THE MINERAL INDUSTRIES OF

PARAGUAY AND URUGUAY

By Pablo Velasco

Paraguay

The Republic of Paraguay in central South America has an area of about 406,750 square kilometers (km^2). In July 2000, the area supported a population of 5,585,828 the gross domestic product (GDP) per capita was $3,650, and the GDP was $19.9 billion based on the 1999 purchasing power parity (1999 estimates).

Paraguay's economy has had significant problems in the past, but the latest signs have been of a recovery, albeit a modest one. Paraguay had a market economy marked by a large informal sector. The informal sector features reexport of imported consumer goods to neighboring countries, as well as the activities of thousands of microenterprices and urban street vendors. Because of the importance of the informal sector, accurate economic measures are difficult to obtain. A large percentage of the population derived their living from agricultural activity often on a subsistence basis. The formal economy grew by an average of about 3% per year during the past 6 years, although the GDP declined slightly in 1998 and 1999. On a per capita basis, real income has stagnated at 1980 levels (U.S. Central Intelligence Agency, 2000, Paraguay—Economy overview, World Factbook 2000, accessed April 26, 2001, at URL http://www.odci.gov/cia/publications/factbook/geos/pa.html).

The country had one of the highest hydroelectric power potentials per person in the world, and its major hydroelectric powerplants more than satisfied the country's demand for electricity. Paraguay and Brazil shared the world's largest hydroelectric facility, Itaipu, with an installed capacity of 12,600 megawatts (MW). A second dam, Yacyreta, which was a joint project with Argentina, produced below capacity in 1999. When fully functioning, Yacyreta will have an installed capacity of 3,200 MW. Paraguay was the lowest cost provider of electricity in South America. Electrical coverage has also improved in recent years and was more than 70% nationwide in 1999. According to the Administración Nacional de Electricidad, which is the state electricity company, 51% of all households had access to electricity. Coverage was highest in the central region (which includes Asunción, the capital) where the rate was 81% and lowest in the rural region of Cazapa where it was only 17.5%. Paraguay is part of the Southern Cone and was a member of Mercado Común del Cono Sur [Southern Cone Common Market (Mercosur)]. Mercosur has reemerged after its decline following Brazil's January 1999 currency devaluation. Paraguay has no known oil or natural gas reserves but was a major producer and exporter of hydroelectric power. The economic recovery of Paraguay's neighbors (Argentina and Brazil) had positive implications for the Paraguayan economy, which has improved since 1999.

Paraguay imported crude and refined petroleum in roughly equal quantities. In 2000, Paraguay imported oil from Algeria because the lighter crude was better suited to Paraguay's refinery. In recent years in an attempt to reduce transportation costs, more oil has been coming from Argentina's Palmar Largo field in Formosa Province, which is close to the Paraguayan border, purchased by Petroleos Paraguayos, which is the state oil refinery. Exploration by local and U.S. companies continued, encouraged by the discovery of substantial deposits in Formosa Province, and by explorations in the Bolivian Chaco. (U.S. Energy Information Administration, June 2000, Paraguay—Background, Country Analysis Briefs, accessed May 2, 2001, at URL http://www.eia.doe.gov/emeu/cabs/paraguay.html).

The economy of Paraguay was dependent on exports of cattle, cotton, soybeans, timber, sugarcane, and yerba mate. The mineral industry of Paraguay accounted for less than 1% of its GDP and was concentrated in the manufacture of cement and the extraction of industrial minerals. Mineral-related activities included production of pig iron and steel, petroleum refining, all of which were derived from imported raw material. Cement demand was expected to remain stable during the next few years, and the local producer, which was state-owned Industria Nacional del Cemento, hoped to continue development of its capacity, thus taking it close to the 1-million-metric-ton (Mt) mark by 2001. The company ran three small plants with a total cement capacity of 675,000 metric tons per year (t/yr)—a clinker production plant at Itapucumi, a clinker grinding unit at Villeta, and the integrated plant of Puerto Vallemi. In mid-1999, the Government announced that Paraguay's state- owned companies should be privatized by the end of 2001 in the hope that this would facilitate the recovery of the economy. Privatization of Paraguay's cement industry should create buyer interest in the regional cement community, and a sale was expected by early 2002 depending upon how the 2000 first-round privatization program proceeds (International Cement Review, 2000a). The country was almost self-sufficient in cement but sporadically imported some from Argentina and Brazil. In total, annual imports of cement probably fluctuate from around 20,000 to 50,000 metric tons (t).

