brookfield, Nova Scotia	621 (dry-process).
Do.	St. Lawrence Cement Inc. (Holcim AG of Swiss)	Joliette, Quebec	1,475 (dry-process).
Do.	do.	Mississauga, Ontario	2,000 (wet and dry).
Do.	Ciment Québec Inc. (Esssroc Group, 50%, and private, 50%)	Saint-Basile, Quebec	1,571 (dry-process).
Do.	ESSROC Canada Inc. (Italcementi Group)	Picton, Ontario	792 (wet and dry).
Do.	Federal White Cement Ltd.	Woodstock, Ontario	544 (dry-process).
Do.	St. Marys Cement (Canada) Inc. (Votarantim Ciment)	Bowmanville, Ontario	1,377 (dry-process).
Do.	do.	St. Marys, Ontario	645 (dry-process).
Do.	Lehigh Inland Cement Ltd. (Heidelberg Cement Group)	Edmonton, Alberta	1,380 (dry-process).
Do.	do.	Delta, British Columbia	1,356 (dry-process).
Coal	Elk Valley Coal Partnership (Consol Energy Inc., Fording Inc., and Luscar Energy Partnership, 59%, and Teck Cominco Limited, 41%)	Coal Mountain Mine at Sparwood, British Columbia	2,500 (open pit), 3,200 (plant).
Do.	do.	Elkview Mine near Sparwood, British Columbia	6,000 (open pit).
Do.	do.	Fording River Mine near Elkford, British Columbia	10,000 (open pit), 9,500 (plant).
Do.	do.	Greenhills Mine near Elkford, British Columbia	4,500 (open pit), 5,000 (plant).
Do.	do.	Line Creek Mine near Sparwood, British Columbia	9,000 (open pit).
Do.	do.	Cardinal River Mine near Hinton, Alberta	8,000 (open pit).
Do.	Western Canadian Coal Corp.	Wolverine Creek Mine, British Columbia	3,000 (open pit).
Do.	Northern Energy and Mining Inc.	Trend Small Mine, British Columbia	1,000 (open pit).
Columbium (niobium) metric tons	Cambior Inc.	Niobec Mine, Chicoutimi, Quebec	3,450 Nb content.

See footnotes at end of the table.

TABLE 2--Continued
CANADA: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity[2]
Copper		Boliden Westmin (Canada) Limited	Myra Falls Mine, British Columbia	9,000.
Do.		Falconbridge Limited (Noranda Inc., 58.9%, and Falconbridge Limited, 41.1%)	Sudbury Division, Sudbury, Ontario	4,250.
Do.		do.	Strathcona and Timmins operations in Timmins, Ontario	4,860.
Do.		do.	Smelter in Timmins, Ontario	440.
Do.		do.	Kidd Creek Mine, Timmins, Ontario	4,000 (ore).
Do.		do.	Montcalm Mine in Timmins, Ontario	2,000 (ore).
Do.		do.	Raglan Mine, Quebec	2,000 (ore).
Do.		do.	Louvicourt Mine, Quebec	2,000 (ore).
Do.		do.	Smelter in Thompson, Manitoba	686 (projected).
Do.		do.	Bell Allard Mine, Murdochville, Quebec	4,000 (ore).
Do.		do.	Horne Smelter in Noranda, Quebec	770.
Do.		Highland Valley Copper (Teck Cominco Limited, 63.9%; BHP Billiton Ltd., 33.6%; others, 2.5%)	Kamloops, British Columbia	4,500.
Do.		Inco Limited	Thompson district, Manitoba	Variable (polymetallic).
Do.		do.	Smelter in Sudbury, Ontario	500.
Do.		do.	Refinery in Sudbury, Ontario	170.
Do.		Huckleberry Mines Ltd. (Imperial Metals Corp., 50%, and Japanese consortium, 50%)	Huckleberry Mine in Omineca, southeast of Houston, British Columbia	37 (Cu contained).
Do.		Imperial Metals Corporation	Mount Polley Mine at Williams Lake, British Columbia	17 (Cu contained).
Do.		Northgate Exploration Limited	Kermss Mine, British Columbia	28 (Cu contained).
Diamond	carats	BHP Billiton Diamonds Inc.(BHP Billiton Group), 80%; Charles Fipke, 10%; Stewart Blussom, 10%	Ekati Mine in Lac de Gras region, Northwest Territories	5,350,000.
Do.	do.	Diavik Diamond Mines Inc., 60% (Rio Tinto plc); Aber Diamond Mines Ltd., 40% (Aber Diamond Corporation)	Diavik Mine in Yellowknife region, Northwest Territories	6,000,000.
Gold		Barrick Gold Corp.	Holt-McDermott Mine at Harker Township, Ontario	405 (ore).
Do.		do.	Bosquet Mines 1 and 2, northwestern Quebec	954 (ore).
Do.		Kirkland Lake Gold Inc.	Macassa Mine at Teck Township, northern Ontario	473 (ore).
Do.	kilograms	Princeton Mining Corp.	Similco Mine in Princeton, British Columbia (suspended)	450 (metal).
Do.		Kinross Gold Corporation	Lupin Mine in Contwoyo Lake, Northwest Territories (suspended)	612 (ore).
Do.		Miramar Mining Corporation	Giant Mine in Yellowknife, Northwest Territories	407 (ore).
Do.		do.	Giant mill-tailings in Yellowknife, Northwest Territories	3,265 (ore).
Do.		Newmont Canada Limited	Golden Giant Mine in Hemlo, Ontario	1,080 (ore).
Do.		Placer Dome Inc.	Campbell Mine in Red Lake, Ontario	584 (ore).
Do.		do.	Detour Lake Mine in Northeast Ontario	1,278 (ore)
Do.	metric tons	do.	Dome Mine in South Porcupine, Ontario	9.8 (metal).
Do.		do.	Sigma and Kiena Mines in Val d'Or, Quebec	730 (ore).
Do.		Teck-Corona Corp. (Teck Corp., 100%)	David Bell Mine in Hemlo, Ontario	456 (ore).
Do.	kilograms	Huckleberry Mines Ltd. (Imperial Metals Corp., 50%, and Japanese consortium, 50%)	Huckleberry Mine in Omineca, southeast of Houston, British Columbia	250 (metal).
Do.	do.	Imperial Metals Corp.	Mount Polley Mine in Williams Lake, British Columbia	3,100 (metal).
Do.	do.	Northgate Exploration Ltd.	Toodogone River, British Columbia	8,700 (metal).
Graphite		Strategic Exploration Inc.	Kearney Lake, Ontario	W.

See footnotes at end of the table.

TABLE 2--Continued
CANADA: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity[2]
Gypsum	Atlantic Gypsum Resources Inc.	Fischell Brook at St. George's, Newfoundland	1,300.
Do.	Georgia-Pacific Corp.	River Denys, Sugar Camp, Nova Scotia	1,460.
Do.	Little Narrows Gypsum Co. Ltd. (USG Corp., 100%)	Little Narrows, Nova Scotia	1,640.
Do.	National Gypsum (Canada) Ltd. (Aancor Holdings Corp., 100%)	Milford, Nova Scotia	3,300.
Do.	Westroc Industries Ltd.	Windermere, British Columbia	1,170.
Iron and steel	Iron Ore Company of Canada (Rio Tinto Ltd., 58.72%; Mitsubishi Corporation, 26.18%; Labrador Iron Ore Royalty Income Fund, 15.1%)	Carol Lake, Labrador	16,000 (concentrate), 12,000 (pellets).
Do.	Québec Cartier Mining Co. (Dofasco Inc., 50%)	Mount Wright, Quebec	16,950 (concentrate), 7,500 (acid pellets), 657 (sinter).
Do.	Wabush Mines Ltd. (Stelco Inc., 37.9%; Dofasco Inc., 24.2%; Cliffs Mining Co., 22.8%; Acme Steel Co., 15.1%)	Wabush, Labrador, and Pointe Noire, Quebec	6,200 (concentrate).
Do.	Dofasco Inc.	Hamilton, Ontario	3,642 (pig iron), 4,500 (crude steel).
Lead	Brunswick Mining and Smelting Corp. Ltd. (Noranda Inc., 100%)	No. 12 Mine in Bathurst and smelter in Belledune, New Brunswick	74 (Pb contained).
Do.	Hudson Bay Mining and Smelting Co., Limited (HudBay Minerals Inc., 100%)	Flin Flon and Snow Lake, Manitoba	60 (Pb-Zn contained).
Do.	Teck Cominco Limited	Trail, British Columbia	120 (refined lead).
Do.	Breakwater Resources Ltd.	Nanisivik Mine on Baffin Island, Northwest Territories	785 (ore).
Do.	Boliden Limited	Myra Falls, British Columbia	800 (ore).
Limestone	Lafarge Canada Inc.	Steep Rock, Manitoba	906 (quarry).
Do.	Atlantic Industrial Minerals Inc.	Iris Cove, Sydney, Nova Scotia	720.
Do.	Inland Cement Ltd. (CBR Materials Corp.)	Cadomin, Alberta	2,160.
Do.	do.	do.	2,160 (quarry).
Do.	Havelock Co. (Kickenson Mines Co., 100%)	Havelock, New Brunswick	864 (limestone).
Do.	Continental Lime Ltd.	Faulkner, Manitoba	1,440 (crushed stone).
Magnesium	Timminco Limited	Haley Station, Ottawa, Ontario	6 (smelter).
Do.	Norsk Hydro Canada Inc.	Becancour, Quebec	48 (smelter).
Molybdenum	Huckleberry Mines Ltd. (Princeton Mines Corp., 60%, and Japanese consortium, 40%)	Southeast of Houston, British Columbia	635 (Mo contained).
Nickel	Falconbridge Limited (Noranda Inc., 58.9%, and Falconbridge Limited, 41.1%)	Craig, Fraser, Lindsley, and Lockerby in Sudbury district, Ontario	54 (metal contained).
Do.	do.	Raglan Mine in Ungave, Quebec	23 (metal contained).
Do.	do.	Smelter in Falconbridge, Ontario	45 (rated capacity).
Do.	do.	Montcalm Mine in Timmins, Ontario	2,000 (ore).
Do.	Inco Limited	Gertrude, Stobie, Creighton, Copper Cliff North and South, Garson-Offsets, McCreedy East and West, Coleman, Crean Hill, and Totten in Sudbury district, Ontario	106 (metal contained).
Do.	do.	Smelter in Sudbury, Ontario	110 (metal contained).
Do.	do.	Refinery in Sudbury, Ontario	57 (metal contained).
Do.	do.	Refinery in Port Colborne, Ontario	30 (metal contained).
Do.	do.	Thompson, Birchtree Mines in Manitoba	62 (metal contained).
Do.	do.	Smelter in Thompson, Manitoba	82 (metal contained).
Do.	Sherritt International Corp.	Refinery in Fort Saskachewan, Alberta	24 (metal contained).

See footnotes at end of the table.

TABLE 2--Continued
CANADA: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity[2]
Petroleum:[1]				
Gas	million cubic meters	BP Canada Inc. (The British Petroleum Co. plc, London, 100%)	Noel Area, northern Alberta; Chauvin, Sibbald, North Pembina, Alberta	47.
Crude	million 42-gallon barrels	do.	do.	12.
Gas	billion cubic meters	do.	do.	1.8.
Crude	thousand 42-gallon barrels	Imperial Oil Ltd. (Exxon Mobil Corp., 70%, and others, 30%)	Judy Creek, Cold Lake, Alberta; Mackenzie Delta, Beaufort Sea, Yukon and Northwest Territories	670.
Gas	million cubic meters	do.	do.	36.4.
Crude	million 42-gallon barrels	Mobil Oil Canada Ltd. (Exxon Mobil Corp., 100%)	Hibernia, Grand Banks, southeast of Newfoundland and Sable Island, Nova Scotia, and others in Alberta	26.1.
Gas	billion cubic meters	do.	do.	3.0.
Crude	million 42-gallon barrels	do.	Terra Nova, near to Hibernia, Jeanne d'Arc Basin, Newfoundland	25.0.
Gas	billion cubic meters	do.	do.	2.0.
Crude	million 42-gallon barrels	Norcen Energy Resources Ltd. (Hollinger Inc., 59%, and Hees International, 41%)	Pembina, Bodo, Majorville, Alberta	12.1.
Do.	do.	Oakwood Petroleums Ltd. (Sceptre Resources Ltd., 100%)	Grantham, Hays Ronalane, Peace River, Normandville, Randell, Alberta; and Grizzly Valley, British Columbia	24.6.
Do.	do.	PanCanadian Petroleum Ltd. (Canadian Pacific Enterprises, 87%, and others, 13%)	Rycroft, Wembley, Elk Point, Rio Bravo, Alberta	19.7.
Gas	billion cubic meters	do.	do.	3.53.
Crude	million 42-gallon barrels	Shell Canada Ltd. (Shell Investments, 79%, and others, 21%)	Dimsdale, Little Smoky Lake, Sousa, Alberta; Midale, Benson, Saskatchewan	22.2.
Gas	billion cubic meters	do.	do.	6.53.
Crude	million 42-gallon barrels	Suncor Inc. (Sun Co. Inc., United States, 75%, and Ontario Energy Resources, 25%)	Kidney, Zama Lake, Cosway, Albersun Prevo, and Medicine River, Alberta; and Leitchville, Unwin, Saskatchewan	4.1.
Crude	thousand 42-gallon barrels	Texaco Canada Petroleum Inc. (Texaco Inc., United States, 78%, and others, 22%)	Eaglesham, Virgo, Alberta; and Desan, British Columbia	158.
Gas	million cubic meters	do.	do.	67.3.
Crude	million 42-gallon barrels	UNOCAL Canada Ltd. (UNOCAL Corp., United States, 100%)	Calgary, Alberta	14.7.
Potash (K_2O equivalent):		Potash Corp. of Saskatchewan Inc. (PotashCorp) (private, 100%)	Lanigan, near Lanigan, Saskatchewan	3,828 (KCl).
Do.		do.	Rocanville, southeast Saskatchewan	2,295 (KCl).
Do.		do.	Allan Division, Allan, Saskatchewan	1.885 (KCl).
Do.		do.	Cory, near Saskatoon, Saskatchewan	1,361 (KCl).
Do.		do.	Patience, near Saskatoon, Saskatchewan	1.033 (KCl).
Do.		do.	Sussex, New Brunswick	1,068 (KCl).
Do.		International Minerals & Chemical Corp. (Canada) Ltd. [IMC Fertilizer Corp., 75%, and Potash Corp. of Saskatchewan Inc. (PotashCorp.), 25%]	Esterhazy, southeast Saskatchewan	953 (KCl).
Do.		Agrium Products Inc.	Vanscoy, Saskatchewan	1,750 (KCl).
Salt and brine operations		The Canadian Salt Co.	Pugwash, Nova Scotia	1,400 (rock salt and brine salt).
Do.		do.	Iles-de-la-Madeleine, Quebec	1,625 (rock salt).
Do.		do.	Ojibway, Ontario	2,600 (rock salt).
Silver		Prime Resources Group Inc.	Eskay Creek Mine in British Columbia	340.
Do.	metric tons	Breakwater Resources Ltd.	Caribou Mine in Bathurst, New Brunswick	7.5 (mill feed).
Do.		Kirkland Lake Gold Inc.	Macassa Mine in Ontario	438 (mill feed).
Do.		Barrick Gold Inc.	Holt-McDermott Mine in Ontario	876 (mill feed).

See footnotes at end of the table.

TABLE 2--Continued
CANADA: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity[2]
Sodium chlorate production using salt		Dow Chemical Canada Inc. (Dow Chemical Co., 100%)	Fort Saskatchewan, Alberta	524 (caustic soda).
Do.		do.	Sarnia, Ontario	350 (caustic soda).
Do.		General Chemical Canada Ltd.	Amherstburg, Ontario	363 (sodium carbonate).
Sulfur:				
Petroleum refinery capacities		Consumer's Cooperative Refineries Ltd. (Federated Cooperatives Ltd., 100%)	Regina, Saskatchewan	54.
Do.		Esso Petroleum Canada (Exxon Mobil Corp., 100%)	Sarnia, Ontario	50.
Do.		Sulconam Inc. (Petro Canada, 7.6%)	Montreal, Quebec	108.
Main sulfur extraction plants (sour gas and oil sands)		Amoco Canada Petroleum Co., Ltd. (Amoco Corp., 100%)	East Crossfield-Elkton, Alberta	650.
Do.		Canadian Occidental Petroleum, Ltd.	East Calgary-Crossfield, Alberta	610.
Do.		Chevron Canada Resources Inc. (ChevronTexaco Corp., 100%)	Kaybob South III, Alberta	1,281.
Do.		Husky Oil Ltd.	Ram River, Ricinus, Alberta	1,646.
Do.		Shell Canada Ltd.	Waterton, Alberta	1,120.
Principal SO_2 and H_2SO_4 production capacities		Canadian Electro Zinc Ltd. (CEZ) (Noranda Inc., 90.17%)	Valleyfield, Quebec	430 (H_2SO_4).
Do.		Inco Limited	Copper Cliff, Ontario	950 (H_2SO_4).
Do.		Falconbridge Limited (Noranda Inc., 50%, and Trelleborg AB, 50%)	Kidd Creek, Ontario	690 (H_2SO_4).
Do.		ESSO Chemical Canada (Exxon Mobil Corp., 100%)	Redwater, Alberta	910 (H_2SO_4).
Titanium slag		QIT-Fer et Titane, Inc. (Rio Tinto Group, 100%).	Sorel-Tracy, Quebec	1,100 (Sorelslag). 250 (UGS slag).
Uranium	metric tons	Cameco Corp. (Cameco Corp., 50.025%; COGEMA Resources Inc., 37.1%; Idemitsu Inc., 7.875%; TEPCO Inc., 5.0%).	Cigar Lake, Saskatchewan	6,500 (oxide).
Do.	do.	do.	Key Lake, Saskatchewan	6,395 (oxide).
Do.	do.	do.	McArthur River Mine, Saskatchewan	5,751 (oxide).
Do.	do.	do.	Rabbit Lake, Saskachewan	5,445 (oxide).
Zinc		Breakwater Resources Ltd.	Nanisivik Mine on Baffin Island, Northwest Territories	60 (Zn contained).
Do.		do.	Bathurst, New Brunswick	1,100 (Zn in concentrate).
Do.		Brunswick Mining and Smelting Corp. Ltd. (Noranda Inc., 100%)	Bathurst, New Brunswick	232 (Zn in concentrate).
Do.		Falconbridge Limited. (Noranda Inc., 49.9%)	Timmins operations and smelter in Timmins, Ontario	212 (Pb-Zn contained), 133 (slab zinc).
Do.		do.	Kidd Creek complex, Ontario	145 (Zn in concentrate).
Do.		Hudson Bay Mining and Smelting Co., Limited (HudBay Minerals Inc., 100%)	Snow Lake concentrator, Manitoba	1,125 (Pb-Zn ore).
Do.		do.	Flin Flon Mine and Smelter in Manitoba	115 (slab zinc).
Do.		Teck Cominco Limited	Smelter in Trail, British Columbia	290 (slab zinc).
Do.		Boliden Limited	Myra Falls Mine in Strathcona Provincial Park, British Columbia	110 (Zn ore).
Do.		Noranda Inc.	Bell Allard Mine in Matagami, Quebec	85 (Pb-Zn ore).
Do.		do.	Valleyfield in Montreal, Quebec	260 (Zn in concentrate).

W Withheld to avoid disclosing company proprietary data.
[1]Projections of annual capacity involve matching decline curves against later discoveries and are generalized extrapolations only based on data presented in the Canadian Oil and Gas Handbook, 2001 and subsequent years. Ownership of various companies and proportionate participation in various leaseblocks and/or joint ventures changes continually. The ownership proportions shown here must be considered to be illustrative only.
[2]Abbreviations used for commodities in this table include the following: Cu--copper; H_2SO_4--sulfuric acid; KCl--potassium chloride; Mo--molybdenum; Nb--niobium; Pb--lead; and Zn--zinc.

TABLE 3
CANADA: RESERVES OF MAJOR MINERALS IN 2005

(Thousand metric tons unless otherwise specified)[1]

Commodity		Reserves
Asbestos, fiber		35,700 [e]
Coal (anthacite, bituminous, and lignite)		6,578,000 [2]
Copper		10,000
Gold	metric tons	1,500 [3]
Gypsum		450,000 [e]
Iron ore		1,700,000 [e]
Lead		1,600
Molybdenum		450
Natural gas	billion cubic meters	1,600 [2]
Nickel		6,600
Petroleum crude	million barrels	16,500 [2]
Potash, K_2O equivalent	million metric tons	4,400 [e]
Salt	thousand short tons	264,000 [e]
Silver	metric tons	47,000
Sodium sulfate	thousand short tons	84,000 [e]
Sulfur		160,000 [e]
Uranium		420 [4]
Zinc		11,000

[e]Estimated; estimated data are rounded to three significant digits; may not add to totals shown.

[1]2004 and 2005 Canadian Minerals Yearbook, Natural Resources Canada, except for natural gas and petroleum crude; U.S. Geological Survey Mineral Commodity Summaries 2006.

[2]BP Statistical Review of World Energy June 2006.

[3]Excludes metal in placer deposits.

[4]Recoverable at prices of $100 or less per kilogram of uranium.

The Mineral Industries of Central America

Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama

By Steven T. Anderson

Central America's identified metallic mineralization occurs as follows: the northwestern part of the region contains deposits that are richer in lead and associated more with silver and zinc; the southern and eastern parts of the region contain relatively less lead but more copper and some associated gold and silver. In 2005, investment in the region's metals mining sector was mainly focused on discovering and developing gold deposits that lie mostly along the Central American Gold Belt (CAGB). The CAGB extends southeastward from at least western Guatemala (the Marlin deposit) across Guatemala (the Cerro Blanco deposit) and continues through central El Salvador and southern Honduras and Nicaragua and extends into western Costa Rica (the Crucitas deposit). Central America had limited resources of mineral fuels and required imports of petroleum (some at preferential prices from Mexico and Venezuela) to supply about 75% of apparent energy consumption in the region (Mining Journal, 2005; U.S. Energy Information Administration, 2006; Johansing, undated§[1]).

In 2005, Central America's mineral industries produced a variety of metals, industrial minerals, and mineral fuels. In the metals mining sector, antimony, gold, iron ore, lead, silver, and zinc were produced. Production of nonprecious refined metals consisted almost exclusively of steel production in electric arc furnaces from imported material. Industrial minerals production included cement, clays, gypsum, limestone, marble, pozzolan, pumice, salt, and common sand and gravel. Primary production of mineral fuels consisted only of petroleum production in Guatemala and some petroleum produced during well-testing operations in Belize. Costa Rica, El Salvador, and Nicaragua produced petroleum refinery products from imported oil.[2] All the countries of Central America that are described in this chapter were part of the San José Pact, which enabled them to receive crude petroleum under preferential terms and pricing from Mexico and Venezuela; the actual distribution of shipments of subsidized oil among the countries during the year, however, was unclear. Venezuela also provided additional shipments of crude petroleum to some countries in the region according to the terms of the Caracas Energy Accord, and to Belize according to the terms of the PetroCaribe initiative (table 1; U.S. Energy Information Administration, 2006).

Although the economies of the region were expected to become more open to foreign direct investment (FDI) by companies based in the United States during the process of approval of the United States–Central America–Dominican Republic Free Trade Agreement (CAFTA-DR), FDI flows into the mineral industries of the Central American countries in 2005 remained slower than expected owing to uncertainties concerning country-specific mining and hydrocarbons laws, a lack of sufficient infrastructure in the most promising mineral resource areas, and public protests against nascent mineral development projects. CAFTA-DR was not expected to be ratified by the Government of Costa Rica until after elections at the end of 2006. The agreement was expected to come into effect in El Salvador, Guatemala, Honduras and Nicaragua sometime earlier in 2006, however (Kose and others, 2005, p. 17; U.S. Energy Information Administration, 2006; DesLauriers, 2005§).

During 2005, foreign company expenditures on mineral exploration in the region were concentrated in the countries with more favorable investment climates, such as Belize, El Salvador, Guatemala, Panama, and Nicaragua. The mining investment climate in Honduras appeared to suffer the most from anti-mining demonstrations, but reports of these types of public protests were more common throughout the region in 2005 compared with 2004 (table 3; Mining Journal, 2005; DesLauriers, 2005§).

Nonfuel mineral exploration efforts in the region were performed almost exclusively by junior or mid-tier mining companies, which accorded with a global trend of junior-company exploration budgets accounting for 63% of the overall $1.34 billion increase in exploration allocations by all companies.[3] In 2005, juniors accounted for about 48% of the worldwide exploration budget, and the juniors involved in exploration for nonferrous metals in Central America were almost all based in Canada. Through the beginning of 2006, direct investment in further exploration and development continued to be left to juniors; the major companies that had invested in metals exploration in the region maintained any further investment in the region at a minimal level, if at all (table 3; Metals Economics Group, 2005).

Capacity to produce some crude steel or steel semimanufactures or both in Costa Rica, El Salvador, and Guatemala was established in the 1960s through an import-substitution policy that severely restricted imports of these steel products from outside the Central American Common Market (CACM). In 2005, however, the costs of importing iron ore, crude steel, scrap, and alloying or coating metals remained at near record levels for the region. The region's production was mostly limited to steel semimanufactures (primarily for

[1]References that include a section mark (§) are found in the Internet References Cited sections.

[2]Some production data from individual company sources are provided in the text of this chapter and are more recent than the aggregate data given in table 1. Therefore, summations of production figures published by individual companies operating in a country may differ from the country totals in table 1.

[3]All values in this chapter are given in current (nominal) U.S. dollars unless otherwise noted.

construction) that were sold only within the CACM, where demand for locally produced steel products was decreasing as cheaper imports became more available. The opening of the U.S. market to Central America's exports of steel through CAFTA-DR could expand the export potential and possibly result in fuller utilization of existing production capacity; however, expected ratification of CAFTA-DR will also require the Governments of these producing countries to eliminate existing subsidies to the manufacturing sector, including the steel subsector (Kose and others, 2005, p. 16).

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BELIZE

Compared with 2004, the value of mine and quarry production in Belize increased by about 5.1% to $10.3 million in 2005 but accounted for the same proportion of the gross domestic product (GDP) (0.5%). In real (adjusted for inflation) terms, the value of production by the mining sector increased by 2.5%, and the country's GDP increased by 3.5% during this same timeframe. In 2005, the country's GDP based on purchasing power parity was $2.1 billion. The mineral industry of Belize included the production of industrial minerals, including clays, dolomite, gravel, limestone, marble, marl, and sand for use in construction and for export to nearby markets in the Caribbean region. In 2005, the demand for industrial minerals within the country was mostly accounted for by major infrastructure and real estate construction projects, including the Chalillo hydroelectric dam and a new road to the Spanish Lookout area as part of increased exploration and development of a crude petroleum reservoir there. All but the last of these projects were funded mostly by tax revenue from tourism, which was the leading sector of the Belizean economy. The agricultural sector also provided some domestic demand for dolomite and such other industrial minerals as fertilizers. Despite production of some of these minerals domestically, the country had to import approximately 100% of its apparent consumption of construction materials and petroleum refinery products, including significant imports of cement and iron and steel semimanufactures from Mexico (table 1; Central Bank of Belize, 2006, p. 15, 19-20, 38, 48, 66-67, 71; International Monetary Fund, 2006§).

In June 2005, Belize Natural Energy Limited (BNE) (together with exploration investment partners Aspect Energy LLC and CHx LLC of Denver, Colorado) discovered a deposit of crude petroleum, the development of which could provide a significant contribution to the country's economy. This site is located in the Spanish Lookout area, Cayo District, and was tested for flow and evaluated for financial viability throughout the year. At the end of the year, BNE estimated the proven reserves of the deposit to be about 6 million barrels (Mbbl). On December 5, 2005, BNE and its investment partners made a down payment toward the taxes and royalties on expected commercial production from this reservoir, with some actual production expected to begin in 2006. Such a downpayment of royalties during the testing phase was considered unusual, and was mostly symbolic of the company's commitment to its production-sharing agreement with the Government. The country's Geology and Petroleum Department (GPD) of the Ministry of Natural Resources, Local Government and the Environment stated that the expected increase in revenues from this agreement, however, would enable the Government to increase monitoring of all activities in the mineral industry of Belize (Ministry of Natural Resources, Local Government and the Environment, Belize, 2005; 2007, p. 4-6; Central Bank of Belize, 2006, p. 24, 53; Ysaguirre, 2005§).

In 2005, the head of the GPD functioned as the Inspector of Petroleum and the Inspector of Mines. In these roles, the GPD head administered the Petroleum Act and the Mines and Minerals Act, which were last revised in 2000 and are codified in chapters 225 and 226, respectively, of the Substantive Laws of Belize. The GPD has responsibility for all Government policy matters related to the development of petroleum and mineral resources in Belize (Geology and Petroleum Department, Belize, undated§).

In 2005, Erin Ventures Inc. produced an undisclosed amount of alluvial gold during bulk sampling operations in the Ceibo Chico Creek area of the Cayo District and reportedly sold the insignificant amount of gold produced on the domestic market. Quarries controlled by Belize Minerals Ltd. around Punta Gorda in the Toledo District accounted for almost all the dolomite produced in the country. This dolomite was used primarily as a fertilizer in agriculture and as a buffer in shrimp farms within Belize and was exported to other countries in the Caribbean for similar uses. Caribbean Investors Limited was a private investment company that controlled quarries around Georgeville in the Cayo District and produced almost all the limestone in the country. This limestone was reported to be of marble grade and was exported mostly as dimension stone (in tiles) rather than for use in cement production. The other principal domestic producers of industrial minerals used in construction, including aggregates, clays, and sand and gravel, were Belize Aggregates Ltd. and Maheias United Concrete & Supplies Ltd. (both private companies based in Belize City) and the National Sand and Gravel Company (a state-owned company located in Belmopan). These companies mined offshore gravel and sand; beach sand; and clays, gravel, and sand in the interior of the country (Belize

Minerals Ltd., 2005§; Erin Ventures Inc., 2005§; Geology and Petroleum Department, Belize, undated§).

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Major Source of Information

Geology and Petroleum Department
Ministry of Natural Resources, Local Government and the Environment
84-36 Unity Blvd.
Belmopan, Belize

COSTA RICA

In December 2005, Glencairn Gold Corporation of Toronto, Ontario, Canada, began commercial production of gold at its Bellavista Mine. Otherwise, the mineral industry of Costa Rica consisted of mine production of some industrial minerals (mostly aggregates for construction and limestone for cement manufacture) and some production of iron and steel semimanufactures for construction projects. The country was a major cement producer in the region and exported cement to, in decreasing order of total annual export value, Nicaragua, Guatemala, El Salvador, and Panama. Other than mineral raw materials for cement production, salt, and some other industrial minerals used in agriculture (diatomite) and other sectors of the economy (clay for the ceramics industry, for example), Costa Rica imported almost all its apparent mineral consumption. In 2005, the value of mine production in Costa Rica (about $30 million[4]) increased by 27% compared with that of 2004, and this sector of the mineral industry contributed 0.15% of the GDP compared with 0.14% in 2004. The real value of mine production increased by 7% and helped contribute to a real growth rate of 5.9% in the GDP. In 2005, the GDP of Costa Rica based on purchasing power parity was about $45 billion (table 1; World Cement, 2004, p. 38, 47; Glencairn Gold Corporation, 2006, p. 3; International Monetary Fund, 2006§; Banco Central de Costa Rica, undated a§, b§).

In 2005, the Government of Costa Rica maintained a moratorium on new oil exploration activities, the opening of any new open pit mines, and any commercial-scale cyanide processing. This policy was approved in May 2002 and continued to deter investment in the mineral industry through 2005. Two notable gold projects, Bellavista and the Cerro Crucitas gold project owned by Vannessa Ventures Ltd. of Calgary, Alberta, Canada, were environmentally approved or in the process of approval before the moratorium was enacted in 2002. Although Bellavista was allowed to proceed to development, Vannessa was required to resubmit the environmental impact study (EIS) for Cerro Crucitas. Near the end of 2005, the Secretaría Técnica Nacional Ambiental approved the EIS for Cerro Crucitas, and Vannessa planned to proceed with developing the project (Seaward and Coates, 2006; 2006§; Vannessa Ventures Ltd., 2006).

In the mid-1980s, a mineral resource assessment for the Republic of Costa Rica was performed by the U.S. Geological Survey (USGS), Costa Rica's Dirección General de Geología, Minas e Hidrocarburos, and the Universidad de Costa Rica. Through 2005, almost none of the areas for further exploration that were identified during the 1980s had been fully explored or developed, and most of Costa Rica's mineral industry development potential has remained unchanged since that time. Gold and silver have been consistently mined since colonial times in Costa Rica, and gold occurs in both underground veins and placer (including alluvial) deposits. The mid-1980s assessment also reported metallic occurrences of aluminum, chromium, copper, iron-titanium bearing sands, lead, manganese, and zinc. Since the time of the assessment, at least three porphyry copper deposits with an average grade of between 0.15% and 2% copper content have been discovered (not by the USGS) along with three larger copper sulfide deposits with some associated zinc content. Occurrences of copper and lead-zinc skarns were also mentioned in the USGS assessment, as were many chromite deposits that had already been discovered but were estimated to be too small for economic mining development on an individual basis. Additionally, more than 90 very small deposits of manganese were reported as having been discovered, and more concealed deposits were estimated to exist. Multiple bauxite (aluminum mineral), placer iron (magnetite), polymetallic (three or more metals), and hot-spring sulfur deposits are also mentioned in the assessment (U.S. Geological Survey and others, 1987, p. 1).

In 2005, Glencairn produced 307 kilograms (kg) of gold from preproduction operations during the first 11 months of the year and an additional 117 kg in December at the Bellavista Mine (although this data was not available in time for inclusion in table 1). Glencairn expected Bellavista to produce about 1,870 kilograms per year (kg/yr) of gold starting in 2006 and continuing through about 2012. During 2005, a Costa Rican investment group indicated that sporadic mining and processing

[4]Where necessary, values have been converted from Costa Rican colones (C) to U.S. dollars (US$) at an annual average exchange rate of C478.644=US$1.00.

of gold had taken place from two veins in the Las Juntas mining district, which had been purchased from Inversiones Valle Columbia S.A. in 2004, but no production details were reported. Inversiones Valle Columbia still owned the rights to the suspended Chassoul Mine and did not report any changes during the year. Because almost all the country's silver production came from this mine in recent years and because no silver production was reported from the new Bellavista Mine, it was not clear if there was actually any silver production in the country in 2005. According to the International Iron and Steel Institute (IISI), production of steel semimanufactures from imports of raw materials in Costa Rica decreased by about 28% in 2005 compared with that of 2004 (Glencairn Gold Corporation, 2006, p. 3; International Iron and Steel Institute, 2006, p. 21, 47; Seaward and Coates, 2006§).

The expansion of Holcim Costa Rica S.A.'s plant to be able to produce 1.5 million metric tons per year (Mt/yr) of cement was completed in 2005; the expansion included installation of greater proportional capacities to include ferruginous sand from domestic deposits and a wider variety of fuels in the production process. Costa Rica's large-scale production of clays included some kaolin, but the proportion of kaolin in the total production of clays (common) was not reported. Some small clay deposits were mined by individuals to produce an unreported amount of clay that was used in the domestic ceramics industry. Diatomite was also mined from many small deposits and some of it was used domestically in agricultural production. Salt was produced by evaporation from the Gulf of Nicoya primarily for domestic consumption (table 1; Whitaker, 1983, p. 160; World Cement, 2004, p. 35, 38, 42, 47; Holcim Costa Rica S.A., 2005§).

In 2005, Refinadora Costarricense de Petróleo S.A. (RECOPE) had a listed capacity to refine 24,000 barrels per day (bbl/d) of petroleum in the city of Limon, but manufacturing petroleum refinery products was similar to the steel semimanufactures sector in that its production was dependent on a secure supply of mineral raw material. Unlike the producers in the country's steel sector, however, RECOPE was able to purchase sufficient imports of mineral raw material (crude petroleum) at discounted prices (in accordance with the San José Pact) to be able to produce close to its listed capacity (U.S. Energy Information Administration, 2006).

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EL SALVADOR

Mining has not played a prominent role in the Salvadoran economy since at least 1987, although the country has been identified as having significant deposits of copper, iron ore, lead, limestone, mercury, silver, sulfur, and zinc during various exploration surveys prior to 2005; of these, only limestone was estimated to have been produced in 2005. Besides cement and limestone, El Salvador was also estimated to have produced aluminum metal, fertilizer materials, gypsum, salt, and steel during the year. El Salvador hosts several major tectonic structures along which gold and silver mines have been developed over the past two centuries. In 2005, El Salvador's GDP based on purchasing power parity was about $31 billion, and the country's real GDP grew by 2.8% compared with that of 2004. Although the real (adjusted for inflation) value of mine production of minerals in the country ($31.4 million) accounted for only about 0.4% of the real GDP, that of the manufacturing sector ($1,942.6 million) accounted for about 23% and included production of aluminum and steel semimanufactures, continuously-cast crude steel, and petroleum refinery products. In 2005, growth in the real value of the combined production of the manufacturing and mining sectors was 1.5% compared with that of 2004, but the growth rate for the mining sector alone was about 4.0% during this same timeframe, which was second only to the real growth rate for the combined agriculture, livestock, and fish production sector (5.8%) in El Salvador (Intrepid Minerals Corporation, 2006, p. 7; Jacobson and Ehrenthal, 1988§; Dirección de Hidrocarburos y Minas, El Salvador, 2005§; International Monetary Fund, 2006§; Banco Central de Reserva de El Salvador, undated b§).

No new changes to the mining law in El Salvador were being officially debated during 2005, and the Government did not make any additional revisions since upgrading the requirements for environmental impact studies (EISs) for mining exploration

projects in 2004. The mining law in El Salvador was thoroughly revised in 2001, and many parts of the law that addressed regulating mineral exploration and exploitation activities and enforcement issues were revised again in 2003. In 2005, this law helped support investment in exploration for coal, copper, gold, gypsum, mineral fertilizers, lime, limestone, pozzolan, new sand and gravel quarries, silver, and deposits of other metals and industrial minerals; the Banco Central de Reserva de El Salvador reported the first noticeable level of FDI in the mining sector of the mineral industry of El Salvador ($1.5 million) and expected this figure to approach $30 million in 2006. El Salvador was regarded as having one of the lowest risk profiles in all Latin America for investment in many sectors of the economy, including the mining sector, because of a stable political-economic climate and the use of the U.S. dollar as the country's standard currency (Curtis, 2005; Intrepid Minerals Corporation, 2006, p. 7; Banco Central de Reserva de El Salvador, undated a§).

According to IISI, production of continuously cast crude steel from imported mineral raw materials in 2005 was estimated to have decreased in El Salvador by 19% compared with that of 2004 (although this estimate was not available in time for inclusion in table 1 and a more conservative decrease of only about 14% was estimated). IISI also estimated that El Salvador's production of steel semimanufactures (that relied primarily on imported iron and steel) was estimated to have increased slightly by about 1% during this same timeframe, although preliminary estimates indicated that it was to have decreased slightly by about 3%. Since Guatemala and Panama closed their crude petroleum refineries in 2002, El Salvador has increased its exports of refinery products, especially to neighboring Guatemala. El Salvador also had already signed a bilateral free trade agreement (FTA) with Mexico by 2005, which helped ensure sufficient flows of crude petroleum into El Salvador for refining, reexporting, and domestic consumption. Very little petroleum was consumed for electricity generation, however, because El Salvador is Central America's leading producer of geothermal energy and about 44% of the country's electricity consumption was provided by domestic geothermal sources. The remainder of El Salvador's electricity demand was met by imports from Guatemala and Honduras (International Iron and Steel Institute, 2006, p. 21, 47; U.S. Energy Information Administration, 2006).

In 2005, the companies that made the largest investments in nonfuel mineral exploration were, in decreasing order of the amount invested during the year, Pacific Rim Mining Corp. of Vancouver, British Columbia, Canada; SilverCrest Mines Inc. of Vancouver, British Columbia, Canada; Intrepid Minerals Corporation of Toronto, Ontario, Canada; and Au Martinique Silver Inc. of Manotick, Ontario, Canada. In 2005, Cargill Incorporated of Minneapolis, Minnesota, began construction of a small ethanol plant at the Port of Acajutla, Sonsonate Department, on the Pacific Coast near the border with Guatemala. The plant was designed to have a production capacity of about 230,000 cubic meters per year and was scheduled to be completed near the end of 2006 (table 3; Curtis, 2005; U.S. Energy Information Administration, 2006).

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Major Source of Information

Dirección de Recursos Minerales
Avenida Norte No. 233
San Salvador, El Salvador

GUATEMALA

The geology of Guatemala is diverse, and many mineral deposits have been discovered, including deposits of antimony, barite, bentonite, cadmium, copper, gold, lead, limestone, marble, nickel, silver, zinc, and sulfur associated with both metal and mineral fuel deposits. In 2005, Guatemala's GDP based on purchasing power parity was about $57 billion, and the annual growth rate of the real GDP was 3.2%. The real (adjusted for inflation) value of mineral industry production (including production of crude petroleum and natural gas) accounted for 0.48% of the real GDP compared with 0.50% in 2004, because the real value of production decreased by about 2.1% during this timeframe. In 2005, the total value of mine production was almost entirely accounted for by mine production of metals, especially gold from the Marlin Mine (which was owned and operated by Glamis Gold Ltd. of Reno, Nevada), but in 2004 it was almost entirely accounted for by mine and quarry production of industrial minerals. In 2005, the nominal value of mine production of metals increased to $11.9 million compared with $42,500 in 2004, and the nominal value of mine production of industrial minerals in the country decreased to $4.3 million compared with $8.4 million in 2004. Production of crude petroleum continued to dominate the mineral industry of Guatemala but accounted for only 84% of the real value of total mineral industry production in 2005 compared with 90%

in 2004. Although prices remained high in 2005, the real value of petroleum production decreased by 8.3% compared with that of 2004 owing to decreasing reserves at the country's existing oilfields in the Peten Department (Harben, 2005; Mining Journal, 2005; Ministerio de Energía y Minas, Guatemala, 2006; U.S. Energy Information Administration, 2006; International Monetary Fund, 2006§; Banco de Guatemala, undated a§, b§).

During the year, anti-mining demonstrations were of concern to investors and potential investors in the mineral industry of Guatemala, but the Government of Guatemala continued to implement its new (2004) mining law, which was designed to encourage investment in the sector. In 2005, the Dirección General de Minería of Guatemala (DIGEMIN) had a long list of metallic and industrial minerals for which deposits had been discovered and further investment in exploration and development was being encouraged. The potential metallic mineral prospects included deposits of the following: antimony, chromium, cobalt, copper, gold, iron ore, lead, manganese, mercury, nickel, silver, titanium, tungsten, uranium, and zinc. The potential industrial minerals included the following: andesite, volcanic ash, barite, basalt, bentonite, coal, common clays, diatomite, dolomite, feldspar, ferruginous clay, fluorite (fluorspar), garnet, graphite, hematite, jade, kaolin, limestone, magnesite, marble, mica, obsidian, opal and jasper, perlite, pumice, quartz, mineral salt, sand and gravel, sandstone, schist, serpentine and gypsum, silica sand, sulfur, and talc (Mining Journal, 2005; Dirección General de Minería, Guatemala, 2005§).

Glamis expected to produce about 7.9 metric tons (t) of gold and about 94 t of silver during the Marlin Mine's first full year of production in 2006. During the mine's expected life of 10 years, Glamis expected to produce about 7.8 metric tons per year (t/yr) of gold and between 93 and 124 t/yr of silver. In 2005, however, production and exploration operations at the Marlin Mine site continued to encounter resistance in the form of public demonstrations and disruptions of mining activities. Nonetheless, Glamis continued to expand its operations in Guatemala and devoted most of its exploration budget in the country to exploration of the Cerro Blanco property in 2005. Exploration activities at Cerro Blanco included beginning a feasibility study that was expected to be completed sometime in 2006. Silver is associated with the gold in the epithermal deposits underlying the Marlin Mine, and the mine's production of silver accounted for all the officially reported production in 2005 in the country. Antimony was the only other metal that was mined during the year in the country, and the country's production ranked second in the Western Hemisphere behind only that of Bolivia (tables 1-3; Glamis Gold Ltd., 2006, p. 6, 9, 23; Carlin, 2007; Harben, 2006§).

According to IISI, production of continuously cast crude steel from imported mineral raw materials in 2005 was estimated to have decreased in Guatemala by 11% compared with that of 2004, although preliminary estimates (which are included in table 1) indicated that the decrease would be closer to about 15%. Also, IISI estimated that production of steel semimanufactures from mostly imported iron and steel increased slightly by 4% during this same timeframe, although earlier estimates indicated a very slight decrease of less than 1% (International Iron and Steel Institute, 2006, p. 21, 47).

Jaguar Nickel Inc. of Toronto, Ontario, Canada, focused the company's exploration efforts on two nickel-cobalt laterite properties, Marichaj and Sechol, on the Buena Vista concession in eastern Guatemala, and continued to expand its licensed holdings in the area. At the end of 2005, however, BHP Billiton Limited purchased all Jaguar's nickel properties in Guatemala, and no further exploration or development efforts at Buena Vista were reported through 2006. The Buena Vista concession bordered on the property of the former Exploraciones y Explotaciones Mineras Izabal S.A. (Exmibal) nickel mine and smelter. In 2004, Skye Resources Inc. of Vancouver, British Columbia, Canada, acquired Inco Limited (of Toronto, Ontario, Canada)'s 70% share of Exmibal and renamed the property the Fenix nickel project. In 2005, Skye increased its share in Compañía Guatemalteca de Níquel S.A. (formerly Exmibal) to 90.9%. During 2005, Skye began a feasibility study for the Fenix project to produce ferronickel or an intermediate nickel-cobalt product for sale or export without further processing. Ferronickel production at this site would require reactivation of Exmibal's powerplant and nickel processing plant, which had been closed for 21 years. Skye estimated that it could potentially produce between 13,500 and 24,500 t/yr of nickel content after updating and expanding the processing plant, but that this reactivation to produce ferronickel would take long enough to potentially miss out on the current (2005-06) run of elevated nickel prices. The company considered the installation of a lower-cost atmospheric leaching process that would use sulfuric acid to produce a nickel-cobalt compound and would have an estimated capacity to produce 20,000 t/yr of nickel content much earlier than either of the ferronickel reactivation plans. Inco retained various contingent claims in Skye and the Fenix project, which were dependent upon Skye's performance in meeting certain production criteria at the property (table 3; Mining Journal, 2005; Jaguar Nickel Inc., 2006; Skye Resources Inc., 2006).

A subsidiary of Perenco Plc of the United Kingdom was the leading producer of crude petroleum in the country. Guatemala exported almost all its crude petroleum production and imported almost all its refinery products for consumption since Guatemala closed its only petroleum refinery in 2002. In 2004, apparent consumption of petroleum refinery products in the country was greater than the requisite production of crude petroleum in Guatemala. The two additional blocks with proven reserves of crude petroleum in the Peten region that were expected to be awarded in 2005 were not expected to enter development until the end of 2006 (U.S. Energy Information Administration, 2006; Perenco Plc, 2005§; Dirección General de Hidrocarburos, Guatemala, 2006§; Harben, 2006§).

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Major Sources of Information

Dirección General de Minería
Diagonal 17, 29-78, Zona 11
Apartado postal 1421
Guatemala City, Guatemala
Ministerio de Energía y Minas
Diagonal 17, entre 20 y 30 Calles, Zona 11
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HONDURAS

According to the annual review by the Mining Journal, a number of industrial minerals, including gypsum and marble (mostly for export), and salt from the Choluteca District were produced in 2005 in Honduras. Honduras also had many opal prospects and mines, and any active mining of opal was apparently done almost exclusively by artisanal miners. These miners work mostly as individuals to extract opal from black basalt at the country's largest known opal deposit in Tablon, near Erandique, as well as andesite opals from Las Colinas deposit near Sosoal in the municipality of San Andres, Department of Lempira. Deposits of gold, silver, copper, lead, zinc, iron ore, and antimony that had already been discovered in the country were suspected to be of some regional commercial significance for Central and North America and the Caribbean, but the mining sector remained underdeveloped during the year. Petroleum deposits had been discovered in the Rio Sula valley and offshore along the Caribbean coast, but very little investment was made to further explore the commercial viability of mineral deposits of either petroleum or metals through 2005 in the country. In 2005, the value of mine production of metals and industrial minerals was about $128 million.[5] The real value of mine and quarry production of minerals in Honduras increased by 4% in 2005 compared with that of 2004, although is still accounted for about 1.5% of the real GDP in each year. This was the most significant percent contribution of the mining sector to the real GDP of any country in Central America. The GDP based on purchasing power parity was about $21.7 billion (Harben, 2005, 2006§; Mining Journal, 2005; Secretaría de Integración Económica Centroamericana, 2006, p. 109; U.S. Energy Information Administration, 2006; DesLauriers, 2005§; International Monetary Fund, 2006§; Banco Central de Honduras, undated§).

On July 16, 2004, the Government decided to suspend granting of any new mineral concession licenses until a new mining law was negotiated that would set out revised conditions for awarding mineral concessions and a higher royalty rate on sales of mine production. Negotiations were reportedly completed before federal elections on November 26, 2005, but the new law was not actually voted on. Following these elections, the new Government advocated including a ban on all open pit mining for gold and silver in the country, which was expected to basically eliminate any further FDI in exploration or development of new mining projects. FDI flows into the sector had already almost completely ceased in 2005 because the Government had already effectively stopped approving any mining exploration or exploitation concession licenses in the country since mid-2004. Accordingly, investment in exploration and development of new capacity to mine metals was lower in Honduras during 2005 than in all other countries in Central America other than Belize (International Monetary Fund, 2005, p. 13, 23, 56; Mining Journal, 2005; U.S. Commercial Service, 2005, p. 13; DesLauriers, 2005§).

In 2005, company reports indicated that one polymetallic and two gold mines were in operation in Honduras. El Mochito lead-silver-zinc mine in western Honduras, which was the leading mine in Central America in the 1990s, was owned by Breakwater Resources Inc. of Toronto, Ontario, Canada. For 2005, this company's reported production of lead, silver, and zinc contained in concentrate at El Mochito accounted for all the reported production of these metals in the country at the time of this writing. The company expanded total mine production compared with that of 2004 and still managed to expand proven and probable reserves of lead and zinc through an exploration program that was completed in 2004. In 2005, Breakwater's investments in El Mochito were mostly targeted at environmental protection and included completion of a new

[5]Where necessary, values have been converted from Honduran lempiras (L) to U.S. dollars (US$) at an annual average exchange rate of L560=US$1.00.

tailings facility in anticipation of more stringent environmental regulations in the new mining law being considered by the Government. For 2006, however, the company did plan to resume investment in exploration in the area around El Mochito for new deposits. As a result of a lack of new discoveries or extensions of currently mined deposits, reserves of silver at El Mochito decreased compared with those of 2004. Glamis produced 2,533 kg of gold compared with 3,177 kg in 2004 at its San Martin Mine and expected to continue encountering progressively lower grades there. Yamana Gold Inc. reported production of about 1,900 kg of gold at the San Andres Mine, and the company expected the mine to produce slightly less in 2006. RNC Gold Inc. of Toronto, Ontario, Canada, acquired San Andres in 2005, and Yamana began the acquisition of RNC on December 4, 2005, and completed it on February 28, 2006 (Breakwater Resources Ltd., 2006, p. 5, 8, 16, 21; Glamis Gold Ltd., 2006, p. 1, 8-9, 19; Yamana Gold Inc., 2006, p. 2-3, 15, 47, 80).

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NICARAGUA

In 2005, gold was still the most significant (in terms of value) metallic mineral mined in Nicaragua. Small amounts of copper, lead, and tungsten have also been mined in Nicaragua in the past, and the country was estimated to have resources of antimony, tungsten, and molybdenum that could be of regional significance. Nicaragua has deposits of industrial minerals that are also of regional significance. In 2005, calcium carbonate, gypsum, dimension limestone and limestone for cement manufacture, pumice, sand and gravel, and tuff were believed to have been mined or quarried, although even estimated data on actual production of some of these industrial minerals was not available at the time table 1 was created. Although last reported to the USGS by the Nicaraguan Government in 2002, some clays may continue to be produced and were suspected to include some bentonite and kaolin. Significant deposits of phosphates and zeolites had been discovered in Nicaragua, and production of these industrial minerals had been proposed although not reported through the end of 2005 (Ellis, 2005; Banco Central de Nicaragua, 2006, p. 60; Administración Nacional de Recursos Geológicos, Ministerio de Fomento, Industria, y Comercio, Nicaragua, 2007§).

The total value of mine production in the country was about $56 million,[6] of which gold accounted for 87.5%; industrial minerals, 11.3%; and silver, 1.2%. The real value of total mine production accounted for about 1.1% of the real GDP in Nicaragua, although the real value of production by the mining sector decreased by about 5.7% compared with that of 2004. Nicaragua's real GDP grew by 4% and the real value of production of industrial minerals in the country increased by 12% during this same timeframe. The GDP based on purchasing power parity was $21 billion (Banco Central de Nicaragua, 2006, p. 60; International Monetary Fund, 2006§; Administración Nacional de Recursos Geológicos, Ministerio de Fomento, Industria, y Comercio, Nicaragua, 2007§).

The real value of mine production of metals decreased by 11% in 2005 compared with that of 2004 and was led by a decrease of about 15% in the quantity of gold mined during the year. The real value of total mine production of metals was more generally affected by an extensive labor strike, the overall decrease in nonfuel mineral reserves in the country, and by lower grades of precious metals (gold and silver) in ores that were mined during the year. In 2005, the total nominal value of nonfuel mineral exports was $44.7 million, which accounted for 5.2% of total exports, and the nominal value of exports of petroleum refinery products was $12.4 million. The country's total exports during the year included 3,186 kg of gold, which was valued at $42.45 million. Nicaragua also exports small amounts of silver in years when prices support mining and exporting the ore. Almost all imports of raw minerals were accounted for by imports of mineral fuels and refinery products, which totaled $520.7 million and included about $260 million spent on imports of crude petroleum. Therefore, the approximate nominal mineral trade balance for Nicaragua appears to have been -$463.6 million (Banco Central de Nicaragua, 2006, p. 68, 146, 148; Administración Nacional de Recursos Geológicos, Ministerio de Fomento, Industria, y Comercio, Nicaragua, 2007§).

Investment in the mining sector of the mineral industry increased to about $54.15 million compared with $22.45 million in 2004, and almost all these funds were accounted for by FDI.

[6]Where necessary, values have been converted from Nicaraguan cordobas (C$) to U.S. dollars (US$) at an annual average exchange rate of C$16.7=US$1.00.

In 2005, investment in the metal mining subsector was $33.17 million compared with $13.25 in 2004, and it was $20.97 million compared with $9.2 in the industrial minerals subsector during the same timeframe. Most of the investment in the metallic mineral mining subsector was in exploration for new gold reserves, because existing reserves continued to decrease during the year. Most of the investment in the industrial minerals sector was to replace decreasing production of limestone and other minerals used in construction, which would minimize Nicaragua's imports of construction materials, including cement. According to data made briefly accessible by the country's Ministerio de Fomento Industria y Comercio (MIFIC), total production of limestone was about 291 cubic meters in 2003 but decreased to about 248 cubic meters in 2004. In 2005, investment in expansions at existing quarries helped increase the country's annual production of limestone to approximately 291 cubic meters again. In 2004, the nominal value of the country's imports of nonmetal mineral materials for construction had increased by about 48% to $47.0 million compared with $31.7 million in 2003, but increased by only another 7.9% to $50.7 million in 2005. Costa Rica was the leading supplier of construction materials (both metallic and nonmetallic) to Nicaragua in each of these years and supplied about 26% of Nicaragua's total imports of construction materials in 2005 (Administración Nacional de Recursos Geológicos, Ministerio de Fomento, Industria, y Comercio, Nicaragua, 2007§; Banco Central de Nicaragua, undated a§, b§).

The leading investor in exploration and development of productive capacity to mine metals in Nicaragua was Meridian Gold Inc. of Reno, Nevada. Near the end of 2004, Meridian entered into a 60% earn-in option contract with Radius Gold Inc. of Vancouver, British Columbia, Canada, to explore for gold at Radius's El Pavon epithermal gold property, which Meridian renamed Natividad. To comply with the terms of this contract, Meridian planned to invest another $1.1 million during 2006 in exploration and would be required to complete a feasibility study by the end of 2008. During the year, Glencairn was the second-ranked investor in the metal mining sector of the mineral industry of Nicaragua, and the company was investing in development of the Santa Pancha vein system in order to replace reserves that had been extracted from the Talavera deposit at its Limon gold mine. By sometime in 2007, the company expected to transfer all mining activities to exploitation of the Santa Pancha deposit at the Limon Mine, because reserves at the Talavera deposit were scheduled to be depleted by then. In May 2006, Glencairn also announced that it would acquire La Libertad gold mine from Yamana and planned to invest in exploration and development to expand the reserves at the property. Glencairn was expected to be the leading investor in nonfuel mineral exploration in 2006 in Nicaragua, but no timeline for potential expansions of gold reserves at La Libertad Mine was available at the time of this writing (table 3; Mining Journal, 2005; Glencairn Gold Corporation, 2006a, p. 3, 8-9; b; Meridian Gold, Inc., 2006, p. 23, 44; Ellis, 2006§).

According to data made available online by the Instituto Nicaragüense de Energía, Nicaragua consumed 8.99 Mbbl of petroleum refinery products and produced about 5.17 Mbbl in 2005. The only refinery products that Nicaragua produced in excess of those consumed in the country were small quantities of kerosene-type fuel and asphalt. During the year, Venezuela was the source of approximately 55% of the nominal value of Nicaragua's imports of crude petroleum and refinery products, followed by Ecuador (20%), Mexico (9.7%), and the United States (5.3%). All the other countries that supplied significant quantities of mineral fuels to Nicaragua were located in Latin America. Nicaragua imported about 5.6 Mbbl of crude petroleum during the year (Instituto Nicaragüense de Energía, 2006§; Banco Central de Nicaragua, undated a§, b§).

In 2005, the country did not produce crude petroleum or natural gas, and exploration plans for private companies interested in the country's offshore mineral fuel resources remained on hold. The two large Atlantic autonomous regions in Nicaragua (north and south) contain a large estimated proportion of the country's mineral resources, including both onshore and offshore deposits of crude petroleum. The national Government declared that legislation that was approved in 2003 to give the Atlantic regional governments more control over their regional economies does not apply to offshore oil rights, but the Northern Atlantic Autonomous Regional government still persisted in attempting to block or benefit from offshore petroleum exploration concessions that the national Government had awarded to private companies. As of December 2005, none of the offshore concessions in either the Pacific or the Atlantic basins for which the Government had granted exploration licenses had yet been signed, and no actual exploration activities had yet been conducted by the private holders of those licenses. In March 2004, the Government granted Industrias Oklahoma Nicaragua S.A. (OKLANICSA) an onshore exploration concession that extended from about 40 km west of Managua to the Pacific coast and down the coast through the Rivas Department in the southwestern part of the country to the border with Costa Rica. In September 2004, the Government also awarded a 4,000-square-kilometer (km^2) offshore exploration concession in the Caribbean Sea to MKJ Exploraciones S.A. of Metairie, Louisiana, as well as a 4,000-km^2 concession and a 3,000-km^2 concession in the Caribbean Sea to Infinity Energy Resources Inc. of Chanute, Kansas. In April 2004, Norwood Resources Ltd. of Vancouver, British Columbia, Canada, acquired a 70% ownership interest in the concession through entering into a joint-venture contract with OKLANICSA, which stipulated that Norwood conduct and finance all exploration and development operations on the property (throughout 2005) until commencement of productive operations (McGettigan, 2004; Norwood Resources Ltd., 2006, p. 9; U.S. Commercial Service, 2006, p. 34, 40; U.S. Energy Information Administration, 2006).