Yamana Resources Inc. announced that its joint venture partner in Paraguay Newmont Overseas Exploration Ltd., which was a wholly owned subsidiary of Newmont Mining Corp., will begin drilling on or about February 5, 2001, on the first of six high-priority "alkalic-type" gold targets to be tested by a planned 2,650-meter core drilling program. The six drilling targets occurs in a 3- by 9-kilometer (km) structural belt southeast of the capital Asuncion. Four targets are in the Sapucai alkaline igneous rock complex that had been identified by Yamana as a Cripple Creek-type gold environment; the other

two are in the similar but largely covered Guazu Cua Complex about 7 km away. This was a pioneering discovery, the first-ever bedrock gold in Paraguay's history. Newmont Overseas Exploration Ltd., became Yamana's joint venture partner in Paraguay and completed extensive regional and detailed geophysical, geochemical, and geologic surveys and expanded the mineral land holding to 120,856 hectares. Newmont's geophysical surveys suggested that the underlying intrusives are locally rich in sulfide minerals, and its geochemical soil surveys showed strong gold and fluorine anomalies clustered above these buried sulfide zones. Newmont believed these anomalies may represent leakage upward through the cracked and broken cover rocks from gold-rich Cripple Creek-type breccia bodies at depth. The 2000 drilling program will examine these targets (Yamana Resources Inc., 2001).

Uruguay

The Republic of Uruguay, which is located in southern South America and borders the South Atlantic Ocean between Argentina and Brazil, has an area of about 176,220 square kilometers (km^2). In July 2000, the population was 3,334,074, the GDP per capita was $8,500, and the GDP was $28 billion based on a 1999 purchasing power parity (1999 estimates) (U.S. Central Intelligence Agency, 2000, Uruguay—Economy overview, World Factbook 2000, accessed April 26, 2001, at URL http://www.odci.gov/cia/publications/factbook/geos/uy.html).

The Uruguayan economy is gradually emerging from the recession in 1999 and 2000; it grew by about 3% per year on average during the 1990's. In 1999 and 2000, however, the economy was affected by a number of adverse shocks that included the devaluation of the Brazilian real, a drop in terms of trade, a drought, and concerns about the stalled recovery and uncertainties in Argentina. Real output contracted by 3.2% in 1999 and a further 1.3% in 2000 through September. The unemployment rate increased to 14.4% in November 2000 from 11.4% at the end of 1999 (Traa and others, 2000).

Almost all economic sectors were hit by the crisis. Given recent export growth, the Government and the International Monetary Fund expected a 2% growth in GDP for 2000. Uruguay's inflation rate decreased to 4.2% in 1999 from 130% in 1990. The Government projected a 4% to 6% inflation rate for 2000.

In 2000, exports increased by a modest 2.5% to $2.3 billion, and imports (f.o.b.) rose by 1.8% to $3.4 billion. Traditionally, a substantial percentage of Uruguay's trade has been with neighboring Argentina and Brazil, and this increased even more with integration into Mercosur. Trade with Mercosur partners, which included Argentina, Brazil, and Paraguay, accounted for more than 80% of Uruguay's overall trade. The United States was the fourth largest exporter to Uruguay after Brazil, Argentina, and the European Union. Mercosur faced several problems in late 1998 and early 1999 that affected the trade flows among its partners—the devaluation of Brazil's real, lack of effective macroeconomic coordination in Mercosur, political problems in Paraguay, and the imposition of trade-restrictive measures in Argentina and Brazil. In the long run, however, membership in Mercosur has benefitted Uruguay. Exports to Mercosur partners ($95 million) have grown to 45% of total exports, and imports from Mercosur partners ($1.46 billion) remained a stable 43% of total imports. Since 1992, Uruguay's trade with Mercosur countries has doubled, and trade with the United States has grown by 56% (U.S. Embassy, Montevideo, Uruguay, 1999).

The Uruguayan mining sector has traditionally been based on the exploitation of nonmetallic minerals for the construction industry, the glass and ceramics industries, and other industrial applications. The following commodities are important: clay, bentonite, broken stone, dolomite, feldspar, gravel, gypsum, limestone, pebbles, quartz, sand, and talc. Ornamental rocks, such as flagstone, granite, and marble, also were exploited, as were semiprecious stones such as agate and amethyst, for jewelry. More than 350 ongoing mining projects that operated with these minerals were small scale.

In the last few years, the Uruguayan mining scene has started to change with the revival of minerals prospecting and exploitation that had been idle for many years. In 1999, diamond exploration was added to this list. The country has opened its doors to foreign investment as a result of changes in national legislation that have improved the business environment. Mining output, which accounted for only 0.2% of the GDP, has grown at a yearly rate of almost 4% during the last 5 years. In 1998, a gold mine and a cement plant began production.

Crystallex International Corporation was a gold mining and exploration company. In 2000, its operating revenue increased by 33% to $32.1 million from $24.2 million reported for 1999. Its operating costs were $20.5 million in 2000 compared with $13.3 million in 1999. The increase was due to the acquisition and expansion of the San Gregorio Mine and modifications to the sag milling process in Uruguay. The average grade processed at the San Gregorio Mine was 2.2 grams per metric ton of gold, although the mine accounted for 75% of the company's gold production in 2000. In early 2000, the annual shutdown of the mine was extended by an additional 2 weeks to allow most of the mine's workforce to take their annual vacations, thus virtually eliminating the need for vacation replacements throughout the remainder of the year. The mine shutdown, while decreasing operating costs, also provided the opportunity to reduce the mine's stockpile of lower grade ore by an additional 50,000 t. Even with the extended mine shutdown and processing of lower grade ore, gold production for the first quarter of 2000 was 18,006 ounces [560 kilograms (kg)] at a cost of approximately $210 per ounce; this compared with 20,000 ounces (622 kg) in the prior year's first quarter at a cost of $207 per ounce. During the quarter, the company implemented an oxygenation project at the mine that would accelerate the dissolution of gold in cyanide by increasing the level of dissolved oxygen in the leach tanks. By April 2000, the project had increased gold recovery to 94% from 92.5%. This was a significant improvement, and the current (1999) plan called for a sustained recovery at the 94% level. Improvements in the sag mill circuit that were designed to increase mill throughput also yielded good results (Crystallex International Corporation, 2001).

Crystallex agreed to form a joint venture with Toronto-based Southern Era Resources Ltd. Corporation to explore for

diamonds. Crystallex has the right to earn a 50% interest in the joint venture for the ongoing diamond exploration and development of their respective concession areas. Crystallex will be the manager and operator of the joint venture, and Southern Era will market any diamond production by the venture (Mining Journal, 1999).

The country must rely heavily on imports to meet its energy needs. More than 50% of total energy consumption came from imported oil. The possibility of building more hydroelectric dams is limited because of the large number of dams already on Uruguay's rivers. Integration, especially of the region's energy sectors, was on the rise throughout the region. For these reasons, the country was planning to change its energy outlook and balance radically. The use of natural gas was to be increased greatly as part of a wider regional trend and was to be used in homes, as well as for thermal generation in existing or new powerplants (U.S. Energy Information Administration, February 2000, Uruguay—Energy, Country Analysis Briefs, accessed March 28, 2000, at URL http://www.eia.doe.gov/emeu/cabs/uruguay.html).