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PANAMA

In 2005, Panama's marketable mine production continued to consist of clays, gravel, limestone, salt, and sand, but there has been significant investment in exploration for base and precious metals since at least 1996, especially for copper and gold. Mine and quarry production of industrial minerals was almost entirely for the construction sector of the domestic economy, and the real (adjusted for inflation) value of mine production was closely correlated with that of the construction sector. In 2003, the real value of mine production increased by 35.4% compared with 2002, and that of the construction sector increased by 32.5%; in 2004, these values increased by 12.7% and 13.9%, respectively, compared with those of 2003. In 2005, the construction boom in the country slowed down drastically and the real value of the construction sector production grew by only 1% compared with that of 2004. This slowdown had a corresponding impact on demand for domestic mine production of industrial minerals, and the real value of mine production increased by only 0.4% compared with that of 2004. In 2005, the nominal value of mine production in Panama was $143.3 million, which accounted for about 1% of the nominal GDP, and there was no mining of metals in the country. The country's real GDP increased by 6.4% compared with that of 2004, but the levels of production of intermediate goods manufactured from industrial minerals decreased by 4.8%. In 2005, the GDP based on purchasing power parity was $23.5 billion (Dirección de Análisis y Políticas Económicas, Ministerio de Economía y Finanzas, Panamá, 2006, p. 4-6, 10; Ellis and Redwood, 2006§; International Monetary Fund, 2006§).

The mainstay of the Panamanian economy was the country's control of the Panama Canal. Of the total tonnage shipped through the canal, nearly 18% more tonnage was shipped from the Atlantic Ocean to the Pacific Ocean than vice versa. In 2005, shipments of chemicals and petroleum chemicals, coal and coke (including petroleum coke), iron and steel manufactures, miscellaneous minerals, nitrates, ores and metals, petroleum and petroleum products, and phosphates and potash accounted for 46% of the total tonnage of commodities shipped through the Canal from the Atlantic to the Pacific Ocean and for about 41% of that shipped in the opposite direction through the Canal. During the year, nearly 10.7 million metric tons (Mt) more crude petroleum and petroleum refinery products, which ranked second only to shipments of grains, was shipped through the Canal from the Atlantic to the Pacific and accounted for about 19% of the total tonnage of all commodities shipped in this direction. Another significant set of commodities that was shipped through the canal toward the Pacific during the year consisted of about 8.4 Mt of nitrates, phosphates, and potash (which represented 8% of the total tonnage shipped in this direction). Crude petroleum and petroleum refinery products ranked as the leading group of commodities shipped from the Pacific to the Atlantic (9.1 Mt), and shipments of metals and ores ranked second (8.6 Mt). Miscellaneous minerals, including commodities used primarily as construction materials, were ranked third in tonnage (5.4 Mt) of shipments from the Pacific to the Atlantic and exceeded the tonnage of shipments of miscellaneous minerals in the opposite direction by about 5.3 Mt. About 5.2 Mt of coal and coke were shipped from the Pacific to the Atlantic, and about 4.2 Mt was shipped in the opposite direction. Panama closed its only crude petroleum refinery in 2002 and did not produce any mineral fuels in 2005 (Dirección de Análisis y Políticas Económicas, Ministerio de Economía y Finanzas, Panamá, 2006, p. 31; U.S. Energy Information Administration, 2006).

In 2005, investment in the mining sector was almost entirely targeted at exploration and development of gold properties.

Minera Petaquilla S.A. was a joint venture between Petaquilla Minerals Ltd. of Vancouver, British Columbia, Canada (52%), and Inmet Mining Corporation of Toronto, Ontario, Canada (48%). Minera Petaquilla was formed in 1997 to explore and develop the Cerro Petaquilla copper-gold porphery deposit and other metallic mineral deposits within the Ley Petaquilla property, which is a large concession area that extends south from the Caribbean coast approximately 100 km west of the Panama Canal. Teck Cominco Limited of Vancouver, British Columbia, Canada, had an option contract to earn a 50% ownership share in Petaquilla Minerals (26% share in Minera Petaquilla) if it continued to fund all Petaquilla Minerals' share (52%) of the exploration and development costs of the Cerro Petaquilla copper project; Inmet was expected to fund the other 48% of total expenditures in the project. In April 2005, however, Petaquilla Minerals and Inmet agreed to waive for 1 year Teck Cominco's obligation to make a final commitment to fund its share of the development of the project until production is achieved or until all three companies agree to terminate the project, and almost no investment was made in the copper project during the year. In June 2005, the shareholders in Minera Petaquilla agreed to separate their ownership interests in the gold deposits of the Ley Petaquilla property from those in the main copper deposit, and this agreement enabled Petaquilla Minerals to acquire 100% ownership of the Molejon epithermal gold deposit, where the company focused almost all its investment during the year through its new gold-properties subsidiary, Petaquilla Gold S.A. Teck Cominco and Inmet retained only royalty rights (at rates to be determined) on any eventual production from gold deposits located within the Ley Petaquilla property (Mining Journal, 2005; Petaquilla Minerals Ltd., 2006, p. 11-13).

In 2005, the nominal value of Panamanian imports of mineral fuels and petroleum refinery products increased to $736.6 million compared with $516.4 million in 2004, and accounted for 17.7% of the nominal value of the country's total imports compared with 14.4% in the previous year. The nominal value of annual production by the domestic construction sector increased by about 14% during the same timeframe, and the nominal value of imports of construction materials (including industrial mineral raw materials, industrial mineral intermediate products, and metallic manufactures) increased by about 8.2% to $275.7 million. Although imports of petroleum refinery products continued to become more costly, the Government did not appear to be attracting much investment in exploration for mineral fuel reserves either onshore or offshore during 2005, and investment in this sector of the mineral industry was negligible. Global Energy Development PLC (Harken Energy Corporation of Southlake, Texas, 34%, and other private shareholders, 66%) of London, United Kingdom, was still negotiating an exploration contract with the Ministry of Commerce and Industry for the Republic of Panama after first gaining the rights to explore the onshore and offshore Garachine Block area in 2001 through the signing of a technical evaluation agreement (TEA) with the Government. Global Energy still expected that the contract would be approved sometime in 2006, however (Ellis, 2005; Dirección de Análisis y Políticas Económicas, Ministerio de Economía y Finanzas, Panamá, 2006, p. 27; Global Energy Development PLC, 2006, p. 8-9; Harken Energy Corporation, 2006, p. 14).

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Outlook

In 2005, some of the countries of Central America succeeded in attracting greater investment in mineral property exploration and development than in 2004, and a few timelines for potential production from some of these projects began to become evident (table 3). In other countries of the region, however, political (tax and policy) risk remained high relative to their estimated mineral resources. As reforms of mining and hydrocarbon laws in the countries of Central America come into affect and as their Governments proceed to ratify CAFTA-DR, this type of uncertainty will decrease somewhat. Greater FDI flows into the mineral industries of the countries where these political goals are accomplished can be expected (especially from United States-based mineral companies) (Ávila, 2005, p. 7, 15-16, 19-20; Economic Commission for Latin America and the Caribbean, 2006a, p. 38, 57, 69; 2006b, p. 22-24, 45, 53, 102, 104; 2007, p. 12-14, 36-45, 57-60).

In 2005, public demonstrations and protests still appeared to have some negative influence on investment decisions in

the mineral industries of Central America, and the higher costs associated with public relations and use of the most environmentally friendly technologies may still deter some investment in the more marginal (economically) mineral development projects. Even with successful development of the projects that are listed in table 3, the percent contribution of production by the mineral industries to the GDPs of these countries is expected to remain small, and any new production is likely to be of significance only to North and Central America and the Caribbean region, at best. Successful development of these projects can alleviate some of the dependence of these economies on imports of mineral raw materials, however, and can improve the tax bases of the Governments of these countries to possibly promote wider economic reforms, economic development, and greater economic integration within the region.

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TABLE 1
CENTRAL AMERICA: PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Country and commodity		2001	2002	2003[e]	2004[e]	2005[e]
BELIZE						
Clays[3]	thousand metric tons	557	487	413 [4]	571 [4]	570
Dolomite		4,525	5,500	6,319 [4]	3,288 [4]	3,300
Gold	grams	715	--	-- [4]	-- [4]	--
Lime[e]		1,200	1,200	1,200	1,200	1,200
Limestone, including marl[5]	thousand metric tons	1,140	358	881 [4]	571	600
Quartz sand (silica)	cubic meters	23,078	38,000 [e]	30,631 [4]	27,763 [4]	28,000
Sand and gravel	thousand cubic meters	165	109 [e]	109 [4]	162 [4]	160
Sand, including silt and mud (offshore)	do.	264	95	82 [4]	250 [4]	250
COSTA RICA[6]						
Cement[e]	thousand metric tons	1,200	1,200	1,600	1,900	2,000
Clays, common[e]		420,000	420,000	419,000	420,000	420,000
Diatomite		26,350	26,400 [e]	26,450 [4]	26,500	26,000
Gold[e]	kilograms	100	100	110	150 [r]	150
Iron and steel, semimanufactures[e]		61,000 [r]	72,000 [r]	102,000 [r]	165,000 [r]	170,000
Lime[e]		9,000	9,900	9,900	9,900	9,900
Petroleum, refinery products[e, 7]	thousand 42-gallon barrels	5,500	5,500	5,450	5,400	5,400
Pumice[e]		8,000	8,000	8,000	8,000	8,000
Salt, marine[e]		20,000 [r]	20,000 [r]	20,000 [r]	20,000 [r]	20,000
Silver[e]	kilograms	100	100	110	110	110
Stone, sand and gravel:[e]						
Crushed rock and rough stone	thousand metric tons	200	200	200	200	200
Limestone and calcareous materials	do.	900	900	920	920	920
Sand and gravel	do.	1,500	1,500	1,550	1,550	1,550
Sandstone	do.	3,300	3,300	3,250	3,250	3,250
EL SALVADOR						
Aluminum, metal, including alloys and semimanufactures[e]		2,650	2,650	2,600	2,600	2,600
Cement, hydraulic		1,174	1,318	1,390	1,256 [4]	1,250
Fertilizer materials:[e]						
Phosphatic		13,600	13,600	13,600	13,600	13,600
Other mixed materials		56,500	56,500	56,000	56,000	56,000
Gypsum[e]		5,600	5,600	5,600	5,600	5,600
Iron and steel, metal:						
Steel, crude		38,502	48,832	56,900	59,000	51,000
Semimanufactures[e]		66,000 [r]	76,000 [r]	92,000 [r]	88,000 [r]	85,000
Lead, metal, secondary		7,000	8,000	8,000	10,000	10,000
Limestone	thousand metric tons	1,425	1,631	1,194 [4]	1,161 [4]	1,150
Petroleum, refinery products[e, 7]	thousand 42-gallon barrels	6,300	6,300	6,300	6,300	6,300
Pozzolan	cubic meters	365,458	279,389	294,871 [4]	222,826 [4]	223,000
Salt, marine		31,610	31,552	31,366 [4]	31,400	31,400
GUATEMALA						
Antimony		8,162 [r]	4,010 [r]	2,000 [r]	2,686 [4]	1,007 [4]
Basalt	cubic meters	243,109	317,558	935,849 [4]	1,050,340 [4]	512,000
Of which, andesite	do.	22,197	99,941	100	110 [4]	100
Barite		700	100 [e]	100	70 [4]	181 [4]
Cement, hydraulic[e]	thousand metric tons	2,000	2,000 [r]	2,000 [r]	2,200 [r]	2,400
Clays:						
Bentonite		18,469 [r]	12,415 [r]	6,438 [4]	81,688 [4]	135,451 [4]
Ferruginous		73,268 [r]	64,683 [r]	64,700 [r]	54,293 [4]	90,237 [4]
Fuller's earth (attapulgite)		40	10	9	9 [4]	-- [4]
Kaolin		227	372	1,497 [4]	2,000 [r]	4,107 [4]
Unspecified[e]		-- [r]	-- [r]	-- [r]	-- [r]	--
Coal, lignite[e]		50	50	50	50 [4]	50
Feldspar		6,809	11,843	9,320 [4]	4,473 [4]	3,808 [4]
Gold, mine output, Au content[e]	kilograms	-- [r]	-- [r]	-- [r]	-- [r, 4]	740 [4]

See footnotes at end of table.

TABLE 1--Continued
CENTRAL AMERICA: PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Country and commodity		2001	2002	2003[e]	2004[e]	2005[e]
GUATEMALA--Continued						
Gypsum, crude		96,817	80,571	66,981 [4]	106,140 [4]	349,589 [4]
Hematite		1,773	947	1,000	2,689 [4]	5,227 [4]
Iron and steel, metal:						
Steel, crude		201,802	216,108	226,000	232,000 [r]	197,000
Semimanufactures[e]		129,000	135,000	173,000	242,000	240,000
Iron oxide		835	35,226	2,276 [4]	2,823 [4]	6,041 [4]
Jadeite	kilograms	61,792	91,776	48,000 [4]	27,000 [4]	26,740 [4]
Lead, metal, primary and secondary		50	39	19 [4]	47 [4]	23 [4]
Lime, hydrated		182 [e]	547	386 [4]	400 [r]	400
Magnesite		764	3,758	8,022 [4]	8,000	5,636 [4]
Natural gas, gross[e]	thousand cubic meters	630	650	670	620	560
Petroleum:						
Crude	thousand 42-gallon barrels	7,695	9,005	9,028 [4]	7,384 [4]	6,728 [4]
Refinery products[e, 7]	do.	7,600	7,600	-- [4]	-- [4]	-- [4]
Pumice	cubic meters	264,322	377,403 [r]	273,933 [4]	226,459 [4]	82,118 [4]
Pyrolusite, manganese dioxide (MnO_2)		10	10 [e]	10	5 [4]	5
Rhyolite[e]		1,000	1,000	1,000	1,375 [4]	2,707 [4]
Salt[e]		50,000	50,000	60,000	60,000	60,000
Silver, mine output, Ag content[e]	kilograms	--	--	--	-- [4]	7,070 [4]
Stone, sand, and gravel:						
Ballast, round stone	cubic meters	6,000 [e]	10,088	48,894 [4]	10,000	5,799 [4]
Dolomite		1,289 [r]	24,881	6,130 [r]	63,082 [4]	8,585 [4]
Flagstone, phyllite[e]	cubic meters	68	98	59	1,446 [4]	513 [4]
Gravel, common	do.	70,000 [e]	69,918	166,851 [4]	19,678 [4]	60,116 [4]
Limestone, crude	thousand metric tons	2,775	3,040	3,773 [4]	4,270 [4]	7,600
Of which, dimension stone[e]	do.	31	34	42	48 [4]	64 [4]
Marble:						
Block	cubic meters	15,039	3,185	7,461 [4]	3,300 [r]	3,000
Chips and pieces		11,448	99,293	29,181 [4]	74,862 [4]	44,598 [4]
Pumicite, fine, including pozzolan	cubic meters	175,824	2,000 [e]	6,000	4,000	6,611 [4]
River sand and gravel	thousand cubic meters	684	743 [r]	296 [4]	90 [4]	367 [4]
Sand, common	do.	126	55	129	226 [4]	82 [4]
Sandstone[e]	cubic meters	200	200	450 [4]	180 [4]	200
Schist, slate		250,682	496,428	496,793 [4]	543,169 [4]	500,000
Silica sand		16,126 [r]	37,552 [r]	30,462 [r, 4]	988 [r, 4]	474 [4]
Stone dust		7,000 [e]	7,433	12,537 [4]	1,852 [4]	-- [4]
Volcanic sand and ash	cubic meters	194,463	312,997	199,435 [4]	219,750 [4]	48,978 [4]
Talc and steatite		1,759 [r]	568	1,585 [4]	2,863 [4]	1,631 [4]
Zinc, mine output, Zn content[e]		--	--	--	10 [4]	11 [4]
HONDURAS[8]						
Cadmium, Cd content of lead-zinc concentrates[e]		75	75	60	60	60
Cement	thousand metric tons	1,321	1,360 [e]	1,400	1,800 [r]	1,800
Copper, run of mine, Cu content[e]		300	300	300	300	300
Gold	kilograms	4,574	4,984	4,484 [r, 4]	3,677 [r, 4]	3,600
Gypsum		59,500	60,000 [e]	60,000	60,000	60,000
Iron oxide, pigments		70,941	71,000 [e]	71,000	71,000	71,000
Lead, mine output, Pb content of concentrate		6,750	8,128	9,014 [r, 4]	8,877 [r, 4]	10,488 [4]
Limestone, for construction[e]		1,230,000	1,230,000	1,230,000	1,230,000	1,230,000
Marble, for construction[e]	square meters	95,000	95,000	90,000	90,000	90,000
Pozzolan		189,999	190,000 [e]	190,000	190,000	190,000
Rhyolite		32,700	32,700 [e]	33,000	33,000	33,000
Salt[e]		42,000 [r]	42,000 [r]	42,000 [r]	42,000 [r]	42,000
Silver, mine output, Ag content of concentrate	kilograms	46,831	52,877	50,962 [r, 4]	48,218 [r, 4]	53,617 [4]
Zinc, mine output, Zn content of concentrate		48,485	46,339	43,766 [r, 4]	41,413 [r, 4]	42,698 [4]

See footnotes at end of table.

TABLE 1--Continued
CENTRAL AMERICA: PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Country and commodity		2001	2002	2003[e]	2004[e]	2005[e]
NICARAGUA[9]						
Bentonite[e]		6,000	6,000	6,300	6,300	6,300
Cement		513,793	549,403	590,000	600,000 [r]	600,000
Gold, mine output, Au content	kilograms	3,840	3,493	3,096 [r, 4]	4,064 [r, 4]	4,000
Gypsum and anhydrite, crude		34,369	28,153	30,642 [4]	30,000	30,000
Lime[e]		55,000	56,000	55,000	55,000	55,000
Limestone:						
For cement		621,000	787,000	789,000 [4]	780,000	780,000
For other uses		8,900	3,310	1,600 [4]	1,600	1,600
Petroleum, refinery products[7]	thousand 42-gallon barrels	6,610 [r]	6,008 [r]	5,981 [r, 4]	6,145 [r, 4]	6,000
Salt, marine		17,710	29,710	31,320 [4]	52,000 [r]	52,000
Sand and gravel	thousand cubic meters	708	492	636	600	600
Silver, mine output, Ag content	kilograms	2,532	2,198	2,040 [4]	2,000	2,000
Stone, crushed	thousand metric tons	5,639	5,859	5,400	5,400	5,400
PANAMA						
Cement[e]		820,000	770,000	800,000 [r]	820,000 [r]	820,000
Clays:						
For cement	cubic meters	64,246	64,000 [e]	64,000	64,000	64,000
For products[e]	do.	4,300	4,300	4,300	4,300	4,300
Lime[e]		3,500	3,500	3,500	3,500	3,500
Salt, marine[e]		18,000 [r]	18,000 [r]	18,000 [r]	18,000 [r]	18,000
Stone, sand and gravel:						
Limestone	thousand metric tons	469	270 [e]	270	270	270
Sand and gravel	thousand cubic meters	441	1,200 [e]	1,200	1,200	1,200

[e]Estimated; estimated data are rounded to no more than three significant digits. [r]Revised. -- Zero.

[1]Table includes data available through November 2006.

[2]In addition to the commodities listed, some additional construction materials (clays, gravel, miscellaneous rock, sand, and weathered tuff) are produced to meet domestic needs, but available information is inadequate to make reliable estimates of output.

[3]Some figures that are reported or estimated as a volumetric measure (cubic meters) have been converted to a weight measure equivalent (metric tons) by multiplying by an average density of 2.40 for clay (common).

[4]Reported figure.

[5]Some figures that are reported or estimated as a volumetric measure (cubic meters) have been converted to a weight measure equivalent (metric tons) by multiplying by an average density of 2.72 for limestone.

[6]An official response to the USGS Minerals Questionnaire for Costa Rica was last received in 2001. Therefore, most of the data is estimated from the most recently reported (2000) figures.

[7]Includes liquefied petroleum gas, aviation and motor gasoline, diesel, kerosene, and distillate fuel oil.

[8]An official response to the USGS Minerals Questionnaire for Honduras was last received in December 2003, with reported figures for 2001 and some estimated figures for 2002. Therefore, most of the data is compiled from individual company and some secondary sources or estimated from the most recent officially reported figures.

[9]In addition to the commodities listed, Nicaragua produced a variety of industrial minerals to meet domestic needs. Output of these materials was not reported, however, and available information is inadequate to make reliable estimates of output.

TABLE 2
CENTRAL AMERICA: STRUCTURE OF THE MINERAL INDUSTRIES IN 2005

(Thousand metric tons unless otherwise specified)

Country and commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
BELIZE				
Dolomite		Belize Minerals Ltd. (Danish Development Bank and other private, 100%)	Punta Gorda, Toledo District	6,320.
Limestone		Caribbean Investors Limited (private, 100%)	Georgeville, Cayo District	1,140.
COSTA RICA				
Cement		Holcim Costa Rica S.A. (Holcim Ltd., 59.8%, and other private, 40.2%)	Cartago cement plant, Aguas Calientes	1,500.
Do.		CEMEX Costa Rica S.A. (CEMEX S.A. de C.V., 98.7%, and other private, 1.3%)	Colorado de Abangares cement plant, Guancaste Province, and Guatuso de Patarra cement grinding and bagging plant, San Jose	850.
Clays		do.	Tajo Finca clay quarry, near City of Platanar	100.
Gold	kilograms	Glencairn Gold Corporation (private, 100%)	Bellavista open pit mine, Montes de Oro Region, 70 kilometers west of San Jose	1,400.
Limestone		CEMEX Costa Rica S.A. (CEMEX S.A. de C.V., 98.7%, and other private, 1.3%)	Cerro Pena Blanca limestone quarry, Guancaste Province	300.
Do.		Holcim Costa Rica S.A. (Holcim Ltd., 59.8%, and other private, 40.2%)	La Chilena and three other quarries near Cartago cement plant, Cartago Province	650.
Petroleum, refinery products	thousand 42-gallon barrels	Refinadora Costarricense de Petróleo S.A. (RECOPE S.A.) (Government, 100%)	Moín refinery, City of Limon, Limon Province	7,600.
Pozzolan		Holcim Costa Rica S.A. (Holcim Ltd., 59.8%, and other private, 40.2%)	La Chilena and three other quarries near Cartago cement plant, Cartago Province	8.
Steel, semimanufactures		Laminadora Costarricense S.A. (Arcelor S.A., 50%, and Grupo Pujol-Martí, 50%)	Rolling mill, steel manufacturing complex, Jimenez de Guapiles, Limon Province	450.
Do.		Trefileria Colima S.A. (Arcelor S.A., 50%, and Grupo Pujol-Martí, 50%)	Wire-drawing unit, City of Jimenez de Guapiles, Limon Province	60.
EL SALVADOR				
Aluminum, semimanufactures	metric tons	Grupo Solaire S.A. de C.V.; Aluminio de Centro America S.A. de C.V.; INCO Industrias Consolidadas S.A. de C.V.; and others	Capital city of San Salvador	2,600.
Cement		Cemento de El Salvador S.A. de C.V. (Holcim Ltd., 64.2%, and other private, 35.8%)	El Ronco and Maya Plants, near Metapan, Santa Ana Department	1,700.
Limestone		do.	Quarries near Aldea El Zapote and Santa Ana, Santa Ana Department	440.
Petroleum, refinery products	thousand 42-gallon barrels	Refinería Petrolera Acajutla S.A. de C.V. (RASA de C.V.) (Exxon Mobil Corp., 65%, and Royal Dutch/Shell Group, 35%)	Puerto de Acajutla, Sonsonate Department	7,000.
Pozzolan		Cemento de El Salvador S.A. de C.V. (Holcim Ltd., 64.2%, and other private, 35.8%)	Quarries near Aldea El Zapote and Santa Ana, Santa Ana Department	650.
Steel:				
Crude		Corporación Industrial Centroamericana S.A. de C.V. (private, 100%)	Electric arc furnace, Quetzaltepeque, La Libertad Department	60.
Semimanufactures		do.	Billet casting machine and rolling mill, Quetzaltepeque, La Libertad	92.
GUATEMALA				
Antimony	metric tons	Minas de Guatemala S.A. (private, 100%)	Clavito, La Florida, and Los Lirios Mines, Ixtahuacan, Huehuetenango Department	2,700.
Cement		Cementos Progreso S.A. (Holcim Ltd., 20%, and other private, 80%)	San Miguel plant, Sanarate, El Progreso Department, and La Pedrera plant, Guatemala City	3,000.
Gold	kilograms	Montana Exploradora de Guatemala S.A. (Glamis Gold Ltd., 100%)	Marlin Mine, near municipalities of San Miguel Ixtahuacan and Sipakapa, Department of San Marcos	7,100.

See footnotes at end of table.

TABLE 2--Continued
CENTRAL AMERICA: STRUCTURE OF THE MINERAL INDUSTRIES IN 2005

(Thousand metric tons unless otherwise specified)

Country and commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
GUATEMALA--Continued				
Lime	metric tons	Cementos Progreso S.A. (Holcim Ltd., 20%, and other private, 80%)	San Miguel plant, Sanarate, El Progreso Department, and La Pedrera plant, Guatemala City	550.
Petroleum, crude	thousand 42-gallon barrels	Perenco PLC (100%)	Rubelsanto and West Chinaja fields, Alta Verapaz Department, and Caribe, Tierra Blanca, and Xan fields, Peten Department	7,500.
Silver	kilograms	Montana Exploradora de Guatemala S.A. (Glamis Gold Ltd., 100%)	Marlin Mine, near municipalities of San Miguel Ixtahuacan and Sipakapa, Department of San Marcos	94,000.
Steel:				
Crude		Siderúrgica de Guatemala S.A. (SIDEGUA) (Aceros de Guatemala S.A., 100%)	Electric arc furnace, near City of Escuintla, Escuintla Department	260.
Semimanufactures		Industria Galvanizadora, S.A. (INGASA) (Industrias Monterrey S.A. de C.V., 100%)	Plant near Guatemala City	74.
HONDURAS				
Cement		Cementos del Norte S.A. de C.V. (Holcim Ltd., 24.2%, and other private, 75.8%)	Rio Bijao plant, municipality of San Pedro Sula, Cortes Department	1,100.
Do.		Lafarge Incehsa S.A. de C.V. (Lafarge Group, 52.8%, and other private, 47.2%)	Piedras Azules plant, municipality of Comayagua, Comayagua department	1,300.
Gold	kilograms	Minerales Entre Mares de Honduras S.A. (Glamis Gold Ltd., 100%)	San Martin open pit mine, Palo Alto deposit, Department of Francisco Morazan	2,550.
Do.	do.	Minerales de Occidente S.A. de C.V. (Yamana Gold Inc., 100%)	San Andres Mine, municipality of La Union, Department of Copan	2,180.
Lead	metric tons	Compañía Minera Santa Bárbara (Breakwater Resources Ltd., 100%)	El Mochito Mine, municipality of Las Vegas, Santa Barbara department, 88 kilometers southwest of San Pedro Sula	9,000.
Silver	kilograms	do.	do.	50,000.
Zinc	metric tons	do.	do.	42,000.
NICARAGUA				
Cement		CEMEX Nicaragua S.A. (CEMEX S.A. de C.V., 100%, but on lease from Government)	San Rafael del Sur plant, 45 kilometers from Managua, and milling plant in Managua	470.
Cement, clinker		Holcim de Nicaragua S.A. (Holcim Ltd., 41.9%, and other private, 58.1%)	Nagarote grinding plant, San Rafael del Sur	300.
Gold	kilograms	Glencairn Gold Corporation, 95%, and Inversiones Mineras S.A., 5%	El Limon Mine, Talavera deposit, 160 kilometers north of Managua	1,500.
Do.	do.	Desarrollo Minero de Nicaragua S.A. (Yamana Gold Inc., 100%)	La Libertad Mine, 110 kilometers east of Managua	1,550.
Petroleum, refinery products	thousand 42-gallon barrels	Refinería Esso Managua S.A. (Exxon Mobil Corp., 100%)	Capital city of Managua; 40-mile (64-kilometer) pipeline to the refinery from Puerto Sandino	7,300.
PANAMA				
Cement		Cemento Panamá S.A. (Cementos del Caribe S.A., 50%, and Holcim Ltd., 50%)	Grinding plant in Quebrancha, Province of Panama	700.
Do.		Cemento Bayano S.A. (CEMEX S.A. de C.V., 99.3%, and other private, 0.7%)	Plant in Calzada Larga, Province of Panama	400.

[e]Estimated; estimated data are rounded to no more than three significant digits.

TABLE 3

CENTRAL AMERICA: ESTIMATED MAJOR INVESTMENT EXPENDITURES IN MINERAL EXPLORATION IN 2005[1]

(Thousand dollars)

Location	Project Name	Commodity	Ownership	Annual investment	Planned startup date
BELIZE					
Ceibo Chico area, Maya Mountains, Cayo District, west-central Belize	Ceibo Chico (exploration)	Gold	Erin Ventures Inc. (on 90% earn-in option from Boiton Minerals Ltd.), 100%	220	NA
Municipality of Spanish Lookout, Cayo District, Blocks 5 and 5a	Yalbac and Hill Bank deposits (exploration, feasibility)	Crude petroleum and natural gas	Belize Natural Energy Limited (Aspect Energy LLC and CHx LLC, 100%), 100%	6,000	mid-2006
COSTA RICA					
105 kilometers north of San Jose, in Alajuela Province, north-central Costa Rica	Cerro Crucitas (feasibility)	Gold, silver	Industrias Infinito S.A. (Vannessa Ventures Ltd., 100%), 100%	1,900	2008[2]
Near Miramar, 70 kilometers west of San Jose, in the coastal Montes de Oro Region	Bellavista (extension)	Gold	Glencairn Gold Corporation, 100%	NA	2006
EL SALVADOR					
65 kilometers east of San Salvador, in the Cabañas Department	El Dorado (prefeasibility)	Gold, silver	Pacific Rim Mining Corp., 100%	5,900	NA
Santa Ana Department, northern El Salvador	El Zapote (prefeasibility)	Gold, silver, zinc	SilverCrest Mines Inc., 100%	1,400	NA
Southern Morazan; northern San Miguel Department, eastern El Salvador	San Cristobal (4 exploration concessions)	Gold, silver	Intrepid Minerals Corporation, 100%	380	NA
South of Chalatenango City, in Chalatenango Department	Cerro Petancol-Ojo Blanco (exploration)	do.	Au Martinique Silver Inc. (on a 50% earn-in option from Intrepid Minerals Corporation), 100%	180	NA
GUATEMALA					
Near San Miguel Ixtahuacan and Sipakapa, San Marcos Department	Marlin (underground expansion)	Gold, silver	Montana Exploradora de Guatemala S.A. (Glamis Gold Ltd., 100%), 100%	2,800	2006
Asuncion Mita, Jutiapa Department	Cerro Blanco (exploration)	Gold	do.	5,400	NA
30 kilometers northeast of Guatemala City, near Sanarate, El Progresso Department	El Sastre (exploration)	do.	Aurogin Resources Ltd. (on a 50% earn-in option from Rocas El Tambor S.A.), 100%	570	NA
El Estor, Izabal Department	Fenix (feasibility)	Nickel laterite	Compañía Guatemalteca de Níquel S.A. (Skye Resources Ltd., 90.9%, and Government, 9.1%), 100%	7,800	2009[2]
140 kilometers northeast of Guatemala City, near Lake Izabal, Izabal Department	Sechol (exploration)	do.	Jaguar Nickel S.A. (Jaguar Nickel Inc., 100%), 100%	5,700	NA
Casas/Huapac and Tortugas/Atzam concession areas, Peten Department	(exploration and testing)	Crude petroleum and natural gas	PetroLatina Energy Plc, 100%	3,500	NA
HONDURAS					
90 kilometers southwest of San Pedro Sula, in the Santa Barbara Department	Vueltas del Rio (restoration)	Gold	Rio Narcea Gold Mines, 100%	700	NA
NICARAGUA					
Onshore, Pacific coast, from border with Costa Rica to 40 kilometers west of Managua	Oklanicsa concession (exploration)	Crude petroleum	Norwood Resources Ltd., 100%	3,200	NA
North-central Nicaragua, 230 kilometers north-northeast of Managua	Natividad (El Pavon) (exploration)	Gold	Meridian Gold Inc. (on 60% earn-in option from Radius Gold Inc.), 100%	2,400	NA
Talavera deposit, 100 miles north of capital city of Managua	Santa Pancha (extension of El Limon Mine)	do.	Glencairn Gold Corporation, 95%, and Inversiones Mineras S.A., 5%	1,400	2007
10 kilometers north of Boaco, Boaco Department, central Nicaragua	Rio Luna (exploration)	do.	First Point Minerals Corp., 100%	410	NA

See footnotes at end of table.

TABLE 3--Continued

CENTRAL AMERICA: ESTIMATED MAJOR INVESTMENT EXPENDITURES IN MINERAL EXPLORATION IN 2005[1]

(Thousand dollars)

Location	Project Name	Commodity	Ownership	Annual investment	Planned startup date
NICARAGUA--Continued					
Northern portion of the La India gold district, 140 kilometers northwest of Managua	Tatascame (exploration)	do.	Gold-Ore Resources Ltd. (on 51% earn-in option from Glencairn Gold Corporation), 100%	240	NA
PANAMA					
100 kilometers west of Panama Canal, in Donoso district, Colon Province	Molejon (exploration)	Gold	Petaquilla Minerals Ltd., 100%	2,400	2007[2]
On Azuero peninsula, Los Santos Province, 190 kilometers southwest of Panama City	Cerro Quema (feasibility and preliminary construction)	do.	Minera Cerro Quema S.A. de C.V. (RNC Gold Inc., 60%, and Carena Equities Corp., 40%), 100%	880	NA

NA Not available.

[1]Estimated data are rounded to no more than two significant digits.

[2]Not before this date.

The Mineral Industry of Chile

By Steven T. Anderson

The Republic of Chile is the leading copper producer and exporter in the world. In 2005, mine production of copper accounted for about 14% ($16 billion[1]) of the country's gross domestic product (GDP), and the total value of copper exports accounted for about 16% ($18 billion) of the GDP. Based on purchasing power parity, Chile's GDP was about $193.2 billion. The annual average price of copper on the London Metals Exchange (LME) rose to about $3.68 per kilogram ($1.67 per pound) compared with about $2.87 per kilogram ($1.30 per pound) in 2004. In 2005, the Government adopted policies to help control the potentially inflationary impacts of higher copper prices on the Chilean economy, but the country's rate of inflation nonetheless increased to 3.1% compared with 1.1% in 2004. In real[2] terms, the value of mine production of copper actually decreased by 0.8% and contributed 6.5% of Chile's real GDP compared with accounting for 7.0% of the real GDP in 2004 (Banco Central de Chile, 2006a, p. 28-29, 37; Comisión Chilena del Cobre, 2006, p. 64, 122; International Monetary Fund, 2006, p. 299; International Monetary Fund, 2006§[3]).

The prices of almost all mineral commodities produced by the mining sector of Chile were at record levels during the year. In 2005, the value of non-copper mine production ($2.4 million) represented an increase of about 61% compared with that of 2004. Most mining companies operating in the country responded to the higher prices by attempting to produce at or above listed capacities. The real value of non-copper mine production increased by 8.1% during the same timeframe, although it contributed about the same amount (0.9%) to the country's real GDP in both years. Total exports of production from all non-copper mining operations in the country accounted for 3.6% ($4.15 million) of the nominal GDP (Banco Central de Chile, 2006a, p. 28-29, 37; Comisión Chilena del Cobre, 2006, p. 64; International Monetary Fund, 2006§).

The most economically important mineral commodities that were lacking in Chile's otherwise diverse natural endowment of mineral resources were mineral fuels. Because of its limited resources of coal, petroleum, and natural gas, uncertain provision of hydropower, and increasing energy consumption (particularly of natural gas), the Chilean economy has become increasingly reliant on imports of mineral fuels. In 2005, Chile spent about $6.2 billion on imports of mineral fuels compared with $4.4 billion in 2004. About 40% of the amount spent in 2005 was spent on imports of mineral fuels from Argentina, although Argentina frequently restricted exports of natural gas to Chile to between 20% and 50% below contracted daily volumes (Banco Central de Chile, 2006b, p. 146; 2006c, p. 46; U.S. Energy Information Administration, 2006).

Chile contained the largest share of world reserves of rhenium and was the leading producer in 2005. Chile was ranked second only to the United States in mine production of molybdenum; its reserves of molybdenum were estimated to be the third largest in the world. Chile was also estimated to be the world's second-ranked producer of lithium-bearing compounds (lithium carbonate), while Australia was estimated to be the leading producer (of spodumene). Chile was the fourth-ranked producer of selenium in the world, and the country was estimated to contain the highest proportion of global reserves. During the year, a globally significant (5% or more of the world total) quantity of silver was mined in Chile, and 61% of this production was extracted as a byproduct from copper mines. The country also produced a regionally significant (about 5% of total mine production in the Western Hemisphere) quantity of gold, and 41% of this production was a byproduct of Chilean copper mines. The country was the leading producer and produced about 60% of the world's iodine; about 60% of global reserves of iodine were located in Chile. The country was the fourth-ranked producer of boron in the world and had boron reserves of global significance. Chile produced regionally significant quantities of nitrates and specialty fertilizers and was estimated to contain the largest natural reserves of nitrates in the world. About 40% ($14.6 million) of Chilean exports of sodium nitrate was sold to the United States during the year (Comisión Chilena del Cobre, 2006, p. 25-26; Servicio Nacional de Geología y Minería, 2006, p. 55, 59; Sociedad Química y Minera de Chile S.A., 2006, p. 11; George, 2007; Lyday, 2007a, b; Magyar, 2007a, c; Ober, 2007).

Operating costs for the mineral industry of Chile continued to increase rapidly. The average annual salary for employees in the production of metals, industrial minerals, and mineral fuels was $28,775 in 2005 compared with $24,991 in 2004 and $21,195 in 2003. In each of these years, the copper sector paid the highest annual salary per worker, on average, at $33,064 in 2005, $28,252 in 2004, and $24,092 in 2003. The annual average energy costs increased in 2005 compared with those of 2004, even relative to the price of copper. That is, the value of 1 metric ton (t) of copper was equal to the value of 75 barrels of crude petroleum in 2004 but was worth only about 68 barrels in 2005. The only mineral commodity of which Chile was a major producer that increased in price relative to the increased price of crude petroleum was molybdenum, and companies that produced this metal did not experience as great a downward pressure on profits from increasing energy prices as producers of the other mineral commodities in Chile. Because about 43% of electricity consumption in Chile was provided by hydropower, the mineral industry was somewhat sheltered from increased prices for mineral fuels but not from uncertainty (droughts) related to inconsistent electricity provision from hydropower (Comisión Chilena del Cobre, 2006, p. 125; Servicio Nacional

[1]Where necessary, nominal values have been converted from Chilean pesos (Ch$) to U.S. dollars (US$) at an annual average exchange rate of Ch$560=US$1.00 for 2005. All values are nominal, at current 2005 prices, unless otherwise stated.

[2]Real values are adjusted for inflation using constant 1996 prices.

[3]References that include a section mark (§) are found in the Internet References Cited section.

de Geología y Minería, 2006, p. 16-19; 2005, p. 118-121; U.S. Energy Information Administration, 2006).

Government Policies and Programs

In 2005, political uncertainty concerning passage of a new mining royalty bill was resolved. A new specific tax on the mine production of private companies in Chile was approved on June 16, 2005, and went into effect at the beginning of 2006. The tax, which is assessed on a per-company basis, takes effect only if the total value of mine production by a single company exceeds the average value of 12,000 t of copper during the year. Because copper prices in 2005 were already higher per metric ton than were those for most other minerals and increased more than for all other minerals besides molybdenum, the new mining tax was expected to apply mostly to companies that mined copper in Chile. The tax rate ranges between 0.5% and 5% depending on the value of the company's mine production for the year. Roughly, an estimate of the minimum value of a company's mine production necessary to incur the new tax would have had to have been 12,000 t x $3,680 per metric ton = $44.16 million in 2005, and the new tax imposed at this minimum level would have been approximately 0.5% x $44.16 million = $220,800 (if the mining royalty law had been in effect in 2005). The tax rate (percent royalty) on the annual production (sales) of a single mineral by a single mining company operating in Chile was set at 0.5% if the value of the company's annual production of that mineral is equivalent to the value of 12,000 t to 14,999 t of fine copper during the same year. The tax rate rises to 1% if the company's annual value of production for the mineral is equivalent to the value of 15,000 t to 19,999 t of fine copper; to 1.5% if equivalent to 20,000 t to 24,999 t of fine copper; 2% if equivalent to 25,000 t to 29,999 t of fine copper; 2.5% if equivalent to 30,000 t to 35,000 t of fine copper; 3% if equivalent to 35,000 t to 40,000 t of fine copper; and 3.5% if equivalent to 40,000 t to 45,000 t of fine copper. The tax rate then jumps to 4.5% if the value equivalent falls in the range of from 45,000 t to 49,999 t of fine copper and to 5% if the value equivalent exceeds 50,000 t of fine copper (Rojas and others, 2006, p. 360-362).

The annual average price of fine copper used in determining this tax is based on the average price of copper sold on the LME. Annual mine production of some other metals (such as lead and zinc) that are traded on the LME are also valued at LME prices. Annual mine output of gold, silver, and some other metals, such as molybdenum, are based on prices listed for those commodities on the New York Commodities Exchange (COMEX) or as published in such publications as Platts Metals Week and the Metal Bulletin. Prices used to value the mine production of industrial minerals are obtained from Government-accepted industrial publications, including the Chemical Market Reporter, Industrial Minerals, and Mineral Price Watch. The Government's Comisión Chilena del Cobre (COCHILCO) is primarily responsible for evaluating and publishing (both electronically and in hard copy) the annual average prices of mined minerals in Chile (in Chilean pesos) from averages of monthly data from the above sources (and some others, as necessary). During the first 15 days following every quarter of the calendar year, COCHILCO is required to publish the monthly data that will be used to calculate the annual averages and the source from which it was obtained (Rojas and others, 2006, p. 360-362).

Throughout the year, all foreign-owned mineral companies continued to pay taxes according to the terms of the country's 1974 foreign investment statute, known as Decree Law 600 (D.L. 600). Under D.L. 600, a foreign investor may sign a contract with the Chilean Government; the Comité de Inversiones Extranjeras (CIE) establishes the terms and conditions of the investment. Such contracts are not allowed to be modified unilaterally by the Government or by the enactment of any legal regulations after the contracts are signed; mining companies, therefore, are allowed to wait for their D.L. 600 contracts to expire before beginning to pay the new mining tax. Only Minera Escondida Ltd. (of which BHP Billiton Plc of London, United Kingdom, and Victoria, Australia, was the controlling owner), however, was expected to continue to operate under its D.L. 600 tax stability clause in 2006. All other mining companies in Chile were expected to opt out of this D.L. 600 clause in 2006. For Minera Escondida and any other mining companies that decide to wait until expiration of their existing D.L. 600 contracts, the new tax will be applied after these contracts expire, at which time their profits would be taxed at the current rates, which could be higher than those outlined above if rates are adjusted through passage of further mining royalty legislation in the meantime. Foreign mining companies were also allowed to apply to pay the mining-specific tax at a fixed rate of 4% for 12 years if they first choose to opt out of their D.L. 600 tax stability clause. The revenue expected by the Government from the first year (2006) of the mining-specific tax was about $270 million, and these funds were earmarked for development of an Innovation and Competitiveness Fund that would be used to invest in diversifying the Chilean economy away from extractive industries. This investment fund was designated to be administered by an independent agency, however, and the monies could still be used to reinvest in exploration for minerals, technological development in mineral extraction and processing, or other measures that might improve the competitiveness of the mining sector (table 2; Placer Dome Inc., 2005, p. 4; Rojas and others, 2006, p. 348-349, 363).

The Chilean Government, through the Ministerio de Minería, exercised control of the mineral industry through three large state-owned companies and four regulatory agencies. These state-run mining companies would not be subjected to the new mining tax and included Corporación Nacional del Cobre (CODELCO), some subsidiaries of Corporación de Fomento de la Producción (CORFO), and Empresa Nacional de Minería (ENAMI). The subsidiaries of CORFO that were important to the mineral industry included Cía. Chilena de Electricidad S.A., Cía. de Acero del Pacífico S.A. de Inversiones (CAP), Empresa Nacional del Carbón S.A. (ENACAR), and the state-owned oil company Empresa Nacional del Petróleo S.A. (ENAP). The four regulatory agencies were CIE, COCHILCO, the Comisión Nacional del Medio Ambiente (CONAMA), and the Servicio Nacional de Geología y Minería.

Structure of the Mineral Industry

In 2005, many of the world's leading private mining companies, which included Anglo American plc of the United Kingdom, Barrick Gold Corporation of Canada, BHP Billiton, Falconbridge Limited of Canada, Phelps Dodge Corporation of the United States, and Placer Dome Inc. of Canada, were deeply invested in the mineral industry of Chile. The effect of the new mining tax on investment was expected to be minimal as long as Chile maintains its global advantages in mineral reserves. Political uncertainty surrounding the Government debates over formulating and passing the mining royalty bill was often cited as at least a partial explanation of why foreign direct investment (FDI) by mining companies decreased to $350 million in 2004 from $392 million in 2003 and $2,003 million in 2002. FDI in the mining sector was estimated to have increased to $823 million in 2005; cost uncertainty, however, was of growing concern to both domestic and foreign investors in the mineral industry of Chile because of increasing energy costs and the shortages and of higher prices for mining equipment and machinery in 2005. In 2003, mining operational inputs, such as mining machinery, chemical reagents, and spare parts, accounted for about $1.24 billion of the approximate $5 billion in operating costs for the 17 leading copper mining companies in Chile. At that time, annual expenditures for these inputs alone by just those companies studied was expected to increase by $850 million by 2010. In 2005, however, total mining operational costs were already substantially higher than predicted just 2 years earlier. Shortages and higher-than-expected prices for equipment were expected to continue through at least 2007 because mining firms were expected to continue to produce as close to listed capacity as possible while mineral prices remain high (Valenzuela and Arias, 2005, p. 394-395; Minería Chilena, 2006a§, b§).

In 2005, COCHILCO estimated that total private investment in copper mining, smelting, and refining, which totaled $1,353 million, greatly exceeded state-sponsored investment through CODELCO, which totaled $727 million, but that CODELCO would increase its share of investment in the sector to about 78% by 2007. COCHILCO also projected that CODELCO would have to maintain this higher proportion of the total annual investment in the sector through at least 2010. In 2006, COCHILCO expected that private firms would invest a total of about $1,200 million in the copper sector, of which about $1,100 million would be invested by Antofagasta plc of the United Kingdom and BHP Billiton, and CODELCO would invest about $810 million. COCHILCO expected that CODELCO would increase investment in this sector of the mineral industry to about $1,750 million in 2007, and that private investors would invest only about $500 million (Vidal, 2006a, p. 15-16; 2006b, p. 14).

On October 31, 2005, Barrick announced its bid to acquire Placer Dome and completed the acquisition on March 8, 2006. Barrick acquired a 100% ownership interest in the Zaldivar copper mine as a result of this acquisition. The acquisition agreement was contingent on the subsequent sale of Placer Dome's interest (50%) in La Coipa gold and silver mine together with some other ownership interests of Placer Dome outside of Chile to Goldcorp Inc. Barrick named this the "Goldcorp Transaction" and planned to complete it by the end of the second quarter of 2006. Assuming completion of this ancillary transaction, Barrick was expected to enter the mineral industry of Chile as a relatively minor copper producer; Goldcorp, on the other hand, would enter the mineral industry with a noncontrolling 50% ownership interest in the leading producing gold mine in the country (table 2; Barrick Gold Corporation, 2006, p. 12-13).

The Chilean company Sociedad Química y Minera de Chile S.A. (SQM) was the world leader in the production of iodine, lithium carbonate (not contained in spodumene), and potassium nitrate. On December 23, 2004, the company acquired PCS Yumbes S.C.M. (a subsidiary of Potash Corporation of Saskatchewan Inc., of Saskatoon, Saskatchewan, Canada), but did not continue to operate the Yumbes Mine during 2005. Instead, the company expected to relocate at least some of the Yumbes facilities from about 90 miles south of Antofagasta in Region II to become part of the Coya Sur plant in the northern part of Region II and of the Nueva Victoria facilities in Region I. This restructuring was expected to help expand SQM's total production of nitrates by 25% in 2006. In 2005, PCS Yumbes S.C.M. changed its name to SQM Industrial S.A. SQM completed a project to increase the company's capacity to produce lithium carbonate at its facility located at Salar del Carmen to about 33,000 metric tons per year (t/yr) compared with approximately 28,000 t/yr at the end of 2004; another project which was started at the end of 2005, would increase the company's capacity to produce lithium carbonate to 40,000 t/yr by 2008. The company also neared completion of a project to increase annual production of iodine to about 3,500 t/yr compared with 2,200 t in 2005 at its Nueva Victoria facility; the expansion was expected to be completed during the first half of 2006. In 2005, SQM's project to expand and modernize its María Elena facilities included beginning replacement of the crushing circuit and development of a new mining area there; the company expected to complete this project by sometime in 2006 (tables 2, 3; Sociedad Química y Minera de Chile S.A., 2006, p. 13, 20, 37, 46, 51).

Exploration

Until at least 2009, BHP Billiton's Spence copper project appears to be the last significant new copper mine that will achieve production. The mine and solvent-extraction/electrowinning (SX-EW) plant is expected to produce about 200,000 t/yr of copper cathodes beginning at the end of 2006. The only other new mine expected to achieve production before 2010 was CODELCO's and Minmetals Non-Ferrous Metals Co. Ltd.'s Gaby project, which was expected to produce about 150,000 t/yr of copper cathodes if it is approved. Development of other copper deposits that had already been discovered by 2005 was still very uncertain owing to various difficulties associated with lower copper grades in the ores, increasing amounts of impurities and hazardous materials in the deposits, and the increasing depth necessary to exploit the deposits. Through 2005, such technical difficulties were expected to continue to become more problematic in Chile because exploration had not resulted in any new discoveries of higher-

grade copper deposits that were close to the surface, which had formed the basis of the development of the Chilean copper sector into the world's leading producer (table 3; Rojas and others, 2006, p. 349; Vidal, 2006b, p. 7-9, 13).

Although Barrick did not expect to have any share in gold mine production in Chile in 2006, it did obtain environmental approval for its Pascua-Lama gold project from the Chilean Government in the form of a resolution concerning the company's environmental impact assessment, which was issued to the company on February 17, 2006. The project straddles the Chilean border with Argentina, however, and Barrick had not yet received environmental approval from the Government of Argentina through the first quarter of 2006. Barrick still expected to be allowed to proceed with the project and projected that the proposed mine would produce about 2,400 kilograms per year (kg/yr) of gold, on average, during the first 10 years of production. The company expected to start production at Pascua-Lama sometime in 2010 after extensive preparation of the mine site is accomplished, including moving a portion of the glaciers that cover a portion of the mine site. On October 26, 2005, Placer Dome agreed to sell its 51% share in the Cerro Casale gold project to the company's partners in the joint venture, Bema Gold Corporation and Arizona Star Resource Corp. (both of Canada), but Barrick had not completed this sale by the end of 2005. Further exploration at the Cerro Casale project was expected to remain on hold until resolution of this issue between the companies involved (Barrick Gold Corporation, 2006, p. 13, 24, 47, 52-55; Bema Gold Corporation, 2006, p. 11)

Production

Although mine output of copper decreased in 2005 compared with that of 2004, the complexity of the copper ores increased, and more associated metals in the ores were extracted in proportion to the copper, including gold, molybdenum, rhenium, and silver. Mine production of gold did not change much during this timeframe, and about 41% of the total mine production of gold was extracted from copper concentrates in both 2004 and 2005. Mine production of silver, however, increased significantly, primarily because of greater extraction of silver from copper concentrates. In 2005, 61% (857 t) of the total silver content of mine production in Chile was extracted from copper concentrates compared with only 55% (747 t) of total silver production in 2004. A greater proportion of molybdenum relative to copper was also extracted per metric ton of ore mined by the three existing molybdenum producers during this same timeframe, and two new operations were started in 2005 to extract molybdenum from primarily copper ores at existing copper mines. These developments were mainly in response to the increase in the average annual price of molybdenum from $11.75 per kilogram in 2003 to $70.68 per kilogram in 2005. By 2005, some companies had also installed additional molybdenum roasting capacity to allow greater production of rhenium and other byproducts, such as ferromolybdenum and molybdenum oxide, compared with levels of production in 2004 (table 1; Servicio Nacional de Geología y Minería, 2005, p. 40, 56; 2006, p. 55, 59; Comisión Chilena del Cobre, 2007, p. 5, 21; Magyar, 2007a).

In 2005, mine production of manganese and zinc increased as mines operated near capacity to take advantage of higher prices compared with those of 2004, but mine production of lead contained in gold and zinc concentrates decreased substantially. All mine production of lead in Chile was through extraction of lead from gold and zinc concentrates that were produced in Region XI of the country. In 2005, the amount of lead extracted from gold concentrates was 579 t compared with 1,777 t in 2004, and from zinc concentrates, it was 299 t compared with 509 t. The precipitous decrease in the production of lead from gold concentrates was partially explained by the decrease in production of gold concentrates in Region XI to 12,654 t compared with 15,596 t in 2004 and also by the lower lead content per metric ton of gold concentrate. The production of zinc concentrates in Region XI increased to 56,552 t compared with 53,804 t, but the lead content of these concentrates also decreased during the same timeframe. In 2005, the annual average price of iron ore increased to about $44.50 compared with about $32.30 in 2003, but production of iron contained in the beneficiated (marketable) ore and concentrates continued to decrease as the average grade of iron in the mined ore continued to decrease (table 1; Servicio Nacional de Geología y Minería, 2005, p. 47, 66, 69; 2006, p. 57, 60-63; Compañía Minera del Pacífico S.A., 2006, p. 5-6, 14; Jorgenson, 2007).

In 2005, production of industrial minerals from caliche ore deposits in Regions I and II and from the brines and saline crusts of the Andean salars mostly decreased compared with that of 2004, including a 48.6% decrease in production of sodium sulfate, a 22.5% decrease in national production of ulexite (a boron compound), and an 8.5% decrease in total production of nitrates (both potassium and sodium nitrates). A slight increase of 2.8% in the production of iodine took place, however, mostly because SQM expanded the iodine production capacity at the company's Nueva Victoria facility. Total production of cement increased by 5.3% mostly owing to completion of capacity expansion projects in 2005 by the Chilean company Cementos Bío Bío S.A. in response to increasing domestic demand. National production of coal increased by more than 200% in 2005 compared with that of 2004 because production of coal (all types) increased to 594,309 t compared with 98,120 t in Region XII (Magallanes) (table 1; Cementos Bío Bío S.A., 2006, p. 5; Servicio Nacional de Geología y Minería, 2006, p. 80-88, 92, 108, 112, 115; Sociedad Química y Minera de Chile S.A., 2006, p. 13).

Trade

In 2005, the value of total copper exports was slightly less than $17.7 billion, which accounted for about 79% of total mining exports and 45% of total Chilean exports. Although the value of copper exports increased by about 22% compared with that of 2004, the annual quantity of copper exported decreased by 2.7% [to 5.3 million metric tons (Mt)] in 2005. The mineral trade balance as reported by the Central Bank of Chile (and excluding mineral fuels) was $21.5 billion. The value of Chilean imports of petroleum, natural gas, and their derivatives was $6.2 billion. Chile imported only $891 million of mine production (metals and industrial minerals), and exported almost no mineral fuels other than about $613 million of methanol. Also,

mining operations consumed about 32% of the total electricity provided in Chile during the year, including that generated by hydropower. Mining operations in Chile imported $5.5 billion in goods, which included mining machinery, chemical reagents, and spare parts; this total represented an increase of about 38% compared with that of 2004, which in turn was 43% higher than that of 2003. Most of these imported inputs into the mining sector were not included in the mineral trade balance given above except for some unknown proportion of the expenditures on imports of chemical reagents that were mined outside of the country (Banco Central de Chile, 2006a, p. 37; 2006b, p. 44, 46; Comisión Chilena del Cobre, 2006, p. 22-23, 101, International Monetary Fund, 2006§).

In 2005, China was the leading customer for Chilean copper and imported enough to account for 19.6% of the total value of the country's copper exports. The leading importer of ferromolybdenum was the Netherlands (53.3%); Chilean gold was the United States (55.1%); iron ore was Indonesia (22.6%); molybdenum concentrates was again the Netherlands (44.5%); molybdenum oxide was Japan (46.8%); silver was again the United States (41.7%); and zinc was North Korea (35.7%). The leading importers for Chile's main industrial mineral exports were Belgium for lithium carbonate (22.3% share of Chile's total exports, by value) and iodine (33.3%), Brazil for potassium nitrate (80.9%), and the United States for sodium nitrate (39.4%). By value, the countries of Asia purchased about 48.7% of Chile's total exports of metals; Europe, 28.4%; the Western Hemisphere, 21.8%; and other countries, including Australia and South Africa most prominently, the remainder. Combined, the countries of the Western Hemisphere were the leading purchasers of Chilean exports of industrial minerals, with a 51.8% share; Europe, 23.5%; Asia, 20.9%; and other countries, the remainder (Comisión Chilena del Cobre, 2006, p. 24-26).

In 2005, Chile signed a bilateral free trade agreement with China. As a result of this agreement, China was expected to increase exports of appliances and electronics to Chile, and Chile was expected to export even more copper concentrate to China, as well as more fish, fruit, and wood pulp. The value of total bilateral trade in goods between the two countries was expected to increase by about 30% in 2005 compared with that of 2004, after already increasing by about 42% in 2004 compared with that of 2003 (British Chilean Chamber of Commerce, 2005). Chile's total exports of copper to China increased in value by 28% in 2005 compared with that of 2004, after increasing by only 9.4% in 2004 compared with that of 2003. In terms of metric tons exported, however, Chile's exports of copper to China increased by only 10% in 2005 compared with that of 2004, and by about 19% in 2004 compared with that of 2003 (Comisión Chilena del Cobre, 2006, p. 35, 37).

Commodity Review

Metals

Copper.—On a national level, investment was increasingly directed more into research and development of technologies that might enable development of already discovered copper deposits to be less costly than those in other countries, despite higher labor costs, and proportionally less was directed into exploration for new copper deposits. After 2006, more Government funding for this type of research may come from revenues generated by the new mining-specific tax. In 2005, CODELCO invested in alternative technologies that included a solution-based method for extracting arsenic from the ores of the proposed Ministro Alejandro Hales Mine and still allow the ore to be smelted using its existing conventional smelting methods. Progress in such technological research was expected to become increasingly responsible for the pace of development of copper mine production capacity relative to investment in exploration and the rate of new discoveries of copper deposits in Chile (Corporación Nacional del Cobre, 2006, p. 7, 16, 38, 42, 44-47; Rojas and others, 2006, p. 349; Vidal, 2006b, p. 3-5, 7).

In 2005, CODELCO continued negotiations on a 15-year contract to sell 55,750 t/yr of fine copper to China for a payment of $550 million (up front) by Minmetals and price balances on each shipment to be determined according to the spot price of copper at the time of delivery. This agreement was expected to be ratified in early 2006, and Minmetals' option to buy into a minority share of CODELCO's Gaby copper project was ratified in 2005. Both of these agreements could help increase investment and speed up development of additional copper production capacity (at least partially targeted for the Chinese market), but CODELCO had still not approved the Gaby project for development through to production as of the end of the first quarter of 2006 (table 3; Corporación Nacional del Cobre, 2006, p. 21, 30, 43, 103).

In 2005, Chilean copper reserves were increasing in arsenic content and complexity of chemical makeup, and decreasing in copper content per ton of ore. According to SQM, Chilean environmental regulations have become increasingly stringent in recent years, both with respect to the approval of new mining projects and with respect to regulating the implementation and development of projects already approved. If this trend continues, then mining and processing costs are going to steadily increase in all Chilean mining sectors independent of other operating costs related to energy, labor, and the costs of purchasing and maintaining mining equipment. Although the sunk costs for investment in research and development of more modern methods to extract and process increasingly complex ores have been high and research was ongoing in 2005, more new copper mining development projects in Chile were being designed to better use such technologies as bioleaching. Prominent projects that were budgeted, ongoing, or completed in 2005 and that would rely on bioleaching to improve cost-effectiveness with low-grade and chemically complex ores were the new Escondida concentration plant, to process material from the Escondida and the Escondida Norte pits that was otherwise too costly to process; the Alliance concentration plant, to process low-grade ores from the Chuquicamata Mine; and the Ministro Alejandro Hales Mine and concentration plant, which was to be located so as to be essentially an extension of the Chuquicamata Mine but with higher arsenic content in the ores. In 2005, CODELCO was bioleaching some copper ore at pilot plants in its CODELCO Norte and Andina divisions, and Escondida was also employing bioleaching and bio-oxidation technology. In 2001, 13 mining companies were already using

some bioleaching in Chile, and about 10% of total copper production in the country used bioleaching (table 3; Corporación Nacional del Cobre, 2006, p. 7, 42, 44-45; Minera Escondida Limitada, 2006, p. 43; Sociedad Química y Minera de Chile S.A., 2006, p. 8-9; Vidal, 2006b, p. 9, 15; Dresher, 2004§).

Iron and Steel.—In 2005, the Chilean company Compañía Minera del Pacífico S.A. (CMP) accounted for about 90% of the total gross weight of iron ore mined in Chile, and production by the company decreased to 7,217 t of ore compared with 7,437 t in 2004. CMP continued to invest in exploration during the year and focused its efforts on exploring the property that immediately surrounded its active mines. As a result of this exploration and higher prices for iron ore, proven higher-grade reserves of iron ore at El Romeral Mine increased to about 45 Mt at an average grade of about 45% iron content compared with about 18 Mt at a grade of about 47% in 2004, but lower-grade reserves at the mine decreased to about 70 Mt at an average grade of 26% compared with 73 Mt at a grade of 26% during the same timeframe. The amount of ore extracted at El Romeral decreased in 2005, however, to 1,879 t compared with 2,172 t in 2004. The company extracted 5,338 t compared with 5,265 t of ore during the same timeframe at its El Algarrobo Mine, but this caused a depletion of proven reserves to 5.5 Mt compared with 7.7 Mt in 2004 despite exploration efforts at El Algarrobo and annual average price increases for iron ore in 2004 and 2005. Production of crude steel decreased only slightly during this timeframe compared with that of iron ore, but the country still imported $853 million worth of iron and steel manufactures in 2005 compared with $698 million in 2004 to help meet its consumption requirements (Compañía Minera del Pacífico S.A., 2005, p. 10, 14-16; 2006, p. 5-6, 8, 14, 18-20; Banco Central de Chile, 2006b, p. 77; Jorgenson, 2007).

Lead, Silver, and Zinc.—In 2005, Breakwater Resources Ltd. of Toronto, Ontario, Canada, accounted for about 94% of the total mine production of zinc in Chile through production at the company's El Toqui Mine. Total tonnage of ore milled during the year by the company at El Toqui increased by about 11% compared with that of 2004 partially owing to improvements in the mill's grinding circuit made in 2004, but production of zinc contained in concentrate at the mine increased by only about 4% during the same timeframe. Breakwater mined lower zinc grades in the parts of El Toqui that were already being mined, and the company experienced delays in further developing the Estatuas area of the mine. Because the Estatuas deposit is more highly faulted and difficult to mine than Breakwater expected and development of the new Concordia deposit at El Toqui was not expected to be completed until sometime in 2007, the company expected to produce only about 24,000 t of zinc in concentrate in 2006 compared with 28,347 t in 2005 (Breakwater Resources Ltd., 2006, p. 6-7, 18, 22).

Table 1 lists production of refined silver metal (granular) only from the Ventanas smelter and refinery in Puchuncavi, Region V, which was acquired by CODELCO from ENAMI in May 2005 and renamed the Ventanas Division of CODELCO. Production of refined silver at Ventanas increased substantially during the year compared with that of 2004. ENAMI retained the Hernán Videla Lira smelter and refinery in Paipote and continued to produce refined silver. Reliable data on total annual production in Chile was not publicly available at the time of this writing, but the country exported 511 t of refined silver metal in 2005. Annual Chilean exports of refined silver have decreased every year since 2001, when the country exported about 682 t (Comisión Chilena del Cobre, 2006, p. 23; Corporación Nacional del Cobre, 2006§).

Although the annual average price of lead increased by about 10% in 2005 compared with that of 2004, mine production of lead in Chile decreased substantially during the same timeframe. SERNAGEOMIN reported that Breakwater was the only producer of mined lead in the country; the company extracted the lead from the gold and zinc concentrates produced at El Toqui Mine. The company reported that the amount of gold in concentrates produced at the mine increased to about 1,300 kilograms (kg) in 2005 compared with about 870 kg in 2004 because of higher quantities of gold produced out of the Aserradero gold skarn deposit. During the last quarter of 2005, however, gold grades and total production of ore both decreased. The two deposits under development during 2005 by Breakwater at El Toqui (Estatuas and Concordia) were estimated to contain little or no gold. The company estimated an indicated and inferred mineral resource of 1.87 Mt at Concordia, at grades of 10.2% zinc, 5.1% lead, and 68 grams per metric ton of silver (table 1; Servicio Nacional de Geología y Minería, 2005, p. 67; 2006, p. 62; Breakwater Resources Ltd., 2006, p. 6-7, 18, 22).

Manganese.—The principal producer of manganese in Chile was Manganesos Atacama S.A.; this company was a subsidiary within the family of subsidiaries of CAP S.A. that also included CMP. Initiation of operations at Manganesos Atacama's Socavón Marquesa concentration plant in 2005 was primarily responsible for the substantial increase in the mine production of manganese compared with that of 2004 in Chile. This plant was constructed to process the ore from the Loma Negra Mine, which has a mean grade of 12% Mn content, and enabled the company to extract manganese at a greater rate from the ores mined at Loma Negra (CAP S.A., 2006, p. 27, 97-102).

Molybdenum and Rhenium.—In 2005, mine production of molybdenum in Chile was entirely as a byproduct of existing copper mines, but a new facility to extract molybdenum from copper ores for the first time was completed by Compañía Minera Doña Inés de Collahuasi SCM at the company's copper mine and another plant to extract molybdenum from tailings generated by CODELCO's El Teniente copper mine and concentration plant was completed by Mineral Valle Central S.A. In 2005, these new facilities accounted for only 349 t and 293 t of molybdenum production, respectively. The leading producer of molybdenum in Chile was CODELCO, which increased production to 36,566 t of Mo content compared with 32,324 t in 2004. The second-ranked producer was Los Pelambres Mine, which produced 8,710 t of molybdenum compared with 7,853 t in 2004, and the third-ranked producer was the Los Bronces Mine, which produced 2,123 t compared with 1,706 t in 2004. Molibdenos y Metales S.A. (Molymet) increased its molybdenum roasting capacity to an estimated 24,600 t/yr of fine molybdenum content in 2005 compared with about 21,300 t/yr in 2004, but Molymet did not control any mine production of molybdenum in Chile. Annually, some undisclosed proportion of Molymet's production of

molybdenum and rhenium products in Chile originates from imports of concentrate into the country, so it is unclear exactly how much of the increase in rhenium production in 2005 was a direct result of the increase in mine production of molybdenum in Chile. In 2005, both Antofagasta plc and CODELCO exported molybdenum concentrate directly and also supplied concentrate to Molymet to be processed in Chile (Comisión Chilena del Cobre, 2007, p. 19, 21-22).

The annual average price of molybdenum contained in oxide increased to $36.73 per kilogram in 2004 from $11.75 in 2003, and it increased again to $70.68 per kilogram in 2005. In response to an increase in the average annual molybdenum price relative to that of copper, Antofagasta increased production of molybdenum and lowered production of copper through a selective mining strategy at Los Pelambres Mine. Both molybdenum grades and recovery rates increased for the ores mined at Los Pelambres compared with those of 2004, and copper grades of the ores decreased during the same timeframe. In a similar manner, CODELCO increased production of molybdenum in all its wholly owned mining divisions during 2005; the CODELCO Norte Division accounted for 73.4% of CODELCO's total production of molybdenum in 2005. After construction of the molybdenum flotation plant at the Collahuasi Mine was completed in November 2005, Anglo American and Falconbridge expected it to be able to produce between 5,000 t/yr and 8,000 t/yr, depending on the grade of molybdenum in the ore being fed into the plant. Anglo American was also responsible for expanding the total production capacity (including of molybdenum) at its wholly owned Los Bronces Mine. This expansion was expected to be completed by 2007 (Anglo American plc, 2006, p. 9; Antofagasta plc, 2006, p. 4-7, 18, 40; Corporación Nacional del Cobre, 2006, p. 26; Comisión Chilena del Cobre, 2007, p. 21; Magyar, 2007b).

Industrial Minerals

Boron and Lithium.—Boron products, such as boric acid and ulexite, and lithium carbonate are produced mostly from brines extracted from underground deposits in a salt-encrusted depression called the Atacama Salar, which is located within the Atacama Desert in northern Chile. These brines contain reserves of boron, lithium, potassium, and sulfates, which were processed to produce various industrial mineral commodities that included boric acid, lithium carbonate, lithium hydroxide, potassium chloride, and potassium sulfate. Most of the boron was left in its natural form, as ulexite, and then used in the production of specialty fertilizers rather than processed to produce boric acid. Although Chile has other salars, most of the country's production of these minerals comes from the Atacama Salar, which is controlled by SQM. The company's production of most of these commodities decreased in 2005, especially production of ulexite. SQM increased production of natural boric acid from the brines of the Atacama Salar, but produced much less ulexite during the same timeframe. Boron that was left as ulexite was mined mostly from another salar called the Salar de Ascotan and then processed in a boron processing facility located at the Salar del Carmen, which was near the company's lithium processing facility and the city of Antofagasta. The Atacama Salar is located about 250 km east of Antofagasta. Considering only company reserves in the Atacama Salar brines, SQM increased its reserves of boron to 1.1 Mt in 2005 compared with 0.7 Mt in 2004; the company's reserves of lithium increased slightly to 2 Mt compared with 1.9 Mt during the same timeframe (table 1; Sociedad Química y Minera de Chile S.A., 2006, p. 14, 20-21, 43).

Clay and Shale.—Prior to 2005, SERNAGEOMIN reported clay production in only three major categories. The first category included only bentonite; the second included kaolin (approximately 40% alumina content) and bauxitic (alumina content above 65%) clays; and the third included plastic (and other ball-type) clays, common clays, and other unspecified clays. These broad categories have been maintained in table 1 for this chapter, but a breakdown of the broader categories for production of clays in 2005 was provided by SERNAGEOMIN to reorganize the Government agency's reporting of production levels in Chile compared with previous years. In 2005, Chile reportedly produced 54,301 t of plastic and other ball-type clays, 35,271 t of bauxitic clays, and 15,183 t of kaolin. SERNAGEOMIN did not list any reported production of bentonite or of any common clay during the year. All production of bentonite in the country was reportedly by a single producer in Region I of the country, but reliable information concerning the company's actual level of production of bentonite in 2005 was not available at the time of this writing (Servicio Nacional de Geología y Minería, 2006, p. 67-71).

Iodine, Nitrates, and Sodium Sulfate.—In Chile, iodine, nitrates, and sodium sulfate are produced mostly from open pit mining of the caliche ore deposits that are located in northern Chile. These deposits are typically only 0.5 to 1.5 meters below the surface. In 2005, production levels of iodine and nitrates in the country were significantly higher than those of 2004; the production of sodium sulfate decreased substantially during this timeframe, however. The relative changes in these production levels were caused primarily by SQM temporarily halting most of the company's extraction of sodium sulfate from the caliche ores mined at SQM's wholly owned Pedro de Valdivia and María Elena Mines, owing to a company decision to give the production of nitrates (and iodine) priority with respect to the production of sodium sulfate during the year. SQM produced sodium nitrate at plants located at both the Pedro de Valdivia and María Elena Mines, while most of the company's capacity to produce potassium nitrate and sodium sulfate were through different processes at the separate Coya Sur plant. SQM produced iodine at plants located at the company's Nueva Victoria and Pedro de Valdivia Mines from ores mined at these two mines and at SQM's two other caliche ore mines, María Elena and Pampa Blanca. The company's combined proven reserves of iodine and nitrates in the caliche ore at the Pedro de Valdivia Mine increased to 144 Mt in 2005 compared with about 142 Mt in 2004, but proven reserves decreased to about 147 Mt compared with 154 Mt at the María Elena Mine. In 2005, proven reserves of caliche ore also increased to about 95 Mt compared with about 37 Mt in 2004 at the Nueva Victoria Mine and to about 81 Mt compared with about 65 Mt at the Pampa Blanca Mine (table 1; Sociedad Química y Minera de Chile S.A., 2006, p. 17-19, 39).

Mineral Fuels

Coal.—In 2005, although ENACAR was beginning to make plans to close its Trongol Mine and total production of coal (all types) decreased slightly to 138,000 t compared with 140,000 t in 2004 in Region VIII of Chile, production of coal in the Magallanes region (Region XII) increased to about 594,000 t compared with about 98,000 t during this timeframe. This dramatic increase in production (although still small in scale relative to most other coal mining operations in Latin America) was primarily owing to increased production after expansion of infrastructure and coal mining activities by Ingenieria del Sur S.A. (Ingesur) in the area surrounding the company's Pecket Mine and reported development of an unnamed coal mine by Chabunco S.A. in the northern sector of Punta Arenas in Magallanes. Investment in exploration for coal in Magallanes also increased during the year. Ingesur continued its exploration and expansion efforts at the Pecket Mine and Chabunco S.A. continued to develop a mine in Punta Arenas. BHP Billiton acquired at least one exploration concession on the island of Isla Riesco and had entered bids in auctions for at least one other coal mining exploration concession on the island. Management of these auctions and all of the coal exploration and exploitation concessions in Magallanes was being conducted by CORFO (table 2; Servicio Nacional de Geología y Minería, 2006, p. 115; La Prensa Austral, 2006§; Compañía Carbonífera San Pedro de Catamutún, undated§).

Natural Gas.—The increasing interest in developing coal reserves in Chile was partly a reaction to continued restrictions on natural gas exports out of Argentina. By 2005, however, Chile had already converted much of its electricity generation capacity to be based on gas-fired plants and did not expect to make another large-scale conversion to coal-burning plants. During 2005, the Government instead promoted plans to develop cross-border pipelines that might provide the country with a secure supply of natural gas from other South American countries. The design of this natural gas pipeline network was most commonly proposed as a gigantic ring around Bolivia, which has not been willing to agree to a new natural gas supply arrangement with Chile. Such a design to circumvent Bolivia was also reportedly growing in popularity with the Governments of some other countries in South America as perceived uncertainty concerning Bolivian natural gas supplies grew during the year. Without the inclusion of Bolivia in the plans for an integrated South American gas network of pipelines, the surplus supply among other South American producers did not appear to be sufficient to satisfy projected Chilean consumption levels (Petroleum Economist, 2006; U.S. Energy Information Administration, 2006)

Outlook

Increasing operating costs combined with expected implementation of the new mining royalty in 2006 could deter investment in exploration and development of new copper deposits by private companies through at least 2010. Private companies are expected to invest in cost-effective technologies to process the more-complex ores during this same timeframe. State-run CODELCO, however, is expected to account for the bulk of both types of mining investment through 2012 in Chile. If high prices for copper are maintained and sufficient technological developments for more cost-effective mining of low-grade high-impurity copper deposits are forthcoming, then Chile's world leading reserves of copper are expected eventually to again attract substantial private and foreign direct investment to the country's copper sector. Although many copper deposits had already been discovered by 2005, these projects were still mostly in the conceptual stages and reliable timelines for their development have not been established.

On a macroeconomic level, the Government expects to continue to have large budget surpluses based mostly on revenues from the copper mining sector. The most pressing mineral industrial issue is considered to be the establishment of a secure supply of mineral fuels (especially natural gas) into Chile to help continue economic development in the country. The outlook for a substantial domestic discovery or development of mineral fuel production capacity or for establishing a network of pipelines to import sufficient quantities of natural gas from other countries in South America does not appear very likely for the next 5 years.

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TABLE 1
CHILE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2001	2002	2003	2004	2005
METALS						
Arsenic trioxide[e]		11,500	11,400	11,600	11,500 r	11,700
Copper:						
Mine output, Cu content[3]	thousand metric tons	4,739	4,581	4,904	5,413	5,321
Metal:						
Smelter, primary	do.	1,503	1,439	1,542	1,518 r	1,558
Refined:						
Electrowon	do.	1,538	1,602	1,653	1,636	1,585 p
Primary, other	do.	1,344	1,248	1,249	1,201 r	1,239 p
Total	do.	2,882	2,850	2,902	2,837 r	2,824 p
Gold, mine output, Au content	kilograms	42,673	38,688	38,954	39,986	40,447
Iron and steel:						
Ore and concentrate:						
Gross weight	thousand metric tons	8,834	7,269	8,011	8,004 r	7,862
Fe content	do.	5,437	4,398	4,865	4,850	4,707
Metal:						
Pig iron	do.	897	934	988	1,137	1,099 p
Ferroalloys:						
Ferromanganese		2,213	--	--	--	--
Ferromolybdenum[e]		1,740	3,160	4,070	5,760	6,200
Total[e]		3,950	3,160	4,070	5,760	5,760
Steel, crude	thousand metric tons	1,247	1,280	1,377	1,579	1,534 p
Semimanufactures	do.	1,067	1,150	1,197	1,356 r	1,330 e
Lead, mine output, Pb content		1,193	2,895	1,697	2,286	878
Manganese ore and concentrate:						
Gross weight		31,320	12,195	19,641	25,801	39,786
Mn content		9,129 r	3,190	5,824	7,188	12,324
Molybdenum:						
Mine output, Mo content		33,492	29,466	33,375	41,883	47,748
Oxides		8,813	7,716	5,398	8,339	8,971
Rhenium, mine output, Re content[e, 4]	kilograms	16,000 r	15,400 [5]	16,000 r	18,900 r	21,500
Selenium[e]	do.	84,000	80,000	83,000	82,000	84,000
Silver:						
Mine output, Ag content		1,349	1,210	1,313	1,360	1,400
Metal, Ag content	kilograms	185,375 r	194,251 r	185,375 r	158,678 r	171,445
Zinc, mine output, Zn content		32,762	36,161	33,051	27,635	28,841
INDUSTRIAL MINERALS						
Barite		584	384	229	31	91
Boron compounds:						
Boric acid (H_3BO_3)		9,644	9,000	8,690	8,545	8,774
Ulexite, natural		327,743	431,293	400,603	594,191	460,683
Total		337,387	440,293	409,293	602,736	469,457
Cement, hydraulic	thousand metric tons	3,513	3,461	3,622	3,798	3,999
Clays:						
Bentonite		1,695	632	748	101	-- e
Kaolin		5,300	6,164	11,500	7,133 r	15,183
Other, including plastic and refractory clays		28,330	35,091	51,622	94,886 r	89,572
Total		35,325	41,887	63,870	102,120	105,000 e
Diatomite		22,705	30,274	25,594	30,015	27,091
Dolomite		29,940	31,439	17,308	27,436	24,903
Feldspar		2,867	3,069	6,690	4,838	5,820
Gypsum:						
Crude	thousand metric tons	517	610	662	630	661
Calcined	do.	175	229	190	304	310
Iodine, elemental		11,355	11,648	15,580 r	14,931	15,346
Lime, hydraulic	thousand metric tons	245 r	212 r	274 r	361 r	409

See footnotes at end of table.

TABLE 1--Continued
CHILE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2001	2002	2003	2004	2005
INDUSTRIAL MINERALS--Continued						
Lithium carbonate		31,320	35,242	41,667	43,971	43,595
Nitrates, crude, natural	thousand metric tons	1,072	1,174	1,134	1,402	1,283
Phosphate rock (apatite):						
Gross weight		11,511	11,066	9,389	11,695	10,311
P_2O_5 content		3,589	3,411	2,894	3,604	3,178
Phosphorite		7,466	8,475	11,911	9,770	10,052
Potash, natural:						
Potassium chloride, KCl		747,839	770,599	764,065	742,709	733,814
Of which, K_2O equivalent[6]		472,400	486,800	482,700	469,200	463,600
Potassium sulfate, K_2SO_4		170,418	173,209	157,174	177,325	162,102
Of which, K_2O equivalent[e,7]		87,000	88,000	80,000	90,000	83,000
Pozzolan, including pumice	thousand metric tons	785	826	1,242 r	1,535 r	1,620
Pyrophyllite[8]		3,385	2,974	3,534	2,271	3,315
Quartz, common	thousand metric tons	538	879	765	1,085	1,151
Salt (NaCl)	do.	5,989	3,503	6,213	4,939	6,068
Siliceous sand and gravel (silica):						
Quartz, common	do.	467	420	428	453	589
Silica sand	do.	71	459	487	632	562
Total	do.	538	879	916 r	1,085	1,151
Sodium compounds, n.e.s., sulfate[9]		67,760	70,776	44,011	30,622	15,730
Stone:						
Limestone, calcium carbonate	thousand metric tons	5,563	5,888	5,905 r	6,516 r	6,783
Lapis lazuli		-- e	-- e	129	43	130
Marble		782	633	828	845	31
Travertine[e]		--	--	--	--	4,680 5
Sulfur, byproduct, metallurgy	thousand metric tons	1,160	1,275	1,430	1,508 r	1,659
Talc		792 r	563 r	840 r	722 r	886
Zeolites		-- e	839 r	-- e	203 r	298
MINERAL FUELS AND RELATED MATERIALS						
Coal, bituminous and lignite, marketable	thousand metric tons	568	452 r	347	238	732
Coke, coke oven[e]	do.	500 5	440 5	400	400	400
Methanol	do.	2,784	2,932	2,704	2,692	2,700 e
Natural gas liquids:[e]						
Natural gasoline	thousand 42-gallon barrels	1,000	1,000	1,000	1,000	1,000
Liquefied natural gas	do.	2,500	2,500	2,500	2,500	2,500
Total	do.	3,500	3,500	3,500	3,500	3,500
Natural gas, marketable	million cubic meters	2,684	2,543	2,181	2,106	2,294
Petroleum:						
Crude and condensate[10]	do.	2,425	2,116	1,319	1,292	1,208
Refinery products:[11]						
Liquefied petroleum gas	do.	7,768	7,914	7,534	7,793	7,101
Gasoline:						
Aviation	do.	5,381	68	97	52	47
Motor	do.	17,808	18,396	19,712	20,809	19,720
Jet fuel	do.	5,852	5,054	4,641	5,416	4,875
Kerosene	do.	1,281	1,185	681	626	689
Distillate fuel oil	do.	29,295	29,345	30,297	27,658	26,282
Residual fuel oil	do.	10,207	9,210	12,332	13,581	15,421
Solvents	do.	409	428	375	336	281
Other, including asphalt, ethilene, naphtha, and so forth	do.	1,489	1,696	1,744	1,719	1,463
Total	do.	79,490	73,296	77,413	77,990 r	75,879

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [p]Preliminary. [r]Revised. -- Zero.

[1]Table includes data available through November 2006.

[2]In addition to the commodities listed, pyrite is also produced, but available information is inadequate to make reliable estimates of output.

TABLE 1--Continued
CHILE: PRODUCTION OF MINERAL COMMODITIES[1]

[3]Figures are the nonduplicate copper content of ore concentrates, blister and refined copper measured at the last stage of commercial production, as reported by Comisión Chilena del Cobre (COCHILCO). Mine production reported by Servicio Nacional de Geologia y Mineria (SERNAGEOMIN) for the same years was only slightly higher (0.01% to 0.95%).

[4]Rhenium content of mine output in Chile (whether processed in Chile or elsewhere) was estimated based on information from COCHILCO; the reported production figure for 2002 may include some rhenium content from Mexico processed at Molibdenos y Metales S.A. in Chile.

[5]Reported figure.

[6]Based on 63.17% potassium oxide equivalent for potassium chloride in Chile, as reported by SERNAGEOMIN, and rounded to four significant digits.

[7]Based on an assumed 51% potassium oxide equivalent for potassium sulfate, according to a minimum global average estimate (Kostick, D.S., 2006, Potash, in Metals and minerals: U.S. Geological Survey Minerals Yearbook 2005, v. I, p. 58.1) and rounded to two significant digits.

[8]Figures included as part of talc production in chapters prior to 2005.

[9]Includes production of natural sodium sulfate and anhydrous sodium sulfate, coproducts of the nitrate industry (salitre).

[10]Includes natural gasoline.

[11]Includes production from both imported and domestic petroleum, as reported by SERNAGEOMIN.

TABLE 2
CHILE: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement	thousand metric tons	Cemento Melón S.A. (Lafarge S.A., 82%, and other private, 18%)	La Calera plant, Region V	1,600.[e]
Do.	do.	Cemento Polpaico S.A. (Holcim Ltd., 54.3%; Compañía de Consumidores de Gas de Santiago, 40.9%; other private, 4.8%)	Cerro Blanco plant, Metropolitan Santiago Region; Mejillones plant, Region II; Coronel plant, Region VIII	2,700.
Do.	do.	Cementos Bío Bío S.A. (CEMEX S.A. de C.V., 11.9%, and other private, 88.1%)	Talcahuano Plant, Region VIII	750.
Do.	do.	Industria Nacional de Cemento S.A. (Cementos Bío Bío S.A., 100%)	Plants in Antofagasta City, Region II; Copiapo City, Region III; Curico City, Region VII	1,500.
Coal, bituminous and lignite	do.	Empresa Nacional del Carbón S.A. (ENACAR)	La Chulita and Trongol Mincs in Curanilahue, and plant in Lota, Region VIII	100.[e]
Do.	do.	Carbonífera Victoria de Lebu S.A. (Empresa Nacional del Carbón S.A., 99.99%, and other private 0.01%)	Victoria de Lebu Mine, Region VIII	85.[e]
Do.	do.	Ingenieria del Sur S.A. (Compañía Carbonífera San Pedro de Catamutún, 100%)	Pecket Mine (open pit), Magallanes, Region XII	1,100.
Copper		Corporación Nacional del Cobre de Chile (CODELCO) (Government, 100%)	Mining divisions and operating mines	1,740,000.
			Of which:	
			Andina Division, including Rio Blanco and Sur Sur Mines	240,000.
			CODELCO Norte Division, including Chuquicamata, Mina Sur, and Radomiro Tomic Mines	985,000.
			El Teniente Division and Mine	440,000.
			Salvador Division, including Inca, Campamento Antiguo, and Damiana Norte Mines	75,000.
Do.		do.	Smelters	960,000.
			Of which:	
			Chuquicamata (CODELCO Norte)	460,000.
			Las Ventanas (Ventanas Division)	400,000.
			Caletones (El Teniente)	360,000.
			Potrerillos (Salvador)	140,000.
Do.		do.	Refineries	815,000.
			Of which:	
			Chuquicamata (oxide)	600,000.
			Chuquicamata (sulfide)	85,000.
			Las Ventanas	365,000.
			Potrerillos	130,000.

See footnotes at end of table.

TABLE 2--Continued
CHILE: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Copper--Continued		Corporación Nacional del Cobre de Chile (CODELCO) (Government, 100%)	SX-EW plants[1]	217,000.
			Of which:	
			Chuquicamata (oxide)	130,000.
			El Teniente	2,000.
			Potrerillos (oxide and sulfide)	85,000.
Do.		Sociedad Contractual Minera El Abra [Phelps Dodge Corporation, 51%, and Corporación Nacional del Cobre de Chile (CODELCO), 49%]	El Abra Mine and SX-EW[1] plant, near Calama	250,000.
Do.		Compañía Minera Doña Inés de Collahuasi SCM (Anglo American plc, 44%; Falconbridge Limited, 44%; companies led by Mitsui & Co. Ltd., 12%)	Open pit mine, concentration plant, SX-EW[1] plant, at Ujina, Region I	515,000.[e]
Do.		Minera Sur Andes Ltda. (Anglo American plc, 100%)	Los Bronces Mine and Tortolas SX-EW[1] plant	240,000.
Do.		do.	El Soldado Mine	70,000.
Do.		do.	Chagres smelter (blister and anodes)	162,000.
Do.		Empresa Minera de Mantos Blancos S.A. (Anglo American plc, 99.9%, and other private, 0.1%)	Mantos Blancos open pit mine, SX-EW[1] plant, Region II	95,000.
Do.		do.	Mantoverde open pit mine, SX-EW[1] plant, Region III	60,000.
Do.		Minera Los Pelambres S.A. (Antofagasta plc, 60%, and Japanese consortia, 40%)	Los Pelambres open pit mine, 200 kilometers northeast of Santiago	360,000.
Do.		Minera El Tesoro S.A. (Antofagasta plc, 61%, and Equatorial Mining Ltd., 39%)	El Tesoro open pit mine and SX-EW[1] plant, near Chuquicamata and Calama	100,000.
Do.		Minera Michilla S.A. (Antofagasta plc, 74.2%, and other private Chilean investor, 25.8%)	Michilla Mine and SX-EW[1]/sulfide leaching plant, 1,500 kilometers north of Santiago	55,000.
Do.		Compañía Minera Quebrada Blanca (Aur Resources Inc., 76.5%, and Inversiones Mineras S.A., 13.5%)	Quebrada Blanca open pit mine, Region I	80,000.
Do.		Compañía Minera Carmen de Andacollo (Aur Resources Inc., 63%; Compañía Minera del Pacífico, 27%; Empresa Nacional de Minería, 10%)	Andacollo Mine, Region IV	22,000.
Do.		Compañía Minera Zaldívar (Placer Dome Inc., 100%)	Zaldívar open pit heap-leach mine, Region II	150,000.
Do.		Compañía Minera Falconbridge Lomas Bayas (Falconbridge Limited, 100%)	Lomas Bayas Mine and SX-EW[1] plant, Region II	65,000.
Do.		Noranda Chile S.A., Fundición Altonorte (Noranda Inc., 100%)	Altonorte smelter, La Negra, Region II	290,000.
Do.		Empresa Nacional de Minería (Government, 100%)	Hernán Videla Lira smelter (anodes and blister), Paipote, Region III	300,000.
Do.		Compañía Minera Cerro Colorado (BHP Billiton Plc, 100%)	Cerro Colorado Mine and SX-EW[1] plant	125,000.
Do.		Alliance Copper Ltd. (BHP Billiton Plc, 50%, and Corporación Nacional del Cobre de Chile, 50%)	Bioleaching plant to process copper from CODELCO Norte concentrates in Chuquicamata	20,000.
Copper, gold, silver	kilograms	Minera Escondida Ltd. (BHP Billiton Plc, 57.5%; Rio Tinto plc, 30%; Japan Escondida Corporation, 10%; International Finance Corp., 2.5%)	Escondida open pit mine, two concentrator plants and an oxide plant, for cathode production (SX-EW[1])	1,250,000 copper; 5,600 gold; 135,000 silver.
Do.	do.	Empresa Nacional de Minería (Government, 100%)	Manuel Antonio Matta plant, Paipote; Osvaldo Martínez plant, El Salado; Vallenar plant, Region III; and José Antonio Moreno plant, Taltal, Region II	22,000 copper; 400 gold; 6,000 silver.
Do.	do.	Cía. Contractual Minera Candelaria (Phelps Dodge Corporation, 80%, and SMMA Candelaria, Inc., 20%)	Candelaria open pit mine, underground mine, and concentration plant; Ojos del Salado Mine and concentration plant, near Copiapo	232,000 copper; 2,500 gold; 30,000 silver.
Gold, silver	do.	Cerro Bayo Ltda. (Coeur d'Alene Mines Corp., 100%)	Cerro Bayo Mine and concentration plant, Laguna Verde, Region XI	1,870 gold;[e] 154,000 silver.[e]
Do.	do.	Corporación Nacional del Cobre de Chile (Government, 100%) (gold and silver byproducts from copper)	Andina, CODELCO Norte, El Teniente, Salvador and Ventanas Divisions	8,000 gold; 490,000 silver.

See footnotes at end of table.

TABLE 2--Continued

CHILE: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Gold, silver--Continued	kilograms	Compañía Minera Mantos de Oro (Placer Dome Inc., 50%, and Kinross Gold Corporation, 50%)	La Coipa open pit mines, 140 kilometers north of Copiapo, Region III	5,700 gold; 230,000 silver.
Do.	do.	Compañía Minera Maricunga (Kinross Gold Corporation, 50%, and Bema Gold Corporation, 50%)	El Refugio open pit, beap-leach mine, 100 kilometers east of Copiapo, Region III	4,300 gold.
Iodine		SQM Químicos S.A. (Sociedad Química y Minera de Chile S.A., 100%)	Nueva Victoria mine and plant, Region I; María Elena, Pampa Blanca, and Pedro de Valdivia mines and plants, Region II	7,700.
Iron ore	thousand metric tons	Cía. Minera del Pacífico S.A. (subsidiary of CAP S.A.) (private, 100%)	El Algarrobo Mine, Region III; El Romeral Mine and El Tofo Mine, Region IV	10,500.
Do.	do.	do.	El Agarrobito, El Laco, El Romeral, Los Colorados, and Huasco concentration plants	14,000.
Do.	do.	Cía. Minera Huasco S.A. (Cía. Minera del Pacifico S.A., 50%, and MC Inversiones Ltda., 50%)	Huasco pellet plant, Region III	4,800.
Lime, hydraulic		Industria Nacional de Cemento S.A. (Cementos Bío Bío S.A., 100%)	Plants in Antofagasta City, Region II, and in Copiapo City, Region III	520,000.
Lithium carbonate		SQM Salar S.A. (subsidiary of Sociedad Química y Minera de Chile S.A.) (private, 100%)	Plant at Salar del Carmen, near the city of Antofagasta, Region II.	33,000.
Manganese		Manganesos Atacama S.A. (subsidiary of CAP S.A., 98.7%, and other private, 1.3%)	Plant in Coquimbo, Region IV	15,000.
Molybdenum		Corporación Nacional del Cobre de Chile (Government, 100%) (byproduct from copper)	Andina, CODELCO Norte, El Teniente, and Salvador Divisions	32,500.
Do.		Minera Los Pelambres S.A. (Antofagasta plc, 60%, and Japanese consortia, 40%)	Los Pelambres open pit mine, 200 kilometers northeast of Santiago	8,000.
Natural gas	million cubic meters	Empresa Nacional del Petróleo S.A. (subsidiary of Corporación de Fomento de la Producción) (Government, 100%)	Byproduct from 23 oilfields, including Costa Auera, in the Magallanes basin, Region XII	2,200.[e]
Petroleum	thousand 42-gallon barrels	do.	Magallanes Basin, Region XII	6,500.
Pig iron	thousand metric tons	Cía. Siderúrgica Huachipato S.A. (subsidiary of CAP S.A.) (private, 100%)	Plant in Bahía de San Vicente, 14 kilometers northeast of Concepcion, Region VIII	1,200.
Nitrates:				
Primarily sodium nitrate		SQM Nitratos S.A. (subsidiary of Sociedad Química y Minera de Chile S.A.) (private, 100%)	Maria Elena, Pampa Blanca, and Pedro de Valdivia mines and plants; Coya Sur concentration and blending plant, Region II	770,000.
Primarily potassium nitrate		do.	do.	650,000.
In fertilizer		Cosayach Nitratos S.A. (Errázuriz Group, 100%)	Plant in Maria Elena, Iquique, Region I	200,000.[e]
Do.		SQM Industrial S.A. (Sociedad Química y Minera de Chile S.A., 100%)	Mine and plant in Santiago, Region II	100,000.[e]
Rhenium, metal	kilograms	Molibdenos y Metales S.A. (private, 100%)	Nos plant, San Bernardo, 30 kilometers south of Santiago	22,000.[e]
Steel, crude	thousand metric tons	Cía. Siderúrgica Huachipato S.A. (subsidiary of CAP S.A.) (private, 100%)	Primary plant in Talcahuano and plant in Rengo, Region VIII	1,100.
Do.	do.	Gerdau AZA S.A. of Brazil	Rolling mills and steel plants in Renca and Colina	375.
Zinc, silver, gold	kilograms	Sociedad Contractual Minera El Toqui Ltda. (Breakwater Resources Ltd., 100%)	Doña Rosa zinc mine and a concentrating plant, 120 kilometers north of Coyhaique, Region XI	870 gold; 9,500 silver; 35,000 zinc.

[e]Estimated; estimated data are rounded to no more than three significant digits.

[1]Solvent-extraction/electrowinning.

TABLE 3

CHILE: ESTIMATED MAJOR MINERAL INVESTMENTS ONGOING OR BUDGETED IN 2005[1]

(Million dollars)

Region	Project name	Commodity	Ownership	Total investment	Planned startup date
I	Choquelimpie (restart)	Gold	Compañía Minera Can Can S.A., 100%	13 [2]	NA
I	Collahuasi Molybdenum Circuit	Molybdenum concentrate	Compañía Minera Doña Inés de Collahuasi SCM (Anglo-American plc, 44%; Falconbridge Limited, 44%; Companies led by Mitsui & Co. Ltd., 12%)	47	2005
I	Collahuasi (extension, Rosario Oeste)	Copper	do.	NA	NA
I	Nueva Victoria Plant (expansion)	Iodine	Sociedad Química y Minera de Chile S.A., 100%	29	2006
II	Alliance bioleaching plant	Copper (bioleach)	Alliance Copper Ltd. (BHP Billiton Plc, 50%, and Corporación Nacional del Cobre de Chile, 50%)	60 [2]	2006
II	Chuquicamata Smelter (expansion)	Copper anodes	Corporación Nacional del Cobre de Chile, 100%	250	2007-10
II	Gaby	Copper cathodes	Copper Partners Investment Company Ltd. (Corporación Nacional del Cobre de Chile, 50%, and Minmetals Non-ferrous Metals Co. Ltd., 50%)	874	end-2008
II	Esperanza	Copper	Antofagasta Minerals S.A. (Antofagasta plc., 60%; Nippon Mining and Metals, 15%; Mitsubishi Materials Corp., 10%; Marubeni Corporation, 8.75%; Mitsubishi Corp., 5%; Mitsui & Co. Ltd., 1.25%)	600	2010
II	Escondida Norte (extension)	Copper oxides	Minera Escondida Ltd. (BHP Billiton Plc, 57.5%; Rio Tinto plc, 30%; Japan Escondida Corporation 10%; International Finance Corp., 2.5%)	390	2006
II	Escondida concentration plant	Copper concentrates	do.	870	end-2006
II	Spence	Copper cathodes	do.	990	end-2006
II	Mantos de La Luna	do.	Compañía Minera Mantos de la Luna (Lipesed S.A., 100%)	42	2006
I	María Elena Plant (expansion)	Iodine, sodium nitrate	Sociedad Química y Minera de Chile S.A., 100%	100	2006
II	Ministro Alejandro Hales Mine	Copper (bioleach); copper cathodes	Corporación Nacional del Cobre de Chile (CODELCO), 100%	728	2011
II	Sierra Gorda	Copper	Quadra Mining Corp. has option agreements with four different owners of the properties being explored	3	NA
III	Candelaria	Copper-gold	Far West Mining Ltd., 100%	NA	NA
III	Cerro Casale	do.	Minera Estrella de Oro Ltda. (Placer Dome Ltd., 51%; Arizona Star Resources, 25%; Bema Gold Corporation, 24%)	1,650 [2]	NA
III	El Morro/La Fortuna	Copper-gold	Falconbridge Limited, 70%, and Metallica Resources Inc., 30%	16	2012 [3]
III	El Refugio (restart)	Gold (doré)	Compañía Minera Maricunga (Kinross Gold Corporation, 50%, and Bema Gold Corporation, 50%)	130	end-2005
III	Pascua-Lama	Gold-silver	Barrick Gold Corporation, 100%	1,750	2010
III	Purén (extension of La Coipa Mine)	do.	Compañía Minera Mantos de Oro (Placer Dome Inc., 50%, and Kinross Gold Corporation, 50%), 65%, and Corporación Nacional del Cobre de Chile, 35%	25	end-2006
III	Hernán Videla Lira Smelter (expansion)	Copper anodes	Empresa Nacional de Minería, 100%	28	2007
III	Volcan	Gold	Andina Minerals Inc., 100%	7	2009
IV	Andacollo (underground extension)	Copper	Compañía Minera Carmen de Andacollo (Aur Resources Inc., 63%; Compañía Minera del Pacifico, 27%; Empresa Nacional de Minería, 10%)	350 [2]	2009 [3]
IV	Delta concentration plant	Copper cathodes	Empresa Nacional de Minería, 100%	14	2008
IV	Los Pelambres (extension)	Copper	Antofagasta Minerals S.A. (Antofagasta plc., 60%; Nippon Mining and Metals, 15%; Mitsubishi Materials Corp., 10%; Marubeni Corporation, 8.75%; Mitsubishi Corp., 5%; Mitsui & Co. Ltd., 1.25%)	458	2009 [3]

See footnotes at end of table.

TABLE 3--Continued

CHILE: ESTIMATED MAJOR MINERAL INVESTMENTS ONGOING OR BUDGETED IN 2005[1]

(Million dollars)

Region	Project name	Commodity	Ownership	Total investment	Planned startup date
V	Andina (extension)	do.	Corporación Nacional del Cobre de Chile, 100%	259	2009
V	Chagres Smelter (expansion)	Blister copper, anodes	Minera Sur Andes Ltda. (Anglo American plc., 100%)	50	2006
V	El Soldado Mine (expansion)	Copper	do.	83	2007
V	Ventanas Smelter and Refinery (expansion)	Copper cathodes, gold ingots, silver grains	Corporación Nacional del Cobre de Chile, 100%	75 [2]	2012-14
VI	Caletones Smelter (expansion)	Blister copper, anodes	do.	249 [2]	2012 [3]
VI	El Teniente Plant (expansion)	Copper concentrate	Corporación Nacional del Cobre de Chile, 100%	846	2007
XI	Aserradero and Concordia (extensions of El Toqui Mine)	Copper, gold, lead, silver, zinc	Breakwater Resources Ltd., 100%	6	NA

NA Not available.

[1]Estimated data are rounded to no more than three significant digits; may not add to totals shown.

[2]If approved.

[3]Not before this date.

The Mineral Industry of Colombia

By Ivette E. Torres

Colombia was Latin America's fourth largest economy after Brazil, Mexico, and Argentina. In 2005, it had a gross domestic product of $123.2 billion[1] or $337.3 billion in terms of purchasing power parity (International Monetary Fund, 2006§[2]). The country's economy grew by 5.23% in 2005 after an increase of 4.89% (revised) in 2004, in part due to the strength of the construction sector. The output of the construction sector, which increased for the fourth consecutive year, grew by 12.1% in 2005. Mining and quarrying, which includes hydrocarbons (natural gas and petroleum), increased by 2.4%; this growth was commensurate with that achieved in 2004. However, when hydrocarbons are excluded, the output of the mining sector increased by 5.3%. In recent years, the performance of the mining sector was attributable in great part to the development of the coal sector, and, to a lesser extent, to the trend toward increased prices for precious metals (Ministerio de Minas y Energía, 2006, p. 13; Departamento Administrativo Nacional de Estadística, 2006a§).

Colombia's economy and mineral production were dominated by the fuel sector. The country was the fifth ranked producer of crude petroleum in Latin America and the Caribbean and contributed about 5% of the Latin American output (BP p.l.c., 2006, p. 8). Colombia was also the leading producer of coal in Latin America. Historically, Colombia has been recognized as an important producer and the world's leading exporter of emerald. In addition, Colombia was an important producer of ferronickel and the only producer of platinum in Latin America. The country also produced copper, iron ore, steel, and silver. Colombia was an important producer of cement in Latin America and produced construction materials and industrial minerals (table 1).

Since 2003, foreign direct investment in Colombia's mining sector (excluding petroleum) had been increasing significantly. In 2002, foreign direct investment in mining was only $466 million. By 2004, the amount totaled $1.2 billion, and it reached $1.98 billion in 2005. The Government attributed this growth to an increase in exploration and production of gold in a time of high prices. Although the increase of foreign investment was slightly less dramatic for petroleum, the total foreign direct investment in the petroleum sector increased from $449 million in 2002 (after dipping to $278 million in 2003) to $1.24 billion in 2005. Total foreign direct investment in 2005 more than tripled to $10.2 billion. This means that, together, the mining and petroleum sectors took in more than 30% of total foreign direct investment for the year (Ministerio de Minas y Energía, 2006, p. 76).

[1]Where necessary, values have been converted from Colombian pesos (Col$) to U.S. dollars (US$) at the rate of Col$2,321.5=US$1.00.

[2]References that include a section mark (§) are found in the Internet References Cited section.

Production

After petroleum, the principal minerals produced in Columbia were, in terms of value, coal, emerald, gold, and platinum. In 2005, production of coal and nickel increased compared with that of 2004 and production of gold was 64% higher than that of 2001. During the same period, production of coal increased by 35% and that of nickel in ferronickel, by 37%. Colombia was the leading producer of coal in Latin America and accounted for almost 70% of the region's output. Although it was the world's 10th ranked producer, Colombia produced only about 1% of the world total (World Coal Institute, 2006§). Despite a decrease in the production of gold for the second consecutive year and losing ground in regional output, Colombia continued to be an important producer of gold and was the fourth ranked producer in Latin America and the Caribbean (after Peru, Brazil, and Chile), producing about 8% of the regional total and about 1% of the world total. The country, which was the leading producer of mine nickel in Latin America and the Caribbean, accounted for 30% of the region's total. As one of the region's four producers of ferronickel, Colombia accounted for 51% of the region's total. It was also an important producer of cement in Latin America, ranking third in the region after Brazil and Mexico.

Colombia was the fifth ranked producer of crude petroleum in Latin America and the Caribbean and accounted for 5% of the region's total. It was the seventh ranked producer of natural gas in the region, and accounted for about 4% of the region's total (BP p.l.c., 2006, p. 8, 24).

Trade

Colombia's exports, of which petroleum and coal were the two main export earners, totaled $21.2 billion. Imports totaled $19.8 billion. The United States was Colombia's main trading partner, accounting for 40% of Colombia's exports and 28% of its imports. Other important partners were countries of the Comunidad Andina de Naciones (Andean Community of Nations), whose members were, in 2005, Bolivia, Colombia, Ecuador, Peru, and Venezuela; the European Union; and the Asociación Latinoamericana de Integración (Latin American Integration Association (ALADI) (Departamento Administrativo Nacional de Estadística, 2006b§, c§). In 2005, in addition to Colombia, ALADI countries included Argentina, Bolivia, Brazil, Chile, Cuba, Ecuador, Mexico, Paraguay, Peru, Uruguay, and Venezuela.

In 2005, mineral exports (including base metals, coal, ferronickel, and industrial minerals but excluding petroleum) totaled $3.95 billion, or 18.6% of total exports. Coal (including coke), which was by far the leading export item of the mining sector, had a value of almost $2.6 billion, which was a 40% increase compared with that of 2004 and represented 12% of Colombia's total exports. The main areas of export for

Colombian coal were Europe and North America. Exports of ferronickel totaled $738 million in 2005 compared with $628 million in 2004. Exports of gold decreased by 8.5% to $517 million, and the value of official emerald exports ($72 million) continued to decrease (Ministerio de Minas y Energía, 2006, p. 75).

The value of petroleum exports from Colombia increased by 33.6% to $2.8 billion. In terms of volume, exports of petroleum decreased by 1.37%. The largest contributor to the total was the Vasconia crude petroleum, which accounted for $961.5 million of Colombia's petroleum exports in 2005. Imports of petroleum tripled to $30.7 million; this increase was due mainly to increased imports of diesel (Ministerio de Minas y Energía, 2006, p. 53; Presidencia de la República de Colombia, 2006§).

Structure of the Mineral Industry

The Ministerio de Minas y Energía was the Government entity entrusted with oversight of the minerals and energy sectors. Several agencies either reported directly to the Ministry or were associated with it; some of these agencies were the Agencia Nacional de Hidrocarburos (ANH), the Comisión de Regulación de Energía y Gas, the Dirección de Energía, the Dirección de Gas, the Dirección de Hidrocarburos, the Dirección de Minería, Ecopetrol S.A., Empresa Colombiana de Gas, Ingeominas, and the Unidad de Planeación Minero Energética.

The production of minerals and energy was by the public and private sectors. Nickel and coal were produced entirely by the private sector. Natural gas and petroleum were produced by the Government through publicly owned Ecopetrol, which operated the country's petroleum refinery production. The Government also entered into partnership with the private companies by way of direct contracts between Ecopetrol and the companies. As part of the reorganization of the the Ministerio de Minas y Energía in 2003, Ecopetrol became a publicly owned company stripped of all administrative and regulatory functions (these functions were given to ANH), and the requirement that Ecopetrol have a minimum participation of 30% with the private sector was eliminated. Consequently, private foreign companies were able to operate in Colombia without being associated with Ecopetrol. Carbocol S.A., Instituto de Fomento Industrial, and Minercol Ltda. were in liquidation (Ministerio de Minas y Energía, 2004, p. 102, 115).

Commodity Review

Metals

Gold.—Despite increased interest in exploration and recent strong performance in output, official gold production decreased for the second consecutive year in 2005 (table 1). The Department of Antioquia had the highest level of production and accounted for 63% of Colombia's total production. The production level of this Department decreased slightly from that of 2004. The Department of Bolivar was the second ranked producer with 12% of the country's production. This Department, which had ranked third after the Department of Cordoba in 2004, gained in ranking because of a 41% increase in output. The Department of Cordoba, which in 2004 had ranked second in gold production, had a 49% decrease in production and was the third ranked producer in 2005, accounting for 10% of the production (Unidad de Planeación Minero Energética, 2006a, p. 23).

Although Colombia has not benefited from the large investment in mining seen in other Latin American countries, some companies were beginning to show interest and were acquiring exploration properties in the country as they perceived that recent Government policies were creating a more welcoming and stable environment for investment. AngloGold Ashanti Ltd. of South Africa (which was one of the world's leading producers of gold), Colombia Goldfields Ltd., and Greystar Resources Ltd. were some of the companies that had established exploration projects in Colombia (Dow Jones Newswire, 2005§).

During the year, Colombia Goldfields acquired the option to buy three gold properties, known as the Caramanta Concessions, in the Marmato Mountain mining district, which is a historical gold producer. The company could earn 100% interest in the concessions by investing $2.99 million in exploration and development in 3 years (Colombia Goldfields Ltd., 2005).

AngloGold Ashanti, which had been in Colombia since 1999, moved its South American operations from Peru to Colombia in 2005; the company was in the early stages of exploration in the country and had eight projects ready to be drilled. The company's goal was to have at least one project in the prefeasibility stage by 2008 (Mining News, The, 2005§).

Greystar Resources owned 100% interest in the Angostura project, which is located in northern Colombia approximately 35 kilometers from Bucaramanga, Department of Santander. The company held several exploration and mining permits in the 6,670-hectare project. Based on information up to mid-2006 that was obtained after about 162,000 meters of drilling, the company estimated indicated resources in oxides and sulfides of almost 220,000 kilograms (kg) (reported as 6.98 million troy ounces) of gold and almost 964,000 kg (reported as 30.98 million troy ounces) of silver (Greystar Resources Ltd., 2006§).

Iron and Steel.—Colombia was Latin America's seventh ranked producer of steel and had an estimated output of 830,000 metric tons (t). The only integrated steel producer in Colombia was Acerías Paz del Río S.A., which had a capacity of about 400,000 metric tons per year (t/yr) of steel. The company had been under restructuring since 2003.

The leading producer of rebar in Colombia was Diaco S.A. In 2005, Gerdau Group (a Brazilian steelmaker that had been a minority owner) purchased additional interest in Diaco for $75 million to become the majority owner of the company with a 57.1% share. The company also purchased the Siderúrgica del Pacífico S.A (Sidelpa). Gerdau planned to invest $30 million in 2006 in Diaco to improve efficiency and productivity. Diaco and Sidelpa had steel production capacities of 400,000 t and 60,000 t, respectively (American Metal Market, 2005; Proexport, 2006§). Gerdau's crude steel production from the two plants was about 400,000 t in 2005. The company planned to increase production to 600,000 t by 2008. Facilities also included two downstream operations and four rebar plants. The company employed 2,000 people in 2005, and as of June 2005,

95% of the production was for the domestic market (Gerdau Group, 2005).

Nickel.—Colombia was the world's second ranked producer of ferronickel after Japan. Cerro Matoso, S.A. was Colombia's only producer of ferronickel. The mine and ferronickel plant were located in Montelibano, Department of Cordoba; the company was owned by BHP Billiton plc through its subsidiary QNI Ltd. In 2005, mine production of nickel from Cerro Matoso was about 81,000 t; this was an 8% increase compared with that of 2004 (table 1). The company produced ferronickel that had a nickel content of more than 52,700 t, which was an 8% increase compared with that of 2004 and an increase of 37% compared with that of 2001. The 2005 production was about 96% of the company's production capacity, which had been expanded in early 2001. As of June 30, 2006, Cerro Matoso's reserves totaled 61 million metric tons (Mt) at a grade of 1.67% nickel, which was sufficient for almost 20 years of production at current rates (BHP Billiton plc, 2006, p. 75).

Platinum.—Colombia was the only producer of platinum in South America. Production of platinum decreased to 1,082 kilograms (kg) in 2005; this was a 10.5% decrease compared with that of 2004 but was a more than 60% increase compared with that of 2001. Almost all the platinum production (1,078 kg) was from the Department of Choco. Other producing Departments were Antioquia, Cauca, Cordoba, and Nariño; these Departments produced less than 1.5 kg each (Unidad de Planeación Minero Energética, 2006a, p. 25).

Silver.—Production of silver in Colombia decreased by 16% in 2005. Production of silver was from more than 11 Departments. The Department of Antioquia produced 61% of the output but its production decreased by 16% from that of 2004. The Department of Caldas produced 27% of the total and its output increased by 13%. Production from the Department of Cordoba, which had the third largest output in 2004, decreased by 78%. As a result, the Department of Bolivar became the third ranked silver producing Department in 2005 with about 4% of the total (Unidad de Planeación Minero Energética, 2006a, p. 24).

Industrial Minerals

Cement.—Colombia was Latin America's fourth ranked producer of cement after Mexico, Brazil, and Venezuela. Production in 2005 increased by 27.3% from the revised figure of 2004 to almost 10 Mt (table 1). Increased demand for building materials and the continued growth of the construction sector were the main reasons for this increase. The leading cement producer in Colombia was Cementos Argos Colombia (a subsidiary of Cementos Argos, S.A.) with about 8.2 million metric tons per year (Mt/yr) of capacity. Cementos Argos Colombia was formed in 2005 by the merger of Cales y Cementos de Toluviejo, S.A., Cementos del Caribe, S.A., Cementos del Nare, S.A., Cementos del Valle, S.A., Cementos El Cairo, S.A., Cementos Ríoclaro, S.A., Cementos Paz del Río, S.A., and Cía Colombiana de Clinker. During the year, Cementos Argos Colombia represented 50% (7.8 Mt) of domestic sales (Cementos Argos, S.A., 2006§, Instituto Colombiano de Productores de Cemento, 2006§).

CEMEX Colombia, S.A (a subsidiary of CEMEX, S.A.B. de C.V., which was one of the world's leading cement companies) was Colombia's second ranked producer and had about 30% of Colombia's production capacity. CEMEX owned 99.7% of CEMEX Colombia, which had five cement plants that had a combined capacity of 4.8 Mt/yr.

Emerald.—Colombia was the world's leading producer of emerald. Official production of emerald (based on export data) decreased by 31% after increasing significantly in 2003 and 2004. According to Government estimates, 98% of the emerald was destined for export and 2% was sold in the country. Recent Government estimates indicate that Colombia produced about 50% of the world's emerald. Other estimates have the number as high as 60%, along with 80% of the high-quality stones (Unidad de Planeación Minero Energética, 2006a, p. 26; Emerald Empire, The, 2006§).

Salt.—Production of salt in 2005 decreased by almost 10% after an increase of almost 18% in 2004. Although marine salt production increased, the increase was not enough to offset the decrease in rock salt production. Since 2002, however, salt exports have increased by 87% to more than 82,000 t and imports have decreased by almost 75%. During the period, Colombia went from being a net importer to being a net exporter of salt (Ministerio de Minas y Energía, 2006, p. 88).

The Government of Colombia's efforts to privatize its salt industry through the granting of concessions was delayed. The bid process, which was expected to be held in February 2005, was postponed until new legislation was passed to address the issue. The proposed legislation was debated once by Congress during the year (Ministerio de Minas y Energía, 2006, p. 88).

Mineral Fuels

Coal.—Colombia, which had the largest reserves and was the leading producer of coal in Latin America, produced 59.1 Mt of coal; this was an increase of 10% compared with that of 2004, an increase of 35% since 2001, and an increase of 80% since 1999 (table 1; Unidad de Planeación Minero Energética, 2006a, p. 21). The leading coal producer was Carbones del Cerrejón LLC in the Department of La Guajira. Carbones del Cerrejón produced 27 Mt during the year, which was an increase of almost 8% compared with that of 2004, and exported 25.5 Mt (Carbones del Cerrejón LLC, 2006b§). In 2005, 59% of Carbones del Cerrejón's exports went to Europe, and 22% went to North America (Carbones del Cerrejón LLC, 2006a§).

The second ranked producer of coal was Drummond Ltd., which produced 22.1 Mt from its property in La Loma, Department of Cesar; this output was a 7% increase compared with that of 2004 and a 25% increase compared with that of 2003. Combined, the Departments of Cesar and La Guajira produced more than 93% of Colombia's total coal production. In 2005, the Department of Cesar, which had led production since 2004, produced 46.9% of Colombia's total coal production, and the Department of La Guajira produced 46% of the total (Unidad de Planeación Minero Energética, 2006a, p. 22). Most of Colombia's output was thermal coal. Only a small amount (less than 1.4 Mt in 2003) was metallurgical. Most of Colombia's coal production (58 Mt) was for export. Domestic

consumption in 2004 (the latest year for which information was available) was about 3.1 Mt, which was a 16.2% decrease compared with that of 2003 when it was 3.7 Mt (revised). Of the total, 75% of the consumption was by the industrial sector; 21%, by the power sector; and the remainder, by the residential sector (Ministerio de Minas y Energía, 2006, p. 248).

Natural Gas.—The leading producer of natural gas in Colombia was Chevron Texaco Colombia (a subsidiary of Chevron Corporation) in association with Ecopetrol in the Department of La Guajira. This association produced natural gas from two platforms in the Chuchupa offshore field and from the Ballena and the Riohacha onshore fields; it produced more than 75% of the natural gas produced in Colombia (Chevron Corporation, 2006§).

Petroleum.—At yearend 2005, Colombia's petroleum reserves totaled 1.453 billion barrels. Although this was a decrease, it was a less than 2% reduction compared with that of 2004 (Ministerio de Minas y Energía, 2006, p. 30). Production during the year was about 192 million barrels (Mbbl), which was a less than 0.5% decrease compared with that of 2004. At this production rate, crude petroleum reserves would be depleted in about 8 years. Because hydrocarbons was Colombia's leading economic subsector, the Government was focusing its efforts on increasing foreign investment in exploration and production of crude petroleum and its associated natural gas and the production and productivity of the refineries. Even though depletion of reserves has slowed down, exploration so far has not resulted in increased reserves. Investment in exploration in 2005 was $343 million, which was an almost 60% increase compared with that of 2004. Of this total amount of investment, $167 million was by the private sector, $96 million was by Ecopetrol, and $80 million was by AHN (Ministerio de Minas y Energía, 2006, p. 22).

Ecopetrol produced 26% of Colombia's crude petroleum production in 2005 and participated in additional production through association contracts with the private sector. In total, Ecopetrol participated in about 59% of the country's total production (Ecopetrol S.A., 2006b§). BP p.l.c. and Occidental Petroleum Corp. were the two leading private producers in Colombia that worked in association with Ecopetrol. BP Exploration Company (Colombia) Limited (a subsidiary of BP) was the operator of the Cupiagua and the Cusiana oilfields. Occidental was the operator of the Caño Limon oilfield.

Refinery Products.—Despite Colombia being a net exporter of crude petroleum, it was an importer of refinery products (mainly gasoline). Production of refinery products for the year was 109.2 Mbbl, which was the equivalent of a capacity utilization of 84% in 2005. Two refineries operated during the year—Barrancabermeja in the Department of Santander, which was the largest of the refineries, processed 75% of Colombia's crude petroleum during the year, and the Cartagena refinery in the Department of Bolivar processed the remainder. Colombia's refining system was owned and operated by the Government through Ecopetrol (Ecopetrol S.A., 2006a§).

Outlook

The Government of Colombia published a National Plan for the development of the mining sector to 2019 (Unidad de Planeación Minero Energética, 2006b). The plan reinforces the position that the mineral industry should be developed by the private sector, while recognizing the important role of the Departments and local authorities.

Based on information provided by the coal producers in Colombia, the Government expects the production of coal to increase to 124.9 Mt in 2011 and to 134.2 Mt in 2019; the largest increase would be in the Department of Cesar. The production from the Departments of Cesar and La Guajira is expected to continue to be exported in its entirety. The Government outlook for coal is somewhat higher than that of other analysts.

The Government also expects the production of gold to increase significantly, with additional companies expected to begin production in the near future and with the modernization of existing operating mines. Production is expected to more than double to 90,000 kg by 2011 and to continue to increase and exceed 230,000 kg by 2019. The Government observed that, historically, production in Colombia has increased when the gold price becomes more attractive to the small-scale producers, which contribute a large portion of the country's output. With recent interest in exploration by the international gold producers, small-scale producers may have less impact on output levels.

The Government expects the production of ferronickel to increase moderately and platinum production to increase significantly. Colombia expects to increase its share of the world emerald market with the certification of origin and quality for emerald (a scheme similar to the Kimberley Process established for diamond) when it becomes effective.

Other minerals of increasing importance are the construction minerals. The Government of Colombia expects the production of many of these minerals to double by 2010.

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TABLE 1
COLOMBIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2001	2002	2003	2004	2005
METALS						
Copper, mine output, Cu content		2,192	1,853	1,578	1,701	1,259
Gold	kilograms	21,813	20,823	46,515	37,739	35,785
Iron and steel:						
Iron ore and concentrate		636,837	688,106	625,002	507,711 r	498,623
Pig iron		318,953	312,879 r	288,214 r	316,025 r	345,000 e
Steel, crude		638,259	663,724	668,410	730,000	830,000 e
Semimanufactures, hot-rolled e		552,000 2	575,000	550,000	575,000	650,000 e
Lead:						
Mine output, Pb content e		-- r	-- r	-- r	-- r	--
Refined (secondary) e		12,000	12,000	12,000	12,000	12,000
Nickel:						
Mine output, Ni content		52,962	58,196	70,844	75,032	81,000 e
Ferronickel, Ni content		38,438 r	43,987	47,868	48,818	52,749
Platinum	kilograms	674	661	828	1,209	1,082
Silver	do.	7,242	6,986	9,511	8,533	7,142
Zinc, mine output, Zn content e		-- r	-- r	-- r	-- r	--
INDUSTRIAL MINERALS						
Asbestos, mine output		96,140	62,785	60,000 e	60,000 e	60,000 e
Barite e		600	600	600	600	600
Cement, hydraulic 3		6,830,423 r	6,063,895 r	7,337,398 r	7,822,386 r	9,959,223
Clays: e						
Bentonite		8,500	8,500	8,500	8,500	8,500
Common clay and kaolin	thousand metric tons	8,400	8,400	8,400	8,400	8,400
Diatomite e		4,000	4,000	4,000	4,000	4,000
Feldspar e		55,000	93,452 2	100,000 r	100,000 r	100,000
Fluorite e		800	800	800	800	800
Gemstones, emerald 4	thousand carats	5,499	5,390	8,963	9,825	6,746
Gypsum e		560,000	560,000	560,000	560,000	700,000
Lime, hydrated and quicklime e	thousand meric tons	1,300 r	1,300 r	1,300 r	1,300 r	1,300
Magnesite e		10,500	10,500	10,500	10,500	10,500
Mica e		55	55	55	55	55
Nitrogen, N content of ammonia		95,200	110,900 r	107,800 r	98,200 r	100,000 e
Phosphate rock: e						
Gross weight		43,000	43,000	43,000	43,000	43,000
P_2O_5 content		8,000	8,000	8,000	8,000	8,000
Salt:						
Rock		110,212	191,554	199,364	231,721	162,941
Marine		285,073	335,783	247,901	294,343	311,055
Total		395,285	527,337	447,265	526,064	473,996
Sodium compounds, n.e.s., sodium carbonate e		125,000	125,000	125,000	125,000	125,000
Stone and sand:						
Calcite e		6,500	6,500	6,500	6,500	6,500
Dolomite e	thousand metric tons	45	45	45	45	45
Limestone for cement	do.	9,075 r	9,047 r	9,887 r	10,087 r	12,082
Marble e		190,000	190,000	190,000	190,000	190,000
Sand, excluding metal-bearing e		925,000	925,000	925,000	925,000	925,000
Sulfur:						
Native (from ore)		69,344 r	60,162	73,024	97,596 r	64,660
Byproduct, from petroleum		15,465	15,500 e	15,500 e	15,500 e	15,500
Total		84,809 r	75,662 r	88,524 r	113,096 r	80,160
Talc, soapstone, pyrophyllite e		15,000	15,000	15,000	15,000	15,000

See footnotes at end of table.

TABLE 1--Continued
COLOMBIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2001	2002	2003	2004	2005
MINERAL FUELS AND RELATED MATERIALS						
Carbon black[e]		24,000	24,000	24,000	24,000	24,000
Coal	thousand metric tons	43,911	39,484	50,028	53,693	59,064
Coke, all types[e]	do.	615	615	615	615	615
Gas, natural:						
Gross	million cubic meters	35,850	33,789	36,417	35,600	36,000 [e]
Marketed	do.	6,207	6,234	5,975	6,404	6,708
Natural gas liquids[e]	thousand 42-gallon barrels	2,600	2,600	2,600	2,600	2,600
Petroleum:						
Crude	do.	220,460	211,007	197,586	192,866	191,990
Refinery products:						
Liquefied petroleum gas	do.	8,503	8,089	8,797	7,257	7,300
Gasoline:						
Aviation	do.	142	69	315	320	509
Motor	do.	43,296 [r]	40,009 [r]	40,250 [r]	41,897 [r]	35,555
Jet fuel	do.	9,032	9,032	9,770	7,521	7,300
Kerosene	do.	162	151	1,093	256	136
Medium distillate fuel oil	do.	24,220	23,678	23,912	26,573	26,451
Lubricants[e]	do.	397	398	400	400	400
Residual fuel oil (black oil)	do.	20,638 [r]	21,036 [r]	19,413	21,990 [r]	20,240
Asphalt	do.	1,125 [r]	883 [r]	1,311 [r]	970 [r]	1,117
Refinery fuel and losses and unspecified products[e]	do.	3,190 [e]	2,620 [e]	2,124 [r]	5,067 [r]	10,205
Total	do.	110,705	105,965	107,385 [r]	112,251 [r]	109,213

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. -- Zero.
[1]Includes data available through November 30, 2006.
[2]Reported figure.
[3]Excludes white portland cement produced in the country. Production capacity of white portland was about 200,000 metric tons.
[4]Based on registered exports by the Banco de la República.

TABLE 2
COLOMBIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Carbon black		Cabot Colombiana, S.A. (private, 100%)	Cartagena, Bolivar Department (plant)	NA.
Do.		Productos Petroquímicos, S.A. (private, 100%)	Cali, Valle del Cauca Department (two plants)	12.
Cement		Cía. Colombiana de Clinker, S.A. (Cementos Argos Colombia, 100%)	Cartagena, Bolivar Department (plant)	1,250.
Do.		Cementos del Caribe, S.A. (Cementos Argos Colombia, 74%)	Barranquilla, Atlantico Department	1,500.
Do.		Cementos del Valle, S.A. (Cementos Argos Colombia, 70%)	Yumbo, Valle del Cauca Department	1,500.
Do.		Cales y Cementos de Toluviejo, S.A. (Cementos Argos Colombia, 95%)	Toluviejo, Sucre Department	980.
Do.		Cementos del Nare, S.A. (Cementos Argos Colombia, 100%)	Puerto Nare, Antioquia Department	200.
Do.		Cementos El Cairo, S.A. (Cementos Argos Colombia, 100%)	Montebello, Antioquia Department	450.
Do.		Cementos Paz del Río, S.A. (Cementos Argos Colombia, 62%)	Belencito, Boyaca Department	880.
Do.		Cementos Ríoclaro, S.A. (Cementos Argos Colombia, 99%)	Sonson, Antioquia Department	1,400.
Do.		Cementos Boyacá, S.A. (Holcim Group, 100%)	Nobsa, Boyaca Department	1,800.
Do.		CEMEX Colombia, S.A. (CEMEX, S.A.B. de C.V., 99.7%)	Bucaramanga, Santander Department; Buenos Aires, Tolima Department; Pamplona, Norte de Santander Department; La Calera, Cundinamarca	4,800.
Coal		Carbones del Cerrejón LLC (Anglo American Plc; 33.3%; Glencor International AG, 33.3%; BHP Billiton plc, 33.3%)	Cerrejon Centro mines, Cerrejon Sur mines, Cerrejon Zona Norte, and Oreganal mines, La Guajira Department	27,500.
Do.		Drummond Ltd. (Drummond Co. Inc., 100%)	La Loma Mine (Pribbenow), Cesar Department	22,000.
Do.		C.I. Prodeco S.A. (Glencore International AG, 100%)	Calenturitas in Cesar Department	5,000.
Do.		Acerías Paz del Río, S.A. (private, 100%)	Paz del Rio, Boyaca Department (mine)	600.
Copper		Minera El Roble, S.A.	El Roble Mine, El Carmen, Choco Department	3.
Gemstones, emerald		Minerales de Colombia, S.A. (MINERALCO) (Government, 100%)	Chivor, Coscuez, Muzo, and Quipama Mines, Boyaca Department	NA.
Gold	kilograms	Frontino Gold Mines Ltd. (private, 100%)	El Silencio Mine, Segovia District and Providencia Mine, Remedios District, Antioquia Department	1,500.
Do.	do.	Grupo de Bullet S.A.	El Limon Oronorte Mine, Segovia, Antioquia Department	1,000.
Do.	do.	Mineros de Antioquia, S.A. (private, 100%)	El Bagre, Rio Nechi, Antioquia Department	2,000.
Do.	do.	Small miners (cooperatives and individual prospectors)	do.	NA.
Iron ore		Acerías Paz del Río, S.A.	Paz del Rio, Boyaca Department (mine)	800.
Iron and steel, steel		do.	Boyaca Department	400.
Kaolin		Cerámicas del Valle Ltda. (private, 100%)	Yumbo, Valle del Cauca Department (mine)	NA.
Natural gas	million cubic meters	Ecopetrol S.A. (Government, 100%)	North coast, La Guajira Department (national gasfields)	4,500.
Do.	do.	International Petroleum Colombia, Ltd. (International Petroleum Corp., 100%)	Barrancabermeja locale, Antioquia and Santander Departments	2,200.

See footnotes at end of table.

TABLE 2--Continued
COLOMBIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Nickel		Cerro Matoso, S.A. [QNI Ltd. 100% (owned by BHP Billiton plc, 100%)]	Cerro Matoso Mine, Montelibano, Cordoba Department	55 plant.
Nitrogen		Abonos de Colombia (private, 100%)	Cartagena, Bolivar Department (plant)	100.
Do.		Monómeros Colombo-Venezolanos, S.A. (private, 100%)	Barranquilla, Atlantico Department (plant)	85.
Petroleum[1]	thousand 42-gallon barrels	Ecopetrol S.A.	16 fields in various Departments	70,000.
Do.	do.	HOCOL, S.A.	14 fields in various Departments	36,500.
Petroleum products	do.	Ecopetrol S.A.	Barrancabermeja refinery, Norte de Santander Department	81,400.
Do.	do.	do.	Cartegena refinery, Bolivar Department	28,000.
Do.	do.	do.	Tibu, Norte de Santander Department	1,825.
Do.	do.	do.	Orito, Putumayo Department	875.
Phosphate rock		Fosfatos de Colombia, S.A. (private, 100%)	Neiva, Huila Department	30.
Do.		Fosfatos Boyacá, S.A. (Government, 100%)	Iza, Boyacá Department	20.
Do.		Siderúrgica del Boyacá, S.A. (private, 100%)	Santa Fe de Bogota	NA.
Do.		Siderúrgica del Medellín, S.A. (private, 100%)	Medellin, Antioquia Department	NA.
Do.		Siderúrgica del Muna, S.A. (private, 100%)	Chusaca, Federal District	NA.
Do.		Siderúrgica del Pacífico, S.A. (private, 100%)	Cali, Valle del Cauca Department	NA.
Sulfur		Industrias Purace, S.A. (private, 100%)	El Vinagre Mine, Cauca Department	60.
Do.		Ecopetrol S.A.	Barrancabermeja, Santander Department	29.

NA Not available.

[1]These two petroleum entries are examples only. Colombia has more than 3,000 producing wells drilled by Government and private companies; these wells have combined capacities that exceed 755,000 barrels per day of oil.

The Mineral Industry of Cuba

By Omayra Bermúdez-Lugo

Cuba, which is located at about 150 kilometers (km) from Key West, Florida, is the largest island of the Greater Antilles island arc. Cuba's territory, which includes Isla de la Juventud and several other islets and cays, comprises a total land area of 110,860 square kilometers (km^2). In 2005, the country's population was estimated to be about 11.2 million (Oficina Nacional de Estadísticas de Cuba, 2006§[1]). Nickel was the most important mineral commodity to the Cuban economy followed by cobalt, which was produced as a byproduct of the mining of nickel. Other minerals produced in the country included cement, clays, crushed stone, feldspar, salt, and silica sand (table 1). Cuba also produced ammonia, gold, natural gas, petroleum, petroleum products, and sulfur as a byproduct of the refining of petroleum.

In 2005, the country's estimated gross domestic product (GDP) based on purchasing power parity was about $37.2 billion and the estimated per capita GDP based on purchasing power parity was about $3,300. Exports, which consisted mainly of citrus, coffee, fish, medical products, nickel, sugar, and tobacco, were valued at about $2.4 billion (U.S. Central Intelligence Agency, 2007§). According to Cuban Government statistics, mining accounted for about 1.1% of the GDP in 2005 compared with about 1.3% in 2004 (Oficina Nacional de Estadísticas de Cuba, 2006§).

The Ministerio de la Industria Básica was the Government entity responsible for the minerals and petroleum sectors. Unión Geológico Minera S.A. (Geominera) was the company in charge of prospecting and exploration for and mining of all metallic and nonmetallic minerals with the exception of nickel and cobalt, which were overseen by Unión del Níquel S.A. Cubapetróleo S.A. (CUPET) was the company in charge of petroleum prospecting, exploration, marketing, and refining. These companies were owned by the Government.

Government Policies and Programs

According to the U.S. Department of State (2005§), the Cuban economy continued to recover from a decline in the GDP of at least 35% between 1989 and 1993 following the disintegration of the Soviet Union and the loss of Soviet subsidies. Although Cuba has pulled back on some of the market reforms it had introduced in 1993 and 1994 and has once again embraced a policy of recentralization, the Government has signed a series of agreements in the mining sector in the past 5 years that might significantly aid the economy in the near future. Among these agreements is one signed in 2000 with Petróleos de Venezuela S.A. (PDVSA) under which Venezuela would supply Cuba with 53,000 barrels per day (bbl/d) of petroleum at preferential prices. According to a 2005 study performed by the Institute for Cuban and Cuban-American Studies (Mesa-Lago, 2005, p. 8-9), the 53,000 bbl/d of imports would supply about 30% of Cuba's domestic petroleum demand. Under the terms of the agreement signed with PDVSA, 80% of petroleum imports were to be paid within 90 days at prevailing market prices, and the remaining 20% was to be paid in 5 to 20 years at an average annual petroleum price, with the option of paying up to one-fifth of the 20% through educational, medical, and sport services to Venezuela. For the period between 2001 and 2003, Cuba's unpaid petroleum deliveries debt reportedly amounted to $752 million and was estimated to be about 80% of the debt owed to PDVSA by its foreign clients.

In December 2004, the Governments of Cuba and Venezuela signed the Bolivarian Alternative for the Americas Agreement (ALBA), which arranged for cooperation and bilateral relations between the two countries. In 2005, under the ALBA, Venezuela would supply Cuba with up to 90,000 bbl/d of petroleum, for which Cuba agreed to pay a price of not less than $27 per barrel. Other provisions under the agreement included allowing Venezuela to hold 100% ownership of its investments in the country, the opening of state bank subsidiaries in each other's country, the elimination of tariffs and import duties on Venezuelan imported goods, tax exemption for all Venezuelan capital in Cuba, and the financing of infrastructure projects (Canadian Foundation for the Americas, The, 2004§; Cuba.com, 2004§; Havana Journal, 2004§). In 2004, Venezuela supplied 78,000 bbl/d of petroleum to Cuba. Cuba, however, reportedly did not consume all the petroleum domestically but instead sold part of it, through negotiations with PDVSA, to Guatemala, Honduras, El Salvador, Nicaragua, and Panama. In 2005, Venezuela was to increase petroleum supplies to Cuba to meet all of the country's needs in excess of domestic production. In addition, Cuba was to provide 2,000 higher education fellowships to Venezuelans, while Venezuela was to transfer technology on energy to Cubans and to award fellowships in the field. As of October 2005, Cuba's petroleum debt to Venezuela was estimated to be $2.5 billion (Mesa-Lago, 2005, p. 8-9).

In 2005, the Cuban Government was also in negotiations with Corporación de Desarrollo de la Región Zuliana (Corpozulia) to import more than 500,000 metric tons per year (t/yr) of Venezuelan coal to Cuba, where it was to be used by a Chinese company (name not disclosed) to generate electricity for a ferronickel plant. Other projects included the creation of a joint-venture among China, Cuba, and Venezuela to produce stainless steel; the construction of a coal-fired thermoelectric plant in Mariel by Sherritt International Corp. of Canada and the Government of Venezuela; and the acquisition by Venezuela of a stake in the Cienfuegos petroleum refinery. Venezuela planned to use Cuban installations to store and distribute petroleum to Caribbean countries (Mesa-Lago, 2005, p. 9; Embassy of the Bolivarian Republic of Venezuela in the United Kingdom, 2005§; Venezuelanalysis.com, 2005§). The Government also signed a letter of intent with Venezuela for the creation of a strategic alliance to develop nickel and cobalt mining projects

[1]References that include a section mark (§) are found in the Internet References Cited section.

in the regions of Aragua, Carabobo, and Cojedes, and for the refurbishing of the Cienfuegos petroleum refinery, which included the refurbishing of an oil pipeline connecting the refinery to an oil tanker terminal in Matanzas (Agencia Cubana de Noticias, 2005§; Bilaterals.org, 2005§).

Also in 2004, the Government had signed a series of agreements with China, which included a credit of $500 million from Chinese banks for the creation of a joint-venture company between the Government (51%) and China (49%) to resume construction of the Camariocas ferronickel plant. Upon completion, the plant would have a production capacity of 22,500 t/yr of nickel. The loan was to be paid in 15 years, upon completion of the plant facilities. Other agreements included the establishment of another Sino-Cuban joint venture for the development of a nickel deposit in San Felipe, Camaguey, which was expected to produce about 50,000 t/yr of nickel at a cost of $1.3 billion, and a petroleum exploration contract with Sinopec Corp. (Mesa-Lago, 2005, p. 11-12; ADITAL Noticias de America Latina y Caribe, 2005§).

In February 2005, the Government signed economic and trade agreements on education, energy, health, and technology with Brazil, which included an agreement with Government-owned Petroleos Brasileiros S.A. to conduct petroleum exploration in the country and to examine the possibility of establishing a factory to produce lubricants in association with Venezuela's PDVSA (Mesa-Lago, 2005, p. 24-25).

Trade

According to Cuba's Ministry of Foreign Affairs, Venezuela continued to be Cuba's principal trading partner in 2005 followed by China (which displaced Spain as the second ranked trading partner), Spain, and Canada. Cuba's main exports were nickel, medicine, sugar, technology, and tobacco (Ministerio de Relaciones Exteriores de Cuba, 2006§). Nickel accounted for about 61% of Cuba's exports to China (Mesa-Lago, 2005, p. 11).

Commodity Review

Metals

Cobalt.—In 2005, production of cobalt, which included ammoniacal liquor precipitate, oxide, and sulfide, increased by about 4.7% to 4,247 metric tons (t) from 4,055 t in 2004 (table 1).

Copper.—Northern Orion Resources Inc. (Northern), through its subsidiary Minera Cobre S.A., held a 50% interest in the Mantua copper-gold deposit, which is located in Pinar del Rio Province about 240 km from Havana. Geominera S.A. held the remaining 50%. In early 2004, Northern had been in discussions with third parties (names not disclosed) regarding the sale of the Mantua project; however, according to company reports, no agreement to sell its interest in the project was reached during the year. In 2005, Northern reported that its ability to develop the copper phase of the project was dependent upon its obtaining third-party financing, and that between 2001 and 2004, the Mantua project was consecutively under option by two different companies, International Barytex Resources Ltd. and Newport Explorations Ltd. As partial consideration for the option, the companies had respectively assumed the carrying costs of the project and had made a commitment to attempt to arrange the necessary financing, but reportedly neither was successful (Northern Orion Resources Inc., 2006, p. 29).

Nickel.—In 2005, production of mined nickel (nickel content of nickel oxide, nickel-cobalt sulfide, and nickel-cobalt ammonium liquor) increased by about 2.5% to 73,753 t compared with 71,944 t in 2004 (table 1). Production of nickel and cobalt came from three operations—two produced nickel oxide, and one produced the intermediate product nickel-cobalt sulfide. Cobalt and refined nickel were derived from the treatment of mixed sulfides from the Moa Nickel S.A. facilities. Moa Nickel was a mining and processing operation that was part of a vertically integrated joint-venture company between the Government of Cuba (50%) and Sherritt (50%). Mixed sulfides produced at Moa were shipped to Canada and then transported by rail to Sherritt's refinery in Fort Saskatchewan, Alberta, Canada, to produce refined nickel and cobalt. In 2005, Sherritt continued with its plans to increase production of mixed sulfides at Moa Mine by 16,000 t/yr to a total of 49,000 t/yr. Basic engineering for the expansion was scheduled for completion by the end of the first quarter of 2006 and construction at the mine and processing facilities was expected to begin during the second quarter of 2006, with commissioning scheduled for mid-2008. Sherritt expected nickel and cobalt production in 2006 to be comparable with that of 2005 and mixed sulfide production to be maintained at approximately 33,000 t (Sherritt International Corp., 2006b, p. 17).

Industrial Minerals

Zeolite.—Cuba had three deposits from which it extracted zeolite. In 2005, Geominera Oriente planned to export about 10,000 t of zeolite to Brazil and about 10,000 t to Colombia (Ahora.cu, 2005§).

Mineral Fuels

In 2005, the U.S. Geological Survey announced the completion of an assessment of undiscovered natural gas and petroleum resources of the North Cuba Basin in northwestern Cuba. The study yielded average estimates for undiscovered resources of 4.6 billion barrels of petroleum, 9.8 trillion cubic feet of natural gas (of which 8.6 trillion cubic feet was associated-dissolved gas and 1.2 trillion cubic feet was non-associated gas), and 0.9 billion barrels of natural gas liquids (U.S. Geological Survey, 2005).

Natural Gas.—Cuba's natural gas production was all associated gas. Sherritt supplied about 15% of all the electricity generated in Cuba from facilities located at Boca de Jaruco, Puerto Escondido, and Varadero, through its minority interest in Energas S.A., a Cuban Government entity. The associated gas produced from the Varadero fields had been flared for many years, thus creating considerable air pollution owing to the flared gas' hydrogen sulfide content. In 2005, however, gas that would previously hve been flared was being used by Sherritt to generate electricity. In 2004, Sherritt began the construction

of an 85-megawatt (MW) expansion at its Cuban facilities that was expected to be commissioned in the first quarter of 2006. The electricity produced by Energas was supplied to a Cuban Government agency under long-term fixed price contracts, and gas was supplied to Energas at no cost. Sherritt planned to increase electricity production capacity to 376 MW from the existing 311 MW upon completion of an additional 65-MW expansion, which was expected to be completed during the second quarter of 2007 (Sherritt International Corp., 2006a, p. 5).

Petroleum.—Oil was produced by Sherritt from near-shore oil deposits, which were explored and developed from land-based drilling locations. The company held an indirect working interest that varied from 40% to 100% in 10 production-sharing contracts (PSCs) in Cuba. Most of Sherritt's Cuban oil production was derived from the Canasi, the Puerto Escondido, the Seboruco, the Varadero West, and the Yumuri oilfields. Other working interests included the exclusive exploration rights on four blocks in Cuba's deepwater economic zone off the north coast and 100% indirect working interests in four PCSs with the Government (Sherritt International Corp., 2006a, p. 20).

Sherritt sold its petroleum production to the Cuban Government, most of which was consumed by state-owned powerplants. In 2005, Sherritt reported that it had six active drilling rigs in Cuba as part of its petroleum exploration and development program. The company planned to continue with its exploration program in 2006 and planned to invest about $140 million to maintain existing production levels and to extend reserve life. Exploration and appraisal efforts were to be focused on Majaguillar-Corajol, Playa Larga, and San Anton, (Sherritt International Corp., 2006a, p. 5, 14).

In December 2004, a petroleum deposit with an estimated 100-million-barrel reserve, was discovered at the Santa Cruz field, which is located off the east coast of Havana, by Pebercan Inc. and Sherritt. The petroleum had a gravity of 18° API and contained less than 5% sulfur, which was of better quality than the petroleum used in Cuba for power generation, which had an average gravity of 16° API and a sulfur content of 8%. In 2005, Sherritt continued with its appraisal program for the Santa Cruz field to determine the commercial viability of the discovery. The first Santa Cruz appraisal well was completed in July 2005, but work at the well was suspended owing to high water production rates. A declaration of commerciality was expected to be made following the completion of the appraisal of the well. In 2006, the company planned to drill an exploration well on Block 10 at Playa Larga, appraise the Majaguillar-Corajol deposit, and follow up on the results of the 2005 exploration wells (Sherritt International Corp., 2006b, p. 20; 2006c, p. 21).

In April 2005, PDVSA opened a branch in Havana, known as PDVSA-Cuba, to undertake the exploration, production, and refining of petroleum in association with CUPET (Agencia Cubana de Noticias, 2005§; Bilaterals.org, 2005§).

Pebercan Inc. held interest in five blocks in Cuba; these included Block 7, Block 12, Block 13, Block 15, and Varadero Profundo, and together cover an area of 6,055 km^2. During 2005, the company drilled at least 11 wells at a cost of $59.5 million. As a result, output was increased at Seboruco and a new deposit was discovered at the Tarara prospect (Pebercan Inc., 2006, p. 6).

Outlook

The signing of the ALBA, which arranges for cooperation and bilateral relations between Cuba and Venezuela and allows for an increasing number of Venezuelan subsidies to Cuba, will perhaps become one of the most significant contributors to the country's economic development in the coming years. The Institute for Cuban and Cuban-American Studies estimates that Venezuela is rapidly approaching the amount of free aid that the former Soviet Union used to provide Cuba before the Soviet Union's collapse. The subsidy from Venezuelan petroleum alone was estimated to be $800 million in 2005. The Institute's report estimates that if Chinese investments in the nickel sector materialize, in addition to Sherritt's expansion plans at Moa, the result would be a significant expansion in Cuba's installed nickel capacity; the timeframe for the commissioning of these projects is still uncertain, however, and questions remain regarding the adequacy of the technology that will be used at the Camariocas plant. The report also indicates that Chinese investors intend only to finish the work started by the Soviets at the Camariocas plant. This would imply the use of old technology and the commissioning of an energy-intensive nickel plant, which, according to the Institute for Cuban and Cuban American Studies, would consume about 18 t of petroleum for each ton of nickel produced. If this is the case, then the Chinese, as the Soviets did in the past, would end up subsidizing nickel prices.

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TABLE I

CUBA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2, 3]		2001	2002	2003	2004	2005
Asphalt[4]		75,800 r	50,700 r	44,800 r	47,400 r	43,300 [4]
Cement, hydraulic		1,324,100 [5]	1,326,900 [5]	1,345,500 [5]	1,401,300 r, [4]	1,566,900 [4]
Chromite[4]		49,500 r	20,400 r	33,300 r	40,300 r	34,000
Cobalt, mine output, Co content:[4, 6]						
Oxide, oxide sinter, sulfide, ammoniacal liquor precipitate		3,915	3,858	3,982 [7, 8]	4,055 [7, 8]	4,247 [7, 8]
Sulfide and ammoniacal liquor precipitate		3,417	3,384	3,465 [7, 8]	3,580 [7, 8]	3,768 [7, 8]
Copper, mine output, Cu content		321 r, [4]	-- r, [4]	--	--	-- [4]
Feldspar[4]		6,400 r	4,700 r	7,200 r	10,500 r	8,000
Gold[e]	kilograms	1,000	1,000	547 [8, 9]	500 r	500 e
Gypsum[e]	thousand metric tons	130	130	130	130	-- [4]
Iron ore[4]		35,600	19,400	18,400	19,700	18,900
Kaolin clay[4]		8,100 r	2,400 r	2,900 r	4,100 r	3,500
Lime[4]		86,300 r	69,600 r	64,700 r	53,600 r	34,000
Natural gas, marketed	thousand cubic meters	594,600 [5]	584,700 [5]	658,000 [5]	704,200 [4]	743,300 [4]
Nickel, Ni content:						
Mine output, oxide, oxide sinter, sulfide, ammoniacal liquor precipitate		72,585	71,342	74,018 [7, 8]	71,944 [7, 8]	73,753 [7, 8]
Metallurgical products:[6]						
Granular oxide, oxide sinter, powder		40,701	38,738	42,282 [7, 8]	38,824 [7, 8]	39,121 [7, 8]
Sulfide[7]		29,914	30,858	29,620 [8]	30,999 [8]	32,354 [8]
Ammoniacal liquor		1,970	1,746	2,116 [7, 8]	2,121 [7, 8]	2,278 [7, 8]
Total		72,585	71,342	74,018 [7, 8]	71,944 [7, 8]	73,753 [7, 8]
Nitrogen, N content of ammonia[4]		22,000 r	15,100 r	21,400 r	51,300 r	27,900
Petroleum:						
Crude	thousand 42-gallon barrels	17,886 [5, 9]	22,787 [5, 9]	23,803 [5, 9]	20,538 r	26,400 e
Refinery products:						
Petroleum coke	do.	101 [4]	79 [4]	99 [4]	72 [4]	72 e
Gasoline, motor	do.	3,467 [4]	2,719 [4]	3,517 [4]	2,826 [4]	2,800 e
Kerosene	do.	1,340 [4]	857 [4]	1,477 [4]	1,691 [4]	1,700 e
Liquefied petroleum gas	do.	1,030 [4]	762 [4]	1,066 [4]	729 [4]	729 e
Lubricants	do.	354 [4]	281 [4]	335 [4]	342	300 e
Naphtha	do.	1,348 [4]	507 [4]	902 [4]	721 [4]	700 e
Total	do.	7,639 r	5,206 r	7,396 r	6,380 r	6,300
Salt[4]		163,400 r	176,100 r	175,700 r	205,600 r	172,600
Sand, calcareous[4]	thousand cubic meters	1,781 r	1,691 r	1,629 r	1,643 r	1,651
Silica sand	do.	64 r, [5]	21 r, [5]	31 r, [5]	33 r, [5]	14 [4]
Stone, crushed[4]	do.	3,059 r	2,485 r	2,430 r	2,400 r	2,437
Steel[4]		269,600	264,100	209,800	193,200	245,100
Sulfur, byproduct of petroleum[4]		419,000 r	436,800 r	438,700 r	448,700 r	426,700
Zeolites[4]		19,800 r	19,200 r	27,600 r	28,600 r	17,200

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. -- Zero.

[1]Table includes data available through November 27, 2006.

[2]In addition to commodities listed, crude construction materials (sand and gravel, and so forth) may be also produced, but data on such production are not available, and information is inadequate to make reliable estimates of output.

[3]Cuba also produced marble and stone, but data on such production are not available, and information is inadequate to make reliable estimates of output.

[4]Source: Anuario Estadistico de Cuba.

[5]Source: Sitio del Gobierno de la República de Cuba, which is available online at URL http://www.cubagob.cu.

[6]The Government of Cuba reports figures of nickel-cobalt content of granular and powder oxide, oxide sinter, and sulfide production. The cobalt content of reported nickel-cobalt production was determined to be 1.16% of granular and powder oxide, 1.21% of oxide sinter, 7.56% of sulfide, and 33% of ammoniacal liquor. The remainder of reported figures would represent the nickel content.

[7]Sources: International Nickel Study Group (INSG), and Sherritt International Corp. Sitio del Gobierno de la República de Cuba, which is available online at URL http://www.cubagob.cu.

[8]Reported figure.

[9]Production has been converted from metric tons to barrels by using the U.S. Energy Information Administration's factor of 6.449 barrels per metric ton of crude petroleum.

TABLE 2
CUBA: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement		Cementos Cienfuegos S.A. (Government, 50%, and Las Pailas de Cemento S.A., 50%)	Cienfuegos, Cuba	1,500.
Do.		Fábrica de Cemento 26 de julio	Nuevitas, Cuba	600.
Do.		Fábrica de Cemento Mártires de Artemisa	Artemisa, Cuba	600.
Do.		Cementos Curazao N.V.	Barrio Mujica, Mariel Province	1,110.
Do.		Fábrica de Cemento Siguaney	Sancti Spiritus	300.
Chromite		Grupo Empresarial Cubaníquel S.A. (Government, 100%)	Moa, Holguin Province	30.
Cobalt		Metals Enterprise S.A. (Government, 50%, and Sherritt International Corporation, 50%)	do.	3.
Copper		Mina Grande El Cobre (Government, 100%)	Santiago de Cuba Province	Closed in 2001.
Do.		Matahambre Mine (Government, 100%)	Pinar del Rio Province	Closed in 1997.
Gold	kilograms	Castellanos Gold Mine	Santa Lucia, Pinar del Rio Province	550.
Do.	do.	Gold Mine	Isla de la Juventud	Closed.
Nickel		Empresa Niquelífera Ernesto Che Guevara	Punta Gorda plant, Holguin Province	31.5.
Do.		Moa Nickel S.A. (Government, 50%, and Sherritt International Corporation, 50%)	Moa plant, Holguin Province	33.
Do.		Empresa Niquelífera Comandante René Ramos Latour (Government, 100%)	Nicaro, Holguin Province	12.4.
Petroleum:				
Crude:	thousand 42-gallon barrels	Empresa de Perforación y Extracción de Petróleo del Centro (Government, 100%)	Northern coast between Havana and Cardenas	12.
Do.		Sherrit International (indirect working interests varying from 40% to 100% in 10 production-sharing contracts with the Government)	Near shore oilfields located at Yumuri, Varadero, Canasi, and Puerto Escondido	7,000.
Refinery products	thousand 42-gallon barrels	Cienfuegos (not operating)	Cienfuegos	27,740.
Do.		Hermanos Díaz	Santiago	37,048.
Do.		Ñico López	Havana	44,457.
Do.		Sergio Soto	Cabaiguan	767.
Sand		Algaba quarry	Sancti Spiritus	50.
Do.		Malabe quarry	NA	32.
Do.		Cajobabo	Imias	NA.
Steel		Grupo Metalúrgico Acinox (Government, 100%): Antillana de Acero	Cotorro, Havana Province	600.
Do.		Empresa de Aceros Inoxidables	Las Tunas, Las Tunas Province	370.
Do.		4 other steel plants	NA	NA.
Zeolite		Empresa Geominera Oriente	Holguin Province	58.

NA Not available.

The Mineral Industry of Ecuador

By Steven T. Anderson

In 2005, the total value of production by the mineral industry of Ecuador was almost entirely (98.67%) accounted for by the value of production of crude petroleum.[1] Production of limestone for cement and glass manufacture was of significant value within the mining sector of Ecuador, however, as was the production of other industrial minerals such as, in order of decreasing value, feldspar, pozzolan, pumice, kaolin, and barite. Existing mine production of metals was dominated by small-scale gold mining operations that employed artisanal methods. These operations mined mostly low-sulfidation epithermal, polymetallic, and skarn deposits, which also produced trace amounts of metals other than gold, such as copper and silver. The potential for establishing a more-diverse mineral industry in Ecuador was beginning to attract increasing flows of foreign direct investment (FDI), especially with respect to exploration for metallic minerals, but this increased investment had not yet resulted in the establishment of any proven or probable reserves of metals for production using modern methods. Gold has been mined in Ecuador since precolonial times and continued to dominate exploration targets during the year, but a few companies were also engaged in extensive exploration for deposits of copper, molybdenum, silver, and zinc. Some diverse types of metallic mineral deposits have been discovered in Ecuador, including copper and copper-gold porphyries, high- and low-sulfidation epithermal gold deposits, and gold-rich volcanogenic massive sulfide (VMS) deposits (Sutcliffe, 2005; 2006§; Banco Central del Ecuador, 2006§[2]; Dirección Nacional de Hidrocarburos, 2006§).

In 2005, about 71% of the volume of the country's production of crude petroleum was exported directly rather than refined domestically. This volume of crude petroleum production represented a slight increase compared with that of 2004. This increase, combined with continuing high prices for crude petroleum, helped increase the country's real gross domestic product (GDP) by 4.7% compared with that of 2004. In 2005, the country's GDP based on purchasing power parity was about $57 billion, and the rate of inflation was 2.1%. The value of the country's production of crude petroleum and natural gas during the year was about $7.4 billion and accounted for about 20% of the country's nominal GDP, and the value of mine production of nonfuel minerals was about $100 million and accounted for 0.3% of the nominal GDP. The value of exports of crude petroleum and natural gas was about $5.4 billion and accounted for about 55% of the nominal value of Ecuador's exports of all goods, whereas the value of exports of nonfuel minerals was only about $950,000. In 2005, Ecuador was the fifth ranked producer of crude petroleum in South America, but the level of proven reserves of crude petroleum in the country decreased to 3,780 million barrels (Mbbl) compared with 3,824 Mbbl in 2004 (Empresa Estatal Petróleos del Ecuador, 2006, p. 33; U.S. Energy Information Administration, 2006; Banco Central del Ecuador, 2006§, undated§; International Monetary Fund, 2006§; Sutcliffe, 2006§).

[1]All values in this chapter are given in current (nominal) U.S. dollars unless otherwise noted. The U.S. dollar has been used since 2000 as legal tender and for financial reporting purposes in Ecuador.

[2]References that include a section mark (§) are found in the Internet References Cited section.

Government Policies and Programs

In September 2005, the Government announced that it would renegotiate all contracts with foreign producers of crude petroleum in Ecuador to increase the total of taxes and royalties paid to the state to equal at least 50% of the value of the crude petroleum produced by foreign-owned operations in the country. Throughout 2005, the average tax burden on foreign production of crude petroleum was about 20%, and the Government expected to complete negotiations with the foreign oil companies by the middle of 2006. Legal actions by both Occidental Petroleum Corporation and EnCana Corporation to recoup expected value-added tax rebates, which had reportedly not been paid by the Government, continued in 2005 but were unsuccessful. Public protests against the mineral fuels sector, including some of the operations of state-owned Empresa Estatal Petróleos del Ecuador (PetroEcuador), were believed to have had a negative impact on the country's production and export of crude petroleum during the year, although total production and exports actually increased compared with those of 2004 (U.S. Energy Information Administration, 2006).

During the last quarter of 2005, public protests against exploration and development (using modern mining methods) of metallic mineral deposits were considered to be the most important source of risk that was deterring the progress of such projects. These public protests were somewhat counteracting Government revisions to the 1991 mining law in 2001 that were aimed at encouraging additional FDI in the mining sector by eliminating Government royalties, reducing the payment of surface rights per hectare, approving mining titles valid for all mining processes for 30 years, and streamlining the concession application and approval processes. The primary goal of the revision was to enable foreign investors to have the same access to mining concessions as domestic investors, and the two main short-run objectives were to double investment in the mining sector and to substitute domestic production for at least 50% of the country's imports of minerals that were deemed critical for establishing a mineral industry in the country. This mineral security strategy targeted imports of copper, gold, silver, and some industrial minerals. In the medium run, the objectives were to have explored and mapped at least 30% of the most promising mineral deposits in the country, to have created at least three industrial parks for mineral processing and metallurgical production, and to have the nonfuel minerals sector contribute at least 5% of the country's GDP. In 2005, it was beginning to appear that at least the main goal of attracting more FDI to the metallic mining sector was beginning to succeed (despite the

public protests), although no hard timeline was set for obtaining any of the above goals (U.S. Commercial Service, 2005, p. 53; Dirección Nacional de Minería, 2005§; Sutcliffe, 2006§).

Structure of the Mineral Industry

Information on the structure of the mineral industry in Ecuador is presented in table 2. PetroEcuador accounted for 36.6% of the country's total production of crude petroleum in 2005 compared with 37.4% in 2004. This decline reflects stagnation in the production of crude petroleum by the state-run company relative to production by private (foreign-owned) petroleum companies. Private companies have combined to increase production and exports of crude petroleum dramatically following completion in 2003 of the Oleoducto de Crudos Pesados (OCP) pipeline in Ecuador. The OCP was constructed to transport crude petroleum mostly from foreign-operated wells to an export terminal on the coast of the Pacific Ocean, while PetroEcuador primarily used the Sistema Oleoducto Trans-Ecuatoriano (SOTE) pipeline for the same purpose. The most significant structural change expected during 2005 that is not reflected in table 2 involved the announcement by EnCana Corporation that it had reached an agreement in principle to sell all its mineral fuel interests in Ecuador to Andes Petroleum Company, which was 100% owned by the Chinese National Petroleum Corporation (CNPC). This agreement was expected to become effective sometime during the first quarter of 2006, although EnCana planned to make the sale retroactive to July 1, 2005. Once the deal becomes effective, it would include the sale of all production from the fields operated by Alberta Energy Corporation Ecuador Ltd. and EnCana's ownership share in the OCP pipeline. In August 2005, PetroEcuador recommended that the Minister of Energy terminate the participation contract of Occidental Petroleum Corporation for exploration and exploitation of Block 15 in Ecuador. During the year, Occidental was the leading foreign-owned producer of crude petroleum in Ecuador and accounted for about 19% of the country's total annual production; EnCana was ranked second and accounted for 12% of the total annual production. Occidental's operation and development of Block 15 accounted for about 7% of the company's consolidated global production of crude petroleum and 4% of its consolidated worldwide reserves. Through the end of 2005 and the first quarter of 2006, Occidental continued negotiations with the Government of Ecuador to resolve this issue. A resolution was not expected to have any consequences for the company's interest in the OCP pipeline (table 2; EnCana Corporation, 2006, p. 29, 31, 47; Occidental Petroleum Corporation, 2006, p. 16-17, 27; Dirección Nacional de Hidrocarburos, 2005§, 2006§).

Ecuador's mineral fuel fields are located in the Amazon Basin in the northeastern part of the country. In 2005, the most productive field was Eden Yuturi, which accounted for about 13% of the total production of crude petroleum in Ecuador. The other leading fields were, in order of production of crude petroleum in 2005, Shushufindi (9%), Sacha (8%), and Dorine (6%). This production was mostly transported to the Pacific coast via two domestic pipelines and one international pipeline. The main domestic pipeline was the SOTE, which was 100% owned and operated by the Government through PetroEcuador. In 2005, about 122 Mbbl of crude petroleum was transported through the SOTE, which terminated in the petroleum terminal at the Port of Balao on the Pacific coast. The other domestic pipeline was the OCP, which was completed in 2003 and was owned and operated by Oleoducto de Crudos Pesados Ltd. (EnCana, 31%; Repsol YPF S.A., 26%; Petróleo Brasileiro S.A., 15%; Occidental, 12%; Agip Petroleum Ecuador Ltd., 8%; Perenco plc, 4%; and Techint S.A., 4%). About 58 Mbbl of crude petroleum was transported through the OCP during the year. The international pipeline was the Oleoducto Trans-Andino (OTA), which was also owned and operated by PetroEcuador. The OTA links Ecuador's fields to the Pacific Port of Tumaco, Colombia, but it was reportedly not in use in 2005 (Empresa Estatal Petróleos del Ecuador, 2006, p. 51-54; U.S. Energy Information Administration, 2006; Dirección Nacional de Hidrocarburos, 2006§).

Exploration

A number of firms were engaged in exploration for nonfuel minerals. A listing of the companies that made the most significant investments during 2005 is provided in table 3. Most of these firms were primarily exploring for gold, although some made significant investments exploring for other metals, such as copper, molybdenum, silver, and zinc. Through the end of 2005, none of these companies had reported any proven or probable reserves for any of these metals (table 3).

Accurate figures were not readily available concerning the amounts separately invested in the exploration for new sources of crude petroleum and the development of new production capacity for mineral fuels. PetroEcuador reported the drilling of one well for the state-run company's own mineral fuels exploration program, and reported that CNPC, EnCana, and Occidental also drilled one exploratory well each. PetroEcuador reported that the only other exploration during the year was carried out by Perenco, which drilled two exploratory wells. No major discoveries were reported, however, and only about 27 Mbbl of new proven reserves were added to the total for Ecuador, while about 71 Mbbl of proven reserves were extracted in the course of production operations in the country (Empresa Estatal Petróleos del Ecuador, 2006, p. 33-37). Any increases in Ecuador's total reserves of crude petroleum were expected to come from development of the Ishpingo-Tapococha-Tiputini (ITT) block of potential petroleum fields. The ITT block is located further east than the major existing fields in the Amazon region, and it was estimated to contain about 900 Mbbl of proven reserves. Private foreign investors have shown mixed interest in developing the ITT block, however, because of uncertainty concerning revisions to the hydrocarbons law and because the ITT fields reportedly contain an extremely heavy variety of crude petroleum that would require blending with lighter mineral fuels before it could be transported via Ecuador's pipelines. Also, protests against increasing crude petroleum production in the Amazon region have repeatedly obstructed exploration and production by all petroleum companies, including PetroEcuador. The protests have primarily focused on the activities of foreign-owned petroleum companies

operating in the country. The protests against the activities of petroleum companies have been mostly by indigenous groups concerned with environmental issues, whereas protests against exploration and development by foreign-owned mining companies have been by small organized groups from the communities immediately surrounding the proposed mine sites. The forces supporting the organization of these small local anti-mining groups remained unclear (U.S. Energy Information Administration, 2006; Sutcliffe, 2006§).

Production

Production of crude petroleum increased slightly in 2005 compared with that of 2004, although the OCP was not being used at full capacity. Previous to completion of the OCP, companies had complained that reliance on the SOTE was creating a bottleneck in production of crude petroleum for export. PetroEcuador's annual production of crude petroleum has decreased since at least 2002, and the state-run company had not reinvested much in its aging fields nor in exploring for new fields since that time. This lack of investment raised the relative importance of the private (foreign-owned) petroleum companies in Ecuador, which increased their annual share in the country's production of crude petroleum during the same timeframe (table 1; U.S. Energy Information Administration, 2006).

In 2005, the artisanal production of gold and some associated metals increased only slightly compared with that of 2004, although gold prices remained high during this timeframe, on average. Total production capacity for mine production of gold by the many small-scale operations in the country has been estimated to range from about 8 metric tons per year (t/yr) to 10 t/yr, but actual production was not very close to these estimates in 2005 (Sutcliffe, 2005; table 1).

The International Iron and Steel Institute (IISI) reported that production of continuously cast crude steel from imports of ferrous raw mineral materials in 2005 increased substantially compared with that of 2004. Primary production of crude steel in Ecuador was by one company, Acerías Nacionales del Ecuador S.A. (ANDEC), and secondary production was by a subsidiary of ANDEC, Fundiciones Nacionales S.A. (FUNASA) (International Iron and Steel Institute, 2005, p. 11).

Trade

In 2005, Ecuador's imports of petroleum refinery products ($1,012 million) and nonfuel minerals in raw form ($21 million) combined to account for about 11% of the value of the country's total imports of goods, but no imports of crude petroleum or natural gas were reported by the Central Bank of Ecuador. The nominal trade balance for petroleum refinery products was about –$540 million and about –$20 million for raw nonfuel minerals. By far, the leading export destination for crude petroleum produced in Ecuador was the United States (which accounted for about 68% of the total value of Ecuadorian exports of crude petroleum in 2005), followed by Peru (14%), Panama (9%), and Chile (4%); the remaining country destinations each accounted for only about 1% or less (Banco Central del Ecuador, 2006§, undated§).

Outlook

The major economic activities in the mineral industry of Ecuador are expected to continue to center around the efforts of PetroEcuador to find joint-venture partners and to reactivate some of the marginal petroleum fields under its control. The Government's plans to auction off the rights to explore and exploit the ITT fields to private foreign investors have continued to be delayed owing to continuing turnover in control of the Government and to uncertainties concerning future ownership of these fields, uncertainties concerning possible passage of a new hydrocarbons law, and the legal risks inherent in inconsistent enforcement of the many overlapping applicable investment, property rights, and tax laws in Ecuador. Foreign companies are also expected to continue to face uncertainties concerning taxation, environmental lawsuits, possible nationalization of their petroleum fields, and ongoing public protests that are disruptive to both exploration and production activities.

The modernization of Ecuador's mining law in 2001 and the continuation of higher prices in 2005 for most of the minerals targeted for investment promotion by this revision to the law resulted in significantly increased exploration for reserves of metallic minerals—an increase that continued into 2006. A few of these exploration projects approached more-advanced stages in 2005, including two or three that entered or completed the feasibility stage. Timelines for eventual production from most of the proposed mines listed in table 3 remain unclear, however, because of political uncertainty and increasing public protests against the mineral industry in 2006.

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Major Sources of Information

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TABLE 1
ECUADOR: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2001	2002	2003	2004	2005[p]
METALS						
Cadmium, mine output, Cd content[e]	kilograms	-- [r]	-- [r]	--	--	--
Copper, mine output, Cu content		-- [r]	-- [r]	--	242 [r]	254
Gold, mine output, Au content	kilograms	3,005	2,750	4,819	5,158 [r]	5,416
Lead, mine output, Pb content[e]		-- [r]	-- [r]	--	-- [r]	--
Silver, mine output, Ag content	kilograms	2,000 [e]	96	100	372 [r]	391
Steel, crude, continuously cast, electric furnace		59,732	68,743	79,794	72,000 [r]	85,000 [e]
Zinc, mine output, Zn content[e]		-- [r]	-- [r]	--	--	--
INDUSTRIAL MINERALS						
Barite		1,181	1,180 [e]	2,139	3,695 [r]	3,879
Carbon dioxide (CO_2)		14	752	329	685	719
Cement, hydraulic[e]	thousand metric tons	2,920	3,000	3,100	3,000 [r]	3,000
Clays:[3]						
Common	do.	345	382	340	903 [r]	948
Kaolin		703	8,483	11,884	5,646 [r]	5,928
Feldspar		60,688	31,254	44,268	53,469 [r]	56,142
Gypsum, crude		834	4,730	5,200	232 [r]	244
Pozzolan		373,023	519,090	190,747	612,256 [r]	642,868
Pumice		100,000 [r,e]	130,459 [r]	88,830	183,119 [r]	192,275
Salt, common[e]		75,000 [r]	75,000 [r]	75,000	75,000 [r]	75,000
Sand:						
Silica (quartz) sand		34,718	40,880	38,856	32,148 [r]	33,754
Ferruginous[e]		9,900	10,000 [r]	10,000	11,325 [r,2]	11,890 [2]
Stone, sand and gravel:						
Limestone[3]	thousand metric tons	4,079	5,712 [r]	4,688	4,700 [r]	4,935
Marble		1,344	265	1,890	1,431 [r]	1,503
Sand and gravel	thousand cubic meters	3,414	4,467	3,272	5,834 [r]	6,126
Sulfur:[e]						
Native		4,000	4,000	4,000	4,000	4,000
Byproduct, petroleum refining		3,000 [r]	3,000 [r]	3,000	3,088 [r,2]	3,008 [2]
Zeolites		1,801	1,883	--	--	--
MINERAL FUELS AND RELATED MATERIALS						
Gas, natural:						
Gross	million cubic meters	1,001	1,085 [r]	1,287	1,422 [r]	1,609
Of which, marketable	do.	-- [r]	86 [r]	249	240	262
Liquefied natural gasoline	thousand 42-gallon barrels	664	603	514	542	458
Petroleum:						
Crude	do.	148,746	143,758	153,539	192,517	194,169
Refinery products:						
Liquefied petroleum gas	do.	2,566 [r]	2,199 [r]	2,358	2,412 [r]	2,259
Gasoline	do.	8,386 [r]	9,883 [r]	9,338	8,816 [r]	6,954
Jet fuel	do.	1,252 [r]	1,820 [r]	1,897	2,235 [r]	2,500
Distillate fuel oil	do.	14,354 [r]	13,174 [r]	11,752	13,397 [r]	13,064
Residual fuel oil	do.	24,543 [r]	23,465 [r]	23,622	22,851 [r]	21,255
Asphalt	do.	1,065	1,087	1,200	1,158	990
Turpentine	do.	32	19	8	19	23
Solvents, including rubber solvent	do.	33	42	13	21	32
Other, including oils and lubricants	do.	67 [r]	87 [r]	64	88 [r]	102
Total	do.	52,298 [r]	51,776 [r]	50,252	50,997 [r]	47,179

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [p]Preliminary. [r]Revised. -- Zero.

[1]Table includes data available through November 2006.

[2]Reported figure.

[3]No reports of separate quantities for limestone or clay used in cement production were available for this table.

TABLE 2
ECUADOR: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Cement	thousand metric tons	Holcim Ecuador S.A. (Holcim Ltd., 83.5%, and other private, 16.5%)	Cerro Blanco Plant, Guayaquil, Guayas Province, and San Rafael grinding plant, Latacunga, Cotopaxi Province	3,500.
Do.	do.	Cementos Selva Alegre S.A. (Lafarge S.A., 98.2%, and other private, 1.8%)	Cement plant near capital city of Quito, Pichincha Province	700.
Gold	kilograms	Small-scale and artisanal mining operations (private, 100%)	Western and eastern Cordilleras, southern Ecuador	8,000.
Petroleum, crude	thousand 42-gallon barrels	Owned and operated by Empresa Estatal Petróleos del Ecuador (Ecuadorian Government, 100%)	About 28 active fields, led by Sacha, Sucumbios Province, and Shushufindi, Napo Province	71,000.
Do.	do.	Operated by Sipetrol S.A. (Empresa Nacional del Petróleo S.A., Chilean Government, 100%)	Biguno, Huachito, Mauro Davalos Cordero, and Paraiso Fields, Napo Province	7,000.
Do.	do.	Operated by Alberta Energy Company (AEC) Ecuador Ltd. (EnCana Corporation, 100%)	Mostly Dorine Field but 6 others, led by Fanny 18-B and Alice Fields, Tarapoa Block, Sucumbios Province	20,000.
Do.	do.	Owned and operated by City Oriente Ltd., 100%	Three fields, led by Tipishca-Huaico, Block 27, Sucumbios Province	1,500.
Do.	do.	Owned and operated by Occidental Petroleum Corporation, 100%	Most production from Eden Yuturi Field, Block 15, Napo Province, but also from Indillana and Yanaquincha wells; Limoncocha Field, Block 15, Sucumbios Province	37,000.
Do.	do.	Owned and operated by Petrobell Inc., 100%	Tigüino field, Block 30, Pastaza Province	1,700.
Do.	do.	Owned and operated by Petróleos Sudamericanos S.A., 100%	Mascarey Field, Block 11, Sucumbios Province	2,400.
Do.	do.	Owned and operated by EnCana Corporation, 100%	Hormiguero, Nantu, Sunka, Wanke Fields, Block 14, Napo Province; fields in Block 17, Napo and Pastaza Provinces	3,200.
Do.	do.	Owned and operated by Perenco plc	About seven fields, led by the Coca-Payamino Field, Block 7, Napo Province, and the Yuralpa Field, Block 21, Pastaza Province	8,100.
Do.	do.	Owned and operated by Repsol YPF S.A.	Amo, Bogui-Capiron, Daimi, Ginta, and Iro Fields, and three other small fields, Block 16, Napo Province	19,300.
Do.	do.	Owned and operated by Agip Petroleum Ecuador Ltd. (Eni S.p.A., 100%)	Villano Field, Block 10, Pastaza Province	7,600.
Do.	do.	Operated by Ecuador TLC S.A. (Petrobras Energía Ecuador S.A. [Petróleo Brasileiro S.A., 100%], 100%)	Palo Azul and Pata Fields, Block 18, Napo Province	11,700.
Do.	do.	Operated by TecpEcuador S.A.; owned by Tecpetrol S.A. (Techint S.A., 100%)	Bermejo Field, Block 11, Sucumbios Province	3,100.
Petroleum, refinery products	do.	Owned and operated by Empresa Estatal Petróleos del Ecuador (Ecuadorian Government, 100%)	Esmeraldas refinery, Esmaraldas Province	40,200.
Do.	do.	do.	Libertad refinery, Guayas Province	16,800.
Do.	do.	do.	Amazonas refinery and gas plant, Napo Province	7,300.
Sand and gravel (aggregates)	thousand metric tons	Holcim Agregados S.A. (Holcim Ecuador S.A., 100%)	Two plants near Manta and Portoviejo, Manabi Province, and one plant near the capital city of Quito, Pichincha Province	2,500
Steel, crude		Complejo Siderurgico ANDEC - FUNASA (Acerías Nacionales del Ecuador-Fundiciones Nacionales S.A.) (Holdingdine S.A. and other private, 100%)	Complex of plants in Port of Guayaquil, Guayas Province	85,000.

[e]Estimated; estimated data are rounded to no more than three significant digits.

TABLE 3

ECUADOR: ESTIMATED MAJOR INVESTMENT EXPENDITURES IN MINERAL EXPLORATION IN 2005[1]

(Thousand dollars)

Location	Project Name	Commodity	Ownership	Annual investment	Planned startup date
50 kilometers west of Cuenca, Azuay Province	Rio Blanco (feasibility)	Gold, silver	International Minerals Corp., 100%	4,900	2008
40 kilometers southwest of Cuenca, Azuay Province	Quimsacocha (advanced exploration)	Gold, silver	IAMGOLD Corporation	5,200	NA
65 kilometers southwest of Cuenca, in Azuay Province	Ganarin (exploration)	Gold, silver	Nortec Ventures Corporation (on 51% earn-in option from Doubloon Exploration Corp.), 100%	340	NA
Azuay, El Oro, and Pichincha Provinces, of which:					
Azuay Province, southcentral Ecuador	Shyri (exploration)	Gold, silver	Cornerstone Capital Resources Inc., (on option from Sierra Minera S.A.), 100%	1,300 [2]	NA
50 kilometers southeast of Machala, El Oro Province, southwestern Ecuador	Bella Maria (exploration)	Gold	Cornerstone Capital Resources Inc. (on option from Sierra Minera S.A.), 100%	do.	NA
60 kilometers west of Quito, Pichincha Province	La Plata (exploration)	Copper, gold, silver, lead, zinc	Cornerstone Capital Resources Inc. (on 70% earn-in option from Sultana del Condor Minera S.A.), 100%	do.	NA
200 kilometers southwest of Quito, in Cotopaxi Province	Macuchi (exploration)	Copper, gold, silver, zinc	Largo Resources Ltd. (on 51% earn-in option from Compañía Minera Macuchi Mimacuchi S.A.), 100%	1,200	NA
40 kilometers southeast of Machala, El Oro Province	Cangrejos (exploration)	Copper, gold, molybdenum	Odin Mining and Exploration Ltd., 100%	65	NA
Near cities of Zaruma and Portovelo, El Oro Province	Zaruma (exploration)	do.	do.	680	NA
60 kilometers northeast of Quito, in Imbabura Province	El Corazon (exploration)	Gold	Skeena Resources Limited	2,400	NA
50 kilometers north of Loja, Loja Province	Cañicapa (exploration)	Gold	do.	22	NA
Loja Province, southwest Ecuador	Dynasty Goldfield (exploration)	Copper, gold, silver	Dynasty Metals & Mining Inc., 100%	1,900	NA
40 kilometers north of Mirador project, Marong-Santiago Province	Panantza and San Carlos (exploration)	Copper, gold, molybdenum	do.	160	NA
North Zamora-Chinchipe and south Marona-Santiago Provinces	Condor (4 exploration sites, including the Fruta del Norte prospect)	Gold	Aurelian Resources Inc., 100%	3,600	NA
Zamora-Chinchipe Province	Condor (exploration)	Gold	Goldmarca Limited (under 70% earn-in option with Government of Ecuador), 100%	2,100	NA
40 kilometers east of Zamora, Zamora-Chinchipe Province	Jerusalem (feasibility)	Gold	do.	320	NA
70 kilometers east-southeast of Cuenca, in Zamora-Chinchipe Province	Mirador (feasibility)	Copper, gold, silver	Corriente Resources Inc., 100%	8,400	2008 [3]

NA Not available.

[1]Estimated data are rounded to no more than two significant digits.

[2]Across La Plata, the Shyri, and the Bella Maria properties in Ecuador.

[3]Not before this date.

The Mineral Industries of French Guiana, Guyana, and Suriname

By Yolanda Fong-Sam

FRENCH GUIANA

French Guiana (Guyane), which is located on the northern coast of South America, is bordered by Brazil to the south and southeast, Suriname to the west, and the Atlantic Ocean to the north. French Guiana has a total area of 91,000 square kilometers (km²) and had an estimated population of 195,500 in 2005 (U.S. Central Intelligence Agency, 2005§[1]). French Guiana has been an overseas department of France since 1946, and its economy was closely tied to that of France through imports and subsidies. The mineral sector was also administered by France. Such goods as chemicals, food, fuels, machinery, and transport equipment were imported from France. Gold was the main mineral exported from French Guiana (U.S. Central Intelligence Agency, 2005§; 2006§).

The leading industries in the country were aerospace (mainly at the French space center in Kourou), fishing, and forestry (U.S. Central Intelligence Agency, 2005§). French Guiana's main mineral industries included cement, clays, columbite and tantalite, gold, sand, and crushed stone. In 2005, the mining sector was affected by a 29.5% decrease in gold production (table 1).

In recent years, the mineral industry has been focused on gold and petroleum exploration. Gold exploration was conducted by Golden Star Resources Ltd. of the United States and Cambior Inc. of Canada. Golden Star Resources held 100% interests in the Bon Espoir and the Paul Isnard gold properties, which are located to the west of French Guiana's capital of Cayenne (Golden Star Resources Ltd., 2005§). Cambior held a 100% interest in the Camp Caiman gold property. During 2004, the French Government had granted Cambior a 30-km² mining concession for the Camp Caiman project that was valid for a period of 25 years. In mid-2005, Cambior completed a feasibility study of the potential development of Camp Caiman, and in the last quarter of 2005, the company filed a permit application for the construction of a mine at Camp Caiman. As of December 2005, the inferred resource was estimated to be 7,745 kilograms at a grade of 2.1 grams per metric ton of gold (Mining Journal, 2005; Cambior Inc., 2006a§).

Hardman Resources Ltd. of Australia was the principal petroleum exploration company in French Guiana during 2005. Hardman held 97.5% interest in an exclusive exploration license offshore French Guiana. During 2005, Hardman initiated a new round of two-dimensional (2D) and three-dimensional (3D) seismic data acquisition; Hardman was expected to select and define prospects with potential hydrocarbon systems by early 2006 (Hardman Resources Ltd., 2006§).

[1]References that include a section mark (§) are found in the Internet References Cited sections.

Outlook

During 2006, gold exploration and investment activities in French Guiana will likely continue at projects begun in 2005. Cambior planned to start construction at Camp Caiman by mid-2006 and anticipated that commercial production could begin in late 2007 (Cambior Inc., 2006a§, b§).

In 2006, Hardman's petroleum exploration projects are expected to progress based on developments achieved in 2005.

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GUYANA

Guyana is the fourth smallest country in South America after French Guiana, Suriname, and Uruguay. It is located in northern South America and bordered by the Atlantic Ocean to the north, Brazil to the south, Suriname to the east, and Venezuela to the west. Guyana has a total area of 214,970 km² and had an estimated population of 751,200 in 2005 (U.S. Central Intelligence Agency, 2005§; World Bank Group, 2006§).

In 2005, the gross domestic product (GDP) based on purchasing power parity was estimated to be $3.49 billion; the estimated GDP per capita based on purchasing power parity was $4,612 (International Monetary Fund, 2006§).

Guyana was one of the main bauxite producers in the world. Other minerals produced in Guyana included clay, diamond, gold, and sand and gravel. In 2005, the value of exports was estimated to be about $587 million; exports included such goods as bauxite and alumina, gold, food products, and timber. Guyana's export partners included Canada and the United States

(18.9% each), the United Kingdom (11.7%), Portugal (8.1%), Jamaica (5.3%), Trinidad and Tobago (4.2%), and others (32.9%). Imports were valued at about $680 million and included such products as food, machinery, manufactures, and petroleum. Guyana's import partners included the United States (26.7%), Trinidad and Tobago (23.9%), Cuba (6.6%), the United Kingdom (5%), China (4.1%), and others (33.7%) (U.S. Central Intelligence Agency, 2006§).

Commodity Review

Metals

Bauxite and Alumina.—In 2005, bauxite production decreased by 6.7% compared with that of 2004 (table 1). In its first year of production during 2005, Omai Bauxite Mining Inc. (OBMI) reported total sales of $36.9 million at its Linden Mining Enterprise Ltd. (Linmine). OBMI was owned by Cambior (70%) and the Government of Guyana (30%). OBMI's target for production sales in 2006 was about $63 million (Cambior Inc., 2006§).

Gold.—In 2005, gold production in Guyana decreased by 0.4% compared with that of 2004 (table 1). Cambior officially ceased its Omai Gold mine operations in September 2005 owing to the depletion of reserves. During 2005, the mine processed the low-grade ore stockpiled from the early years of the mine's operation for a total production of 99,500 troy ounces [3,095 kilograms (kg)] of gold. The Omai Gold mine produced more than 3.7 million troy ounces (115,081 kg) of gold during its lifetime (Cambior Inc., 2006, p. 4, 18).

Guyana Goldfields Inc. held 100% interest in the Aurora Mine and the Peters Mine (Guyana Goldfields, 2006a§, b§). Sacre-Coeur Minerals Ltd. held four gold permits at the Kartuni regional block, the Lower Puruni regional block (Million Mountain), the Northwest regional block, and the Oko regional block (Sacre-Coeur Minerals Ltd., 2006b§). Vannessa Ventures Ltd. held 100% interest in the Marudi Mountain gold project, which is divided into the following four zones: the Marudi Ridge zone, the Mazoa zone, the Paint Mountain Ridge zone, and the Peace Creek-Toucan Hill zone (Vannessa Ventures Ltd., 2005a, p. 5-6).

Industrial Minerals

Diamond.—During 2005, two Canadian-based companies were actively prospecting for diamond in Guyana: Sacre-Coeur and Vannessa Ventures. Sacre-Coeur held prospecting permits for the Kurupung and the Potaro-Kuribrong regional blocks (which are located in north-central Guyana), and a claim-permit and claim-license in the Mahdia-Issano regional block (which is located in northwestern Guyana) (Sacre-Coeur Minerals Ltd., 2006a§).

Vannessa Ventures held interest in the Maple Creek and the Potaro projects. In 2004, the construction of the Maple Creek diamond and gold mine was completed; in addition, the property was under the final preproduction inspection phase by the Executive Branch of the Government of Guyana and the Ministry of Mines. During 2005, the sampling work in the Maple Creek property was suspended; the project was placed on temporary care and maintenance status owing to the company's decision to evaluate additional exploration and development areas (Vannessa Ventures Ltd., 2005b, p. 7).

Outlook

Production in the mining sector will likely continue to be dominated by the production of bauxite. OBMI expects its Linmine assets to produce 300,000 metric tons (t) of high-alumina refractory bauxite in 2006. Gold exploration activities in Guyana are likely to continue as a result of several gold exploration projects that progressed during 2005.

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SURINAME

Suriname, which is located on the northern coast of South America, is bordered by the Atlantic Ocean to the north, Brazil to the south, French Guiana to the east, and Guyana to the west. Suriname has a total land area of 163,270 km² and had an estimated population of 449,200 in 2005 (World Bank Group, 2006§).

In 2005, Suriname's GDP based on purchasing power parity was estimated to be $2.9 billion; the estimated GDP per capita based on purchasing power parity was $5,683 (International Monetary Fund, 2006§).

The mineral industry of Suriname included refined alumina; mined bauxite and gold; quarried clays and sand and gravel; and cement and petroleum. In recent years, mineral production has been focused on alumina, bauxite, and petroleum. In 2005, the production of alumina decreased by 4.7% compared with that of 2004; bauxite production increased by 17.4%; petroleum products and crude petroleum increased by 8% and 6.8%, respectively (table 1).

In 2004 (the latest year for which data were available), the country's exports included such goods as alumina, crude oil, food products, and lumber and were valued at about $881 million. Suriname's export partners in 2005 included Norway (23.5%), the United States (16.5%), Canada (16.1%), Belgium (9.7%), France (7.9%), the United Arab Emirates (7.3%), and others (19%). Imports in 2004 were valued at about $750 million and included such products as equipment, food, and petroleum. Suriname's import partners in 2005 included the United States (29.3%), the Netherlands (17.5%), Trinidad and Tobago (12.7%), China (6.5%), Japan (5.2%), and others (28.8%) (U.S. Central Intelligence Agency, 2006§).

Production at Cambior's Rosebel gold mine, which is located 100 km south of Suriname's capital of Paramaribo, was begun in February 2004. During 2005, production at the mine increased by about 25% to 10,619 kg from the 8,513 kg produced in 2004 (table 1). The projected gold production at the mine in 2006 was approximately 335,000 troy ounces (10,420 kg) of gold (at an estimated mine operating cost of $240 per troy ounce), which is a decrease of 2% compared with 2005 production. The projected decrease was owing to an expected reduction in output caused by the failure of one of the mine's tank foundations in November 2005. The Rosebel Mine was owned by Rosebel Gold Mines N.V., which was a joint venture of Cambior (95%) and the Government of Suriname (5%) (Mining Journal, 2006; Cambior Inc., 2006§).

Outlook

During 2006, the alumina industry in Suriname is expected to grow given the 2005 completion of the 250,000-metric-ton-per-year (t/yr) expansion of the Paranam refinery. The expansion increased the total capacity of the refinery to 2.2 million metric tons per year (Alcoa Inc., 2005§).

For 2006, the crude petroleum production in Suriname is expected to continue to increase. The national oil company of Suriname, Staatsolie Maatschappij Suriname N.V., estimates an annual production of 4.44 million barrels for 2006, which represents an increase of about 1.4% compared with 2005 production of 4.38 million barrels (Staatsolie Maatschappij Suriname N.V., 2006, p. 18).

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TABLE 1
FRENCH GUIANA, GUYANA, AND SURINAME: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Country and commodity		2001	2002	2003	2004	2005[e]
FRENCH GUIANA[e]						
Cement	metric tons	58,000	62,000	62,000	62,000	62,000
Clays	do.	5,000	5,000	5,000	5,000	5,000
Columbite and tantalite	kilograms	1,500	1,500	1,500	1,500	1,500
Gold, mine output, Au content[2]	do.	4,062 [3]	3,290 [3]	3,296 [3]	2,773 [r, 3]	1,955 [3]
Sand		1,500	1,500	1,500	1,500	1,500
Stone, crushed		1,500	1,500	1,500	1,500	1,500
GUYANA[4]						
Bauxite, dry equivalent, gross weight		1,950	1,690	1,846 [r, 5]	1,506 [r, 5]	1,405 [3, 5]
Clay[5]	metric tons	NA	NA	NA	3,000	12,000 [3]
Diamond	carats	178,698 [5]	248,436	412,537 [r]	444,940 [r, 5]	340,000 [e]
Gold, mine output, Au content	kilograms	14,186	13,581	11,707 [r, 5]	11,148 [r, 5]	11,102 [3, 5]
Sand	metric tons	240,083	186,327 [r, 5]	253,674 [r, 5]	142,092 [r, 5]	573,150 [3, 5]
Stone, crushed	do.	117,814	54,746 [r, 5]	154,093 [r, 5]	285,583 [r, 5]	315,964 [3, 5]
SURINAME[e]						
Aluminum:						
Bauxite, gross weight		4,394 [3]	4,002 [3]	4,215 [3, 6]	4,052 [3, 6]	4,757 [3, 6]
Alumina		1,900 [3]	1,900	2,004 [3, 7]	2,039 [3, 6]	1,944 [3, 7]
Cement, hydraulic		65 [3]	65	65	65	65
Clays, common		20	20	20	20	20
Gold, mine output, Au content	kilograms	300	300	300	8,513 [2, 3]	10,619 [3, 8]
Petroleum:						
Crude[9]	thousand 42-gallon barrels	4,700 [3]	4,500 [3]	4,300 [3]	4,100 [3]	4,380 [3]
Products	do.	2,550 [3]	2,700	2,600 [9]	2,500 [3, 9]	2,700 [3, 9]
Sand and gravel:						
Gravel		35	35	35	35	35
Sand, common		160	160	160	160	160
Stone, crushed and broken		50	50	50	50	50

[e]Estimated; estimated data are rounded to no more than three significant digits. [r]Revised. NA Not available.

[1]Table includes data available through November 29, 2006.

[2]Source: Direction Regionale de l'Industrie, de La Recherche et de l' Environment and Bureau de Recherches Géologiques et Minières.

[3]Reported figure.

[4]In addition to the commodities listed, Guyana's Government also reported laterite production, in metric tons: 2004--44; and 2005--zero; and loam production, in metric tons: 2004--3,000; and 2005--4,000.

[5]Source: Guyana Geology and Mines Commission.

[6]Source: World Bureau of Metal Statistics.

[7]Source: BHP Billiton Group.

[8]Source: Cambior Inc.

[9]Source: Staatsolie Maatschappij Suriname N.V.

TABLE 2
GUYANA AND SURINAME: STRUCTURE OF THE MINERAL INDUSTRIES IN 2005

(Thousand metric tons unless otherwise specified)

Country and commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
GUYANA				
Alumina		Bauxite Industry Development Co. Ltd. (BIDCO)	Alumina refinery at Linden (presently closed)	300
Bauxite		Bauxite Industry Development Co. Ltd. (BIDCO) (Government, 100%)	Kara Kara, Northeast Dorabece, and East Montgomery Mines, MacKenzie, Linden, West Demerara District	3,500
Do.		do.	Block 2 Manaka, North, South mines, Kwakwani, East Berbice District	1,500
Do.		do.	Processing plant at Linden	900
Do.		do.	Processing plant at Everton, East Berbice District	700
Do.		C.A. Dayco (private, Venezuela, 100%) [Bauxite Industry Development Co. Ltd. (BIDCO) contract]	Kwakani area	500
Do.		Green Mining Inc. (Green Construction Co., United States, 100%) (Guymine contract)	Dacouria Mine, Linden	NA
Do.		Aroaima Bauxite Co. (Government, 100%)	Aroaima, East Berbice District	2,000
Do.		Omai Bauxite Mining Inc. (Cambior Inc., 70%, and Government of Guyana, 30%)	Omai Bauxite Mine and Processing Plant located close to Linden on the Demerara River about 100 kilometers south of Guyana's capital city of Georgetown	300
Gold	kilograms	Omai Gold Mines Ltd. (Cambior Inc., 95%, and Government of Guyana, 5%)	Omai Mine, Mazaruni-Potaro District; shut down in third quarter of 2005 owing to depletion of mine	300
Gravel		Baracara Quarries (private)	Quarry near Bartica, Mazaruni-Potaro District	100
Silica sand		Minerals and Technology Ltd. [Minerals and Chemicals of Texas (United States)]	Sand Hills, Demerara River, West Demerara District	300
Stone		Mazaruni Granite Products Inc. of Guyana (private)	Mazaruni River	3,650
SURINAME				
Alumina		Suriname Aluminum Co. (Suralco) (Alcoa, Inc., 55%, and BHP Billiton plc, 45%)	Refinery at Paranam	2,200
Aluminum		Suralco, 55%, and BHP Billiton plc, 45%	Smelter at Paranam	50
Bauxite		do.	Mines at Accaribo, Coermotibo, and Lelydorp III, District of Marowijne	4,000
Do.		Suralco, 76%, and BHP Billiton plc, 24%	Accaribo Mine, District of Para	1,000
Cement		Vensur N.V. (private, 100%)	Paramaribo, District of Para	60
Gold	kilograms	Rosebel Gold Mines N.V. (Cambior, Inc., 95%, and Government of Suriname, 5%)	Brokopondo District, 100 kilometers south of Paramaribo	10,500
Petroleum		Staatsolie Maatschappij Suriname NV (Government, 100%)	Tambaredjo, District of Saramacca	5,000
Petroleum products		do.	do.	2,600

NA Not available.

The Mineral Industries of the Islands of the Caribbean

Aruba, The Bahamas, Barbados, Dominican Republic, Jamaica, Trinidad and Tobago, and Other Islands

By Omayra Bermúdez-Lugo

ARUBA

The mining sector played a minor role in the economy of the island of Aruba. Aruba is located in the Caribbean Sea approximately 29 kilometers (km) off the Paraguana Peninsula of northern Venezuela. Mineral commodities produced in the country included petroleum refinery products and sulfur (table 1).

THE BAHAMAS

The Bahamas is a group of islands located in the Caribbean Sea to the southeast of Florida. Mining played a minor role in the country's economy. Mineral commodities produced were limited to aragonite and salt (table 1).

BARBADOS

Barbados is located to the east of the main chain of the Lesser Antilles group of islands on the boundary between the Caribbean Sea and the Atlantic Ocean. Mineral commodities produced in the country included clay, hydraulic cement, limestone, natural gas, petroleum, sand, and shale (table 1).

DOMINICAN REPUBLIC

The Dominican Republic is located on the eastern portion of the Caribbean island of Hispaniola. The country produced bauxite, cement, ferronickel, gypsum, limestone, marble, salt, sand and gravel, and steel. Limestone, marble, and sand and gravel were produced solely for domestic consumption. Amber and pectolite (larimar) were produced in modest amounts by artisanal miners. In 2005, the country produced about 2.8 million metric tons (Mt) of hydraulic cement; 534,555 metric tons (t) of bauxite; and 6,060 cubic meters of marble (table 1). Ferronickel was produced by Falconbridge Dominicana C. por A. (Falcondo) (a subsidiary of Falconbrdige Ltd. of Canada). The company mined, milled, and smelted its own nickel laterite ores. In 2005, Falcondo produced 28,668 t of nickel in ferronickel (table 1). The Dominican Republic did not produce petroleum and relied on imports of petroleum and refined petroleum products from Mexico and Venezuela to meet domestic needs. Petroleum was refined at Bonao by Falcondo to be used at the company's nickel plant and at Haina by Refinería Dominicana de Petróleo.

In 2005, mining activities continued to center around gold exploration. Production of gold and silver in the Dominican Republic was suspended in 1999. The country's sole producer of gold and silver prior to 1999 had been Government-owned Rosario Dominicana S.A., which was a company established in 1975 to operate the Pueblo Viejo gold and silver mine. The mine had an original output capacity of about 12,400 kilograms per year of doré (gold and silver bullion bars). The company's estimated export earnings from 1975 to 1998 were about $2.0 billion (Rafael Osiris de León, Secretary, Academy of Sciences of the Dominican Republic, written commun., July 2002). In July 2001, Placer Dome Inc. of Canada was awarded the right to negotiate an agreement to operate the Pueblo Viejo Mine and in August 2002, following the ratification of a Special Lease Agreement by the Congress of the Dominican Republic, the company launched a feasibility study at Pueblo Viejo. At the time, Placer Dome's allowed timeframe to reach a production decision was 4 years. In September 2005, Placer Dome Inc. announced its intention to go ahead with the development of the Pueblo Viejo gold mine. The company planned to produce a total of about 370,000 kilograms (kg) of gold (reported as 12 million troy ounces) for a period of 20 years at a capital cost of $1 billion. During the first 6 years of operation, the mine is expected to produce an average of about 25,000 kg (reported as 800,000 troy ounces). In addition to the revamping of the mine, Placer Dome planned to build a 140-megawatt powerplant to support mining activities at Pueblo Viejo, which would be integrated into the national grid. The commissioning of the mine was subject to Placer Dome submitting a project notice and receiving the required permits from the Government for the mine and powerplant (Placer Dome Inc., 2005§[1]).

In May, GlobeStar Mining Corp. announced the results of a revised feasibility study for the development of the Cerro de Maimon polymetallic deposit. Cerro de Maimon is located in the municipality of Maimon in the Nouel Province about 70 km northwest of Santo Domingo. The feasibility study, which was performed by Denver-based Behre Dolbear & Company Inc., yielded measured and indicated resources of about 4.9 Mt of ore at a cutoff grade of 1% copper and 1.0 grams per metric ton (g/t) gold, containing 2.516% copper, 1.481% zinc, 37.89 g/t silver, and 1.175 g/t gold. Inferred resources were estimated to be about 494,000 t of ore containing about 1.716% copper, 1.679% zinc, 30.2 g/t silver, and 0.730 g/t gold. The company was to invest about $28.3 million in the initial phase of the project and an additional $7.1 million for the installation of a sulfide circuit

[1]References that include a section mark (§) are found in the Internet Reference(s) Cited sections.

once the oxide circuit is commissioned (GlobeStar Mining Corp., 2005a). In November, GlobeStar announced the results from a mine plan optimization study for Cerro de Maimon. The study envisioned a 22-month period for the engineering and construction of the sulfide plant, the commissioning of a 1,300-ton-per-day (t/d) sulfide circuit to produce copper concentrates, and a 500-t/d oxide circuit to be commissioned 4 months after the commissioning of the sulfide plant (GlobeStar Mining Corp., 2005b).

Other companies that were exploring for gold in the Dominican Republic included Canadian companies Energold Mining Ltd., Gold Quest Mining Corporation, Linear Gold Corp., and Unigold Inc., and Las Lagunas Ltd. of Australia.

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JAMAICA

Jamaica, which is the third largest island of the Greater Antilles group of islands, is located about 150 km south of Cuba and about 160 km west of Haiti. The country ranks among the world's leading producers of alumina and bauxite. Other mineral commodities produced in Jamaica included cement, gold, gypsum, lime, limestone, refined petroleum products, salt, and other construction materials. In 2005, alumina and bauxite production were about 4 Mt and 14.1 Mt, respectively. Production of cement was 844,840 t; gypsum was 302,066 t; and lime was 269,743 t (table 1). The country had one petroleum refinery, which processed crude petroleum into asphalt, automobile diesel oil, heavy fuel oil, liquefied petroleum gas, turbo fuel, and unleaded gasoline.

According to the Planning Institute of Jamaica (2006§), in 2005, the real GDP increased by 1.4% following a trend of 7 consecutive years of economic growth. Growth performance, however, was adversely affected by the residual impact of Hurricane Ivan; drought and bush fires during the first half of the year; hurricanes Dennis and Emily, which caused damage to infrastructure and productive assets estimated at about $6 billion; and high petroleum prices. Mining and quarrying increased by 2.8%; bauxite production increased by about 6.2%. The performance in bauxite production, however, was lower than expected owing to a period of heavy rains associated with tropical storm Wilma, which prevented Alumina Partners of Jamaica (Alpart) and Jamaica Aluminum Company (Jamalco) from running at full capacity (Planning Institute of Jamaica, 2006§). The bauxite and alumina industry is Jamaica's second largest foreign exchange earner; it generated more than $900 million in 2004 and was expected to generate more than $1 billion in 2005 (Jamaica Information Service, 2005a§).

Jamalco, which was a joint venture between Alcoa World Alumina and Chemicals (AWAC) and the Government (50% each), mined bauxite in Manchester through a mining contractor (name not disclosed), and owned and operated an alumina refinery and port facilities in Jamaica. AWAC and the Government had signed an agreement to invest $115 million to expand the Jamalco alumina refinery in 2002. The 250,000-t/yr expansion and modernization of the plant were completed in November 2003 and, in 2005, AWAC and the Government announced plans to further increase capacity at the Jamalco refinery by an additional 1.5 million metric tons per year (Mt/yr). The expansion would cost $1.2 billion and the first phase of the project, which would add 150,000 t/yr of capacity, was scheduled to be completed by the end of 2006. The second phase of the project, which would add an additional 1.35 Mt/yr of capacity, was expected to be completed by the end of 2007. Upon completion of these projects, AWAC's ownership in Jamalco would increase to 77% and the Government would retain the remaining interest (Alcoa World Alumina and Chemicals, 2005).

Jamaica depended on imported petroleum for most of its energy needs. Crude petroleum and petroleum products were imported from Mexico and Venezuela under the 1980 San Jose Accord. The Accord, which is renewed every year, allows Jamaica to import about 7,000 barrels per day (bbl/d) of oil equivalent supplied in equal proportion from Mexico and Venezuela. In addition, since 2000, Jamaica also receives about 7,400 bbl/d of crude petroleum and petroleum products from Venezuela under the Caracas Agreement. Under this agreement, Jamaica purchases petroleum from Venezuela at world market prices and pays only 75% of the purchase price; the remaining 25% is paid during a period of more than 15 years with 1 year's moratorium at an interest rate of 2% per year. At a meeting of Caribbean Energy Ministers held in Caracas, Venezuela, on July 10, 2004, Venezuela proposed a "PetroCaribe Initiative" to establish bilateral agreements in the energy sector with Caribbean countries and other countries within the Americas (excluding the United States) (Jamaica Information Service, 2005c§). On June 29, 2005, the PetroCaribe Energy Cooperation Agreement was signed between Jamaica and Venezuela. The agreement, which was seen as a replacement and enhancement of the Caracas Agreement, included the supply of 21,000 bbl/d of crude petroleum, petroleum products, and liquefied petroleum gas to Jamaica, of which 40% of the purchase price was to be provided as concessionary loans for up to 25 years at an interest rate of 1% per year when prices equal or exceed $50 per barrel (Jamaica Information Service, 2005b§).

On February 16, 2005, Jamaica signed a letter of intent with Venezuela for the joint development of energy-related projects, which included upgrading the Petrojam Refinery. The first phase of the project would cost $200 million and would include the expansion of the crude unit from 35,000 bbl/d to 50,000 bbl/d, a new vacuum unit, and a new visbreaker unit. The second phase of the project would include the installation

of a coker and would cost between $250 million and $300 million. Construction work was scheduled to begin in 2006, and commissioning was scheduled for 2008. PDVSA Caribe and Petroleum Corporation of Jamaica planned to establish a new joint-venture company to oversee the refinery upgrade and expansion of local retail and establish trade ties with other countries in the region (Jamaica Information Service, 2005c§).

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TRINIDAD AND TOBAGO

Trinidad and Tobago, which forms the southernmost islands of the Caribbean archipelago, is located northeast of Venezuela and northwest of Guyana. The leading industries in the country were chemicals, natural gas, petroleum, and tourism. Besides natural gas and petroleum, Trinidad also produced asphalt, cement, direct-reduced iron, limestone, natural gas liquids, and steel.

According to the Central Bank of Trinidad and Tobago (2006b, p. 1), real GDP increased by 7.0% in 2005 following a trend of 12 consecutive years of economic growth. The energy sector, which continued to be the major contributor to this growth, increased by 10.9% despite the shutting down of several facilities as a precautionary measure during the passage of tropical storm Emily. The increased output of the energy sector was attributed to increased production from the Atlantic LNG Train IV facilities and the M5000 methanol plant. The construction sector increased by 8.1%. Growth in the sector was attributed to ongoing investments in infrastructure for the energy sector, which included construction work at the M5000 methanol plant and at the Atlantic LNG Train IV facilities, and to the Government's public sector investment program for housing. Other projects that were underway in 2005 included the construction of La Brea Nitrogen Limited plant, which will produce ammonia and urea ammonia nitrate, and the Clico/Ferrostaal plant, which will produce urea ammonia melamine (Central Bank of Trinidad and Tobago, 2006a, p. 8; 2006b, p. 3). In 2005, production of natural gas increased by about 9.9% to 33,270 million cubic meters and production of crude petroleum increased by about 17.2% to 52.7 million barrels (table 1).

As of 2005, 13 of the 15 members of the Caribbean Community and Common Market (CARICOM) had signed Venezuela's PetroCaribe petroleum alliance with the exception of Barbados and Trinidad and Tobago. Under PetroCaribe, countries can purchase up to 185,000 bbl/d of petroleum at market prices and pay upfront only part of the cost; the remaining cost can be converted into soft loans payable for a period of up to 25 years at a financing interest rate of 1%. Barbados and Trinidad and Tobago requested additional time to review the terms and implications of the agreement to their respective countries in particular given that Barbados already purchases petroleum products from Trinidad and Tobago at discount prices. Trinidad and Tobago wanted to examine how the agreement could affect its exports of petroleum products to the region (Central Bank of Trinidad and Tobago, 2006a, p. 14; BBC Caribbean.com, 2005§).

During the year, British Gas Trinidad and Tobago and Chevron Corporation announced the discovery of about 1 to 1.5 trillion cubic feet of natural gas in Block 6d, and the National Gas Company announced the completion of the Cross Island pipeline, which is a 36-cm-wide, 75.6-km-long pipeline from Beachfield, Guayaguayare, to Point Fortin at a cost of $2.1 billion (Central Bank of Trinidad and Tobago, 2006a, p. 15-16).

In the natural gas sector, Government-owned Petroleum Company of Trinidad and Tobago (Petrotin) and World GTL Limited were to invest $100 million for the construction of a gas-to-liquids plant at a mothballed methanol facility in Point-a-Pierre. The plant would use 18.4 million cubic feet per day (521,000 cubic meters per day) of natural gas as feedstock to produce 2,250 bbl/d of diesel that would be used as a blend stock for existing diesel produced by Petrotin. The plant was scheduled to be commissioned in 2007. The Government planned to open a bidding round in 2006 for four land and near-shore blocks and three offshore blocks, which included the Central Range Block, the Guayaguayare Block, the Herrera Block, the North Coast Marine Area (NCMA) 2 Block, the NCMA 3 Block, the South West Peninsula Block, and the 2ab Block (Central Bank of Trinidad and Tobago, 2006b, p. 5).

In April, the Ministry of Energy and Energy Industries awarded production-sharing contracts for Blocks 1a, 1b, 3b, and 5c to Petro/Canada Petrotin, Kerr McGee Offshore Petroleum Limited, Primera Block 3(b) Limited, and Canadian Superior Energy Inc., respectively (Central Bank of Trinidad and Tobago, 2006a, p. 13).

In July, Repsol YPF S.A. of Spain acquired a 70% interest in the Poui, the Samaan, and the Teak producing oilfields in Trinidad and Tobago in addition to the undeveloped Onyx gas field. The oilfields produce about 20,400 bbl/d of petroleum. The remaining interest was held by Petrotin (15%) and Government-owned National Gas Company of Trinidad and Tobago LNG (15%) (Repsol YPF S.A., 2005§).

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OTHER ISLANDS OF THE CARIBBEAN

The mineral industries of other islands of the Caribbean (Antigua and Barbuda, Bermuda, Dominica, Grenada, Guadeloupe and Martinique, Haiti, Montserrat, the Netherlands Antilles, Saint Kitts and Nevis, Saint Lucia, and Saint Vincent and the Grenadines) were small. Mineral production was limited mostly to cement, construction materials for domestic consumption, and salt. Petroleum refinery products were produced in Martinique and the Netherlands Antilles.

More-extensive coverage of the mineral industries of Aruba, The Bahamas, Barbados, Dominican Republic, Jamaica, Trinidad and Tobago, and other islands of the Caribbean can be found in the 2002 and 2003 U.S. Geological Survey Minerals Yearbook, volume III, Area Reports—International—Latin America and Canada, which are available on the World Wide Web at URL http://minerals.usgs.gov/minerals/pubs/country.

TABLE 1

ISLANDS OF THE CARIBBEAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Country and commodity		2001	2002	2003[e]	2004[e]	2005
ARUBA[e, 2]						
Petroleum refinery products	thousand 42-gallon barrels	100,000	100,000	65,000 [3]	80,000 [3]	80,000
Sulfur, byproduct of petroleum		77,000	77,000	60,000 [3]	65,000 [3]	65,000
BAHAMAS, THE[e, 4]						
Salt		900,000	900,000	1,341,755 [3]	1,269,209 [3]	1,270,000
Stone, argonite		1,200,000	1,200,000	9,848 [r, 3]	1,992 [r, 3]	2,000
BARBADOS[4, 5]						
Cement:						
Hydraulic		249,544 [6]	297,667 [6]	325,106 [3, 6]	322,270 [3, 6]	322,000 [e]
Clinker		241,899 [6]	284,009 [6]	300,291 [3, 6]	291,445 [3, 6]	291,000 [e]
Clay and shale		132,000 [6]	132,000 [6]	138,000 [r, 6]	144,900 [3, 6]	145,000 [e]
Limestone		1,730,000 [6]	1,230,000 [6]	1,785,000 [3, 6]	1,874,250 [3, 6]	1,870,000 [e]
Liquefied petroleum gas	42-gallon barrels	17,587 [6]	11,011 [6]	3,690 [6]	-- [6]	-- [e]
Natural gas:						
Gross	million cubic meters	32 [6]	29 [6]	23 [6]	20 [6]	20 [e]
Marketed	do.	16 [6]	14 [6]	12 [6]	13 [6]	13 [e]
Petroleum, crude	thousand 42-gallon barrels	464	391	371 [6]	378 [6]	380 [e]
Sand[e]		550,000	500,000	500,000 [6]	500,000 [6]	500,000 [e]
DOMINICAN REPUBLIC						
Bauxite		--	--	6,481 [3, 7]	79,498 [3, 7]	534,555 [3, 7]
Cement, hydraulic[8]		2,745,980	3,050,430	2,906,699 [r, 3, 7]	2,653,639 [r]	2,778,708
Clay		NA	314 [8]	41,894 [r, 7]	84,730 [r, 7]	85,000 [e]
Gypsum[9]		175,553 [7]	163,026	250,286 [3, 7]	459,496 [3, 7]	370,143 [7]
Iron and steel:						
Ferroalloys, ferronickel		60,654 [8]	58,101 [8]	69,628 [3, 9]	75,763 [3, 9]	61,057 [7]
Steel, crude		32,521 [8]	60,956 [8]	61,000	61,000	60,000 [e]
Lime	thousand metric tons	NA	113 [8]	102 [3, 8]	100	100 [e]
Limestone	do.	530 [7]	1,115 [8]	1,607 [3]	1,214 [3]	1,200 [e]
Marble[8]	cubic meters	5,420 [7]	6,333	8,186	10,384	6,060 [7]
Nickel, Ni content:						
Mine output, laterite ore		39,120 [8]	38,859 [8]	45,253 [r, 3, 9]	46,000 [3, 9]	45,900 [e]
Metal, Ni contained in ferronickel:						
Smelter		21,661 [8]	23,303 [8]	27,227 [3, 9]	29,477 [3, 9]	28,668 [9]
Shipments		23,411 [8]	22,945 [8]	26,486 [3, 9]	28,327 [3, 9]	26,183 [9]
Petroleum refinery products:[e]						
Liquefied petroleum gas	thousand 42-gallon barrels	450	450	450	500	500
Gasoline, motor	do.	1,900	1,900	1,900	2,000	2,000
Kerosene	do.	90	90	90	100	100
Jet fuel	do.	1,800	1,800	1,800	1,900	1,900
Distillate fuel oil	do.	2,700	2,700	2,700	2,900	2,900
Residual fuel oil	do.	4,400	4,400	4,400	4,600	4,600
Total	do.	11,300	11,300	11,300	12,000	12,000
Salt:						
Marine[e]		50,000	50,000	50,000	50,000	50,000 [e]
Rock		189,595	157,278 [8]	106,988 [3, 8]	--	-- [e]
Total		239,595	207,278	156,988 [3, 8]	50,000	50,000
Sand and gravel[8]	thousand cubic meters	15,486	15,977 [r]	14,374 [3]	13,266 [3]	13,300 [e]
GUADELOUPE[e, 4, 10]						
Cement		265,200 [3]	229,500 [3]	229,500 [3]	230,000	230,000
Limestone		5,000	5,000	5,000	5,000	5,000
Pumice		210,000	210,000	210,000	210,000	210,000
Salt		49,000	49,000	49,000	49,000	49,000
HAITI[e, 11]						
Cement		203,768 [3]	290,298 [3]	290,300 [3]	290,000	290,000

See footnotes at end of table.

TABLE 1--Continued
ISLANDS OF THE CARIBBEAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Country and commodity		2001	2002	2003[e]	2004[e]	2005
HAITI--Continued[e, 11]						
Sand and gravel:						
Gravel	cubic meters	450,000	450,000	450,000	450,000	450,000
Sand	do.	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000
Stone, marble	cubic meters	131	131	131	131	131
JAMAICA						
Aluminum:[12]						
Bauxite, dry equivalent, gross weight	thousand metric tons	12,370	13,119 [13]	13,445 [3, 13]	13,297 [3, 13]	14,118 [14]
Alumina	do.	3,542	3,631 [13]	3,844 [3, 13]	4,021 [3, 13]	4,086 [14]
Cement, hydraulic[12]		596,247	613,981 [13]	607,682 [3, 13]	808,070 [3, 13]	844,840 [14]
Clay[12]		91	66 [13]	81 [3, 13]	525 [3, 13]	45 [14]
Gold[12]	kilograms	214	328 [13]	277 [3, 13]	20 [r, 14]	-- [14]
Gypsum[12]		320,323	164,880 [13]	248,558 [3, 13]	283,352 [3, 13]	302,066 [14]
Lime[12]		281,853	255,266 [13]	275,763 [3, 13]	269,139 [3, 13]	269,743 [14]
Petroleum refinery products[e]	thousand 42-gallon barrels	3,600	3,600	3,600	3,600	11,600
Salt		19,070	19,000 [e]	19,000	19,000	19,000 [e]
Sand and gravel	do.	2,205	2,249 [13]	2,316 [3, 13]	2,362 [r, 3, 14]	2,392 [14]
Shale, for cement		151,277	144,205 [13]	217,005 [3, 13]	184,993 [3, 13]	164,235 [14]
Silica sand[12]		8,244	9,367 [13]	12,825 [3, 13]	11,172 [3, 13]	14,261 [14]
Silver	kilograms	95	174 [13]	92 [3, 13]	9 [13]	-- [14]
Stone:[13]						
Limestone	thousand metric tons	3,488	3,522 [13]	3,593 [3, 13]	2,500 [13]	2,610 [14]
Marble, cut and/or polished		150	150 [r, 13]	155 [3, 13]	120 [13]	120 [14]
Marl and fill	thousand metric tons	5,422	5,693 [13]	6,376 [3, 13]	5,900 [13]	5,310 [14]
MARTINIQUE[e, 4, 10]						
Cement, hydraulic		255,000 [3]	220,500 [3]	221,000 [3]	221,000	221,000
Lime		5,000	5,000	5,000	5,000	5,000
Petroleum refinery products	thousand 42-gallon barrels	4,800	4,800	4,800	4,800	4,800
Pumice		130,000	130,000	130,000	130,000	130,000
Salt		200,000	200,000	200,000	200,000	200,000
NETHERLANDS ANTILLES[e, 2]						
Petroleum refinery products	thousand 42-gallon barrels	80,000	80,000	80,000	80,000	80,000
Salt		500,000	500,000	500,000	500,000	500,000
Sulfur, byproduct of petroleum		30,000	25,000 [r]	23,000 [r]	23,000	23,000
SAINT KITTS AND NEVIS						
Sand and gravel		215,000 [e]	227,700	223,000	223,000	223,000
Stone, crushed		121,270	130,800	131,000	131,000	131,000
TRINIDAD AND TOBAGO						
Asphalt, natural[14]		16,216	16,203	16,200	16,200	16,200
Cement, hydraulic		696,800 [15]	743,700 [15]	765,600 [3, 16]	768,400 [3, 17]	686,400 [17]
Iron and steel:[15]						
Direct-reduced iron		2,186,382 [16]	2,316,300 [16]	2,275,000 [3, 16]	2,336,500 [3, 17]	2,055,000 [17]
Steel, crude		696,111	838,900	923,000	783,000	783,000 [e]
Semimanufactures, billets		668,267 [16]	816,900 [16]	896,000 [3, 16]	789,800 [3, 17]	712,000 [17]
Lead, refined, secondary[e]		1,600	1,600	1,000	1,000	1,000
Natural gas:						
Gross	million cubic meters	16,599 [17]	19,172 [15]	26,810 [3, 15]	30,273 [3, 17]	33,270 [17]
Marketed	do.	15,173 [17]	17,777 [15]	26,046 [3, 15]	29,456 [3, 17]	31,348 [3, 17]
Natural gas liquids	thousand 42-gallon barrels	7,521 [17]	8,505 [15]	10,500 [15]	10,687 [3, 17]	9,889 [3, 17]
Nitrogen, N content of anhydrous ammonia		3,036,307 [17]	3,258,619 [15]	3,529,000 [3, 15]	3,875,300 [3]	5,187,400 [17]
Petroleum:						
Crude	thousand 42-gallon barrels	41,469 [15]	47,824 [15]	49,117 [3, 17]	44,985 [3, 17]	52,740 [17]
Refinery products	do.	54,818 [15]	54,788 [15]	52,876 [3, 17]	46,349 [3, 17]	55,219 [17]
Stone, limestone[14]	thousand metric tons	975	851	850	850	850
Sulfur, byproduct of petroleum[e, 18]		15,000	14,000	29,000	29,000	29,000
Urea		NA	310,100	297,600 [3]	284,900 [3]	285,000

See footnotes at end of table.

TABLE 1--Continued

ISLANDS OF THE CARIBBEAN: PRODUCTION OF MINERAL COMMODITIES[1]

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. NA Not available. -- Zero.

[1]Table includes data available through November 28, 2006.

[2]In addition to commodities listed, crude construction materials (lime, sand, stone, and so forth) may also be produced, but data on such production are not available, and information is inadequate to make reliable estimates of output.

[3]Reported figure.

[4]In addition to commodities listed, crude construction materials (sand and gravel, and so forth) may be also produced, but data on such production are not available, and information is inadequate to make reliable estimates of output.

[5]Barbados also produced stone, but data on such production are not available, and information is inadequate to make reliable estimates of output.

[6]Ministry of Energy and Public Utilities of Barbados.

[7]Source: Direccón General de Minería de la República Dominicana.

[8]Source: Banco Central de la República Dominicana.

[9]Source: Falconbridge Dominicana C. por A.

[10]Guadeloupe and Martinique also produced stone, but data on such production are not available, and information is inadequate to make reliable estimates of output.

[11]In addition to commodities listed, asphalt, lime, and salt may also be produced, but data on such production are not available, and information is inadequate to make reliable estimates of output.

[12]Source: Ministry of Mining and Energy of Jamaica.

[13]Source: Ministry of Land and Environment of Jamaica.

[14]Ministry of Agriculture and Lands, Mines and Geology Divison of Jamaica.

[15]Source: Ministry of Energy and Energy Industries of Trinidad and Tobago.

[16]Source: Caribbean Ispat Limited.

[17]Source: Central Bank of Trinidad and Tobago Annual Economic Survey.

[18]Sulfur as a byproduct of natural gas may be produced, but information is inadequate to make reliable estimates of output.

TABLE 2
ISLANDS OF THE CARIBBEAN: STRUCTURE OF THE MINERAL INDUSTRIES IN 2005

(Metric tons unless otherwise specified)

Country and commodity	Major operating companies	Location of main facilities	Annual
ARUBA			
Petroleum, refinery 42-gallon barrels per day	Valero Energy Corporation	Southern Aruba	230,000
THE BAHAMAS			
Petroleum, refinery thousand 42-gallon barrels	Bahamas Oil Refining Company International Limited (Petróleos de Venezuela S.A.)	Storage facilities, Freeport	20,000
BARBADOS			
Cement	Arawak Cement Company Limited (Trinidad Cement Limited and Cementos Mexicanos S.A. de C.V., 20%)	NA	NA
DOMINICAN REPUBLIC			
Nickel	Falconbridge Dominicana C. por A. (Falconbridge Ltd., 85.26%)	La Vega Province, town of Bonao, 80 kilometers north of Santo Domingo	28,000
Petroleum, refinery 42-gallon barrels per day	Refinería Dominicana de Petróleo S.A. (Government, 50%, and Shell International Petroleum Company Ltd., 50%)	Haina Port	34,000
JAMAICA			
Alumina	Alumina Partners of Jamaica (ALPART) (Kaiser Aluminum Corp., 65%, and Hydro Aluminium Jamaica, 35%)	Refinery, Nain, St. Elizabeth	1,500,000
Do.	West Indies Alumina Company (WINDALCO) (Glencore International AG of Switzerland, 93%, and Government, 7%)	Ewarton Works refinery, Saint Catherine	1,200,000 [1]
Do.	West Indies Alumina Company (WINDALCO) (Glencore International AG of Switzerland, 93%, and Government, 7%)	Kirkvine Works refinery, Manchester	
Do.	Jamaica Aluminum Company (Jamalco) (Alcoa World Alumina and Chemicals, 50%, and Government, 50%)	Refinery at Halse Hall, Clarendon, 70 kilometers west of Kingston	1,270,000
Bauxite	St. Ann Bauxite Company Ltd. (Falconbridge Ltd., 50%, and Century Aluminum Inc., 50%)	Bauxite mine, Discovery Bay	4,500,000 [2]
Do.	Jamaica Aluminum Company (Jamalco) (Alcoa World Alumina and Chemicals, 50%, and Government, 50%)	Bauxite mine, Manchester	NA
Do.	West Indies Alumina Company (WINDALCO) (Glencore International AG of Switzerland, 93%, and Government, 7%)	Bauxite mine in Schwallenburgh, Ewarton	NA
Do.	West Indies Alumina Company (WINDALCO) (Glencore International AG of Switzerland, 93%, and Government, 7%)	Bauxite mine in Russell Place	NA
Petroleum, refinery 42-gallon barrels per day	Petrojam Limited (Government, 100%)	Kingston Port	36,000
TRINIDAD AND TOBAGO			
Ammonia	Tringen I (Government, 51%, and Norsk Hydro ASA of Norway through Hydro Agri Trinidad Ltd., 49%)	Point Lisas Industrial Estate	500,000
Do.	Tringen II (Government, 51%, and Norsk Hydro ASA of Norway through Hydro Agri Trinidad Ltd., 49%)	do.	454,000
Do.	YARA Trinidad Ltd. (Government, 51%, and Norsk Hydro ASA of Norway through Hydro Agri Trinidad Ltd., 49%)	do.	227,000
Do.	PCS Nitrogen (Trinidad) Ltd. (Potash Corporation of Saskatchewan, 100%), of which:	do.	1,758,000
	Plant 1		(454,000)
	Plant 2		(454,000)
	Plant 3		(250,000)
	Plant 4		(600,000)

See footnotes at end of table.

TABLE 2--Continued
ISLANDS OF THE CARIBBEAN: STRUCTURE OF THE MINERAL INDUSTRIES IN 2005

(Metric tons unless otherwise specified)

Country and commodity		Major operating companies	Location of main facilities	Annual
TRINIDAD AND TOBAGO--Continued				
Ammonia--Continued		Caribbean Nitrogen Company I (a consortium of Clico Energy Company Ltd., Ferrostaal AG of Germany, Duke Energy Corp., EOG Resources Inc., and Kellogg, Brown, and Root of the United States)	Point Lisas Industrial Estate	660,000
Do.		Caribbean Nitrogen Company II (a consortium of Clico Energy Company Ltd., Ferrostaal AG of Germany, Duke Energy Corp., EOG Resources Inc., and Kellogg, Brown, and Root of the United States)	do.	660,000
Do.		Point Lisas Nitrogen Limited (formerly Farmland Misschem) (Mississippi Chemicals, 50%, and KOCH Minerals Services LLC of the United States, 50%)	do.	600,000
Iron and steel		Mittal Steel Point Lisas Limited, formerly Caribbean Ispat Limited, (Mittal Steel Group):	Point Lisas, Couvas	2,200,000
		Direct-reduced iron pellets		(900,000)
		Billets		(700,000)
		Wire Rods		(600,000)
Liquefied natural gas		Atlantic LNG Company of Trinidad and Tobago Train 1 (BP Trinidad and Tobago LLC, 34%; British Gas Trinidad Ltd., 26%; Repsol YPF S.A., 20%; Tractobel Trinidad LNG Corp, 10%; National Gas Company of Trinidad and Tobago, 10%)	Point Fortin	NA
Do.		Trains 2 and 3 (BP Trinidad and Tobago LLC, 42.5%; British Gas Trinidad Ltd., 32.5%; Repsol YPF S.A., 25%)	do.	NA
Do.		Train 4 (BP Trinidad and Tobago LLC, 37.7%; British Gas Trinidad and Tobago Limited, 28.89%; Repsol YPF S.A., 22.22%; National Gas Company of Trinidad and Tobago, 11.11%)	do.	NA
Methanol[3]		Trinidad and Tobago Methanol Company I (CIL Financial, Ferrostaal AG, Helm AG, GE Capital Group)	do.	500,000
Do.		Trinidad and Tobago Methanol Company II (Owned by Trinidad and Tobago Methanol Company)	do.	500,000
Do.		Caribbean Methanol Company Ltd. (two plants) (Clico Energy Company Ltd., a subsidiary of a local insurance conglomerate, Ferrostaal A.G. of Germany, and the Methanex Corporation of Canada	do.	1,050,000 [4]
Do.		Atlas plant (Methanex Corporation, 100%)	do.	NA
Do.		New Methanol Holdings M5 Plant	do.	NA
Natural gas liquids	42-gallon barrels per day	Phoenix Park Gas Processors Limited (National Gas Company of Trinidad and Tobago, 51%; Conoco Inc., 39%; Pan West Constructors, 10%)	NA	33,500
Petroleum, refinery	42-gallon barrels per day	Petroleum Company of Trinidad and Tobago Ltd. (Petrotin) (Government, 100%)	Pointe-a-Pierre	175,000
Urea		PCS Nitrogen Trinidad Limited (Potash Corporation of Saskatchewan, 100%)	do.	530,000

NA Not available.
[1]Dry metric tons.
[2]Ewarton and Kirkvine's combined capacity.
[3]Combined capacity of all six methanol plants is 3.1 million metric tons.
[4]Two plants with production capacities of 500,000 metric tons per year (t/yr) and 550,000 t/yr.

The Mineral Industry of Mexico

By Ivette E. Torres

Mexico was the 11th most populated country in the world with 103.1 million people in 2005. Its nominal gross domestic product (GDP) was $768.4 billion[1] ($1,073 billion based on purchasing power parity). The real GDP increased by 3.0% compared with that of 2004 after a 4.2% increase in 2004 (revised). Mining (including petroleum extraction) grew by 1.5% after a 3.4% increase in 2004. The construction sector increased by 3.3% after a 6.1% increase in 2004 (Instituto Nacional de Estadística, Geográfica e Informática, 2006a§,[2] b§; International Monetary Fund, 2006§; World Bank, The, 2006§).

Mining investment in 2005 was $911.8 million; this was a significant increase from that of 2004, when investment was about $458 million. The largest portion of investment in 2005 ($349.2) was destined for development of new projects. Expansion of projects took $167.8 million of the total, and exploration received $120.3 million. Interest in the sector is evident by the increased number of international (mainly Canadian) companies exploring in Mexico (Cámara Minera de México S.A. de C.V., 2006b§).

During the year, 89 new mining companies were registered with the Government. This number was 15% lower than that of 2004, but was still the second highest number of companies registered since 1999. Of the total, 45 had foreign participation and 44 companies were financed with Mexican capital. During the year, 208 of the companies doing mineral exploration in Mexico had foreign participation. The Government issued 2,904 concessions that covered an area of 6.6 million hectares; of the total, 2,113 were for exploration and 791 were for production. The State of Sonora had 547 concessions in an area of 1.29 million hectares (Secretaría de Economía, 2006, p. 40-41, 64–table A14).

Government Policies and Programs

Under the Mexican Constitution, minerals are part of the national patrimony. The mining law, which governs Mexico's mining industry, is under Article 27 of the Constitution. The Mining Law of 1992 became effective in September 1992; it was amended in 1996 and again in April 2005. This law covers exploration for and production and beneficiation of minerals. The Mining Law permits up to 100% private equity ownership in exploration, development, and production even in commodities previously reserved for the Government, such as coal, iron, phosphorus, potassium, and sulfur (Cámara de Diputados del H. Congreso de la Nación, 2006§). Hydrocarbons and radioactive materials are exempt from the Mining Law.

During the year, the Energy Commission of the Chamber of Deputies was working on a project to modify the rules that apply to the production of natural gas from coal production. The intention was to remove this portion of natural gas from the Hydrocarbon Law and to add it to the Mining Law. This would set the rules to allow coal producers to use the natural gas for internal consumption and to transfer the excess natural gas to Petróleos Mexicanos, S.A. de C.V. (PEMEX) and would reduce the amount of the gas being vented in these operations (Gaceta Parlamentaria, 2006).

Production

Mexico was an important mineral producer, ranking among the top world producers in a variety of minerals. On the basis of U.S. Geological Survey production figures, Mexico, which had been the world leader for many years in the production of mined silver, became the second ranked producer of silver (mined) in 2003 (revised) after Peru's production increased significantly and Mexico's production decreased. In 2005, when mine production increased by 12.6% compared with that of 2004, Mexico supplied about 14% of the world's mined silver. Mexico, which had been the world's leading producer of celestite, lost its ranking when Spain increased its production in 2002. In 2004 (revised) and in 2005, Mexico was estimated to be the third ranked producer of celestite after Spain and China. Despite the loss in ranking, Mexico supplied 23% of the world's celestite. It was the world's second ranked producer of bismuth (after China) with about 17% of the world's mine and 8% of the world's refined total. Mexico maintained its position as an important producer of many mineral commodities, which included cadmium, cement, copper, fluorspar, gypsum, manganese ore (metal content), molybdenum, salt, steel, sulfur, and zinc (mine). The country produced 26% of the Latin America and the Caribbean steel output (Instituto Latinoamericano del Fierro y el Acero, undated§).

Fueled by the high prices that persisted in 2005, the value of mineral production (excluding petroleum and natural gas) was $6.59 billion; this was a significant increase compared with that of 2004 when production was $5.87 billion[3] (revised). Of the total value, 56% was from metals and 44% was from industrial minerals. This was significant because the nominal value of industrial minerals had exceeded the nominal value of metal production for years (Servicio Geológico Mexicano, 2006, p. 24).

By far, the value of copper production ranked highest with a nominal value of $1.37 billion, or about 38% of metal production and 21% of total mineral production; the increase was because of increased production and the significant increase in the price of copper during the year. Among metals, silver production ranked second with a nominal value of $607 million, which was a decrease of 9% compared with that of 2004. After a

[1]Where necessary, 2005 values have been converted from Mexican pesos (MEX$) to U.S. dollars (US$) at the rate of MEX$10.8979=US$1.00.

[2]References that include a section mark (§) are found in the Internet References Cited section.

[3]Where necessary, 2004 values have been converted from Mexican pesos (MEX$) to U.S. dollars (US$) at the rate of MEX$11.2648=US$1.00.

significant rise in the price of zinc, which has increased by 70% since 2002, the value of zinc ranked third in the total nominal value of metals produced in 2005 at $597 million; this was a 48% increase from that of 2004. During the year, the value of only four metals (arsenic, lead, silver, and tin) decreased (Servicio Geológico Mexicano, 2006, p. 20).

The nominal value of industrial minerals decreased by almost 7% from that of 2004. Combined, sand and gravel were valued at $840 million; this was the highest value of any industrial mineral and the second highest overall value. More than one-half of the reported industrial minerals decreased in value in 2005, but coal, common clays, fluorspar, kaolin, marble, and vermiculite increased by at least 15% each (Servicio Geológico Mexicano, 2006, p. 11, 19).

Mexico was the world's 6th ranked producer of crude petroleum and the 12th ranked producer of natural gas. In terms of total sales, the state-owned company PEMEX ranked seventh at $86,163 billion (Petróleos Mexicanos, S.A. de C.V., 2006a, p. 57-59).

Metal production in Mexico was dominated by the large-scale producers, which produced 100% of the country's cadmium, coal and coke, iron, manganese, and molybdenum output, 99% of the zinc, 96% of the lead, 90% of the gold, 80% of the copper, and 79% of the silver. The medium-scale producers, which had a more significant participation in the production of industrial minerals, contributed 100% of the country's production of barite, diatomite, feldspar, fluorspar, gypsum, kaolin, silica sand, and wollastonite. This sector also accounted for 86% of the graphite, 85% of the celestite, and 78% of the dolomite produced. However, large-scale producers dominated the production of magnesium sulfate, salt, and sodium sulfate (Secretaría de Economía, 2006, table A17).

Trade

In 2005, Mexico's exports (free on board) had a nominal value of $213.7 billion. The nominal value of mineral exports (excluding petroleum and natural gas) was $5.2 billion, or 2.4% of the country's total exports. The nominal value of metal exports totaled $4.5 billion, or 87% of total mineral exports (excluding petroleum and natural gas). Total imports (cost, insurance, and freight) had a nominal value of $221.3 billion. Mineral imports (excluding petroleum and natural gas) accounted for $6.0 billion, or 2.7% of the country's total exports. For the second consecutive year, these figures represented a mineral trade deficit (Servicio Geológico Mexicano, 2006, p. 14-16).

Of the total mineral exports (including petroleum and natural gas), iron (in all forms) was the leading source of foreign exchange with $1.4 billion, or about 27% of the total followed by silver ($712 million), copper ($681 million), and molybdenum ($571 million). Industrial mineral exports were led by dimension stone ($149 million), cement ($115 million), and salt ($89 million). Metal imports were led by iron (in all forms) with 23% of the total import value ($1.35 billion) followed by aluminum ($1.27 billion), copper ($456 million), and silver ($251 million). Industrial mineral imports were led by precious and semiprecious stones ($229 million), natural abrasives ($81 million), and graphite ($78 million). Coal and coke imports were valued at $674 million and $101 million, respectively (Servicio Geológico Mexicano, 2006, p. 143-147, 151-155).

Mexico was a net importer of steel products. In 2005, Mexico exported 5.86 million metric tons (Mt) of steel products with a value of $4.3 billion and imported 7.1 Mt with a value of $6.2 billion (Servicio Geológico Mexicano, 2006, p. 453-454).

During 2005, the U.S. share of the Mexican mineral trade (excluding petroleum and natural gas) continued to decrease, although exports (in current dollars) increased by almost 13% to $3.2 billion and imports, by 7%. During the year, about 61% of Mexico's mineral exports went to the United States (compared with 70% in 2004 and 80% in 2003), and 39% of its mineral imports originated from the United States (compared with 48% in 2004 and 48% in 2003). Exports to China increased by more than five times to $337 million and exports to Germany rose to $238 million in 2005 from $19 million in 2004. Exports to Japan more than quadrupled to $445 million. Other important trading partners of minerals (excluding petroleum and natural gas) were Australia, Brazil, Canada, Chile, India, and Spain (Servicio Geológico Mexicano, 2006, p. 148, 156).

Mexico was the world's seventh ranked exporter of crude petroleum. It exported 663 million barrels of crude petroleum with a value of $31.7 billion, which was a 35.5% increase in value and a 3% decrease in volume compared with that of 2004. Mexico, however, was a net importer of natural gas and refinery products. Net exports totaled $23.3 billion. The average price for Mexican crude was $42.69 per barrel, which was a 37.5% increase (revised) in nominal value compared with that of 2004. Of the total crude exports, 78% went to the United States followed by Spain (9%) and the Netherlands Antilles (5%) (Petróleos Mexicanos, S.A. de C.V., 2006a, p. 45-46, 50-51).

Structure of the Mineral Industry

Government responsibilities for the mining sector are held by the Secretaría de Economía. The Secretaría de Energía is responsible for petroleum and electricity. The Coordinación General de Minería is the highest office charged with mining policies with the purpose of fostering new investment and maintaining a healthy mining sector. It is supported by the Servicio Geológico Mexicano (SGM), the Dirección General de Minería, the Dirección General de Fomento Minero, and the Fideicomiso de Fomento Minero. The SGM is responsible for promoting and conducting geologic, mining, and metallurgical research with the purpose of improving the use of the mineral resources within the country, identifying and estimating the development potential of the mineral resources of Mexico, and integrating the inventory of Mexico's mineral resources. With the reorganization of the SGM, the new organization and changes in functions were published in the Diario Oficial de la Federación of April 28, 2005. The main functions of the Dirección General de Minería are to award mining concessions and to maintain the national mining and mapping registers. The Dirección General de Fomento Minero is responsible for promoting the mining sector by using, for example, incentives for domestic and foreign investment in the sector. The Fideicomiso de Fomento Minero is the Government entity

responsible for providing administrative, financial, and technical assistance to the mining sector.

The Cámara Minera de México (Mexico Chamber of Mines) is another important organization in the mining sector. It promotes the interests of the private sector and maintains a dialogue between the private mining sector and the Government. Other prominent mineral-related organizations include the Asociación Nacional de Productores de Cal, the Cámara Nacional de la Industria del Hierro y del Acero, the Federación Nacional de Pequeños Mineros, and the Instituto Mexicano de Aluminio.

Such diversified Mexican companies as Grupo Acerero del Norte, S.A. de C.V., Grupo México, S.A. de C.V., and Industrias Peñoles, S.A. de C.V. dominated the production of nonfuel minerals (table 2). Smaller companies, such as Minas Luismín, S.A. de C.V. (a subsidiary of GoldCorp Inc.), were significant or emerging producers of precious metals. A large portion of the production of industrial minerals was in the hands of the medium-scale and small-scale mining companies. A large number of foreign companies were active in exploration in Mexico, a few of which were in production or development stages. A significant portion of the exploration effort was for gold and silver.

During the year, investment in the mining sector totaled $911.8 million. Of this amount, $349.2 million was for new projects, $235.5 was for new equipment, $167.8 was for expansion of existing projects, and $120.3 million was for exploration (Cámara Minera de México, S.A. de C.V., 2006b§).

Mexico's cement industry was dominated by Cementos Mexicanos, S.A. B de C.V. (CEMEX) (and its operating company CEMEX México). CEMEX was the world's third ranked producer after the LaFarge Group of France and Holcim Ltd. of Switzerland. Cementos Apascos, S.A. de C.V. and Cooperativa La Cruz Azul, S.C.L. were other important producers of cement in Mexico.

The production of crude petroleum, natural gas, and basic petrochemicals, which were reserved for the Government under Article 27 of the Constitution, was entrusted to PEMEX. It operated through several subsidiaries—PEMEX Exploración y Producción, PEMEX Gas y Petroquímica Básica, PEMEX Petroquímica, and PEMEX Refinación.

In 2005, employment in the minerals sector was 264,448; this was a 2.8% increase compared with that of 2004 and a 6.6% increase compared with that of 2003. Of the total workforce, 132,293 were employed in the manufacturing of nonmetallic mineral products; 68,620, in base-metal industries; 36,516, in the production of coal, graphite, and nonmetals; and 25,206 in the extraction and beneficiation of metals (Secretaría de Economía, 2006§). Nearly all miners were represented by the Sindicato Nacional de Trabajadores Mineros, Metalúrgicos y Similares de la República Mexicana. The Confederación de Trabajadores de México, the largest Mexican union, represented the cement employees.

At yearend 2005, PEMEX employed 145,427 employees, of which 126,618 were permanent and 18,809 were temporary. The largest sectors of employment in the company were PEMEX Refinación, with 49,494 employees, and PEMEX Exploración y Producción, with 49,427 (Petróleos Mexicanos, S.A. de C.V., 2006b, p. 20).

Commodity Review

Metals

Copper.—In 2005, mine production of copper increased to 429,042 metric tons (t), or by almost 6% compared with that of 2004. Most producing States increased their production levels. The State of Sonora produced 86% of Mexico's total copper production. Three other States—Zacatecas (21,700 t), San Luis Potosi (19,600 t), and Chihuahua (11,400 t)—produced 12% of the total (Servicio Geológico Mexicano, 2006, p. 191). Two large mines in the State of Sonora produced the bulk of copper output in that State (89%) and an equally impressive portion of the national output (77%). These two open pit mines, Cananea and La Caridad, were owned by Grupo México and were operated by Mexicana de Cananea, S.A. de C.V. and Mexicana de Cobre, S.A. de C.V., respectively. Both mines produced copper from concentrates and from solvent extraction-electrowinning (SX-EW). Grupo México also produced copper from three of its underground mines (Charcas in San Luis Potosi, San Martín in Zacatecas, and Santa Bárbara in Chihuahua) under its subsidiary Industrial Minera Mexicana, S.A. de C.V. (Grupo México, S.A. de C.V., 2006, p. 13, 31). Since 2003, Minera Mina María, S.A. de C.V., which was located in the Cananea mining district in the State of Sonora, produced copper by open pit methods. In 2005, production from the María mine exceeded 14,000 t. The mine had previously produced by underground methods but had been inactive since 1999 (Mining and Construction, 2006§).

Peñoles produced less than 3% of the copper mined in Mexico in 2005. However, the company's construction work on its Milpillas Mine in Sonora was almost complete with production scheduled to begin by mid-2006. The $217.8 million mine had a design capacity of 55,000 t of copper cathode produced by SX-EW. Peñoles continued its exploration effort on the Precobre project with Chile's Corporatión Nacional del Cobre de Chile (Codelco) in the State of Sonora's copper belt. Diamond drilling in the project inferred 1 billion metric tons of ore at a grade of 0.3% copper and 400 Mt at a grade of 0.4% zinc. Peñoles planned to continue exploring the area in 2006 (Industrias Peñoles, S.A. de C.V., 2006, p. 5, 15).

Another copper project, Piedras Verdes, which was located in the State of Sonora, was near completion at yearend 2005. The project—an open pit, heap leach, and SX-EW operation that was scheduled to begin production in mid-2006—was owned by Frontera Copper Corporation of Canada. Frontera Copper planned to produce an average of about 31,800 t (reported as 70 million pounds) of copper per year for 12 years; production would decrease thereafter. Piedras Verdes, which had an expected mine life of 18 years, had proven and probable reserves of 191 Mt of ore at a grade of 0.36% copper (Frontera Copper Corporation, 2006§). When operating at full capacity, these two projects would represent an increase of about 20% of Mexico's copper mine and refining levels produced in 2005.

Mexico's production of primary refined copper increased by 11.4% compared with that of 2004. Most of the production was from Mexicana de Cobre's metallurgical complex in the State of Sonora where the company had the largest electrolytic copper

refinery in Mexico. Another producer was Cobre de México, S.A. de C.V. Primary refined copper was also produced at the Cananea, La Caridad, and the María SX-EW plants. A small amount of secondary refined copper was estimated to have been produced in Mexico in 2005 (table 1).

Gold and Silver.—In 2005, Mexico's mine production of gold increased by 39% to 30,536 kilograms (kg). Three States (Chihuahua, Durango, and Sonora) produced 76% of the mined gold. Almost 32% of the production was from the State of Durango. Almost all production from Durango came from the San Dimas and the Santiago Papasquiaro mining districts. La Herradura Mine in the State of Sonora was Mexico's leading producing mine. La Herradura was a joint venture between Peñoles and Newmont Mining Corporation. During the year, La Herradura produced about 5,700 kg of gold, which was a more than 16% increase compared with that of 2004. The second largest production in the Santiago Papasquiaro district was from La Ciénega Mine (owned by Peñoles), which produced more than 4,500 kg. Expansion of La Ciénega's milling capacity to 700,000 t/yr was completed in 2005; this expansion increased the gold production capacity to about 5,100 kilograms per year (kg/yr) (reportcd as 165,000 troy ounces per year) (Industrias Peñoles, S.A. de C.V., undated§).

In terms of output, Peñoles was the largest gold company in Mexico. In 2005, it produced almost 40% of the country's total. Luismin continued to be an important producer of precious metals in Mexico. The company produced about 4,500 kg of gold from its mines in the States of Durango, Guerrero, and Queretato.

El Sauzal mine, which is located in the State of Chihuahua, began production in 2004 and was the newest gold mine in Mexico. The mine, which was owned by Glamis Gold Ltd. in 2005, exceeded production levels planned for the year and became Mexico's leading producing mine with an output of about 6,000 kg/yr (reported as 191,586 troy ounces per year). Original plans called for an average production of about 5,300 kg/yr (reported as 170,000 troy ounces per year) of gold for a period of 10 years. The company owned seven exploration concessions surrounding El Sauzal and was planning to explore the area to increase the 52,900 kg (reported as 1.7 million troy ounces) of gold reserves (Glamis Gold Ltd., 2006a§, b§).

During the year, another new open pit gold and silver mine was being constructed in the State of Sonora. The Mulatos Mine, which was owned by Alamos Gold Inc. and had a small production of doré in 2005, was nearing commercial production by yearend when mine and plant facilities were completed. Production plans called for an output of almost 4,700 kg/yr (reported as 150,000 troy ounces per year) for a period of 10 years. Mulatos's reserves were estimated to be 36.39 Mt at a grade of 1.637 grams per metric ton (g/t) gold from the Estrella Pit. The company was conducting additional advanced exploration in other areas of the project (Alamos Gold Inc., 2005a, b).

Another advanced gold (gold and silver) project in Mexico was Los Filos, which was owned by GoldCorp. During 2005, the feasibility study for Los Filos was completed. The study was later extended to include the Bermejal deposit, which was acquired by the company in March. The project (including Bermejal) had proven and probable reserves that totaled 202.65 Mt of ore at a grade of 0.69 g/t gold. GoldCorp planned to complete construction of the open pit in 2006 and to begin commercial production in 2007. The ore will be heap leached to produce doré bars onsite (GoldCorp Inc., 2006a§).

In 2005, Mexico maintained its position as the second ranked silver producer (after Peru), although China continued to increase its production. Mexico's mine production of silver increased to 2,894 t, or by almost 13% compared with that of 2004. Six States produced 91% of Mexico's mined silver. The State of Zacatecas, where the Proaño (Fresnillo) Mine (Mexico's richest silver mine) is located, was the leading producing State with 1,529 t. Other States that produced significant amounts of silver were Durango (437 t), Chihuahua (326 t), Mexico (139 t), Sonora (121 t), and San Luis Potosi (107 t). The leading producing company was Peñoles, which produced 50% of the silver mined in Mexico during the year; this was a slightly lower share than in 2004 when Peñoles produced 54% of the mined silver in Mexico, but an almost 7% increase in terms of the company's output. In addition to Proaño, which produced about 72% of Peñoles silver mine output (1,054 t), the company produced silver from Bismark, Francisco I. Madero, La Ciénega, Naica, Sabinas, and Tizapa (Industrias Peñoles, S.A. de C.V., 2006, p. 19-22, 44). Other important silver mine producers were Grupo México, which produced about 435 t (reported as 14 million troy ounces) of silver, most of it from its underground properties, and Minas Luismín, with about 211 t (Grupo México, S.A. de C.V., 2006, p. 21; GoldCorp Inc. 2006b§).

In 2005, Pan American Silver Corp. announced that it would bring its Alamo Dorado silver-gold project in the State of Sonora into production. During the year, the company began construction of the primary crusher, the mill, the cyanide leach recovery system, and the tailing system. Plans called for the $76 million project to begin production in 2007 with an output of 155 t/yr (reported as about 5 million troy ounces per year) of silver and about 62 kg/yr (reported as 2,000 troy ounces per year) of gold and a mine life of 8 years. Alamo Dorado's proven and probable reserves totaled 11.6 Mt of ore at a grade of 118 g/t silver and 0.33 g/t gold (Pan American Silver Corp., 2006a§). Pan American Silver also produced silver in Mexico from its La Colorada Mine in Central Mexico. Production from La Colorada in 2005 was about 96 t (reported as 3.1 million troy ounces) (Pan American Silver Corp., 2006b§).

Peñoles owned the world's largest silver refinery in Torreon, Coahuila, with a capacity to produce almost 3 Mt/yr. Grupo Mexico also owned a silver refinery through Mexicana de Cobre in the State of Sonora. Grupo Mexico's refined silver capacity was more than 465 t/yr.

Iron and Steel.—Mexico was the second ranked producer of steel in Latin America and the Caribbean (after Brazil). Production of steel decreased slightly in 2005 to 16.2 Mt. Mexico's three leading producers were Mittal Steel, with 3.67 Mt; Altos Hornos de México, S.A. de C.V. (Hylsa), with 3.24 Mt; and SICARTSA, with 1.26 Mt. Despite the decrease, which was attributed in part to the high cost of natural gas and refinery products, and a labor dispute in one of the country's leading steel producers, the year was a financially sound one for the industry (Cámara Minera de México, S.A. de C.V., 2006a§).

During the year, consumption of steel products continued to increase and reached 14.6 Mt. Of the total, 80% was supplied by

domestic producers. From 2000 to 2005, consumption of steel products increased by almost 33% (Altos Hornos de México, S.A. de C.V., 2006, p. 27).

In August, the Techint Group acquired Hylsamex, S.A. de C.V. from Grupo Alfa. Hylsamex was the holding company of the integrated steel producer Hylsa. Ternium S.A., a company that was registered in Luxembourg and in which Techint had a 59% equity share, had an 86.68% equity share in Hylsamex (also known as Ternium Hylsa) at yearend (Ternium S.A., 2006, p. 26; 2005§). Hylsa also owned the iron ore mine and pellet plant producer Las Encinas, S.A. de C.V., which produced iron ore from the Cerro Náhualt and Aquila Mines in the States of Colima and Michoacan, respectively. The company shared ownership of the Consorcio Benito Juárez-Peña Colorada, S.A. de C.V. iron ore and pellet producer with Mittal Steel (table 2).

Lead and Zinc.—Mexico was the world's fifth ranked producer of mined lead. Production in 2005 increased by 13% to about 134,400 t. Of the total, 39% was from the State of Chihuahua where the Naica Mine (Mexico's richest lead mine) is located. During the year, the State of Zacatecas produced almost as much mined lead as did Chihuahua.

Peñoles continued to dominate the production of mined lead with 46% of the national output. Grupo México produced 19,200 t from its underground mines (Grupo México, S.A. de C.V., 2006, p. 22; Industrias Peñoles, S.A. de C.V., 2006, p. 21, 44; Servicio Geológico Mexicano, 2006, p. 276-277).

Zinc mine production in Mexico increased by 11.7% to about 476,300 t (table 1). The country was an important producer of mined zinc, ranking sixth in the world. The leading producing State was Zacatecas, with almost 42% of the total. Chihuahua produced about 27% of the total. The leading producing company was Peñoles, which produced 44% of the national total. Its Francisco I. Madero Mine in Zacatecas produced about 65,400 t, and its Bismark Mine produced about 45,100 t. The Charcas Mine, which was owned by Grupo México, produced 70,500 t in the State of San Luis Potosi. Grupo Mexico produced 30% of Mexico's mined zinc in 2005.

Industrial Minerals

Cement.—Mexico produced 37.5 Mt of cement in 2005. The leading producer of cement in Mexico was CEMEX México, with 15 plants. In addition to CEMEX México, two of the other world leaders in cement production, the Holcim and Lafarge Groups, had plants in Mexico. Corporación Moctezuma, S.A. (a joint venture between Cementos Molins, S.A. of Spain and Buzzi Unicem SpA of Italy) owned two cement plants in Mexico. The company's newest plant, which was constructed in 2004, was in Cerritos, State of San Luis Potosi. Cementos Molins announced in 2005 that it would invest $100 million to expand the production capacity at Cerritos, which was producing at full capacity during the year. With the expansion, the plant would reach a capacity of 2.4 Mt/yr by 2005, which would be equal to the capacity of Moctezuma's plant in the State of Morelos (Corporación Moctezuma, S.A., 2006§).

Fluorspar.—Mexico, which was the world's second ranked producer of fluorspar after China, produced slightly less than 17% of the world total. Fluorspar production increased by almost 4% compared with that of 2004 after an increase of 12% in the previous year. The State of San Luis Potosi was the leading producer with 82% of the country's production. The States of Coahuila (16%) and Durango (2%) produced the remainder. The leading producing company of fluorspar in Mexico, which produced its entire output in the State of San Luis Potosi, was Cía. Minera Las Cuevas, which was a subsidiary of Mexichem, S.A. de C.V. (formerly Grupo Industrial Camesa, S.A. de C.V.). The company's mine had proven reserves of 30 Mt to 40 Mt. The mine's content of fluorspar calcium fluoride exceeded 84% (Grupo Industrial Camesa, S.A. de C.V., 2005, p. 6, 24-25). Mexichem also owned Química Fluor, S.A. de C.V., which was Mexico's leading producer of hydrofluoric acid and the leading consumer of fluorspar. Química Fluor had a plant in the State of Tamaulipas with a capacity of 90,000 t/yr of hydrofluoric acid. Mexichem planned to invest $12 million during 2005 to reduce the impurity of the fluorspar from Las Cuevas and to improve the processing between Las Cuevas and Química Fluor. Mexichem exported about 75% of its production; 40% of exports went to the world steel market (Grupo Industrial Camesa, S.A. de C.V., 2005, p. 25).

Sulfur.—In Mexico, sulfur was produced as a byproduct of petroleum refining and in the form of sulfuric acid in metallurgical facilities. In 2005, production of sulfur as a byproduct of the petroleum industry decreased slightly to about 1 Mt. The State with the largest share of petroleum byproduct sulfur production was Tabasco, with 40%. The States of Chiapas and Guanajuato were also important producers of petroleum byproduct sulfur. In 2004, PEMEX began construction of a sulfur plant in La Cangrejera complex in the State of Veracruz. The plant was to produce 10 metric tons per day of sulfur and would have an efficiency of 96%. This would be PEMEX Gas' 12th sulfur recovery plant in its complexes. With the construction of the recovery plant, the sulfur dioxide emissions would be significantly reduced and the facilities would be in compliance with Mexican environmental laws. The plant, which had an estimated cost of $8.8 million and was originally scheduled to begin production in May 2005, was completed in August (Petróleos Mexicanos, S.A. de C.V., 2006b, p. 53; PEMEX Gas y Petroquímica Básica, 2004§).

Mineral Fuels

The Government of Mexico's strategy, through its producing company PEMEX, focused on increasing its hydrocarbon reserves by increasing the production of light crude and nonassociated natural gas. PEMEX reported that, in 2005, the company had 74 new exploration wells, of which 39 were successful producers (13 for crude petroleum and 26 for natural gas) (Petróleos Mexicanos, S.A. de C.V., 2006a, p. 14).

Coal.—Production of coal increased by about 2% to about 11.8 Mt, of which 4.7 Mt was metallurgical. All the coal produced in Mexico was from the State of Coahuila. The principal producer was Minera Carbonífera Río Escondido, S.A. (MICARE), which was a subsidiary of Altos Hornos de México, S.A. de C.V. (AHMSA). The company produced thermal coal for electricity production from an open pit and an underground mine, which supplied Mexico's electricity company Comisión

Federal de Electricidad. The company was developing another underground mine. Another AHMSA subsidiary, Minera Monclova, S.A. de C.V., produced metallurgical coal from four underground mines and an open pit. These mines produced most of AHMSA's metallurgical coal requirements (Altos Hornos de México, S.A. de C.V., 2006, p. 52-55).

Mexico's coal reserves totaled 972.3 Mt. Of these, AHMSA had more than 54% of the total (Cámara Minera de México, S.A. de C.V., 2006a§).

Natural Gas.—Despite having less than 1% of the world reserves, Mexico was the world's 12th ranked producer of natural gas. In the Americas, only the United States, Canada, and Argentina, in that order, produced more natural gas than Mexico (BP p.l.c., 2006, p. 22-23; Petróleos Mexicanos, S.A. de C.V., 2006b). Nonetheless, Mexico was a net importer of dry (marketable) natural gas. Production of gross natural gas increased by about 5% compared with that of 2004 and production of dry natural gas remained basically unchanged. About 25% of the country's total production was from the Burgos Basin, which is located in the Region Norte. The leading producing field was Cantarell in the Region Marina Noreste, with almost 15% of the total (Petróleos Mexicanos, S.A. de C.V., 2006a, p. 5, 19-20).

Petroleum.—Mexico was the world's fifth ranked producer of crude oil. In the Americas, only the United States produced more crude petroleum than Mexico (Petróleos Mexicanos, S.A. de C.V., 2006a, p. 57). Production of crude petroleum and condensate in 2005 decreased by about 1% after a small increase in 2004 compared with that of 2003. Mexico had 357 fields, 5,682 wells, and 193 marine platforms in production. Offshore wells produced most of Mexico's crude petroleum (83%). The Cantarell oilfield was Mexico's largest field and produced 61% of Mexico's total production, a slightly smaller portion than in 2004 when it produced 63% of the total. Heavy crude accounted for 72% of the production. Light and super-light crude accounted for about 24% and 4% of the total, respectively. Of the total crude distributed, 55% was sent to export terminals and 38% went to domestic refineries; the petrochemical plants received 4%, and the maquiladora industry received 3% (Petróleos Mexicanos, S.A. de C.V., 2006a, p. 6, 16-17, 21).

Refinery Products.—In 2005, PEMEX had six refineries in operation. Refinery production decreased by about 2% compared with that of 2004. Despite efforts to increase the production capacity of refinery products by upgrading its refinery system, Mexico was a net importer of refinery products. Exports of refinery products increased significantly in terms of volume (39%), but they were outpaced by the increase of their imports (82%). The country has been upgrading its refinery system to improve the quality of gasoline and to expand the system's production capacity. Additional capacity was due to become available in 2008. PEMEX would need to invest $19 billion to reduce its import requirement, which was the result of low production levels (U.S. Energy Information Administration, 2007§).

Outlook

Investment in the mining sector is expected to increase in 2006 by more than 25% to $1.15 billion, which is a level almost as high as that achieved in 1997. Equipment acquisition is expected to absorb the largest portion of the investment with more than $410 million; this would be a more than 75% increase from the level recorded in 2005. Investment in new projects, expansion of projects, and exploration are expected to total $331 million, $219 million, and $140 million, respectively (Cámara Minera de México, S.A. de C.V., 2006b§).

A number of mining projects were near completion in 2005. Such projects as Alamo Dorado (silver), Cerro San Pedro (gold and silver), Los Filos (gold), Milpillas (copper), Mulatos (gold), Ocampo (gold and silver), Piedras Verdes (copper), which were scheduled to begin production in 2006 and 2007, are expected to have a positive impact on the production levels of copper, gold, and silver.

The production of cement in Mexico is expected to increase as two of the producers increase their production capacity. Lafarge México was doubling its production capacity with the construction of its new plant in Tula, which was expected to begin production in 2006. CEMEX México planned to increase its production capacity in its Yaqui plant in the State of Sonora. The plant's production capacity would increase to 1.8 Mt from 1.35 Mt. CEMEX also planned to expand the production capacity of its Tepeaca plant in the State of Puebla to 4.4 Mt by 2009 from 3.2 Mt. Strong demand for cement in Mexico, which has been generated by the strength of the housing construction sector, was behind the decisions for the capacity expansions (CEMEX, S.A. B de C.V., 2006a§; b§).

According to PEMEX, Mexico's proven reserves have decreased significantly in recent years and, based on the production levels, would be depleted in 10 years. Although the majority of PEMEX's investment is dedicated to exploration and production (96% in 2005) and PEMEX expects to increase production from other producing fields, many analysts think that, under present circumstances, PEMEX will be unable to allocate enough funds to reverse this trend. Because of this, and the declining output from the Cantarell field, Mexico's production of crude petroleum is expected to decline (U.S. Energy Information Administration, 2007§).

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TABLE 1
MEXICO: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2001	2002	2003	2004	2005
METALS						
Aluminum, metal:						
Primary		51,500	39,000	--	--	--
Secondary		216,400 r	253,500 r	495,900 r	519,500 r	574,100
Total		267,900 r	292,500 r	495,900 r	519,500 r	574,100
Antimony[3]		81	155	434	503	564
Arsenic[4]		2,381	1,946	1,729	1,829	1,664
Bismuth:						
Mine output, Bi content[5]		1,390	1,126	1,064	1,014	970
Metal, refined		1,390	1,126	1,064	1,014	970
Cadmium:						
Mine output, Cd content		1,245	1,609	1,616	1,662	1,627
Metal, refined		1,421	1,382	1,590	1,594	1,627
Copper:						
Mine output, Cu content:						
By concentration or cementation		306,779	260,574	279,254 r	327,432 r	336,367
Leaching, electrowon		60,500	69,300	76,399 r	78,108 r	92,675
Total		367,279	329,874	355,653	405,540	429,042
Metal:						
Anode and blister, primary		344,500 r	260,700 r	220,100 r	271,000 r	301,200
Refined:						
Primary		440,100 r	349,200 r	314,399 r	368,308 r	410,375
Secondary[e]		6,000 r	6,000 r	6,000 r	6,000 r	6,000
Total		446,100 r	355,200 r	320,399 r	374,308 r	416,375
Gold:						
Mine output, Au content	kilograms	23,543	21,324	20,406	21,824	30,356
Metal, refined	do.	25,749	23,594	22,177	24,496	28,782
Iron and steel:						
Iron ore, mine output:[6]						
Gross weight	thousand metric tons	8,783	9,941	11,265	11,483	11,687
Fe content	do.	5,270	5,965	6,759	6,890	7,012
Metal:						
Pig iron	do.	4,363	3,996	4,183	4,278	4,047
Direct-reduced iron	do.	3,672	4,740	5,473	6,345	5,973
Total	do.	8,035	8,736	9,656	10,623	10,020
Ferroalloys, electric arc furnace:[7]						
Ferromanganese	do.	60	39	56	72	90
Silicomanganese	do.	74	73	81	103	105
Total	do.	134	112	137	175	195
Crude steel	do.	13,292	14,010	15,159	16,730	16,195
Rolled products[8]	do.	11,185	11,639	12,214	13,126 r	13,727
Lead:						
Mine output, Pb content		136,413	138,707	139,348	118,484	134,388
Metal:						
Smelter:						
Primary[9]		143,523	128,241	137,483	107,414 r	116,539
Secondary[e]		110,000	110,000	110,000	110,000	110,000
Total[e]		254,000	238,000	247,000	217,000 r	227,000
Refined:						
Primary[10]		143,345	128,201	137,483	107,414 r	103,691
Secondary[e]		110,000	110,000	110,000	110,000	110,000
Total[e]		253,000	238,000	247,000	217,000 r	214,000

See footnotes at end of table.

TABLE 1--Continued
MEXICO: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2001	2002	2003	2004	2005
METALS--Continued						
Manganese ore:[11]						
Gross weight[e]		277,000	245,000	320,000	377,000	369,000
Mn content		99,751	88,358	114,550	135,893	132,872
Mercury, mine output, Hg content[e]		15	15	15	15	15
Molybdenum, mine output, Mo content		5,518	3,428	3,524	3,731	4,245
Silver:						
Mine output, Ag content	kilograms	2,759,985	2,746,989	2,568,877	2,569,478	2,894,161
Metallurgical products, Ag content:						
In copper bars	do.	283,539	208,360	236,468	235,970 r	251,838
Mixed gold and silver bars	do.	195,086	183,383	193,453	189,128 r	83,076
Metal, refined, primary	do.	2,330,811	2,500,652	2,310,283	1,860,996 r	2,014,304
Tin:						
Mine output, Sn content		8	1	2	NA r	NA
Metal, smelter, primary		1,789 r	1,756	1,790 r	25 r	17
Zinc:						
Mine output, Zn content		428,828	446,104	413,991	426,360	476,307
Metal, refined, primary		303,810	302,122	320,364	316,834 r	327,205
INDUSTRIAL MINERALS						
Abrasives, natural[12]		NA r	NA r	NA r	NA r	NA
Barite		142,017	163,620	287,451	306,668	268,657
Cement, hydraulic[13]	thousand metric tons	32,134 r	33,372	33,593	34,992	37,452
Clays:						
Bentonite		415,133	488,215	464,056	564,017	425,629
Common		13,257,459	13,258,195	13,242,893	15,127,163	41,190,217
Fuller's earth		148,194	147,064	152,917	129,502	107,265
Kaolin		681,709	745,498	798,407	654,711 r	877,147
Diatomite		69,474	62,322	53,395	59,818	62,132
Feldspar		329,591	332,101	346,315	364,166	373,411
Fluorspar:						
Acid-grade	thousand metric tons	343	343	409	402	325
Metallurgical-grade	do.	276	279	347	441	551
Total	do.	619	622	756	843	876
Graphite, natural, amorphous		21,442	14,065	8,730	14,769	12,357
Gypsum and anhydrite, crude (yeso)		6,237,056	6,739,834	6,986,491	9,221,458 r	6,251,969
Lime, hydrated and quicklime[e]	thousand metric tons	6,500	6,500	6,500	6,500	6,500
Magnesium compounds:						
Magnesite		250	--	--	--	--
Magnesia[14]		37,565	40,194	53,900	73,313	85,800
Mica, all grades		648	456	506	424	120
Nitrogen, N content of ammonia		581,154	558,960	438,948	559,782	422,450
Perlite		80,297	85,703	194,463	188,027	91,724
Phosphate rock[15]		787,283	4,764	5,500	350	350
Salt, all types	thousand metric tons	8,501	7,802	7,547	8,566	9,508
Sodium compounds:[e]						
Carbonate, soda ash, synthetic		290,000	290,000	290,000	290,000	290,000
Sulfate, natural, bloedite[16]		547,000	591,500	626,100	648,000	647,000
Stone, sand and gravel:						
Calcite, common		2,711,889	2,935,127	3,425,623	18,545,973	3,712,097
Dolomite		670,797	457,665	565,896	1,158,929	1,308,977
Limestone	thousand metric tons	63,346	59,421	56,253	72,763	57,568
Marble		4,155,745	3,615,728	3,529,274	2,824,181	3,595,970
Quartz, quartzite, glass sand (silica)		1,720,211	1,778,715	1,689,042	2,055,940	2,120,878
Sand	thousand metric tons	67,712	63,576	62,060	63,059	62,199
Gravel	do.	57,157	68,239	76,332	74,224 r	65,927
Strontium minerals, celestite		145,789	94,015	130,329	87,610	110,833

See footnotes at end of table.

TABLE 1--Continued
MEXICO: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2001	2002	2003	2004	2005
INDUSTRIAL MINERALS--Continued						
Sulfur, elemental, byproduct:						
Of metallurgy[e]	thousand metric tons	572	575	575	575	575
Of petroleum and natural gas	do.	878	887	1,052	1,122	1,016
Total[e]	do.	1,450	1,460	1,630	1,700	1,590
Talc		77,650	111,621	114,870	101,896	64,827
Vermiculite		--	300	312	218	140,276
Wollastonite		39,830	42,756	31,234	28,224	27,132
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Run of mine:						
Metallurgical	thousand metric tons	5,242	5,097	6,648	5,786	4,653
Steam	do.	6,935	6,308	6,530	5,687	7,097
Total	do.	12,177	11,405	13,178	11,473	11,750
Washed metallurgical coal[e]	do.	2,000	2,000	2,000	2,000	2,000
Coke:[17]						
Metallurgical	do.	2,025	1,412	1,414	1,401	1,492
Breeze	do.	40	39	49	44	45
Total	do.	2,065	1,451	1,463	1,445	1,537
Gas, natural:						
Gross	million cubic meters	46,624	45,716	46,509	47,269	49,818
Marketable (dry)	do.	28,998 [r]	30,147 [r]	31,323 [r]	32,510 [r]	32,539
Petroleum:						
Crude	thousand 42-gallon barrels	1,141,355	1,159,642	1,230,415	1,234,795	1,216,654
Condensate, natural gas liquids	do.	158,045	148,920	152,570	161,330	158,978
Total	do.	1,299,400	1,308,562	1,382,985	1,396,125	1,375,632
Refinery products:						
Liquefied petroleum gas	do.	10,147	11,425	12,410	10,220	11,169
Motor gasoline	do.	142,423	145,343	162,425	170,346	166,112
Jet fuel	do.	20,696	20,696	21,900	22,667	23,105
Kerosene	do.	110	--	--	--	--
Distillate fuel oil, diesel	do.	102,784	97,419	112,420	118,516	116,143
Lubricants	do.	1,898	1,789	1,825	1,971	1,898
Residual fuel oil	do.	159,104	164,104	144,905	134,320	128,042
Asphalt	do.	10,476	10,512	9,490	9,928	10,695
Other, refinery fuel and losses	do.	14,854	14,416	5,840	28,870	31,316
Total	do.	462,492	465,704	471,215	496,838	488,480

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. -- Zero. NA Not available.

[1]Table includes data available through September 30, 2006.

[2]In addition to the commodities listed, additional types of crude construction materials are produced, but output is not reported; available information is inadequate to make estimates of output.

[3]Sb content of antimonial lead.

[4]Arsenic content of white arsenic.

[5]Refined metal plus bismuth content of impure smelter products.

[6]Iron ore pellets.

[7]Reported by Cámara Nacional del Hierro y del Acero.

[8]Includes flat, nonflat, and seamless pipe steel products.

[9]Lead content of impure bar, antimonial lead, and refined metal.

[10]Includes lead content of antimonial lead.

[11]Mostly oxide nodules; includes smaller quantities of direct-shipping carbonates and oxide ores for metallurgical and battery applications.

[12]The previous series, which was based on exports comprising mostly pumice stone and emery (a granular, impure variety of corundum), is believed to be incomplete. Available information is inadequate to make estimates of output.

[13]Includes grey and white portland and masonary cement.

[14]Reported by Industrias Peñoles, S.A. de C.V. as the only major producer. Includes caustic, electromelt, hydroxide, and refractory.

[15]Includes only output used to manufacture fertilizers.

[16]Series reflects output reported by Industrias Peñoles, S.A. de C.V. plus an additional 40,000 metric tons of estimated output by other producers.

[17]Includes coke made from imported metallurgical coal.

TABLE 2
MEXICO: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities[1]	Annual capacity
Aluminum, primary	Aluminio y Derivados de Veracruz, S.A. de C.V. (private Mexican, 100%)	Smelter in Veracruz, Ver.	65.
Antimony	Cía. Minera y Refinadora Mexicana, S.A. (private Mexican, 51%, and Cookson Ltd., 49%)	San Jose Mine, Catorce, S.L.P.	365.
Barite	Barita de Sonora, S.A. [Grupo Acerero del Norte, S.A. de C.V. (GAN), 100%]	Mazatan, Son.	219.
Do.	Minerales y Arcillas, S.A. de C.V. (private Mexican, 100%)	San Francisco del Huerto Mine in San Pedro, Coah., La Escondida and Angelita Mines and plant in Galeana	55.
Do.	Barita de Santa Rosa, S.A. de C.V. (private Mexican, 100%)	Muzquiz, Coah.	256.
Bismuth	Met-Mex Peñoles, S.A. de C.V. (Industrias Peñoles, S.A. de C.V., 100%)	Torreon, Coah.	1.2.
Cement	CEMEX México (CEMEX, S.A. B de C.V., 100%)	Ensenada, B.C.N.; Torreon, Coah.; Barrientos, D.F.; Arotonilco and Huichapan, Hgo.; Guadalajara and Zapotilic, Jal.; Hidalgo and Monterrey, N.L.; Tepeaca, Pue.; Tamuin and Valles, S.L.P; Hermosillo and Yaqui, Son.; and Merida,Yuc.	26,650.
Do.	Cementos Apasco, S.A. de C.V. (Holcim Group, 49%, and other, 51%)	Apasco, Mex.; Ramos Arizpe, Coah.; Macuspana, Tab.; Tecoman, Col.; Orizaba, Ver.; and Acapulco, Gro.	8,900.
Do.	Cooperativa La Cruz Azul, S.C.L. (private Mexican, 100%)	Cruz Azul, Hgo., Lagunas, Oax.	5,000.
Do.	Cementos de Chihuahua, S.A. de C.V. (CEMEX México, 36%, and private Mexican, 64%)	Chihuahua, Cuidad Juarez, and Samalayuca, Chih.	2,000.
Do.	Lafarge México (Lafarge Group, 100%)	Vito, Hgo.	600.
Do.	Corporación Moctezuma, S.A. (Cementos Molins, S.A., 50%, and Buzzi Unicem SpA, 50%)	Tepetzingo, Mor.	2,400.
Do.	Corporación Moctezuma, S.A. (Cementos Molins, S.A., 50%, and Buzzi Unicem SpA, 50%)	Cerritos, S.L.P.	2,400.
Coal	Minera Monclova, S.A. [Altos Hornos de México, S.A. de C.V. (AHMSA), 100%]	Mimosa and Palau Mines and Muzquiz washing plant at Palau, Coah., and coking plant at Monclova, Coah.	3,000.
Do.	Carbonífera de San Patricio, S.A. de C.V. (private Mexican, 100%)	Progreso, Coah.	1,314.
Do.	Industrial Minera México, S.A. de C.V. (IMMSA) (Grupo México, S.A. de C.V., 90%)	Nueva Rosita, Coah.	1,500.
Do.	Minera Carbonífera Río Escondido, S.A. [Grupo Acerero del Norte, S.A. de C.V. [Altos Hornos de México (AHMSA), 100%]	Mina 1, Mina II, and Tajo 1 at Nava and Piedras Negras, Coah.	6,500.
Copper	Mexicana de Cobre, S.A. de C.V. (Grupo México, S.A. de C.V., 90%)	La Caridad Mine, smelter, refinery, SX-EW[2] plant, and rod plant at Nacozari de Garcia, Son.	350 smelter, 50 SX-EW,[2] 300 refinery, 150 rod plant.
Do.	Mexicana de Cananea, S.A. de C.V. (Grupo México, S.A. de C.V., 90%)	Mine and SX-EW[2] plant at Cananea, Son.	29,200 mill, 33 SX-EW.[2]
Do.	Minera María S.A. de C.V. (Grupo Frisco, 100%)	Mine and SX-EW[2] plant at Cananea, Son.	20 SX-EW.[2]
Do.	Cobre de México, S.A. de C.V. (Grupo Condumex)	Primary refinery in Mexico City and secondary refinery in Villagran, Gto.	150.
Ferroalloys	Cía. Minera Autlán, S.A. de C.V. (Grupo Ferrominero, S.A. de C.V., 54%; Minas de Basis, S.A. de C.V., 32%; BHP Ltd., 14%)	Plant in Tamos, Ver.	140.
Do.	do.	Plant in Teziutlan, Pue.	38.
Do.	do.	Plant in Gomez Palacio, Dgo.	35.

See footnotes at end of table.

TABLE 2--Continued
MEXICO: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities[1]	Annual capacity
Fluorspar		Cía. Minera Las Cuevas, S.A. de C.V. (Mexichem, S.A. de C.V.)	Salitera (Zaragoza), S.L.P.	520.
Do.		Fluorita de México, S.A. de C.V. (Corp. Alfil, 51%, and Applied Industrial Minerals Corp., 49%)	Mines at La Encantada district and plant at Muzquiz, Coah.	150.
Gold, mine	kilograms	Minera Fresnillo, S.A. de C.V. (Industrias Peñoles, S.A. de C.V., 100%)	Proaño (Fresnillo) Mine, Zac.	1,200.
Do.	do.	Peñoles, S.A. de C.V., 56%, and Newmont Mining Corporation, 44%)	La Herradura Mine, Son.	6,900.
Do.	do.	Minera Mexicana La Ciénega, S.A. de C.V. (Industrias Peñoles, S.A. de C.V., 100%)	La Ciénega Mine, Dgo.	4,500.
Do.	do.	Minas Luismín, S.A. de C.V. (GoldCorp Inc., 100%)	San Dimas Gold, Dgo. (two mines)	2,700.
Do.	do.	Cía. Minera de Santa Gertrudis (Grupo Ariztegui, 51%, and Phelps Dodge Corp., 49%)	Santa Gertrudis Mine, Son.	1,600.
Do.	do.	Exploraciones El Dorado, S.A. de C.V., 70%, and Minerales Sotula, 30%	La Colorada Mine, Son.	800.
Do.	do.	Cía. Minera El Cubo, S.A. de C.V. (Mexgold Resources Inc., 100%)	El Cubo Mine, Gto.	128.
Do.	do.	Minas de las Altas Pimerias, S.A. de C.V. (Glamis Gold Ltd., 100%)	El Sauzal Mine, Chih.	5,900.
Do.	do.	Alamos Gold Inc.	Mulatos Mine, Son.	4,700.
Do.	do.	Sociedad Cooperativa Minero Metalúrgica Santa Fe de Guanajuato (private Mexican, 100%)	Guanajuato, Gto.	438.
Gold, refined	do.	Met-Mex Peñoles, S.A. de C.V. (Industrias Peñoles, S.A. de C.V., 100%)	Torreon, Coah.	22,700.
Graphite		Grafitos Mexicanos, S.A. (Cummings Moore Graphite Co. of the United States, 25%, and private Mexican, 75%)	Lourdes and San Francisco Mines, Son.	60.
Do.		Grafito Superior, S.A. de C.V. (Superior Graphite Co., 100%)	Covalmar, Santa Clara, and Rio Mayo Mines, and plant in Son.	25.
Gypsum		Cía. Occidental Mexicana, S.A. (private Mexican, 51%, and Domtar, Ltd. of Canada, 49%)	Santa Rosalia on San Marcos Island, B.C.S.	2,500.
Iron ore		Consorcio Minero Benito Juárez Peña Colorada, S.A. de C.V. (Hylsamex, S.A. de C.V., 51%, and Mittal Steel, 49%)	Peña Colorada mine and pellet plant near Manzanillo, Col.	3,500.
Do.		Altos Hornos de Mexico, S.A. de C.V. (AHMSA) [Grupo Acerero del Norte, S.A. de C.V. (GAN), 78.9%]	La Perla Mine, Chih.; Hercules Mine, Coah.; and Cerro de Mercado Mine, Dgo.	5,000.
Do.		Siderúrgica Lázaro Cárdenas-Las Truchas, S.A. de C.V. (SICARTSA) (Grupo Villacero, 100%)	Ferrotepec, Volcan, and Mango deposits in Las Truchas project area and pellet plant, Mich.	2,350.
Do.		Hylsamex, S.A. de C.V. (Ternium S.A, 86.68%)	Cerro Nahualt, Col. and Aquila Mine, Mich.	1,500.
Lead and zinc		Industrial Minera México, S.A. de C.V. [(IMMSA) (Grupo México, S.A. de C.V., 90%)	Charcas, S.L.P.; San Martin, Zac.; Santa Eulalia, Chih.; Taxco, Gro.; Rosario, Sin.; Santa Barbara, Chih.; Velardena, Dgo; lead refinery at Monterrey, N.L.; and zinc refinery at S.L.P.	70 lead, mine; 110 refined zinc.
Do.		Industrias Peñoles, S.A. de C.V. (private Mexican, 97%, and private United States, 3%)	Mines at La Encantada, Coah.; Fresnillo, Zac.; Naica, Chih.; Bismark, Son; Rey de Plata, Gro. (Peñoles, 51%; Dowa Mining Co., 39%); metallurgical complex at Torreon, Coah., with silver, lead, and zinc smelter and refineries operated by Met-Mex Peñoles (Peñoles, 100%)	180 refined lead, 240 refined zinc.
Do.		do.	Francisco I. Madero Mine, Zac.	100,000 zinc.
Do.		Minera San Francisco del Oro, S.A. de C.V. (Empresas Frisco, S.A. de C.V., 100%)	San Francisco del Oro, near Hidalgo del Parral, Chih.	15 lead, 21 zinc.

See footnotes at end of table.

TABLE 2--Continued
MEXICO: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities[1]	Annual capacity
Manganese	Cía. Minera Autlán, S.A. de C.V. (Grupo Ferrominero, S.A. de C.V., 81.75%, and private Mexican, 18.25%)	Molango, Naopa, and Nonoalco Mines, Hgo.	600 ore and concentrate.
Molybdenum	Mexicana de Cobre, S.A. (Grupo México, S.A. de C.V., more than 90%)	La Caridad Mine and molybdenum plant, Son.	6.
Petroleum thousand barrels per day	Petróleos Mexicanos, S.A. de C.V. (PEMEX) (Government, 100%)	Comalcalco, Poza Rica, Ver., and Gulf of Campeche, Cam., Districts	3,500.
Salt	Exportadora de Sal, S.A. (Fideicomiso de Fomento 51%, and Mitsubishi Corp., 49%)	Solar salt complex at Guerrero Negro, B.C.S.	6,000.
Silver kilograms	Minera Fresnillo, S.A. de C.V. (Industrias Peñoles, S.A. de C.V., 100%)	Proaño (Fresnillo) Mine, Zac.	1,100,000.
Do. do.	Minera Mexicana La Ciénega, S.A. de C.V. (Industrias Peñoles, S.A. de C.V., 100%)	La Ciénega Mine, Dgo.	65,800.
Do. do.	Minera Bismark, S.A.de C.V. (Industrias Peñoles, S.A. de C.V., 100%)	Bismark Mine, Chih.	7,000.
Do. do.	Co. Minera Sabinas, S.A. de C.V. (Industrias Peñoles, S.A. de C.V., 100%)	Sabinas Mine, Zac.	157,000.
Do. do.	Minera Tizapa, S.A. de C.V. (Industrias Peñoles, S.A. de C.V., 50%)	Tizapa Mine, Mex.	140,000.
Do. do.	Minas Peñoles S.A. de C.V. (Industrias Peñoles, S.A. de C.V., 50%)	Francisco I. Madero Mine, Zac.	63,000.
Do. do.	Industrial Minera México, S.A. de C.V. (IMMSA) (Grupo México, S.A. de C.V., 90%)	San Martin Mine, Sombrerete, Zac.; Taxco, Gro.; Charcas, S.L.P.; Santa Eulalia, Chih.; and refinery at Monterrey, N.L.	335,000.
Do. do.	Pan American Silver Corp.	La Colorada Mine, Zac.	100,000.
Do. do.	Met-Mex Peñoles, S.A. de C.V. (Industrias Peñoles, S.A. de C.V., 100%)	Torreon, Coah.	2,900,000 refinery.
Do. do.	Mexicana de Cobre, S.A. de C.V. (Grupo México, S.A. de C.V., 100%)	La Caridad metallurgical complex, Son.	466,500.
Sodium sulfate	Química del Rey, S.A. de C.V. (Industrias Peñoles, S.A. de C.V., 100%)	Plant at Laguna del Rey, Coah.	620.
Steel	Altos Hornos de Mexico, S.A. de C.V. (AHMSA) [Grupo Acerero del Norte, S.A. de C.V. (GAN), 78.9%]	Steelworks at Monclova, Coah.	3,316 steel, 3,800 pellet.
Do.	Hylsamex, S.A. de C.V. (Ternium S.A., 86.68%)	Steel works and direct-reduction units at Monterrey, N.L., and Puebla, Pue.; pelletizing plant in Col.	3,100 steel, 1,500 pellet.
Do.	DEACERO, S.A. de C.V. (private Mexican, 100%)	Steelworks at Saltillo, Coab., and Celaya, Gto.	1,450.
Do.	Mittal Steel Lazaro Cardenas (Mittal Steel, 100%)	Facilities at Lazaro Cardenas, Mich.	5,300 steel, 4,000 pellet.
Do.	Siderúrgica Lázaro Cárdenas-Las Truchas, S.A. de C.V. (SICARTSA) (Grupo Villacero, 100%)	Port Lazaro Cardenas, Mich.	2,350 steel, 1,850 pellet.
Do.	Tubos de Acero de México, S.A. (private Mexican, 100%)	Veracruz, Ver.	1,000.
Strontium (celestite)	Cía. Minera La Valenciana (private Mexican, 100%)	San Agustin Mine, Torreon, Coah.	50.
Sulfur	Petróleos Mexicanos, S.A. de C.V. (PEMEX)	Nationwide petroleum operations	890.
Tin[4]	Fundidora Marni, S.A.	San Luis Potosi, S.L.P.	NA.
Do.	PIZUTO, S.A.	do.	NA.

NA Not available.

[1]State abbreviations: Baja California Norte (B.C.N.), Baja California Sur (B.C.S.), Campeche (Cam.), Chihuahua (Chih.), Coahuila (Coah.), Colima (Col.), Distrito Federal (D.F.), Durango (Dgo.), Guanajuato (Gto.), Guerrero (Gro.), Hidalgo (Hgo.), Jalisco (Jal.), Mexico (Mex.), Michoacan (Mich.), Nuevo Leon (N.L.) Oaxaca (Oax.), Puebla (Pue.), Queretaro (Qro.), San Luis Potosi (S.L.P.), Sinaloa (Sin.), Sonora (Son.), Tabasco (Tab.), Veracruz (Ver.), Yucatan (Yuc.), and Zacatecas (Zac.).

[2]Solvent extraction-electrowinning.

[3]Petróleos Mexicanos, S.A. de C.V. operated six refineries with an installed capacity of 1.68 million barrels per day.

[4]Smelter output from mostly imported concentrates.

The Mineral Industries of Paraguay and Uruguay

By Yolanda Fong-Sam

PARAGUAY

Paraguay, a landlocked country, is located in central South America to the northeast of Argentina, southeast of Bolivia, and southwest of Brazil. The three main rivers of Paraguay are the Paraguay River, which runs from north to south across central Paraguay, the Parana River, which runs along the southeastern side of the country and is shared with Argentina and Brazil, and the Pilcomayo River, which is located in the southwest and is shared with Argentina (Rand McNally, 1995). The Parana River holds three hydroelectric dams—the Central Acaray (operated by Paraguay's state-owned utility Administracion Nacional de Electricidad), the Itaipu Binacional (operated in cooperation with Brazil), and the Yacyreta Binacional (operated in cooperation with Argentina). Paraguay has a total area of 406,750 square kilometers (km²) and had an estimated population of 6.2 million in 2005. Paraguay was a Spanish possession until 1811, when independence was granted (U.S. Central Intelligence Agency, 2005§[1]; U.S. Energy Information Administration, 2005§; World Bank, The, 2005§).

Paraguay's main mineral industries in 2005 were cement, iron and steel, and petroleum refinery products. The gross domestic product (GDP) based on purchasing power parity was estimated to be $28.3 billion, which was an increase of about 5.6% compared with that of 2004. The estimated GDP per capita based on purchasing power parity was $4,888 (International Monetary Fund, 2006§). The industrial sectors that made the largest contributions to Paraguay's 2005 GDP were commerce (18.7%), agriculture (17.2%), and manufacturing (14.5%). The mining sector contributed the least to the country's economy with 0.1% (Banco Central del Paraguay, 2005).

Paraguay's economy was highly dependent on its neighboring countries of Argentina, Bolivia, Brazil, and Uruguay. Three of these countries—Argentina, Brazil, and Uruguay—were fellow members of the Southern Cone Common Market [Mercado Común del Sur (MERCOSUR)]. Paraguay's important industries included cement, hydroelectric power, steel, sugar, textiles, and wood products. Paraguay had no known natural gas or oil reserves but was a major exporter and producer of hydroelectric power. To meet its crude oil and petroleum products demand, Paraguay relied completely on imports of approximately 25,400 barrels per day (bbl/d) based on 2005 estimates (U.S. Energy Information Administration, 2005§; 2006§).

[1]References that include a section mark (§) are found in the Internet References Cited section.

Commodity Review

Metals

Iron and Steel.—Based on the world crude steel production report of the International Iron and Steel Institute, Paraguay produced 103,000 metric tons (t) of crude steel in 2005, which was a 5.5% decrease compared with production in 2004 (table 1). Production of pig iron, however, totaled 126,000 t, which was a 5.9% increase compared with production in 2004 (table 1) (International Iron and Steel Institute, 2004a§, b§; 2005a§, b§). During the year, domestic sales of steel products in Paraguay totaled 71,343 t, which was an 8.7% decrease compared with the 78,133 t sold in 2004 (Ministerio de Hacienda, 2005; Ministerio de Industria y Comercio, 2006b§).

Industrial Minerals

Cement.—In June 2005, three cement enterprises [Camargo Correa Cimentos S.A. and Votorantim Cimentos (of Brazil) and Concret-Mix S.A (of Paraguay)] expressed their interest in investing $17 million to build a cement mill in the city of Mariano Roque Alonso in Paraguay. The mill would have a production capacity of 200,000 t; the companies planned to sell the cement output domestically and to export it. The facility was expected to meet about 20% of the country's demand for cement when the plant is fully operational (Business News America, 2005§; Portal Paraguayo de Noticias, 2005§).

In 2005, the Industria Nacional del Cemento (INC), a state-owned company, was the only cement producer in Paraguay. During 2005, INC's cement production was 549,686 t, which was an increase of 17% compared with that of 2004 (table 1). In 2005, the National Customs Department of Paraguay registered a total of 98,646 t of cement imported to complement the domestic production and satisfy high demand. Approximately 84.8% of Paraguay's cement was produced locally, and the remaining 15.2% was imported (Ministerio de Hacienda, 2005; Ministerio de Industria y Comercio, 2006a§).

Mineral Fuels

Natural Gas.—During the last quarter of 2004, Chaco Resources Plc acquired 100% of the shares of two Paraguayan companies, Amerisur S.A. and Bohemia S.A. Chaco was the successor company of Gold Mines of Sardinia Plc, a gold company that in early 2004 had changed its name and its orientation to exploration and development of hydrocarbons in South America.

In 2005, Chaco applied for the right to explore the Canindeyu, the Curupayty, and the San Pedro Blocks (Chaco Resources Plc, 2005a§; b§). In August 2005, the Congress of Paraguay

approved two acts that granted Chaco's subsidiary Amerisur S.A. hydrocarbon exploration and production rights to the Curupayty and the San Pedro Blocks. For the Canindeyu Block, Chaco was awarded a prospecting permit for 1 year. The Curupayty Block covers almost 1.4 million hectares of the Curupayty Basin in northern Paraguay. The San Pedro concession covers more than 1 million hectares of the western Parana Basin. As a requirement under the Paraguayan legislation, the company (Chaco) has to select an exploration area of no more than 800,000 hectares per block for the Curupayty and the San Pedro concessions in order to enter into a 4-year exploration phase (Alexander's Gas & Oil Connections, 2005a§; Chaco Resources Plc, 2005a§; b§)

Chaco's plans for its Paraguay properties during 2006 included the analysis and interpretation of the historical seismic data for all three locations to produce regional structural maps of key seismic horizons. Data from existing wells would also be reviewed and correlated for seismic interpretation. After the analysis of seismic data is completed, the company would decide if further seismic shooting was required to determine possible drilling targets. Chaco was also exploring the possibilities of joint-venture opportunities for future exploration drilling (Chaco Resources Plc, 2005a§).

CDS Energy S.A., which was the Paraguayan subsidiary of CDS Oil & Gas Group Plc (a United Kingdom-based oil and gas exploration company), held contractual rights to three blocks of property that cover an area of 2.9 million hectares in the Chaco region of Paraguay. The Boqueron Block covers a total area of 2,389,850 hectares, of which CDS Energy had prospecting and exploration rights for an area of 120,000 hectares. CDS energy held 100% interest in the Boqueron Block. CDS Energy also held interest in the Gabino Mendoza Block, which covers an area of 40,000 hectares; the company had exploitation rights with a 96.5% gross revenue interest (the owner of the remaining 3.5% was not specified) and a 100% working interest. CDS Energy's PG&E Block covered an area of 491,077 hectares; CDS Energy held a 99.4% gross revenue interest (no information was available regarding who managed the remaining 0.6%) and a 100% working interest in the prospecting area (CDS Oil & Gas Group Plc, 2006b).

In November 2005, CDS Energy drilled its first well on the Gabino Mendoza Block in an area of Devonian sand sequence at a depth of between 723 and 1,635 meters (m). Results revealed the presence of liquid hydrocarbons. Further analysis of the drill cuttings, sidewall cores, and well logs revealed that a deeper Devonian section (between 1,800 and 3,240 m) was prospective for gas (CDS Oil & Gas Group Plc, 2006a, b).

CDS Energy planned to finance its property obligations by securing additional financing or through joint-venture participation. During 2006, CDS Energy planned to continue to explore for deep Devonian gas in the Gabino Mendoza Block. Also in 2006, CDS Energy planned to continue its exploration of shallow oil in the Emilia well, which is located within the Boqueron Block. Although no hydrocarbon reserves had been proven in the Emilia prospect, CDS Energy considered this to be its most potentially productive property. Independent studies have estimated a recoverable resource of 40 million barrels of oil at the Emilia prospect (CDS Oil & Gas Group Plc, 2006a, b).

Petroleum Products.—Petróleos Paraguayos (Petropar) (the state-owned oil company) was responsible for the management of all crude oil and petroleum products sold in the country and imported. Petropar also operated Paraguay's only refinery, Villa Elisa, which had a production capacity of 7,500 bbl/d. In September 2005, Paraguay and Venezuela discussed the possibility of building an oil refinery in Paraguay that could process Venezuela's heavy crude. This effort could help meet Paraguay's demand for crude oil as well as supply the markets of neighboring countries. Venezuela's exports to Paraguay could reach about 18,600 barrels of crude oil per day in the form of gasoil (Alexander's Gas & Oil Connections, 2005b§; Latin Petroleum, 2005b§).

In late 2005, Paraguay and Venezuela signed an oil supply agreement. Under the agreement, Paraguay will be able to postpone the payment of 25% of the oil imported from Venezuela for up to 15 years at a rate of 2% interest. The remaining 75% must be paid within 90 days after delivery. The agreed amount of supply consisted of about 560,000 barrels per month of oil, which is equivalent to about 73% of the country's monthly demand; the remaining 27% would be imported from Paraguay's regular suppliers (Alexander's Gas & Oil Connections, 2005b§; Latin Petroleum, 2005a§).

Outlook

Paraguay's economy was expected to continue to grow in 2006 at a rate of 5.6% based on purchasing power parity (International Monetary Fund, 2006§). The increase in the GDP will be highly dependent on the continued regional economic stability of neighboring countries, such as Argentina and Brazil.

The cement industry was expected to grow during 2006 if the planned construction of a new cement mill by the joint venture of Camargo, Concret-Mix, and Votorantim takes place; the annual production of the mill is projected to meet about 20% of Paraguay's cement demand. The Paraguayan mineral fuels industry is set to continue its exploration activities during 2006 owing to the continuation of CDS Energy's and Chaco's exploration projects, which were started in 2005.

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URUGUAY

Uruguay, which is located on the central southeastern coast of South America, is bordered by Argentina to the west, Brazil to the northeast, the Atlantic Ocean to the southeast, Rio de la Plata's delta to the southwest, and Rio Uruguay (which it shares with neighboring country Argentina) to the west (Rand McNally, 1995). Uruguay has a total area of 176,220 km² and had an estimated population of 3.5 million in 2005 (U.S. Central Intelligence Agency, 2005§; World Bank, The, 2005§). The main industries in Uruguay included chemicals, electrical machinery, food processing, petroleum refinery products, textiles, and transportation equipment (U.S. Central Intelligence Agency, 2005§; 2006§). Uruguay's mineral industries included clays, semiprecious gemstones, gold, iron and steel, sand and gravel, and stone.

In 2005, Uruguay (a founding member of MERCOSUR) had an estimated GDP based on purchasing power parity of $34.3 billion, which was an increase of 8.7% compared with that of 2004. The estimated GDP per capita based on purchasing power parity was $10,720 (International Monetary Fund, 2006§).

Uruguay's economy was highly dependent on those of its MERCOSUR partners. Uruguay had no proven natural gas or oil reserves but it does have substantial hydroelectric capacity. To meet its oil consumption demand, Uruguay relied completely on imports (mainly from Venezuela) of approximately 35,700 bbl/d based on 2005 estimates (U.S. Energy Information Administration, 2006§).

Commodity Review

Metals

Gold.—In 2005, gold production in Uruguay was reported to be 3,151 kilograms (kg), which was an increase of about 35% compared with that of 2004 (table 1). The country's only operating gold mine in 2005 was the Minas de Corrales gold project, which is located approximately 450 km north of the capital city of Montevideo in the Department of Rivera in northern Uruguay. The project was 100% owned by Uruguay Mineral Exploration Inc. (UME) of Canada and was the company's only producing asset. The Minas de Corrales gold project had two main deposits— the San Gregorio and the Arenal. The San Gregorio deposit had produced more than 15,500 kg since its discovery in the 1880s. The Arenal deposit, which was discovered in 2004 and put into commercial production in October 2005, had an inferred gold resource of more than 23,000 kg. During fiscal year 2005-06, UME reported that the Arenal gold deposit had supplied about 65% of the company's plant feed. Exploration within the Minas de Corrales gold project had resulted in the discovery of other deposits, such as the Argentinita and the Zapucay deposits, which had been mined previously, and the Castrillon and the Sobre Saliente deposits, which had not been mined. The Argentinita and the Zapucay deposits were located within the Zapucay shear zone, which is characterized by a series of small and shallow quartz veins. The Castrillon and the Sobre Saliente deposits had approximate resources of 600 kg and 6,000 kg of gold, respectively (Uruguay Mineral Exploration Inc., 2006a, p. 13; 2006b, p. 6, 13, 17; 2006c, p. 6).

Other gold projects owned by UME were the Casupa, the Chamizo, the Mirta, and the Presidente Terra. The Casupa project is located 100 km north of Montevideo and the Chamizo project is located 120 km east-northeast of the capital city; both projects were being explored during 2005. Also during 2005, the Mirta project, which is located near Colonia in southwestern Uruguay, was being assessed for future drilling targets. The Presidente Terra gold project, which is located approximately 240 km northeast of Montevideo, was put on hold during

2005 (Uruguay Mineral Exploration Inc., 2006a, p. 13; 2006b, p. 9-11, 17; 2006c, p. 6).

Iron and Steel.—The Dirección Nacional de Minería y Geología (DINAMIGE) [National Directorate of Mining and Geology] reported production of 12,436 t of iron ore in 2005, which was an increase of about 33% compared with that of 2004 (table 1). The 2005 production of crude steel reported by the International Iron and Steel Institute was 64,000 t, which was an increase of about 10% compared with that of 2004 (table 1).

Other Metals.—In 2005, UME owned projects that focused on a variety of base metals at the Carpinteria, the Dom Feliciano Mobile Belt, the Lascano, and the Mal Abrigo-Cerro Negro properties. The Carpinteria project, which is located about 500 km north of Montevideo, was in the exploration stage during 2005 and consisted of a sequence of ultramafic flow rocks with high nickel content. During 2005, a geophysical survey and mapping were performed in the area with the objective of targeting nickel sulfide locations. The Dom Feliciano Mobile Belt was an iron-copper-gold deposit that was discovered 300 km northeast of the capital city; exploration at this site was suspended in 2005 owing to disappointing results. The Lascano project, which is located about 250 km northeast of Montevideo, was explored for possible nickel. During 2005, UME announced the completion of a detailed airborne gravity and magnetometry survey in the Lascano project area; results were in the interpretation stage. The Mal Abrigo-Cerro Negro project, which is situated approximately 140 km northwest of Montevideo, had been explored for copper, nickel and platinum-group metals. Exploration in the area had revealed disseminated copper and nickel sulfides (Uruguay Mineral Exploration Inc., 2006a, p. 10-11; 2006b, p. 7-8, 17).

Industrial Minerals

Cement.—In 2005, Venezuela initiated plans to invest $18 million in a cement project in Uruguay's state-owned company Administración Nacional de Combustibles, Alcohol y Portland (ANCAP). The investment would be used to modernize ANCAP's cement plant, which would export cement to Venezuela under preferential conditions (Alexander's Gas & Oil Connections, 2005§).

Diamond.—During 2005, exploration for diamond in Uruguay was performed by UME at UME's Rivera Diamonds-Cinco Rios project, which is located in northern Uruguay in the area of the Minas de Corrales gold project. Samples previously recovered from the Rio de la Plata Craton included macro and micro diamonds, kimberlitic garnets, and chrome spinel. UME planned to launch a close-space airborne gravity gradiometer to perform a magnetic survey of the area in May 2006 (Uruguay Mineral Exploration Inc., 2006a, p. 11; 2006b, p. 8, 17).

Mineral Fuels

Natural Gas.—Uruguay has no proven natural gas reserves; therefore, the natural gas supply was imported through two existing pipelines between Argentina and Uruguay. The first pipeline, Gasoducto del Litoral, which runs 12 miles (19 km) from Colon, Argentina, to Paysandu in western Uruguay, had a capacity of 4.9 million cubic feet per day (140,000 cubic meters per day) and was managed by ANCAP. The second pipeline, Gasoducto Cruz del Sur, which extends 130 miles (210 km) from Argentina's natural gas grid to Montevideo, had a capacity of 176 million cubic feet per day (about 5 million cubic meters per day) and was owned by a consortium of international companies that was led by British Gas Plc of the United Kingdom (U.S. Energy Information Administration, 2005§).

Petroleum.—Uruguay has no proven reserves of oil. ANCAP operated Uruguay's single oil refinery, La Teja, which had a production capacity of 50,000 bbl/d. In 2005, Venezuela agreed to supply Uruguay with up to 43,600 bbl/d of crude oil under preferential financing terms (a down payment of 75% and the remaining 25% to be paid in goods and services). In August 2005, Venezuela shipped the first crude oil vessel carrying 1 million barrels of oil to Uruguay as part of an agreement reached between the two countries that included oil supply to Uruguay for up to 25 years. The crude oil came from Venezuela's state-owned Petroleos de Venezuela S.A. (PDVSA) property, Faja del Orinoco. In December 2005, Uruguay and Venezuela signed a contract for the study phase of a proposed multimillion-dollar expansion of La Teja oil refinery. The agreement would allow Venezuela to process its heavy crude oil in the Uruguayan refinery. The agreement proposed expansion of the total refining capacity to 100,000 bbl/d; the expansion was targeted to be completed by 2010 or 2011 (Alexander's Gas & Oil Connections, 2005§, 2006§; Latin Petroleum, 2005§).

In conjunction with the crude oil agreement, Venezuela also planned to invest in other projects in Uruguay's ANCAP, such as an investment of $12 million toward the improvement of ANCAP's sugar-cane alcohol plant. This plant improvement would benefit Venezuela because the plant's products would be exported to Venezuela under preferential terms (Alexander's Gas & Oil Connections, 2005§).

Outlook

Uruguay's economy was expected to continue to grow in 2006 at a rate of about 6% (International Monetary Fund, 2006§). The increase in the GDP will be highly dependent on the continued regional economic stability of the members of MERCOSUR.

In 2006, UME plans to maintain its Minas de Corrales gold production at 3,000 kilograms per year. As for the Arenal, the Argentinita, and the San Gregorio gold deposits, UME plans to define additional gold reserves for those properties. For the Lascano nickel project, UME expects to define drilling targets during 2006 based on the results obtained from the gravity and magnetic survey completed in 2005. During fiscal year 2006-07, UME also plans to start joint venture partnership with interested parties to develop UME's diamond and other metals prospects (Uruguay Mineral Exploration Inc., 2006a, p. 6, 8, 11).

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TABLE 1
PARAGUAY AND URUGUAY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Country and commodity		2001	2002	2003	2004	2005
PARAGUAY[2]						
Cement, hydraulic[e]	thousand metric tons	510 [r]	450 [r]	520 [r]	470 [r]	550
Clays:[e]						
Kaolin		66,500 [3]	66,700	66,600	66,600	66,000
Other, unspecified		233,500 [3]	233,000	230,000	230,000	230,000
Gypsum[e]		4,300 [3]	4,300	4,500 [3]	4,500	4,500
Iron and steel:						
Pig iron		71,765	87,600	98,000 [4]	119,000 [r, 4]	126,000 [4]
Semimanufactures		56,729	51,700	51,600 [e]	51,600 [e]	51,500 [e]
Steel, crude		67,034	80,400	93,000 [r, 4]	109,000 [r, 4]	103,000 [4]
Lime[e]		100,000 [3]	100,000	90,000	90,000	90,000
Petroleum, refinery products:[e]						
Distillate fuel oil	thousand 42-gallon barrels	600	600	600	600	600
Gasoline	do.	675	670	660	660	660
Jet fuel	do.	21	20	20	20	20
Kerosene	do.	249	200	250	250	250
Liquefied petroleum gas	do.	638	630	630	630	630
Residual fuel oil	do.	263	450	460	460	460
Unspecified	do.	37	37	40	40	40
Total	do.	2,483	2,610	2,660	2,660	2,660
Pigments, mineral, natural, ocher[e]		300	300	250	250	250
Sand, including glass sand[e]		27,500	25,000	25,500	25,500	25,500
Stone:[e]						
Dimension	thousand metric tons	70	70	70	70	70
Crushed and broken:						
Limestone, for cement and lime		16,320 [3]	16,000	16,300	16,300	16,000
Marble		750	750	750	750	750
Other		2,000	2,000	2,000	2,000	2,000
Talc, soapstone, pyrophyllite[e]		200	200	200	200	200
URUGUAY						
Aluminum, secondary[e]		45	45	45	45	45
Barite[e]		12 [3]	15	15	15	15
Bentonite		125	70 [5]	230 [5]	122 [5]	195 [5]
Cement, hydraulic[e]	thousand metric tons	1,015 [3]	1,000	1,050	1,050	1,050
Clays, unspecified		24,886	26,076 [5]	35,444 [5]	47,519 [5]	64,447 [5]
Coke, gashouse[e]		5,500 [3]	5,000	5,000	5,000	5,000
Feldspar		4,722	1,550 [5]	2,450 [5]	2,450 [r, 5]	2,150 [5]
Gemstones, semiprecious:						
Agate		416	1,004 [5]	5,361 [5]	14,560 [r, 5]	16,730 [5]
Amethyst		179	140 [5]	390 [5]	435 [5]	433 [5]
Gold[6]	kilograms	2,056 [r]	2,126 [r]	1,500 [r]	2,334 [r]	3,151 [3]
Gypsum[e]	thousand metric tons	1,127 [3]	1,130	1,130	1,130	1,130
Iron and steel:						
Iron ore		9,743	7,768 [r, 5]	5,941 [5]	9,319 [5]	12,436 [5]
Metal:						
Ferroalloys, electric-furnace ferrosilicon crust[e]		200	200	200	200	200
Semimanufactures[e]		28,830 [3]	32,400	32,300	32,000	32,000
Steel, crude		30,890	34,900 [e]	41,000 [4]	58,000 [r, 4]	64,000 [4]
Lime[e]		10,000	10,000	10,000	10,000	10,000
Petroleum, refinery products:[e]						
Distillate fuel oil	thousand 42-gallon barrels	4,100	4,100	4,200	8,810 [r, 3, 7]	8,476 [3, 7]
Gasoline	do.	2,200	2,200	2,200	1,793 [r, 3, 7]	1,830 [3, 7]
Kerosene	do.	500	500	500	75 [r, 3, 7]	67 [3, 7]
Liquefied petroleum gas	do.	400	400	400	915 [r, 3, 7]	1,005 [3, 7]
Residual fuel oil	do.	3,600	3,600	3,650	3,650	3,650
Unspecified	do.	280	280	280	401 [r, 3, 7]	201 [3, 7]
Total	do.	11,100	11,100	11,200	11,200	15,000

See footnotes at end of table.

TABLE 1--Continued
PARAGUAY AND URUGUAY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Country and commodity		2001	2002	2003	2004	2005
URUGUAY--Continued						
Sand and gravel:						
Sand, common	thousand metric tons	2,697	1,265 [5]	958 [5]	1,270 [r,5]	1,693 [5]
Gravel		40,373	24,095 [5]	29,417 [5]	48,023 [5]	61,144 [5]
Stone:						
Flagstone		3,590	3,278 [5]	2,697 [5]	5,605 [5]	5,869 [5]
Granite:						
Dimension		4,369	3,463 [5]	3,768 [5]	4,834 [5]	5,997 [5]
Crushed and broken, alum schist	thousand metric tons	528	392 [5]	1,072 [5]	625 [5]	699 [5]
Other, rough stone		13,585	10,765	5,450	4,950	10,299 [5]
Diorite	thousand metric tons	1,092	1,100	1,019 [5]	798 [5]	226 [5]
Dolomite		5,468	4,518 [5]	12,177 [5]	9,839 [5]	11,158 [5]
Limestone[5]	thousand metric tons	1,127	754	830	1,052	1,185
Marble, in blocks and broken:[e]						
Onyx		121 [3]	120	121 [3,5]	122 [3,5]	120
Travertine		39	30	27 [3,5]	-- [3,5]	--
Other, unspecified		170	160	115 [3,5]	120	39 [3,5]
Marl		6,780	4,861 [5]	3,142 [5]	3,310 [5]	4,350 [5]
Quartz		146	150 [e]	150 [e]	1,130 [r,3,5]	104 [5]
Other, including ballast	thousand metric tons	2,523	1,580 [5]	1,035 [5]	1,453 [5]	1,811 [5]
Sulfur, elemental, byproduct[e]		3,000	3,000	3,000	3,000	3,000
Talc, soapstone, pyrophyllite		1,694	816 [5]	1,095 [5]	1,042 [5]	1,131 [5]
Tuff, tufa	thousand metric tons	1,185	341 [5]	1,281 [5]	142 [5]	244 [5]

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. -- Zero.
[1]Includes data available through November 2006.
[2]In addition to the commodities listed, construction materials (clays, miscellaneous rock, sand, and weathered tuffs) are presumably produced, but available information is inadequate to make reliable estimates of output.
[3]Reported figure.
[4]Source: International Iron and Steel Institute.
[5]Source: Dirección Nacional de Minería y Geología.
[6]Source: Uruguay Mineral Exploration Inc. Data are for fiscal year ending March 31 of the following year.
[7]Source: Administración Nacional de Combustible, Alcohol y Portland (ANCAP). Numbers were converted into 42-gallon barrels (bbl) from cubic meters using the U.S. Energy Information Administration conversion factors of 1 cubic meter = 6.289812 bbl.

TABLE 2
PARAGUAY AND URUGUAY: STRUCTURE OF THE MINERAL INDUSTRIES IN 2005

Country and commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
PARAGUAY				
Cement	thousand metric tons	Industria Nacional del Cemento (INC)	Planta Vallemi and Planta Villeta	675
Petroleum, refinery products	thousand 42-gallon barrels	Petróleos Paraguayos (Petropar)	Villa Elisa refinery at Villa Elisa Municipality	2,700
Steel	thousand metric tons	Consorcio Siderurgico de Paraguay (Cerro Lorito, 67%, and Cooperativa de Trabajadores de ACEPAR, 33%)	ACEPAR steel mill at Villa Hayes	150
URUGUAY				
Cement	thousand metric tons	Compañía Uruguaya de Cemento Portland S.A	Mine and clinker plant in Department of Lavalleja	500
Gold	kilograms	Uruguay Mineral Exploration Inc. (UME) (100%)	Minas de Corrales Gold in Department of Rivera	3,000
Iron ore and steel	thousand metric tons	Gerdau Laisa, S.A.	Gerdau Laisa S.A	70
Petroleum, refinery products	thousand 42-gallon barrels	Administración Nacional de Combustibles, Alcohol y Portland (ANCAP)	La Teja oil refinery near Montevideo	18,000

The Mineral Industry of Peru

By Alfredo C. Gurmendi

In Latin America in 2005, Peru was the leading producer of, in terms of value, gold, zinc, silver, lead, tin, and tellurium and the second ranked producer of copper and molybdenum (after Chile) and bismuth (after Mexico). In the world, Peru was the third ranked producer of arsenic trioxide (after China and Chile), bismuth (after China and Mexico), silver (after China and Mexico), tin (after China and Indonesia), and zinc (after China and Australia); the fourth ranked producer of copper (after Chile, the United States, and Indonesia), lead (after China, Australia, and the United States), and rhenium (after Chile, Kazakhstan, and the United States); and the fifth ranked producer of gold (after South Africa, Australia, the United States, and China) and molybdenum (after the United States, Chile, China, and Canada) (Brooks, 2006a, b; Carlin, 2006a, b; Edelstein, 2006; Gabby, 2006a, b; George, 2006; Magyar, 2006a, b; Ministerio de Energía y Minas, 2006a, p. 66).

In 2005, with an area of about 1.3 million square kilometers and a population of almost 28 million, Peru had a gross domestic product (GDP) of $167.2 billion[1] based on purchasing power parity. Peru's real GDP growth was 6.4% compared with 5.2% in 2004. The annual inflation rate in 2005 was 1.5% compared with 3.5% in 2004 (Banco Central de Reserva del Perú, 2006a§,[2] b§; International Monetary Fund, 2006a§, b§; U.S. Central Intelligence Agency, 2006§). The mining and fuel sectors contributed a total of 8.1% of Peru's real GDP compared with 5.2% in 2004. In 2005, Peru's economy benefited from higher prices for its mineral exports and increased demand for base metals used in construction and manufacturing in, in order of importance, the United States, China, and South Asia. The higher prices for Peru's major mineral exports were, in order of price increase, silver, which increased to $7.30 per troy ounce from $6.70 per troy ounce in 2004 (or by 9%); lead, to $0.690 per pound from $0.627 per pound (10%); gold, to $449.80 per troy ounce from $407.10 per troy ounce (10.5%); copper to $1.549 per pound from $1.196 per pound (29.5%); and zinc, to $0.335 per pound from $0.253 per pound (32.4%). Higher prices for exported precious and base metals more than offset the effect of higher prices for imported crude oil, which increased to $47.0 per barrel from $32.3 per barrel in 2004 (a 45.5% increase). Peru's foreign debt amounted to about $26.3 billion, and its net international reserves increased by $1.4 billion to $14.1 billion from $12.7 billion in 2004 (Banco Central de Reserva del Perú, 2006b§; Ministerio de Energía y Minas, 2006a§).

Foreign investors have invested in Peru because it has an open market economy and because the Government guarantees property ownership, investments, free remittance of profits, and capital repatriation, and provides equal treatment with domestic investors. The Government continued to reduce subsidies and tariffs, freed foreign exchange and interest rates, liberalized international investment rules, simplified the tax code, and established concessions for construction and operation of public infrastructure, such as, in order of magnitude, telecommunications, roads, ports, and airports. The Government continued its policy of fiscal austerity and increased investment in social development to establish better relationships with the local communities. The Government continued to maintain its role as regulator, promoter, and overseer, thus minimizing interferences with the private sector (Banco Central de Reserva del Perú, 2006b§; Ministerio de Energía y Minas, 2006a§, c§).

In 2005, foreign direct investment (FDI) inflows into Latin America and the Caribbean increased to $68.0 billion, or by 10.6%, compared with $61.5 billion in 2004. FDI inflows into South America also increased to $44.5 billion, or by 18.0%, compared with $37.7 billion in 2004. In the Andean Community (whose members were Bolivia, Colombia, Ecuador, Peru, and Venezuela), FDI amounted to $16.9 billion, which was an increase of 119.5% compared with $7.7 billion in 2004. This healthy increase mainly reflected the high international prices of such commodities as, in order of value, petroleum, copper, and gold. In 2005, Peru's hydrocarbon sector received $1.8 billion compared with $1.4 billion in 2003 (Economic Commission for Latin America and the Caribbean, 2006§; ProInversión —Foreign Direct Investment in Peru, 2006b§).

According to the Banco Central de Reserva del Perú, Comisión Nacional de Inversiones y Tecnologías Extranjeras (CONITE), and Agencia de Promoción de la Inversión Privada (ProInversión), the flow of private investment into Peru's economy, which had increased since its 1993 level of $14.6 billion, continued to increase to $15.9 billion in 2005 from $13.3 billion in 2004, and $12.9 billion in 2003. These increases were in part owing to the country's stability on the economic front; its natural resources, mainly base and precious metals, and oil and gas; and the positive effect of the global commodity price increases. National and international corporations have been very active in the country's minerals sector (Banco Central de Reserva del Perú, 2006b§; Comisión Nacional de Inversion y Tecnología, 2006§; Economic Commission for Latin America and the Caribbean, 2006§).

Considering China's increasing consumption of metals and minerals, such as copper, which was expected to increase to 6 million metric tons (Mt) by 2010 from 4 Mt in 2004, two Chinese companies—Aluminum Corporation of China Limited (Chalco) and Baosteel Co., Ltd. (Baosteel)—were planning to establish joint ventures with Latin America's leading copper mining companies, such as Companhia Vale do Rio Doce (CVRD) of Brazil, Corporación Nacional del Cobre (Codelco) of Chile, and Sociedad Minera Cerro Verde S.A.A. of Peru. China Minmetals Company planned to invest in metals and minerals mainly in Brazil, Chile, and Peru. In Peru, additional investments of $4.1 billion were expected in projects with advanced exploration and environmental assessment work, such as Las Bambas ($1.5 billion), which has copper reserves

[1]Where necessary, values have been converted from Peruvian new soles (S/) to U.S. dollars (US$) at the rate of S/3.215=US$1.00.

[2]References that include a section mark (§) are found in the Internet References Cited section.

of 500 Mt, and Los Chancas copper deposits (Department of Apurimac) owned by Xstrata Plc. of Switzerland and Southern Perú Copper Corporation Sucursal del Perú (SPCC) (a subsidiary of Grupo Mexico S.A. de C.V.), respectively (M.A.Yepez, Mineral Economist, U.S. Embassy, Lima, Peru, Economic Section, written commun., August 23, 2005; ProInversión—Foreign Direct Investment in Peru, 2006b§).

Other investments in copper deposits included Centromín's Rio Blanco ($800 million to produce copper by 2008) and Tambogrande ($526 million, 17 years copper mine life), Perú Copper Syndicate Co.'s Toromocho ($1.2 billion, reserves 1.6 billion metric tons), SPCC was planning to invest $600 million in additional exploration and to improve efficiencies in Cuajone and Toquepala, and Cerro Verde was planning to increase its copper output to 300,000 t/yr from 100,000 t/yr with an investment of $850 million by 2006. Other prospects included the San Gregorio zinc project of Sociedad Minera El Brocal S.A.A. in the Department of Cerro de Pasco, the Minas Carachugo gold-and-silver mineralization of Minera Yanacocha S.R.L. (MYS) [Newmont Mining Corp. of the United States (51.35%), Compañía de Minas Buenaventura S.A.A. (43.65%), and the World Bank's International Finance Corporation (5%)] in the Department of Cajamarca, and the Magistral copper-molybdenum-silver deposit of Minera Ancash Cobre S.A. in the Department of Ancash. Magistral is located in the same geologic trend as that of Compañía Minera Antamina S.A.'s (CMA) Antamina base-metal mine (M.A.Yepez, Mineral Economist, U.S. Embassy, Lima, Peru, Economic Section, written commun., August 8, 2005; ProInversión—Foreign Direct Investment in Peru, 2006b§).

Government Policies and Programs

According to the Ministerio de Energía y Minas, the country's current metal and oil and gas reserves and resources offer attractive investment opportunities (table 3; Ministerio de Energía y Minas, 2005§; ProInversión—Private Investment in Peru, 2006a§). The privatization of state-owned firms and the formation of joint ventures and consortia in the mining and fuels industries provided a continuous committed capital flow of about $10 billion total between 1992 and 2007 (Ministerio de Energía y Minas, 2005§). In Peru, privatizations and concessions generated $58.9 million with a committed investment of $2.3 billion by such mining companies as Rio Tinto Limited, which acquired La Granja copper project for $22 million and had committed an investment of $760 million, and Companhia Vale do Rio Doce bought the Bayovar phosphate project for $3 million with a committed capital of $300 million. The Ministerio de Energía y Minas reported that, of the committed investment in 2005, Peru received for the minerals sector—mining, $1.1 billion; gas, $1 billion; and petroleum, $200 million compared with a committed investment of $3.5 billion in 2004 (Banco Central de Reserva del Perú, 2006a§, b§; Ministerio de Energía y Minas, 2006a§, c§).

Peru offers a legal framework favorable to national and foreign investors by means of such Constitutional Mandates as Legislative Decree No. 662 (promotion of foreign investment), which provides unrestricted access to all economic sectors; Legislative Decree No. 757 (framework for the development of private investment), which pertains to the private investment growth; and Texto Unico Oficial (TUO) approved by Supreme Decree No. 059-96-PCM, which promotes private investment in public infrastructure and utility works. Within the framework of Decree law No. 708 of November 1991 (promotion of investment in mining), Legislative Decree No. 818 of April 1996 (incentives for investing in natural resources), and Supreme Decree No. 162-92-EF of October 1992 (rules guaranteeing foreign investment), more than 250 domestic stability and guarantee contracts have been signed since 1993 (Banco Central de Reserva del Perú, 2006b§; Comisión Nacional de Inversion y Tecnología, 2006§; ProInversión—Private Investment in Peru, 2006a§).

CONITE reported that since July 19, 1991, when the privatization program began, the Peruvian Government has privatized more than 235 state-owned corporations and netted almost $11 billion, and domestic and foreign investors have committed new annual investments of about $10 billion for the period 2005-07. By yearend 2005, the Government had privatized most of its assets in the following sectors: mining, 96%; manufacturing, 95%; electricity and hydrocarbons, 90% each; and agriculture, 40% (Banco Central de Reserva del Perú, 2006b§; Comisión Nacional de Inversion y Tecnología, 2006§; Ministerio de Energía y Minas, 2006a§).

Supreme Decree No. 014-92-EM of June 1992 (the general mining law) and Legislative Decree No. 868 of May 1996 (Texto Unico Oficial) provide guaranteed protections to mining ventures and contracts under the Peruvian Civil Code. Consequently, such ventures and contracts are immune from unilateral changes by any governmental authority in Peru without an appropriate legal or administrative remedy or arbitration by the Convenio Constitutivo del Centro Internacional de Arreglo de Diferencias Relativas a Inversiones (Comisión Nacional de Inversion y Tecnología, 2006§; ProInversión—Private Investment in Peru, 2006a§).

Additionally, Peru enacted Supreme Decree No. 047-2002-EF of April 2002 (import duties for capital goods) to reduce the duties paid to 7% from 20% and 12% on capital goods to be used in exploration and production of certain minerals, such as oil and gas in the Amazon region. Supreme Decree No. 135-2002-EF of April 2002 was enacted to reduce duties paid to 4% from 7% on certain capital goods linked to agricultural exports under the Andean Trade Preferences and Drug Eradication Act. The capital, goods, and services linked to minerals exploration benefited from the elimination of the 18% sales tax when law No. 27623-EF was enacted in January 2002. Supreme Decree No. 015-2004-PGM of January 2004 (legal framework for decentralization) was established to use revenues from mineral production to maximize the well-being of the local communities through economic growth, environmental protection, and social development in a sustainable way. Supreme Decree No. 066-2005-EM of May 2006 (legal framework for creation of the Dirección de Gestión Social) was established to administer the Corporate Social Responsibility program in the mining sector (Banco Central de Reserva del Perú, 2006b§; Comisión Nacional de Inversión y Tecnología, 2006§; Ministerio de Energía y Minas, 2006a§, b§; ProInversión—Prívate Investment in Peru, 2006a§). Hydrocarbon law No. 26844 of 1997 of

May 1997 eliminated the exclusive rights of the state-owned Petróleos del Perú S.A. to control the secondary recovery of crude oil, refining, and imports and subsequent resale of petroleum and byproducts.

All these laws provide a legal system that guarantees that the basic rules and regulations—such as no discriminatory treatment for domestic or foreign investors, free availability and remittance of foreign currency, and an income tax system that is applicable to dividends—are not changed. The Peruvian Constitution establishes equal protection for domestic and foreign investors who may enter into agreements with the Government and guarantees free access to, possession of, and disposal of foreign currency.

The Peruvian laws have attempted to ensure more-favorable contract terms for investors in minerals and crude oil and gas exploration and production. Owing to these favorable terms, an increased number of domestic and foreign companies have expressed interest in participating in prospecting, exploration, production, and distribution of natural gas and petroleum contracts with Perupetro S.A. and of mineral properties with Centromín (table 2).

Legal procedures to obtain mining rights were made easier by the enactment of Supreme Decree No. 018 of July 9, 1992. The Government relinquished exclusive control of exploration, mining, smelting, and refining of metals and fuel minerals. Individuals and private companies are allowed to hold mining permits in Peru. In the legal framework for investment and taxation, no distinction is made among domestic and foreign investors, corporations, joint ventures, and consortia formed in Peru or abroad. Municipalities and Regional governments in areas where mineral resources (metals and industrial minerals) are exploited will receive 50% of the taxes collected to be invested in education and social programs (health, housing, and others) in conformance with the Canon Minero (Ministry Resolution No. 266-2002-EF/15 of May 1, 2002). The remittance of dividends, depreciation, and royalties abroad has no restrictions. Contracts can be signed by investors, and the Government guarantees the stability of legal commitments and taxes. To increase protection of investors' interests, Peru signed agreements with the World Bank's Multilateral Investment Guarantee Agency in April 1991, which was authorized by Legislative Decree No. 25312 and with the Overseas Private Investment Corporation in December 2002, which was authorized by Legislative Decree No. 25809 (Comisión de Promoción de la Inversión Privada, 2005, p. 6; ProInversión—Private Investment in Peru, 2006a§).

Petroperú S.A. managed energy-related activities for the Government. In principle, all mineral and geothermal resources belong to the State, which grants concessions for use by the private companies and individuals. The administration and management of all mining legal processes and concessions rested with the executive branch.

Environmental Issues

The Dirección General de Asuntos Ambientales (DGAA) of the Ministerio de Energía y Minas (MEM) has the responsibility to address environmental problems that result from energy and mining activities. It is also mandated to implement the laws and regulations of the environmental legal framework, such as Legislative Decree No. 613 of September 1990 (the environmental code) and Supreme Decree No. 016-93-EM of April 28, 1993 (the environmental regulation) (ProInversión—Private Investment in Peru, 2006a§).

The sustainable development model for the mining and energy sectors began in 1993 with regulations and procedures for the gradual reduction of pollution, which include economic development policies and environmental protection. The mining industry must comply by adjusting its ongoing operations to permissible effluent levels and its new operations by using cleaner technologies. The DGAA evaluates and proposes the environmental regulations for the mining and energy sectors, which include the maximum emission levels that are compatible with the internationally accepted limits set by the United Nations and the World Bank. The DGAA also approves environmental impact assessments for new operations and environmental adjustment and management programs for ongoing ones, and administers the national environmental information system. The MEM is authorized to handle environmental affairs in the minerals sector, such as by establishing the environmental protection policy and maximum allowable levels for effluents, signing environmental administrative stability agreements, overseeing the impact of operations, determining responsibilities, and imposing administrative sanctions. The mining and oil companies are increasing their efforts to protect the environment. Oil companies, in particular, are under pressure because the number of operations in the Amazon Rain Forest, which is one of the world's most sensitive ecosystems, is increasing (Ministerio de Energía y Minas, 2006b§; ProInversión—Private Investment in Peru, 2006a§).

The Rio Blanco and the Tambogrande projects were the target of protestors who were demonstrating against their development in 2005. MYS's Cerro Quilish prospect and development of the gold deposit at the Yanacocha Mine were stalled by the city government of Cajamarca, which wanted to protect the city's major watershed by issuing Municipal Ordinance 012, which declared that the Cerro Quilish area was a "protected area" in 2003. As result, Newmont was unable to proceed with the Cerro Quilish project. In 2005, the acquisition of Las Bambas by Xstrata for $121 million was strongly opposed during the auction process. About $46 million of that total was a social contribution to the community, and the proactive stand of Xstrata and Las Bambas community relations strategy was remarkable and successful in overcoming opposition to the projects (M.A.Yepez, Mineral Economist, U.S. Embassy, Lima, Peru, Economic Section, written commun., May 18, 2005).

Oxfam America continued to support communities affected by mining in Peru and said "mining should demonstrate greater respect for the human rights of such communities." The local CONACAMI indicated, "it has the right to participate [in] and be consulted on mineral polices that involve communities affected by mining operations" (M.A.Yepez, Mineral Economist, U.S. Embassy, Lima, Peru, Economic Section, written commun., May 18, 2005). Their position could, however, affect future flows of mineral investments into Peru.

Production

In 2005, the production value of Peruvian minerals (metals, industrial minerals, and fuels) amounted to $5.1 billion, compared with $4.8 billion in 2004. Mining and fuel production increased by 8.1% as a result of higher values of metals (7%) and fuel output (23.4%). The increase of mineral output (content) was mainly led by natural gas (76.5%), molybdenum (21.6%), gold (20%), crude oil (17.9%), and iron (7.5%) and, to a lesser extent, by silver (4.4%) and lead (4.3%) compared with those of 2004.

In 2005, metal prices were also driven upwards because of the higher consumption associated with increased world economic activity, such as in, in order of importance, China, the United States, and other Asian countries. Metal production growth was mainly led by increased output of gold, iron, lead, molybdenum, and silver, which offset the decreased output of copper and zinc. The hydrocarbon sector's output also increased owing to the increased extraction of natural gas at Camisea and Aguaytia, and crude oil output increased because 15 new oil exploration and production contracts were signed in 2005; 14 contracts were signed in 2001 (table 1; Ministerio de Energía y Minas, 2006a, p. 2-3, 18-24; 2006a§; Banco Central de Reserva del Perú, 2006b§).

Trade

Peru's mining industry, which has consistently been the country's major foreign exchange generator since 1997, accounted for about 56.6% ($9.8 billion) of total export revenues of more than $17.3 billion in 2005 compared with 55.5% ($7.1 billion) of total export revenues of about $12.8 billion in 2004. In 2005, Peru's total trade balance recorded a surplus of about $5.3 billion compared with $3 billion in 2004, which was an increase of 6.6% compared with a 4.3% increase in 2004. Mineral and petroleum and derivatives exports in 2005 (which were valued at about $11.3 billion) increased by almost 45.0% compared with those of 2004 (which were valued at almost $7.8 billion) (Banco Central de Reserva del Perú, 2006b§; Ministerio de Energía y Minas, 2006a§).

In 2005, mining was the main exporting sector of the country. The price increases for such commodities as, in order of value, copper (29.5%), gold (10.5%), zinc (32.6%), and molybdenum (65.4%) played an essential role in the Peruvian trade balance. Two-thirds of the total minerals exported ($9.8 billion) were copper ($3.4 billion) and gold ($3.2 billion). Peru's other mineral exports were molybdenum ($1.15 billion), zinc ($805 million), lead ($491 million), silver ($281 million), tin ($270 million), and iron ($216 million) (Ministerio de Energía y Minas, 2006a, p. 8-15; 2006a§; Banco Central de Reserva del Perú, 2006b§).

Peru's fourth major traditional export, petroleum and derivatives, was valued at $1.5 billion in 2005 compared with $646 million in 2004 and $621 million in 2003. Peru's total mineral exports, which included petroleum and derivatives, amounted to more than 65% of its total exports in 2005. Total mineral imports, which consisted mostly of petroleum and derivatives, however, increased in value by about 32.4% to $2.3 billion compared with $1.8 billion in 2004 and $1.4 billion in 2003. Total imports increased in value by about 23.2% to $12.1 billion compared with $9.8 billion in 2004 and $8.2 billion in 2003 and generated a surplus of $5.3 billion compared with $3.0 billion in 2004 and $853 million in 2003 (Sociedad Nacional de Minería, Petróleo y Energía, 2006a, p. 32; 2006b, p. 28; 2006c, p. 17; Banco Central de Reserva del Perú, 2006b§). In 2005, the United States (31.4%), China (11.0%), Chile (6.7%), Canada (6.0%), and Japan (3.5%) were Peru's leading mineral consumers. The United States, China, and Chile were the main importers of gold, copper, and molybdenum, respectively. Peru sold about 6% of its exports to the other members of the Mercado Común Andino (Ancom) (Bolivia, Colombia, Ecuador, Peru, and Venezuela); about 3% was sold to the Mercado Común del Cono Sur (Mercosur) countries (Argentina, Brazil, Paraguay, and Uruguay and associate members Bolivia and Chile); and 15% to other Latin American countries. Peruvian mineral exports could increase if the negotiations between Ancom and Mercosur were to lead to a South American free trade agreement and because of the free trade agreement signed recently (2006) between the United States and Peru (Ministerio de Energía y Minas, 2006a, p. 31, 2006a§; Sociedad Nacional de Minería, Petróleo y Energía, 2006c, p. 55; Banco Central de Reserva del Perú, 2006b§).

Structure of the Mineral Industry

The structure of the Peruvian mineral industry continued to change owing to the privatizations and joint-venture projects. The establishment of consortia in such deregulated industries as oil and gas and joint ventures in energy and mining projects were becoming a common practice in Peru. According to the Ministerio de Energía y Minas (2005§; 2006b§), Peru was the seventh most attractive area for investments in exploration after, in order of investment attractiveness ranking, Tasmania (Australia), Nevada and Alaska (United States), Northwest Territories (Canada), Western Australia, and Indonesia (Ministerio de Energía y Minas, 2005§; 2006b§; ProInversión—Private Investment in Peru, 2006a§).

The new operating process, which was the result of privatization and joint-venture projects, incorporated policies that deal with economic and societal development issues and with environmental protection in a sustainable way. Private local interests owned most of the medium- and small-sized mining operations. More than 250 foreign mining companies have been established in Peru since 1990 (table 2).

Commodity Review

Metals

Copper.—Peru's copper output (Cu content) was about 1.01 Mt compared with almost 1.04 Mt in 2004, which was a decrease of less than 3%. The decreased output was the result of lower economic activity in BHP Billiton Tintaya S.A.'s Tintaya Mine, which was affected by social unrest with the neighboring communities, and decreased production at SPCC's Cuajone and Toquepala copper mines. These decreases were partially offset by increased production at CMA's Antamina Mine and Cerro

Verde's Cerro Verde Mine; expansions at Volcan's San Cristobal Mine, Doe Run Peru S.R. Ltda.'s Cobriza Mine, Compañía Minera Condestable S.A.A.'s Condestable Mine; and several small- and medium-sized copper mines contributed as well. The country's copper metal exports in 2005 totaled about 984,200 metric tons (t) valued at $3.4 billion compared with 940,500 t valued at $2.5 billion in 2004; this value was 36% higher than that of 2004 as a result of the copper price increase to $1.549 per pound of copper in 2005 from $1.196 per pound in 2004 (Ministerio de Energía y Minas, 2006a, p. 25-26, 2006a§; Banco Central de Reserva del Perú, 2006b§).

At the end of 2004, SPCC identified a massive sulfide ore body, which increased the Toquepala Mine's proven and probable reserves to 770 Mt at grades of 0.74% copper and 0.08% molybdenum and 1.931 billion metric tons of copper oxide—leachable ("lixiviable") reserves at a grade of 0.20% copper (Ministerio de Energía y Minas, 2006a, p. 4-6, 20). SPCC continued to be the leading copper company producer in the country with a total output of 357,612 t of copper, which included 321,114 t in concentrates from the Cuajone 1 (163,659 t) and the Toquepala 1 (157,455 t) open pits, and 36,498 t of cathode copper, which was produced by solvent extraction-electrowinning (SX-EW), from the Totoral (24,213 t), the Simarrona (6,414 t), and the Cocotea (5,871 t) (about 31.8% of Peru's total copper concentrate and lixiviates produced in 2005). Copper metal output at SPCC's Ilo refinery, which was located in the Department of Moquegua, increased to 285,199 t in 2005 from 280,676 t in 2004, or by about 1.6% (Ministerio de Energía y Minas, 2006a, p. 25-26; 2006a§).

The CMA's Antamina Mine was the leading copper concentrate producer in the country with a total output of 383,039 t in 2005 compared with 370,957 t in 2004. Cerro Verde's SX-EW plant at the Cerro Verde copper mine produced 93,542 t of cathode compared with 88,493 t in 2004. BHP Billiton Tintaya's SX-EW plant reported an output of 35,491 t of cathode compared with 36,381 t in 2004. Doe Run Peru produced 59,663 t of cathode compared with 57,632 t in 2004 (Ministerio de Energía y Minas, 2006a, p. 5, 16, 26; 2006a§).

Gold.—In 2005, the increased gold output was a result of better prices in the open market and higher production achieved by all types of mine operations, which was 207.8 t compared with 173.2 t in 2004. MYS produced 103.2 t compared with 90.4 t in 2004. Other gold producers were Minera Barrick Misquichilca S.A. (36.6 t), Aruntani S.A.C. (6.4 t), Compañía Minera Ares S.A.C. (6.2 t), Minera Aurífera Retamas S.A. (5.3 t), Compañía Minera Aurífera Santa Rosa S.A. (4.7 t), Buenaventura and Consorcio Minero Horizonte S.A. (4.0 t, each), and Inversiones Mineras del Sur S.A. (1.7 t). The increase in gold production reflected Barrick's start of operations at Alto Chicama; Aruntani S.A.C.'s, Yanacocha's, and Minero Horizonte's increased output compared with 2004; and, to a lesser extent, Buenaventura's operations at Chipmo gold mine, which is located in the Department of Arequipa (Ministerio de Energía y Minas, 2006a, p. 18-21; 2006a§).

Gold recovered as a byproduct from the concentrates of Peru's polymetallic mines amounted to 2.5 t. From the total gold output in 2005, large- and medium-sized producers reported 190.2 t; small-sized mines, 1.4 t; and an unknown number of placers and "garimperos" (informal individual miners), 16.1 t. Placers accounted for almost 8% of the gold produced in the country. The southeastern Andes have well-known gold placers on the Inambari River and its tributaries. Placer gold was produced mostly in the Inca and the Mariategui Regions and also from rivers and streams throughout the jungle (Ministerio de Energía y Minas, 2006a, p. 17-18; 2006a§).

Goldfields Limited, which was the world's fourth ranked gold producer, entered into a joint venture with Compañía de Minas Buenaventura S.A.A. to start operations in the Puquio gold project in the Department of Ayacucho in the third quarter of 2007. Goldfields Limited was also looking into the Cerro Corona gold project in the Department of Cajamarca (ProInversión—Private Investment in Peru, 2006a§).

Iron Ore.—Shougang Hierro Perú S.A.A. (a subsidiary of China's Shougang Corp.) continued to be Peru's sole iron ore producer in Marcona, Department of Ica. Mine output increased to 4.6 Mt of iron content in 2005 from 4.3 Mt in 2004. The iron ore exports amounted to 6.6 Mt at a value of $216.0 million compared with 6.0 Mt at a value of $129.0 million in 2004, which was an increase in value of 67.4% compared with that of 2004. The domestic consumption amounted to 300,000 t of iron ore, which was about the same level as that of 2004. Iron ore production increased in response to higher demand in China and other economies in the Asian region for construction and higher steel output, which had a positive effect on molybdenum production as well (Ministerio de Energía y Minas, 2006a, p. 34; 2006a§; Banco Central de Reserva del Perú, 2006b§).

Lead, Silver, and Zinc.—In spite of higher demand for zinc by Asian countries and higher international prices in 2005, the Peruvian zinc industry produced 1.2 Mt of zinc in concentrates, which was about the same level as that of 2004. Of the total output, the main producers' contributions were, in order of tonnage, Volcan (237,288 t), CMA (218,265 t), Empresa Minera Los Quenuales S.A. (191,291 t), Compañía Minera Milpo S.A. (89,346 t), El Brocal (60,230 t), Atacocha (59,174 t), Empresa Administradora Chungar S.A.C. (55,576 t), and others (290,501 t) (Ministerio de Energía y Minas, 2006a, p. 27-33; 2006a§).

The country's total silver content output increased to more than 3,190 t compared with 3,060 t in 2004. Peru, for the second time, surpassed Mexico's silver output of 2,700 t in 2005. In silver output, companies, such as Aruntani, El Brocal, Compañía de Minas Buenaventura S.A.A., and Volcan Compañía Minera S.A.A. were more active, and silver production was higher than last year because Minera Yanacocha S.R.L. and medium-sized gold-silver mines exceeded their initial production goals. Yanacocha increased its output mainly as a result of technological innovations in its gold-silver recovery process. Higher international prices allowed medium-sized mines and small producers to mine lower grade ores. Peru produced 319,345 t of lead in concentrates compared with 306,211 t in 2004 (Ministerio de Energía y Minas, 2006a, p. 32, 35; 2006a§). Exports of zinc, lead, and silver were valued at about $805 million, $491 million, and $281 million, respectively, compared with $577 million, $389 million, and $260 million, respectively, in 2004 (Banco Central de Reserva del Perú, 2006b§).

In 2005, Volcan was the first ranked zinc producer in the country with an output of 237,288 t of zinc, 62,463 t of lead,

and 346.4 t of silver from its operations at the Cerro de Pasco property, which is located in the Department of Cerro de Pasco, and the Andaychahua, the Carahuacra, and the San Cristobal base-metal mines, which are located in the Department of Junin. CMA, which was the country's second ranked zinc producer, produced 218,265 t of zinc and 333.7 t of silver from the Antamina Mine. Empresa Minera Los Quenuales S.A. produced 191,291 t of zinc, 25,059 t of lead, and 170.8 t of silver from the Iscaycruz, the Pachangara, and the Yauliyacu mines and became Peru's third ranked private zinc producer after Volcan and CMA (Ministerio de Energía y Minas, 2006a, p. 27-33; 2006a§).

Refined metals were reported as follows: Doe Run Peru produced 122,079 t of lead, 1,080 t of silver, and 41,179 t of zinc from La Oroya complex; Sociedad Minera Refinería de Zinc Cajamarquilla S.A. produced 33.0 t of silver and 122,424 t of zinc from the Cajamarquilla refinery; and SPCC produced 109.9 t of silver from its refining operations in Ilo. Peru's silver metal production decreased to 1,223 t from 1,250 t in 2004 (table 1; Ministerio de Energía y Minas, 2006a, p. 27-33; 2006a§).

In the mining sector, Grupo Votorantim Metais S.A. of Brazil acquired 99% of the Cajamarquilla refinery for about $210 million. Grupo Votorantim was planning to increase its zinc output to 260,000 metric tons per year (t/yr) from 130,000 t/yr with an additional investment of $200 million by 2007 (Banco Central de Reserva del Perú, 2006b§; Grupo Votorantim Metais S.A., 2006§).

Tin.—Production from Minsur's San Rafael Mine in the Mariategui Region was 42,145 t in concentrate compared with 41,613 t in 2004. Minsur's tin smelting and refining operations in Pisco, which is located south of Lima, produced 36,733 t of metal compared with 40,624 t in 2004. The decrease was owing to a lower market price of tin, which decreased to $3.31 per pound from $3.90 per pound in 2004. Peru continued to be the leading tin producer in Latin America followed by Bolivia and Brazil. Minsur, which was the only fully integrated tin supplier in Peru, produced 15% of the world's output and exported 40,400 t valued at $270.0 million in 2005, which was 21.9% lower in value compared with that of 2004 (Ministerio de Energía y Minas, 2006a, p. 35; 2006a§; Banco Central de Reserva del Perú, 2006b§).

Industrial Minerals

Cement.—Peru's total cement production was at about the same level as that of 2004, or 4.6 Mt. Five main cement companies had an operating capacity of almost 6.0 Mt/yr. Cementos Lima S.A. (CLSA) was the leading cement producer and produced about 3.0 Mt of cement, or more than 65%, of Peru's total cement output; CLSA's Atocongo plant had a production capacity of about 3.5 Mt/yr and drew from nearby limestone quarries. Cementos Pacasmayo S.A.A. was the second ranked cement producer and accounted for about 17% of total production; it had a production capacity of 1.0 Mt/yr. Cemento Andino S.A. was the third ranked cement producer and accounted for 13% of total production; it had a production capacity of 0.8 Mt/yr. Cementos Yura S.A. was the fourth ranked company and had a production share of 3%. Cemento Sur S.A. was the fifth ranked company and had a production share of about 2%. Yura and Sur had production capacities of 300,000 t/yr and 200,000 t/yr, respectively (Pflucker, 2005, p. 6; Ministerio de Energía y Minas, 2006a, p. 62-64).

Phosphate Rock.—Empresa Minera Regional Grau Bayvar S.A.'s [Companhia Vale do Rio Doce (CVRD)] phosphate deposits (Bayóvar project) produced 37,757 t of phosphate ore, which was about the same level as that of 2004. The 90,000-t/yr phosphate plant that was operated by Grau Bayóvar produced 14,000 t of phosphate (P_2O_5) in 2005. The Bayóvar project comprises 150,000 hectares of phosphate and brine and has proven reserves of 820 Mt of phosphatic rock equivalent to 260 Mt of rock phosphate with 30% P_2O_5 content. CVRD won an international bid on March 16, 2005, to explore further the Bayóvar phosphate deposit. The feasibility study to produce about 3.3 Mt/yr was expected to be completed in the second quarter of 2007 (Ministerio de Energía y Minas, 2006a, p. 46; Companhia Vale do Rio Doce, 2006§).

Mineral Fuels

Coal.—Peru's largest coal deposits were at Alto Chicama in La Libertad Region. Other coal deposits occur in the Cuenca del Santa in the Maranon Region and the coal basins of Goyllarisquizga and Hatun Huasi in the Caceres Region of central Peru. In 2005, according to the Ministerio de Energía y Minas (2006a, p. 57), Peru's recoverable coal reserves were estimated to be 1.1 billion metric tons, and coal production was relatively small (about 22,252 t) compared with an estimated consumption of more than 1.3 Mt/yr (U.S. Energy Information Administration, 2006§).

Natural Gas and Petroleum.—In 2005, according to the Ministerio de Energía y Minas (2006b-d§), Peru's recoverable (proven and probable) and possible crude oil, liquefied natural gas (LNG), and natural gas reserves were estimated to be 6,239.1 million barrels (Mbbl); LNG 1,373.8 Mbbl; and natural gas 859 billion cubic meters (30.4 trillion cubic feet), respectively. The leading gasfields were the Aguaytia, which is located about 41 km west-northwest of Pucallpa and had proven reserves of 8.5 billion cubic meters (301 billion cubic feet) of gas and 9 Mbbl of natural gas liquids (NGL) and the Camisea gasfields in the Ucayali Basin with 250 billion cubic meters (8.7 trillion cubic feet), which included 600 Mbbl of NGL. Natural gas production increased to 860 million cubic meters from 523 million cubic meters in 2004 and was produced by Aguaytia S.A. (43.6%), Pluspetrol S.A. (23.2%), Petrotech del Perú S.A. (13.4%), Petróleo Brasileiro S.A. (Petrobrás) (10.1%), and others (9.7%). Petrobrás through Petrobrás Energía S.A. acquired exploration and production rights for natural gas and petroleum in Lots 57 and X, respectively (Ministerio de Energía y Minas, 2006b, p. 40-42; 2006b§, d§; Petróleo Brasileiro S.A., 2005§; U.S. Energy Information Administration, 2006§).

The Camisea Project encompasses three phases—Upstream, Transportation, and Distribution of natural gas from the Camisea field, which is located in the Ucayali Basin in the Department of Cusco. Under the license contract, the Upstream Consortium holds the rights to produce natural gas and liquids in Block 88 for 40 years. Investments to develop and produce, transport, and distribute natural gas from the Camisea field were estimated as

follows: the Upstream Project to develop and produce natural gas, $550 million; the Transportation Project to transport natural gas and liquids to Lima through pipelines, $820 million; and the Distribution Project for the distribution network in Lima, $170 million (Camisea Project, 2006§).

In 2005, crude oil production increased to 106,688 barrels per day (bbl/d) from 94,120 bbl/d in 2004, or by 13.4%. Production of petroleum derivatives increased to 64,390 bbl/d from 63,525 bbl/d in 2004, or by 1.4%. Peru imported an average of 49,112 bbl/d crude oil and petroleum products to satisfy its internal consumption of 155,800 bbl/d (Ministerio de Energía y Minas, 2006b, p. 17; 2006d§; U.S. Energy Information Administration, 2006§).

Peru's total crude oil production of 38.9 Mbbl in 2005 came from Pluspetrol S.A. (63.8%), Petrobrás (12.0%), Petrotech (13.4%), and others (10.8%) (table 1; Ministerio de Energía y Minas, 2006b, p. 25; 2006d§; Sociedad Nacional de Minería, Petróleo y Energía, 2006c, p. 55). Almost 60% of the country's crude oil production came from the jungle blocks in the Loreto and the Ucayali Regions; the remainder was produced at the coastal and offshore fields in Talara. The country's proven petroleum reserves were estimated to be about 0.9 billion barrels on January 1, 2006 (Ministerio de Energía y Minas, 2006d§; U.S. Energy Information Administration, 2006§).

In 2005, the largest oil refinery continued to be Petroperú's La Pampilla, which had a designed capacity of about 100,000 bbl/d. The second largest oil refinery was Petroperú's Talara, which had a designed capacity of about 70,000 bbl/d. Other refineries had the following designed capacities: Conchan, 20,000 bbl/d; Iquitos, 10,500 bbl/d; Pucallpa, 3,500 bbl/d; and El Milagro, 2,500 bbl/d. Refinery production came from La Pampilla (47%), Talara (37%), Conchan (8%), Iquitos (5%), Pucallpa (2%), and Milagro (1%) (Ministerio de Energía y Minas, 2006b, p. 17; 2006d§; Sociedad Nacional de Minería, Petróleo y Energía, 2006a, p. 50).

Reserves

Table 3 lists the Peruvian reserves of major minerals, such as copper, gold, iron ore, lead, molybdenum, silver, and zinc, on or about January 1, 2006. Data are shown in terms of metal contained in ore for the base and precious metals or recoverable quantities of other mineral commodities, which included industrial minerals and mineral fuels. These mineral reserves represent "proven" (measured) and "probable" (indicated) categories and exclude quantities reported as "possible" (inferred). Reserves were defined as being well-delineated and economically recoverable volumes of crude oil and natural gas from wells and minable ore from mines committed to production (U.S. Bureau of Mines and U.S. Geological Survey, 1980; Ministerio de Energía y Minas, 2006a, p. 51; 2006d§).

Annual changes in assessment of reserves are the result of additions to reserves, deletions from reserves, and production. A complication in Peru has been the production of more than one metal by a large number of mines, thus necessitating close attention to market prices and processing costs for two or more mineral commodities simultaneously to determine production as coproducts (share costs) or/and byproducts (credits).

Reserves of the leading base and precious metals increased significantly—gold in Alto Chicama and copper ore during the expansion of the Cerro Verde, the Cuajone, the Tintaya, and the Toquepala Mines. Reserves of major metals are distributed unevenly throughout Peru and were influenced mostly by mineralization of the Precambrian Cordillera and the Coast Ranges where several districts dominated the reserves position in terms of proven and probable (minable) reserves of major metals (Sociedad Nacional de Minería, Petróleo y Energía, 2006a, p. 15).

Infrastructure

Peru had 3,462 km of railways and 78,672 km of roads, of which 10,314 km was paved and 68,358 km was unpaved. Peru had 8,808 km of waterways—8,600 km of navigable tributaries of the Amazon River system and 208 km of waterways into Lake Titicaca. Also, a petroleum depot at Bayovar serviced the 800-km northern Peru crude oil pipeline. Crude oil was transported through a 1,754-km pipeline; natural gas and NGL, 983-km dual pipelines; and refined products, a 13-km pipeline. Important mineral industry ports included Callao, Chimbote, Ilo, Matarani, Paita, Puerto Maldonado, Salaverry, San Martin, San Nicolas, and Talara on the Pacific Ocean and Iquitos Pucallpa and Yurimaguas on the Amazon River and its tributaries. Peru had an installed electrical generating capacity of 5,050 megawatts (MW), about 80% of which was provided by hydroelectric plants. The Peruvian Government raised about $2 billion from the privatization of its electrical sector and committed to an investment of about $20 million to install an additional 1,006 MW of capacity in the immediate future. The energy mix, by source, was hydro (74.5%), fossil fuel (24.5%), and others (1.0%) (Ministerio de Energía y Minas, 2006b§; U.S. Central Intelligence Agency, 2006§).

Outlook

A positive macroeconomic performance characterized the Peruvian economy in 2005. The GDP grew by 6.4% and inflation was 1.5%. The country reduced its fiscal deficit to 0.3% of the GDP from 1.0% of the GDP in 2004; this action is worth highlighting because the price of its exports increased by 16.3%, with copper, gold, molybdenum, and zinc contributing most heavily to this result. In this context, exports grew by 35.3% and reached $17.3 billion in 2005, a level that was more than $4.5 billion higher than that of 2004, as a result of both higher prices and larger volumes of exports. Imports increased by 23.2% as well, but Peru's trade balance increased to $5.3 billion from $3.0 billion in 2004. Peru's net international reserves increased to $14.1 billion from $11.2 billion in 2004. The Standard and Poor's upgrading of the country's economic outlook to positive from stable and Peru's earlier external debt payment to the members of the Paris Club generated good will among investors. This good will has, however, decreased owing to the uncertainty brought about by the closeness of the Presidential and Congressional elections in April 2006. Peru has maintained its country risk index at 287, which was among the lowest of the region (Chile was 75, and

Mexico, 174). Latin America had a risk index of 485 in 2005 (ProInversión—Private Investment in Peru, 2006b). Changes in legislation will not affect investors and/or corporations who have signed legal stability agreements for a period of 10 years and, in the case of mineral concessions, the term will be subject to the life of the agreement (Banco Central de Reserve del Peru, 2006a§; Comisión Nacional de Inversion y Tecnología, 2006§; ProInversión—Private Investment in Peru, 2006a§).

The energy, mining, and related industries are expected to continue to attract capital flows via joint ventures and consortia, privatizations, and direct acquisitions. According to CONITE and ProInversión, the privatization process in the minerals sector and FDI in every sector of the Peruvian economy, particularly in the banking and energy industries, are expected to continue to generate additional investments. Higher demand for copper, gold, iron ore, and silver and high metal prices are likely to encourage mining companies to invest in expanding and modernizing their operations. The liquefaction of Camisea's natural gas for export to China, Mercosur, North American Free Trade Agreement (NAFTA), and other trading partners is expected to increase Peru's mineral exports further (ProInversión—Private Investment in Peru, 2006a; Ministerio de Energía y Minas, 2005§, 2006b§; Comisión Nacional de Inversion y Tecnología, 2006§). The transportation phase of Camisea's pipelines for natural gas (714 km) and for NGL (560 km), however, could encounter financial difficulties because of leaky NGL pipeline. This second phase will involve the establishment of infrastructure to pipe the gas and associated liquids from Camisea to the Lima area and to liquefy 17 million cubic meters per day of gas for export to NAFTA and possibly to Chile. For that and to develop the 113 billion cubic meters of gas in Camisea's Block 56 will require an investment of $3.2 billion. However, the natural gas liquids pipeline, which began operating in 2004 following the Upstream phase of development, has ruptured on five different occasions (Petroleum Economist, 2006, p. 39).

Peru continues to encourage community development and environmental protection based on social responsibility and sustainable development principles. In spite of that strategy, the country is facing political unrest, and the mining industry has been the target of social protest. These events have affected the image of the mining industry and caused growing concern about the regional climate for mining investments. At the national level, this trend could reduce the attraction of new investments and preclude the higher mineral output needed for regional economic development.

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TABLE 1
PERU: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2001	2002	2003	2004	2005[p]
METALS						
Antimony:						
Mine output, Sb content[e]		460	460	460	460	1,000
Metal		274	356	356	356	807
Arsenic, white[2]		2,800 [r]	2,970	2,970	2,970	2,970
Bismuth:						
Mine output, Bi content[e]		1,000	1,000	1,000	1,000	952 [3]
Metal		640	568	600	600	600
Cadmium, metal		485 [r]	422	529	532	481
Copper:						
Mine output, Cu content		722,355 [r]	844,553	842,578 [r]	1,035,574	1,009,898
Sulfate, Cu content		1,953	1,950	2,000	2,000	2,000
Metal:						
Blister		326,899	314,938	314,228	320,135	321,968
Refined, primary:						
Electrowon		131,409	156,467	171,198	167,000 [r]	165,530
Other		342,502	346,282	345,848	338,308	344,862
Total		473,911	502,749	517,046	505,308 [r]	510,392
Gold:[4]						
Mines	kilograms	121,902	138,810	159,770	158,438 [r]	191,688
Placers	do.	16,620	18,720	12,849	14,786 [r]	16,134
Total	do.	138,522	157,530	172,619	173,224 [r]	207,822
Indium	do.	4,263	5,500 [e]	5,500	5,500	5,500
Iron and steel:						
Iron ore and concentrate:						
Gross weight	thousand metric tons	4,564	4,594	5,239	6,439	6,810
Fe content	do.	3,087	3,105	3,541	4,315	4,565
Metal:						
Pig iron[e]	do.	330	330	330	330	330
Sponge iron	do.	70	30	80 [e]	80	80
Ferrosilicon[e]		600	600	600	600	600
Steel:						
Crude[5]		690,000	750,000	750,000	750,000	750,000
Ingots and castings[e]	thousand metric tons	510	510	510	510	510
Semimanufactures[e]		250	250	250	250	250
Lead:						
Mine output, Pb content		289,546	305,651	308,874	306,211	319,345
Metal		121,169	119,588	112,289	118,970	122,079
Manganese, mine output, Mn content[e]		200	200	200	200	200
Molybdenum, mine output, Mo content		9,499	8,613	9,561	14,246	17,325
Selenium, metal, refined	kilograms	16,110	20,600	20,600	21,000 [e]	17,400
Silver:						
Mine output, Ag content		2,571	2,870	2,921	3,060	3,193
Metal, refined		1,194	1,193	1,147	1,250	1,223
Tellurium, metal	kilograms	19,105	21,600	22,000 [e]	22,000	32,880
Tin:						
Mine output, Sn content		38,182	38,815	40,202	41,613	42,145
Metal[6]		27,683	35,828	39,181	40,624	36,733
Zinc:						
Mine output, Zn content		1,056,629	1,232,997	1,372,790	1,209,006	1,201,671
Metal		204,646	172,688	202,076	195,692	163,603

See footnotes at end of table.

TABLE 1--Continued
PERU: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2001	2002	2003	2004	2005[p]
INDUSTRIAL MINERALS						
Barite		11,031	3,806	2,906	3,606	3,700
Boron materials, crude (borates)		9,374	6,698	9,315	9,578	9,600
Cement, hydraulic	thousand metric tons	3,950	3,980	4,000	4,590	4,600
Chalk[e]		101,000	101,000	101,000	101,000	101,000
Clays:						
Bentonite		18,217	20,760	14,980	18,471	18,500
Fire clay		5,900 [e]	5,900	5,900	5,900	5,900
Kaolin		5,532	1,934	2,653	2,720	2,700
Common clay		676,944	428,820	232,002	438,976	440,000
Diatomite[e]		35,100	35,100	35,100	35,100	35,100
Feldspar		4,253	6,018	7,349	6,005	6,000
Gypsum, crude		20,966	75,306	71,114	149,735	150,000
Lime[e]		142,000	184,800	195,400	205,100	215,400
Limestone		4,370,865	5,695,392	6,021,502	6,321,592	6,636,600
Nitrogen, N content of ammonia[e]		5,000	5,000	5,000	5,000	5,000
Phosphate rock:						
Crude, gross weight[e]		15,800	16,400	31,600	37,760	37,800
P_2O_5 content		4,825	6,018	11,610	13,870	14,000
Salt, all types		418,954	278,948	187,416	248,898	250,000
Stone, sand and gravel:						
Stone:[e]						
Dolomite		645	645	645	645	645
Flagstone		300,000	300,000	300,000	300,000	300,000
Granite		2,000	2,000	2,000	2,000	2,000
Limestone	thousand metric tons	4,370	4,370	4,400	4,400	4,400
Marble		11,636 [3]	16,553 [3]	21,134 [3]	22,208 [3]	22,200
Onyx		150	150	150	150	150
Quartz and quartzite (crushed)		40,000	40,000	40,000	40,000	40,000
Shell, marl		4,000	4,000	4,000	4,000	4,000
Slate		16,800	10,944 [3]	14,260 [3]	11,950 [3]	11,950 [3]
Travertine		2,971 [3]	4,183 [3]	4,658 [3]	6,038 [3]	6,050
Sand and gravel:						
Construction	thousand metric tons	1,154	1,011	907	1,220	1,220
Silica sand	do.	120	300	196	871	900
Sulfur, elemental:						
Native[e]		100	100	100	100	100
Byproduct of metallurgy		203,000 [r]	201,000 [r]	204,000 [r]	204,000 [r, e]	204,000 [e]
Sulfuric acid, gross weight		623,084	623,100	623,000	623,000	623,000
Talc and related materials:						
Talc		11,165	10,685	10,791	9,548	9,500
Pyrophyllite		8,069	9,514	12,291	14,282	14,300
Total[e]		19,234	20,199	23,082	23,830	23,800
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Anthracite, run-of-mine		6,593 [r]	17,602 [r]	5,768 [r]	8,876 [r]	8,837
Bituminous, run-of-mine		13,626 [r]	3,976 [r]	9,900 [r]	13.475 [r]	13,415
Total		20,219 [r]	21,578 [r]	15,668 [r]	22,351 [r]	22,252
Coke, all types[e]		10,000	10,000	10,000	10,000	10,000
Gas, natural:						
Gross	million cubic meters	371	543	523	860	860
Marketed	do.	370	442	520	857	857
Natural gas liquids:						
Natural gasoline and others[7]	thousand 42-gallon barrels	595	573	584	4,216	4,216
Butane	do.	1,223	989	1,037	5,508	5,508
Total	do.	1,818	1,562	1,621	9,724	9,724

See footnotes at end of table.

TABLE 1--Continued
PERU: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2001	2002	2003	2004[P]	2005[P]
MINERAL FUELS AND RELATED MATERIALS--Continued						
Petroleum:						
Crude	thousand 42-gallon barrels	35,440	35,356	33,343	34,448 [r]	38,941
Refinery products:						
Liquefied petroleum gas	do.	2,612	3,100	2,551	2,938	2,978
Gasoline, motor	do.	9,767	11,593	9,202	8,848	8,968
Jet fuel	do.	2,966	3,521	3,289	3,822	3,874
Kerosene	do.	5,503	6,532	4,354	2,467	2,501
Distillate fuel oil	do.	12,988	15,417	14,972	15,082	15,287
Lubricants	do.	539	642	520	266	271
Residual fuel oil	do.	19,287	22,894	23,134	20,462	20,740
Asphalt	do.	--	--	770	1,011	1,025
Other[8]	do.	5,053	5,998	5,379	8,629	8,746
Total	do.	58,715	69,697	64,171	63,525	64,390

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [P]Preliminary. [r]Revised. -- Zero.

[1]Table includes data available through October 2006.

[2]Output reported by Doe Run Resources Corp.

[3]Reported figure. Source: Ministerio de Energía y Minas - Perú.

[4]Peru's placer gold production was reported.

[5]Output reported by Mexico's Steel Chamber-CANACERO—Ten years of steelmaking statistics in Latin America, 1996-2005.

[6]Output reported by Minsur S.A.'s smelter.

[7]Includes hexane.

[8]Includes refinery fuel and losses.

TABLE 2
PERU: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Antimony	metric tons	Doe Run Resources Corp. (private, 100%)	Smelter at La Oroya, Junin Department	700
Barite		Barmine S.A. (private, 100%)	Santa Cruz de Cocachacra, Huarochiri, Lima Department	NA
Bentonite		Minerales Andinos S.A. (NL Industries Co., 90%)	Vichayal Mine, Piura Department	9
Bismuth	metric tons	Doe Run Resources Corp. (private, 100%)	Refinery at La Oroya, Junin Department	1,000
Cement		Cementos Lima S.A. (private, 100%)	Atocongo Plant, Lima Department	3,500
Do.		Cementos Pacasmayo S.A.A. (private, 100%)	Pacasmayo Plant, La Libertad Department	1,000
Do.		Cemento Andino S.A. (private, 100%)	East Lima Plant, Lima Department	800
Do.		Cementos Yura S.A. (private, 100%)	Yura Plant, Arequipa Department	300
Do.		Cementos Sur S.A. (private, 100%)	Arequipa Plant, Arequipa Department	200
Copper		Southern Peru Copper Corp. (SPCC) (Grupo Mexico, S.A. de C.V., 54.2%; Marmon Corp., 14.2%; Phelps Dodge Overseas Capital Corp., 14%; others, 17.6%)	Cuajone Mine, Moquegua Department	200
Do.		do.	Toquepala Mine, Tacna Department	160
Do.		do.	Cocotea, Simarrona, and Totoral mines—SX-EW, Tacna Department	40
Do.		do.	Smelter at Ilo, Moquegua Department	320
Do.		do.	Refinery at Ilo, Moquegua Department	300
Do.		Compañía Minera Antamina S.A. (CMA) (BHP Billiton plc., 33.75%; Noranda Inc., 33.75%; Teck Cominco Ltd., 22.5%; Mitsubishi Corp., 10%)	Antamina Mine, Huari, Ancash Department	400
Do.		do.	Antamina concentrator, Ancash Department	400
Do.		Doe Run Peru S.R. Ltda. (private, 100%)	Cobriza, Huancavelica Department	70
Do.		do.	Smelter at La Oroya, Junin Department	65
Do.		do.	Refinery at La Oroya, Junin Department	60
Do.		Compañía Minera Atacocha S.A. (private, 100%)	Yanacancha Mine, Junin Department	30
Do.		Compañía Minera Condestable S.A. (private, 100%)	Condestable Mine, Junin Department	20
Do.		Glencore International AG (private, 100%)	Casapalca, Lima Department	60
Do.		Volcan Compañía Minera S.A.A. (private, 100%)	San Cristobal, Mahr Tunel, and Andaychagua, Junin Department	60
Do.		Cía. Minera San Ignacio de Morococha S.A. (private, 100%)	Yauricocha, Junin Department	60
Do.		BHP Billiton Tintaya S.A. (private, 100%)	Tintaya Mine, Cusco Department	90
Do.		Sociedad Minera Cerro Verde S.A.A. (Phelps Dodge Corp., 55%; Sumitomo Metal Mining Co. Ltd., 25%; Compañía de Minas Buenaventura S.A.A., 20%)	Cerro Verde, Arequipa Department	100
Do.		do.	Electrowon at Cerro Verde, Arequipa Department	90
Dolomite		Minera Baribent S.A. (private, 100%)	Esperanza, Ancash Department	25
Gold	kilograms	Minera Yanacocha S.R.L. (Newmont Mining Corp., 51.35%; Compañía de Minas Buenaventura S.A.A., 43.65%; World Bank International Finance Corporation, 5%)	Yanacocha, La Quinua, and Maqui-Maqui mines, Cajamarca Department	110,000
Do.	do.	Minera Barrick Misquichilca S.A. (Barrick Gold Corp., private, 100%)	Pierina, Cajamarca Department	40,000
Do.	do.	Compañía Minera Poderosa S.A. (private, 100%)	Poderosa, La Libertad Department	2,000
Do.	do.	Compañía de Minas Buenaventura S.A.A, (private, 100%)	Orcopampa, Arequipa Department	5,000
Do.	do.	Minas Arirahua S.A. (private, 100%)	Arirahua, La Libertad Department	2,000
Do.	do.	Asesoría Contable Minera S.A. (private, 100%)	Ocoña, Santa Clarita, Explatoro, and Molino de Oro, Arequipa Department	1,000
Do.	do.	Cía. Aurífera Río Inambari S.A. (Cía. Minera del Sur S.A., 84%; Aurífera Claudia, 16%)	Rio Caichive, Madre de Dios Department	200
Do.	do.	Minera Aurífera Retamas S.A. (private, 100%)	Retamas, La Libertad Department	5,500

TABLE 2--Continued
PERU: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Gold--Continued	kilograms	Consorcio Minero Horizonte S.A. (private, 100%)	Parcoy, La Libertad Department	4,000
Do.	do.	Compañía Minera Sipan S.A.C. (private, 100%)	Sipan, Inca, La Libertad Department	4,800
Do.	do.	Compañía Minera Ares S.A.C. (private, 100%)	Ares, La Libertad Department	6,500
Do.		Cía. Minera Aurifera Santa Rosa S.A. (private, 100%)	Santa Rosa, Peno Department	5,000
Do.	do.	Aruntani S.A.C (private, 100%)	Florencia and Santa Rosa mines, Moquegua Department	6,500
Iron ore		Shougang Hierro Perú S.A. (Shougang Corp., 100%)	Marcona, Ica Department	13,000
Lead		Doe Run Peru S.R. Ltda. (private, 100%)	Smelter at La Oroya, Junin Department	150
Do.		do.	Refinery at La Oroya, Junin Department	125
Do.		Empresa Minera Los Quenuales S.A.	Izcaycruz, Lima Department	10
Do.		do.	Yauliyacu, Lima Department	15
Do.		Volcan Compañía Minera S.A.A. (private, 100%)	San Cristobal, Mahr Tunel, and Andaychagua, Junin Department	70
Do.		do.	Paragsha, Cerro de Pasco Department	85
Do.		Compañía Minera San Ignacio de Morococha S.A. (private, 100%)	Yauricocha, Junin Department	5
Do.		Compañía Minera Atacocha S.A. (private, 100%)	Yanacancha Mine, Junin Department	40
Do.		Compañía Minera Milpo S.A. (private, 100%)	El Porvenir Mine, Cerro de Pasco Department	25
Do.		Compañía Minera Santa Luisa S.A. (private, 100%)	Huanzala Mine, Junin Department	40
Do.		Sociedad Minera El Brocal S.A.A. (private, 100%)	Colquijirca Mines, Cerro de Pasco Department	30
Do.		Corp. Minera Nor Perú S.A. (Pan American Silver Corp., 100%)	Quiruvilca, La Libertad Department	10
Molybdenum		Southern Peru Copper Corp. (SPCC) (Grupo Mexico, S.A. de C.V., 54.2%; Marmon Corp., 14.2%; Phelps Dodge Overseas Capital Corp., 14%; others, 17.6%)	Cuajone, Moquegua Department and Toquepala, Tacna Department	NA
Natural gas	million cubic meters per day	Pluspetrol Perú Corp. S.A. (Pluspetrol S.A., 36%; Hunt Oil Company, 36%; SK Corp., 18%; Tecpetrol del Perú S.A.C., 10%)	Camisea gas deposit, Cusco Department	NA
Do.	do.	Petrotech del Perú S.A. (Petroperú S.A., 100%)	Pucallpa, Loreto Department	120
Do.	do.	Aguaytia S.A. (Petroperú S.A., 100%)	Aguaytia gas deposit, Ucayali Department	80
Do.	do.	Pluspetrol S.A. (private, 100%)	Pucallpa, Loreto Department	60
Petroleum, crude	42-gallon barrels per day	Petrotech del Perú S.A. (Perupetro, 100%)	Onshore Piura Department; northeast and central jungle areas, Loreto Department	68,000
Do.	do.	Petróleo Brasileiro S.A. (Perupetro, 100%)	Pacific Coast, offshore Piura Department	30,000
Do.	do.	Pluspetrol S.A. (private, 100%)	Northeastern jungle, Loreto Department	90,000
Do.	do.	Occidental Petroleum Corp. (private, 100%)	Block 1-AB, northern jungle, Loreto Department	28,000
Petroleum products	do.	Petroperú S.A.	Refineries in Talara, Iquitos, Milagro, and Pucallpa	105,000
Do.	do.	do.	Refinery La Pampilla, Lima Department	100,000
Do.	do.	do.	Refinery Conchan, Lima Department	20,000
Phosphate rock	metric tons	Empresa Minera Regional Grau Bayóvar S.A. (Companhia Vale do Rio Doce, 100%)	Bayovar phosphate mine, Piura Department	50
Silica sand		Minera Baribent S.A. (private, 100%)	Maria G. and Martin I., Junin Department	27
Silver	kilograms	Empresa Minera Los Quenuales S.A.	Yauliyacu, Lima Department	150,000
Do.	do.	do.	Izcaycruz, Lima Department	20,000
Do.	do.	Doe Run Peru S.R. Ltda. (private, 100%)	Refinery at La Oroya	1,100,000
Do.	do.	Compañía Minera San Ignacio de Morococha S.A. (private, 100%)	Yauricocha, Junin Department	46,500
Do.	do.	Compañía de Minas Buenaventura S.A.A. (private, 83%; Centromin 17%)	Julcani and Huachocolpa Mines Huancavelica Department, Uchucchacua Mine, Lima Department	350,000

TABLE 2--Continued
PERU: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Silver--Continued	do.	Compañía de Minas Buenaventura S.A.A. (private, 100%)	Orcopampa Mine, Arequipa Department	161,000
Do.		Volcan Compañía Minera S.A.A. (private, 100%)	San Christobal, Mahr Tunel, and Andaychagua, Junin Department	350,000
Do.		Sociedad Minera Corona S.A. (private, 100%)	Hualgayoc, Cajamarca Department	175,000
Do.	do.	Compañía Minas Arcata S.A. (private, 100%)	Arcata, Arequipa Department	170,000
Do.	do.	Southern Peru Copper Corp. (SPCC) (Grupo Mexico, S.A. de C.V., 54.2%; Marmon Corp., 14.2%; Phelps Dodge Overseas Capital Corp., 14%; others, 17.6%)	Ilo smelting and refining, Moquegua Department	150,000
Do.	do.	Compañía Minera Santa Luisa S.A. (private, 100%)	Huanzala Mine, Junin Department	53,000
Do.	do.	Compañía Minera Antamina S.A. (CMA) (BHP Billiton plc., 33.75%; Noranda Inc., 33.75%; Teck Cominco Ltd., 22.5%; Mitsubishi Corp., 10%)	Antamina Mine, Huari, Ancash Department	340,000
Do.	do.	Aruntani S.A.C. (private, 100%)	Florencia and Santa Rosa mines, Moquegua Department	14,500
Do.	do.	Compañía Minera Raura S.A. (private, 100%)	Raura, Lima Department	54,000
Do.	do.	Compañía Minera Milpo S.A. (private, 100%)	Yanacancha, Cerro de Pasco Department	110,000
Do.	do.	Compañía Minera Atacocha S.A. (private, 100%)	Yanacancha Mine, Junin Department	130,000
Do.	do.	Sociedad Minera El Brocal S.A.A. (private, 100%)	San Gregorio Mine, Cerro de Pasco Department	110,000
Do.	do.	Corp. Minera Nor Perú S.A. (Pan American Silver Corp., 100%)	Quiruvilca, La Libertad Department	125,000
Steel		Sider Corp. S.A. (Acerco S.A., 49.4%; Grupo Wiese, 49.4%; Others, 1.2%)	Chimbote, Ancash Department	550
Do.		Empresa Laminadora del Pacífico S.A. (Acero Arequipa S.A., 100%)	Pisco, Ica Department	180
Tellurium	metric tons	Doe Run Peru S.R. Ltda. (private, 100%)	Refinery at La Oroya	12
Tin	do.	Minsur S.A. (private 100%)	San Rafael Mine/plant, Puno Department	50,000
Do.	do.	do.	Pisco smelting and refining, Ica Department	45,000
Tungsten	do.	Minera Regina S.A. (private, 100%)	Palca XI, Puno Department	1,400
Do.	do.	Fermín Málaga Santolalla S.A. (private, 100%)	Pasto Bueno, Ancash Department	1,000
Zinc		Volcan Compañía Minera S.A.A. (private, 100%)	Cerro de Pasco, Cerro de Pasco Department; San Cristobal, Mahr Tunel, and Andaychagua, Junin Department	320
Do.		Compañía Minera Antamina S.A. (CMA) (BHP Billiton plc., 33.75%; Noranda Inc., 33.75%; Teck Cominco Ltd., 22.5%; Mitsubishi Corp., 10%)	Antamina Mine, Huari, Ancash Department	220
Do.		do.	Antamina concentrator, Ancash Department	70
Do.		Empresa Minera Los Quenuales S.A.	Pachangara, Lima Department	200
Do.		do.	Izcaycruz, Lima Department	40
Do.		Compañía Minera San Ignacio de Morococha S.A. (private, 100%)	Yauricocha, Junin Department	80
Do.		do.	San Vicente Mine, Junin Department	70
Do.		Doe Run Peru S.R. Ltda. (private, 100%)	Refinery at La Oroya	70
Do.		Sociedad Minera Refinería de Zinc Cajamarquilla S.A. (Grupo Votorantim Metais S.A., 99% and employees, 1%)	Refinery at Cajamarquilla, Lima Department	130
Do.		Compañía Minera Atacocha S.A. (private, 100%)	Yanacancha Mine, Junin Department	60
Do.		Compañía Minera Raura S.A. (private, 100%)	Raura, Lima Department	45
Do.		Corp. Minera Nor Perú S.A. (Pan American Silver Corp., 100%)	Quiruvilca, La Libertad Department	25
Do.		Compañía Minera Santa Luisa S.A. (private, 100%)	Huanzala Mine, Junin Department	50
Do.		Compañía Minera Milpo S.A. (private, 100%)	Yanacancha, Cerro de Pasco Department	80
Do.		Sociedad Minera El Brocal S.A.A. (private, 100%)	Colquijirca Mines, Cerro de Pasco Department	60
Do.		Empresa Administradora Chungar S.A.C. (private, 100%)	Animon Mine, Cerro de Pasco Department	60

TABLE 3
PERU: RESERVES OF MAJOR MINERALS IN 2005

(Thousand metric tons unless otherwise specified)[1]

Commodity		Reserves	
Coal, all types		1,100,000	
Copper		57,900	
Gold	metric tons	3,000	[2]
Iron ore		861,000	
Lead		5,200	
Molybdenum		450	e
Natural gas	billion cubic meters	250	
Petroleum crude	million barrels	900	
Phosphate Rock		820	
Salt		100,000	e
Silver	metric tons	43,800	
Sulfur		150,000	e
Tin		700	
Uranium		100	[3]
Zinc		18,200	

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown.

[1]2005 and 2006 "Anuario de la Minería del Perú" Ministerio de Energía y Minas except for natural gas and petroleum crude; U.S. Geological Survey Mineral Commodity Summaries 2006; U.S. Energy Information Administration 2006.

[2]Excludes metal in placer deposits.

[3]Recoverable at prices of $100 or less per kilogram of uranium.

The Mineral Industry of Venezuela

By Ivette E. Torres

Venezuela, which was South America's fifth most populous country after Brazil, Colombia, Argentina, and Peru, had 26.6 million inhabitants in 2005. With an area of 912,050 square kilometers (km^2), it is South America's sixth largest country. The country's gross domestic product (GDP) in terms of purchasing power parity was $164.4 billion[1] compared with $110.1 billion[2] in 2004 (revised) (International Monetary Fund, 2006a§[3]; World Bank, The, 2006§). In real terms, the GDP increased by 9.3%, which was a significant increase for the second consecutive year. Improved overall economic activity, which was led by a 23% increase in construction and a 9.3% increase in manufacturing, was the main reason for the increase in the GDP; the GDPs of Venezuela and the Dominican Republic had the highest growth rates of the Americas. Unemployment increased to 15% in the first half of the year and decreased to 13% in the second half of the year. The second highest unemployment level (18.4%) was in the hydrocarbons, mining, and quarrying sector. Inflation was 15.9%, which was an improvement compared with that of 2004 when it was 21.7% (Banco Central de Venezuela, 2006a§, b§; International Monetary Fund, 2006b§, c§; World Bank, The, 2006§).

Production

In 2005, Venezuela was an important producer of nonfuel mineral commodities in the Latin American region, although it held modest ranking in terms of world output (table 1). According to U.S. Geological Survey data, Venezuela was the world's 8th ranked producer of bauxite, the 9th ranked producer of alumina, and the 12th ranked producer of aluminum. In Latin America, it was the second ranked producer of primary aluminum (after Brazil), coal (after Colombia), iron ore, and phosphate rock (after Brazil); the third ranked producer of bauxite and alumina (after Brazil and Jamaica) and cement (after Brazil and Mexico); and the fourth ranked producer of steel (after Brazil, Mexico, and Argentina). In the Americas, Venezuela was the third ranked producer of bauxite (after Brazil and Jamaica) and phosphate rock (after the United States and Brazil), the fourth ranked producer of primary aluminum (after the United States, Canada, and Brazil), and the fifth ranked producer of alumina (after the United States, Brazil, Jamaica, and Suriname). Venezuela was the third ranked producer of crude petroleum in the Americas (after the United States and Mexico).

Government Policies and Programs

In January 2005, the responsibilities of the mineral sector were transferred from the Ministerio de Energía y Minas, which became the Ministerio de Petróleo y Energía, to the newly created Ministerio de Industrias Básicas y Minería (MIBAM). MIBAM was organized into three areas: the Viceministerio de Industrias Básicas, the Viceministerio de Minas, and the Viceministerio de Promoción e Inversión. The Government-owned mineral and industrial producer Corporación Venezolana de Guayana (C.V.G.) and its companies and the Instituto Nacional de Geología y Mina were assigned to the new Ministry.

In September, the Government announced that it would annul inactive gold and diamond concessions and contracts of the private domestic and foreign companies and suspend permits if the appropriate processes had not been followed. The Government also announced plans to create a state mining company similar to the country's petroleum company Petróleos de Venezuela, S.A. (PDVSA). The new company, Empresa de Producción Social Nacional Minera (EPS Nacional Minera), which was established to explore and produce minerals (with emphasis on diamond and gold), would absorb the Government mining company C.V.G. Minerven and would take over the inactive mining concessions (Reuters, 2005§).

Later in September, the Government announced that, in an effort to regain control of its mining sector, it would stop granting mining concessions for diamond and gold mining to the private sector and that EPS Nacional Minera would begin operating on January 1, 2006. As a result of these changes, all mining concessions and contracts were being reviewed by the Government (Bloomberg, 2005§).

The Government of Venezuela had a number of operation contracts with private companies that had been the result of several contract bids that began in the 1990s in what was then called "La Apertura Petrolera" (the opening of the petroleum sector). This participation of the private sector was seen as a way to bring investment and new technology to Venezuela's petroleum production process. During 2005, the Government of Venezuela announced that the terms of the existing contracts were illegal under the Constitution and proceeded to change the operating contracts to joint ventures in which the Government holds the majority interest (at least 60%). The maximum taxes were increased to 50% from 36%, and royalties, which were related to the production from the Orinoco Belt, were increased to 16.6% from 1% in 2005 and to more than 30% in early 2006. At the time of the announcement, 18 companies held 32 operating agreements. These companies were given until March 2006 to transition to the new terms (Venezuelan Views, News and Analysis, 2006§).

In 2005, Venezuela and 13 Caribbean countries signed an energy cooperation agreement through which a new permanent intergovernmental organization, PetroCaribe, was formed. Barbados and Trinidad and Tobago did not become members of the new organization. Through PetroCaribe, Venezuela was to sell crude petroleum at preferential financing terms to the signatory countries. The new agreement, which is similar to the Caracas Energy Agreement and the San José Accord, improves

[1]Where necessary, values have been converted from Venezuelan Bolivars (Bs) to U.S. dollars (US$) at the rate of Bs 2,111.67=US$1.00.

[2]In current international dollars.

[3]References that include a section mark (§) are found in the Internet References Cited section.

the terms of the previous agreements by allowing financing of up to 25% of the cost with a grace period of 1 year to be paid in 15 years at a 2% interest rate. When the price exceeds $40 per gallon, the payment period would be extended to 25 years (23 years plus a 2-year grace period), the interest would be reduced to 1%, and the short-term payment would be extended from 30 days to 90 days. To Venezuela, PetroCaribe was not just an energy agreement; rather, it was one of the means to achieve economic and political integration in Latin America and the Caribbean (Petróleos de Venezuela S.A., 2005d§; Punto Final, 2006§). Another important step for Venezuela's vision of Latin American integration was for it to become a full member of the Mercado Común del Sur (Mercosur). In December, the executive body of Mercosur ratified Venezuela's membership and Venezuela became a full member of the organization (BBC News, 2005§; Embassy of the Bolivarian Republic of Venezuela in the UK, 2005a§, e§).

In April 2005, the President of Venezuela and the Vice President of China signed 19 cooperation agreements, which included mining and oil and gas projects (ChinaDaily, 2005§). Venezuela has been strengthening its relationship with China for several years. One of the immediate plans was for Venezuela to increase its exports of crude and extra heavy crude to China. Later in the year, the China Petroleum Corporation and the Government of Venezuela signed two contracts for Venezuela to export 160,000 barrels per day (bbl/d) of crude petroleum for a year and 60,000 bbl/d of fuel oil for 2 years to China. Venezuela's goal was to increase exports of crude petroleum and refinery products to China to 300,000 bbl/d (Embassy of the Bolivarian Republic of Venezuela in the UK, 2005b§).

Late in 2005, Venezuela, which was a member of the Comunidad Andina de Naciones (CAN), proposed to the other member countries that CAN stop exporting raw minerals and mineral products (bauxite, iron ore, steel) and instead use those materials to produce finished products for export. The proposal was on the agenda for diseussion at CAN's upeoming meeting as an issue of regional development (Embassy of the Bolivarian Republic of Venezuela in the UK, 2005f§).

Commodity Review

Metals

Aluminum.—The Government announced that construction of an additional aluminum production line for the C.V.G. Venezolana de Alumino S.A. (Venalum) smelter, which would increase production capacity to 715,000 t, would begin in November 2005. Plans called for the additional production capacity to be available in 2008 (Metal Bulletin, 2005). In addition to this expansion, the Government planned to increase Venalum's sales to the domestic market as part of MIBAM's plan to increase the production of finished products in the country and reduce the export of intermediate products. Venezuela's other aluminum producer, Aluminios del Caroní S.A. (Alcasa), was studying the possibility of constructing an extrusion plant. Such a project would be in line with MIBAM's plan to create a downstream industry to replace imports (Vheadline, 2005§).

Gold.—Although official gold production statistics were unavailable, Hecla Mining Company reported that it was the leading producer of gold and had produced about 3,160 kilograms (kg) (reported as 101,474 troy ounces) from La Camorra Mine in the State of Bolivar, which was operated by Minera Hecla Venezolana, C.A. The profitability of the mine had decreased as the total production cost increased to $337 per troy ounce. The cost increase was due in part to changes in the mine design and environmental costs, as well as labor issues and currency issues. During the year, the ore grade decreased by 18%. The company completed the construction of a shaft, which would reduce the haulage cost in 2006 when full production capacity was reached at Mina Isadora. The company's gold reserves in Venezuela were low (about 13,700 kg, which were reported as 441,392 troy ounces), but the company continued its exploration efforts (Hecla Mining Company, 2006, p. 4, 7, 9).

Another gold producer in the State of Bolivar was Crystallex International Corp. of Canada, which produced about 1,650 kg (reported as 53,178 troy ounces) of gold at the Revemin mill, more than 90% of which was from its Tomi concession. The remainder was from Crystallex's La Victoria Mine (8%), which was part of Lo Increible property, and from local cooperatives (about 2%). The company continued its exploration efforts during the year and awaited approval of an environmental permit from the Government for its Las Cristinas property in Kilometro 88 in the State of Bolivar (Crystallex International Corp., 2006, p. 1, 6).

Late in 2005, Gold Fields Limited of South Africa announced that it was acquiring the Choco-10 multi-pit mine with potential for underground production in El Callao in the State of Bolivar through the acquisition of Bolivar Gold Corporation. The Choco-10 was a new gold mine that began production in August 2005 and had reserves of about 37,300 kg (reported as 1.2 million troy ounces) of gold. During the first quarter of 2006, production from Choco-10 was 787 kg; this production was lower than the company had anticipated. Gold Fields planned to make improvements to the carbon-in-leach plant to improve the metal recovery (Gold Fields Limited, 2006§).

Iron and Steel.—Venezuela's production of crude steel was 4.9 million metric tons (Mt), which was a 7% increase compared with that of 2004. Production during the year was from the private sector with the Government holding a minority interest in SIDOR C.A., which was the country's leading producer. In September, the President of Venezuela announced that the Government would renationalize SIDOR if the company did not agree to produce seamless pipes, which were used by the petroleum industry and were costing Venezuela $1 billion per year to acquire (Diario Exterior, 2005§).

Industrial Minerals

Cement.—In June, the Venezuelan National Assembly approved the construction of a cement plant in the municipality of Piar in the State of Monagas. The plant, which was a joint venture between C.V.G. (51%) and the Iranian company Ehdasse Sanat Corporation, was under the umbrella of the technical cooperation agreement between the two countries, which was signed in March. The estimated cost for the construction of

the plant, which would have a production capacity of 1 million metric tons per year (Mt/yr) and was scheduled to begin production in 4 years, was $196 million (Asamblea Nacional de la República Bolivariana de Venezuela, 2005§; Radio Nacional de Venezuela, 2005§).

Mineral Fuels

Coal.—For years, the Government had plans to increase its coal production capacity significantly. However, production increases for the past 5 years were modest. One of the largest increases was expected to come from the Socuy project in the State of Zulia. Another project was the smaller Cosila project. During the year, some progress was made on Socuy's development. Early in 2005, the project was among a number of bilateral agreements signed between the Governments of Brazil and Venezuela. The Socuy agreement followed the signing (in 2004) of a memorandum of understanding (MOU) between the Government-owned company Corporación de Desarrollo de la Región Zuliana and Brazil's Companhia Vale do Río Doce for exploration of the Socuy project. Environmental impact studies for the project were completed and production would begin at 500,000 metric tons per year (t/yr) of coal with proposed expansion to 10 Mt/yr. By yearend, however, the Government of Venezuela had nót given permission for the project to proceed. Socuy's reserves were 1.38 billion metric tons of coal, of which 375 Mt could be produced by open pit and 756 Mt could be produced by underground mining (Soberanía, 2006§).

Excel Coal Limited, through its subsidiary Excelven S.A., which owned a 31% equity interest in the Cosila coal project in the State of Zulia, increased its interest in the project to 49% and acquired the export facilities in the Port of Palmarejo from Tomen America. The $40 million project, which was scheduled to begin operation in 2006, was expected to produce 2 Mt/yr of coal for 15 years. The export facility at Palmarejo was expected to be expanded to 5 Mt/yr from 1 Mt/yr (Excel Coal Limited, 2006).

Opposition to Venezuela's coal expansion was evident in 2005 when a group of indigenous people and their supporters protested coal mining activity in the Sierra de Pejira in the State of Zulia (Venezuelan Views, News and Analysis, 2005§). Nonetheless, another coal mine was being developed in the State of Anzoategui. The Naricual coal underground mine, which had been a producer in the 1980s, was scheduled to reopen at yearend 2006. Carbones Nueva Naricual C.A. (a company that was owned by Chilean investors) won the bid to open two of the nine lots that were open for bid (Pastora 1 and Pastora 2). Plans called for production to begin at a rate of 500,000 t/yr, with the possibility of expansion to 1.2 Mt/yr in 2008 or 2009. The mine has reserves of 15 Mt of coal (CoalTrans International, 2006; El Tiempo, 2007§).

Natural Gas.—Despite changes to the private participation petroleum sector during the year, the Government of Venezuela proceeded with the plan to increase the production of nonassociated offshore gas through the Rafael Urdaneta project production bids. The project, which covers 29 blocks, of which 18 are located in the Gulf of Venezuela and 11 are located in the State of Falcon, cover an area of 30,000 km^2. The first phase of the project would grant six blocks (five exploration blocks and one development block). The terms of the licenses would be 30 years for exploration and production with Government participation of up to 35% through PDVSA. The companies would have to pay 20% in royalties and 34% in income tax. The first priority for the Government was to reduce the gas deficit in Venezuela's supply to cover its demand. The companies, though, could begin exporting their excess gas production in 2008, with approval from the Government. In August, the Government announced that it had received the bids for phase A of the project. In September, it announced that bids were made for three of the six blocks. Grazprom of Russia won the right to operate the Urumaco I and Urumaco II blocks for $15.2 million and $24.8 million, respectively. Chevron Corp. bid $5.6 million for Cardón III. The second phase of the project, which comprises four blocks outside of the Gulf of Venezuela, would be put up for bid next (Petróleos de Venezuela, S.A., 2005a§; b§).

Petroleum.—At yearend, the Government of Venezuela announced that it had agreed with the Government of Brazil to build a $2.5 billion crude oil refinery in northwest Brazil to process Venezuelan heavy crude and Brazilian offshore crude. Construction of the 200,000-bbl/d refinery would begin in 2008, and the refinery was scheduled to come onstream in 2011. This would be the first refinery built in Brazil in 30 years (Embassy of the Bolivarian Republic of Venezuela in the UK, 2005c§, d§).

Infrastructure

At yearend, the Governments of Argentina, Brazil, and Venezuela signed an MOU to build a 6,000-kilometer (km) natural gas pipeline that would carry Venezuelan natural gas to the south and would connect to Rio de Janeiro and Buenos Aires, with connections to other existing pipelines. The pipeline, which would cost an estimated $17 billion to $20 billion, would take 5 to 7 years to complete. Planning for the project, which was still in the early stages, would begin with a proposal in 2006 (Platts, 2006§).

Outlook

Venezuela's real GDP is expected to continue to grow in 2006 and 2007, although at a slower rate than in 2005. Projections called for a 7.5% increase in 2006 and a 3.7% increase in 2007 (International Monetary Fund, 2006b§).

In 2005, the Government expressed its intention to reform its mining legislation. One of the possibilities was to convert the mining concessions to operating contracts or joint ventures with the state company C.V.G. (Behre Dolbear, 2006). This would be consistent with the changes made to the petroleum sector in 2005 and could impact mineral output and development significantly. The country has a number of plans regarding the mining, basic industries, and petroleum sectors. The new plans and proposed legislation are geared toward the integration of the Caribbean, Central American, and South American economies and policies. A significant part of the plan would involve the construction of infrastructure to deliver oil and natural gas throughout the region. Because Venezuela has the largest

reserves of crude petroleum in the region, such integration would give the country a significant advantage in marketing petroleum and natural gas in the region in the long term.

Venezuela exports a large portion of its iron ore and iron and steel intermediate products and it imports a large percentage of its consumption of finished steel products. As a result, the Government announced its intention to construct a 1.5-Mt-capacity steel company that will produce finished products mainly for the infrastructure, naval, and oil and gas sectors. A feasibility study for the steel complex was scheduled to begin in 2006 and would be a small part of the $3 billion that C.V.G. was planning to invest in 2006 (Ministerio de Industrias Básicas y Minería, 2005; Panorama, 2005§).

Venezuela plans to increase its production of crude petroleum to 5.8 million barrels per day (Mbbl/d), of which 4.9 Mbbl/d was expected to be from PDVSA. The remainder is expected to come from joint ventures and association contracts. This would mean that PDVSA's participation in Venezuela's total output would be slightly less in 2012 than it was in 2005 (69% of total production) (Petróleos de Venezuela S.A, 2005c).

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TABLE 1
VENEZUELA: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity		2001	2002	2003	2004	2005
METALS						
Aluminum:						
Alumina		1,833	1,901	1,882	1,900	1,920 e
Bauxite		4,585	5,191	5,446	5,842	5,900 e
Metal, primary, unalloyed	metric tons	570,580	605,290	601,290	623,540	615,070
Gold, mine output, Au content	kilograms	9,076	9,465	8,190	9,690	10,000 e
Iron and steel:						
Iron ore and concentrate, gross weight		16,902	16,684	17,954	19,196	20,000 e
Iron ore and concentrate, metal content		10,817	11,092	11,936	12,669	13,200 e
Metal, direct-reduced iron		5,903	6,824	6,645	6,800	8,900
Ferroalloys:						
Ferromanganese		12,715	--	--	--	--
Ferronickel		32,300	51,700	57,300	58,000 r, e	56,300 e
Silicomanganese		56,640	36,794	30,632	30,000 e	30,000 e
Ferrosilicon[2]		46,236	99,576	90,543	92,000 r, r	92,000
Total		147,891	188,070	178,475	180,000	178,000
Steel, crude		3,814	4,164	3,930	4,575	4,907
Semimanufactures, hot-rolled		2,797	3,000	2,900	3,400	3,500
Lead, secondary, refined[e]	metric tons	30,000	30,000	30,000	30,000	30,000
Nickel:						
Mine output, Ni content	do.	13,600	18,600 r	20,700	20,468	20,000 e
Ferronickel, Ni content	do.	9,700	15,500 r	17,200	17,400 r	16,900
INDUSTRIAL MINERALS						
Amphibolite		14 r	19 r	4 r	-- r	--
Cement, hydraulic[e]		8,700	7,000	7,700	9,000	10,000
Clays, common		4,664	3,672	2,275	3,060	235
Diamond:						
Gem	carats	14,321	45,707	11,080	40,000 r, e	46,000 e
Industrial	do.	27,826 r	61,060	23,710	60,000 r, e	69,000 e
Total	do.	42,147	106,767	34,790	100,000 e	115,000 e
Feldspar		142	147	149	176	202
Gypsum		5	--	5 r	4 r	6
Lime[e]		400	400	400	400	400
Nitrogen, N content of ammonia		808	884 r	731 r	1,012	1,110 e
Phosphate rock:						
Gross weight		399	390 r	260	300	392
Content of P_2O_5		114	111	75	85	110
Pyrophyllite[e]		32	32	32	32	32
Salt, evaporated[e]	metric tons	500,000 r	500,000 r	500,000 r	500,000 r	500,000
Serpentinite, crushed[e]		550	550	550	550	550
Stone, sand and gravel:						
Stone:						
Dolomite		67 r	103 r	54 r	-- r	--
Granite		796	750 e	750 e	750 e	750 e
Limestone[3]		18,158	13,532 r	2,516 r	11,444 r	18,781
Sand and gravel		8,601	4,104 r	2,704 r	2,878	605
Silica sand[3]		627	878 r	625 r	943 r	207
Sulfur, petroleum byproduct		340 r	570 r	560 r, e	800 e	800 e
MINERAL FUELS AND RELATED MATERIALS						
Carbon black[e]		60	60	60	60	60
Coal, bituminous		7,685	8,097	7,034	8,107	8,200 e
Gas, natural:						
Gross	million cubic meters	62,941 r	61,982	61,027 r	67,000 e	67,000 e
Marketed	do.	35,347 r	33,124	30,875 r	34,000 e	34,000 e
Natural gas liquids:						
Natural gasoline	thousand 42-gallon barrels	11,284 r	11,847 r	9,232 e	10,100 e	10,100 e
Liquid petroleum gas	do.	53,696 r	53,411 r	43,915 e	48,300 e	48,300 e
Total	do.	64,980 r	65,258	53,147 e	58,400 e	58,400 e

See footnotes at end of table.

TABLE 1--Continued
VENEZUELA: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity		2001	2002	2003	2004	2005
MINERAL FUELS AND RELATED MATERIALS--Continued						
Petroleum:						
Crude[4]	thousand 42-gallon barrels	1,219,746 r	1,092,806 r	1,025,508 r	1,100,000 e	1,110,000 e
Refinery products:						
Liquefied petroleum gas	do.	4,931	4,395 r	5,355 r	5,500 e	5,500 e
Gasoline, motor	do.	74,128	64,386 r	52,374 r	75,000 e	75,000 e
Naphtha and other gasolines	do.	63,601	52,027 r	40,157 r	60,000 e	60,000 e
Jet fuel	do.	32,233	29,784 r	25,955 r	30,000 e	30,000 e
Kerosene	do.	157	77 r	117 r	120 e	120 e
Distillate fuel oil	do.	110,642	96,725 r	96,108 r	100,000 e	100,000 e
Lubricants	do.	1,814	1,467 r	1,142 r	1,200 e	1,200 e
Residual fuel oil	do.	92,914	84,479 r	85,052 r	80,000 e	80,000 e
Asphalt	do.	11,581	10,012 r	5,402 r	5,500 e	5,500 e
Petroleum coke	do.	11,362	12,279 r	9,994 r	10,000 e	10,000 e
Parafins	do.	150	1,288 r	241 r	250 e	250 e
For internal consumption	do.	28,010	28,258 r	24,809 r	30,000 e	30,000 e
Unspecified	do.	1,447	1,124 r	2,124 r	1,000 e	1,000 e
Gains and losses	do.	-3,409	38,460 r	41,468 r	1,930 e	1,930 e
Total[5]	do.	429,561	424,761 r	390,298 r	400,500 e	400,500 e

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

[1]Table includes data available through December 31, 2005.

[2]Production of 75% silicon-content ferrosilicon.

[3]Excludes production under contract with the Government.

[4]Includes condensate and bitumen for the production of Orimulsión.

[5]Excludes byproduct sulfur, which is reported in the industrial minerals portion of this table, but includes losses.

TABLE 2
VENEZUELA: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Alumina		C.V.G. Bauxilum C.A. (Corporación Venezolana de Guayana, 99%, and Alusuisse Lonza Holding, 1%)	Ciudad Guayana, Bolivar State	2,000.
Aluminum		C.V.G. Aluminio del Caroní, S.A. (Corporación Venezolana de Guayana, 82%, and Alcoa, 7.3%)	do.	210.
Do.		C.V.G. Venezolana de Aluminio C.A. (Corporación Venezolana de Guayana, 80%, and Showa Denko K.K., Kobe Steel Ltd., Sumitomo Chemical Co. Ltd., Mitsubishi Materials Corp., Mitsubishi Aluminum Co., and Marubeni Corp., 20%)	do.	430.
Bauxite		C.V.G. Bauxilum C.A. (Corporación Venezolana de Guayana, 100%)	Los Pijiguaos, Bolivar State	6,000.
Cement		CEMEX Venezuela, S.A. C.A. (Cementos Mexicanos S.A. de C.V., 100%)	Barquisimeto, Lara State; Maracaibo, Zulia State; Pertigalete, Anzoategui State; San Cristobal, Tachira State	4,600.
Do.		LaFarge Venezuela (Lafarge Group, France, 56.2%)	La Vega, Miranda State and San Cristobal, Tachira State	1,750.
Do.		Holcim (Venezuela) S.A. (Holcim Group, 50%)	Carupano, Sucre State; San Sebastian de los Reyes, Aragua State	2,200.
Do.		C.A. Fábrica Nacional de Cementos (Lafarge Group, France, 46.13%)	Palmira and Ocumare del Tuy, Miranda State	1,330.
Do.		Cementos Catatumbo (Lafarge Group, France, 23.32%)	Montellano, Zulia State	650.
Do.		Cemento Andino	Curcas, Trujillo State	560.
Coal		Carbones del Guasare, S.A. (Carbozulia S.A., 48.37%; Peabody Energy Corp., 25.17%; Anglo Coal, 25.17%)	Paso Diablo, Zulia State, Guasare coal basin	7,100.
Do.		Carbones de la Guajira, S.A. (InterAmerican Coal Holdings NV, 64%; and Carbozulia S.A., 36%)	Mina Norte and Cachiri, Zulia State, Guasare coal basin	1,500.
Ferronickel		Loma de Níquel C.A. (Anglo American plc, 91.4%)	Loma de Niquel, Aragua and Miranda States	18.
Ferrosilicon		Ferroatlántica de Venezuela, S.A. (Ferroatlántica S.L., 80%, and Corporación Venezolana de Guayana, 20%)	Ciudad Guayana, Bolivar State	80.
Gold	kilograms	Revemin (Crystallex de Venezuela C.A., 51%, and Corporación Venezolana de Guayana, 49%)	Remevin mill, El Callao, Bolivar State	1,500 mill.
Do.	do.	El Callao Mining Corp. (Crystallex de Venezuela C.A., 80%)	La Victoria (Lo Increible), El Callao, Bolivar State	1,700.
Do.	do.	Crystallex de Venezuela C.A. (Crystallex International Corp., 100%)	Tomi Mine, El Callao, Bolivar State	1,100.
Do.	do.	Minera Hecla Venezolana C.A. (Hecla Mining Inc.)	La Camorra, El Callao, Bolivar State	4,000.
Do.	do.	C.V.G. Compañía General de Minería C.A. (C.V.G. Ferrominera Orinoco C.A., 66.77%, and Corporación Venezolana de Guayana, 33.23%)	Colombia and Unión Mines and Caratal and El Peru plants, El Callao, Bolivar State	4,600 plant.
Do.	do.	Promotora Minera de Venezuela (Gold Fields Limited, 70%, and Ferrominera Orinoco C.A., 30%)	Choco 10, El Callao, Bolivar State	4,500.
Iron:				
Direct-reduced		Siderúrgica del Orinoco C.A. (Cosorcio Siderúrgico Amazonia Ltd., 70%, and Corporación Venezolana de Guayana, 30%)	Ciudad Guayana, Bolivar State	4,600.
Hot-briquetted		Complejo Siderúrgico de Guayana C.A. (Kobe Steel, 36.7%; C.V.G. Ferrominera, 17.4%; Tubos de Acero de México, S.A., 6.9%; Mitsui and Co. Ltd., Nissho Iwai Corp., Tomen Corp. and Shinsho Corp., 30.3%; International Finance Corp., 8.7%)	do.	1,000.
Do.		Orinoco Iron (International Briquettes Holding, 100%)	Puerto Ordaz, Bolivar State	2,200.
Do.		Venezolana de Prereducidos de Caroní (International Briquettes Holding, 100%)	do.	815.
Iron ore		C.V.G. Ferrominera Orinoco C.A. (Corporación Venezolana de Guayana, 100%)	Cerro San Isidro, Los Barrancos, and Las Pailas, Bolivar State	25,000.
Iron ore pellets		do.	Ciudad Guayana, Bolivar State	3,600.
Do.		Siderúrgica del Orinoco C.A. (Cosorcio Siderúrgico Amazonia Ltd., 70%, and Corporación Venezolana de Guayana, 30%)	do.	7,000.
Lime		C.V.G. Compañía Nacional de Cal (Corporación Venezolana de Guayana, 100%)	Plant at Cerro Penas Blancas, Anzoategui State	500.

TABLE 2--Continued
VENEZUELA: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Natural gas million cubic meters	Petróleos de Venezuela, S.A. (Government, 100%)	Processing plants in Anzoategui, Monagas, and Zulia States	25,000.
Nickel	Loma de Níquel C.A. (Anglo American plc, 91.4%)	Loma de Niquel, Aragua and Miranda States	22 mine.
Nitrogen content of ammonia	Fertilizantes Nitrogenados de Oriente S.A. (Pequiven, 35%; Koch Industries, 35%; Snamprogetti International S.A., 20%; Empresas Polar, 10%)	Jose, Anzoategui State	1,070.
Do.	Pequiven (Petróleos de Venezuela, S.A., 100%)	Petrochemical complexes in Zulia and Carabobo States	670.
Petroleum:			
Crude million 42-gallon barrels	Petróleos de Venezuela, S.A. (Government, 100%)	Fields in Anzoategui, Apure, Falcon, Guarico, Monagas, and Zulia States	1,393.
Crude, synthetic[1] do.	Petrozuata (Conoco Inc., 50.1%, and Petróleos de Venezuela, S.A., 49.9%)	Jose Industrial Complex, Anzoategui State	40.
Do. do.	Cerro Negro (Exxon Mobil Corp., 41.665%; Petróleos de Venezuela, S.A., 41.665%; Veba Oil & Gas, 16.67%)	do.	40.
Do. do.	SINCOR (Total S.A., 47%; Petróleos de Venezuela, S.A., 38%, and Statoil ASA., 15%)	do.	67.
Refinery products do.	Petróleos de Venezuela, S.A. (Government, 100%)	Refineries in Amuay and Cardon, Falcon State; Puerto La Cruz and San Roque, Anzoategui State; El Palito, Carabobo State; Bajo Grande, Zulia State	475.
Steel	Sidor C.A. (Amazonia Consortium, 70%; Corporación Venezolana de Guayana, 20.4%; employees, 9.6%)	Ciudad Guayana, Bolivar State	4,000.
Do.	Siderúrgica del Turbio C.A. (Siderúrgica Venezolana Sivensa S.A., 100%)	Antimano, Miranda State; Barquisimento, Lara State; Casima, Bolivar State	840.
Sulfur	Petróleos de Venezuela, S.A. (Government, 100%)	Refineries in Amuay and Cardon, Falcon State; El Palito, Carabobo State; San Roque, Anzoatequi State	422.
Do.	Petrozuata (Conoco Inc., 50.1%, and Petróleos de Venezuela, S.A., 49.9%)	Jose Industrial Complex, Anzoategui State	53.

[1]Extra-heavy crude processing, assumed 330 days per year of operation.

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