Because Uruguay has no known oil resources, it must import 38,000 barrels per day (bbl/d) of crude to met demand. La Administración Nacional de Combustibles, Alcohol y Portland (ANCAP) is the state cement and oil company. It owned Uruguay's only refinery, the 37,000-bbl/d La Teja refinery in Montevideo (U.S. Energy Information Administration, February 2000, Uruguay—Oil, Country Analysis Briefs, accessed March 28, 2000, at URL http://www.eia.doe.gov/emeu/cabs/uruguay.html).

The first natural gas pipeline to connect Argentina and Uruguay was inaugurated in late 1998 and runs, from Entre Rios, Argentina, to Paysandu, western Uruguay; this 19.3-km pipeline cost $8 million. Construction on the Cruz del Sur pipeline from Buenos Aires to Montevideo began in mid-1999. This 214-km pipeline was expected to cost $135 million and to carry as much as 15 million cubic meters per day of gas. The gas will be supplied from fields in the western Neuquén and the southern Austral Basins of Argentina (U.S. Energy Information Administration, February 2000, Uruguay—Gas, Country Analysis Briefs, accessed March 28, 2000, at URL http://www.eia.doe.gov/emeu/cabs/uruguay.html).

The production of minerals for the construction industry has been economically significant in Uruguay. Among these materials, limestone, which is used in the manufacture of portland cement, has vast possibilities for export growth. In 2000, Uruguayan output of limestone was 1.5 Mt; this was an increase of 2% compared with that of 1999. In 2000, cement production decreased to 700,000 t; this was a decrease of (2.9%) compared with that of 1999. In 1999, Loma Negra, which was a Argentinian cement producer that bordered Uruguay to the south and west, formed a new company Cementos del Plata. This company sold most of its production to ANCAP and some for domestic consumption in Argentina. In addition, Loma Negra provided technical assistance to other two cement plants in Uruguay and planned to build a new cement plant as a joint venture with these Uruguayan companies. Uruguay continued to export cement into Argentina, but this trade has been declining rather than increasing, and more emphasis was expected to be placed on the domestic market in 2001. Uruguay has three cement companies with a combined capacity of about 1.02 Mt. The largest company was ANCAP (510 t/yr, two plants Minas and Paysandú) and was followed by Compañia Uruguaya de Cemento Portland (450 t/yr, two plants Verdum and Sayago) and Compañia Nacional de Cementos (55 t/yr, one plant at Maldonado) (International Cement Review, 2000b).

References Cited

Crystallex International Corporation, 2001, Crystallex reports earnings for fourth quarter and fiscal year 2000: Vancouver, Crystallex International Corporation news release, April 23, 4 p.

International Cement Review, 2000a, Paraguay, *in* Global cement report (5th ed.): International Cement Review, p. 224.

———2000b, Uruguay, *in* Global Cement Report (5th ed.): International Cement Review, p. 303.

Mining Journal, 1999, Uruguay: Mining Journal [London], v. 333, no. 6597, September, 3, p. 134.

Traa, Bob, Braumann, Benedikt, Honjo, Keito, and Jaramillo, J.C., 2000, Uruguay—Recent economic developments: Washington, International Monetary Fund Country Report No. 01/47, February 1, 109 p.

U.S. Embassy, 1999, Montevideo, Uruguay—Major trends and outlook—Mercosur Integration: U.S. Embassy Montevideo, Uruguay, Country Commercial Guide Fiscal Year 2000, p. 7.

Yamana Resources Inc., 2001, Newmont to drill Yamana's gold targets in Paraguay: Canada, Yamana Resources Inc. news release, February 5, 2 p.

Major Source of Information

Ministerio de Industria-Energia y Mineria (M.I.E.M.)
Direccion Nacional de Mineria y Geologia (DINAMIGE)
Hervidero 2861, Montevideo, Uruguay
Telephone: (598-2) 200-1951
Fax: (598-2) 209-4905

TABLE 1
PARAGUAY AND URUGUAY: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Country and commodity		1996	1997	1998	1999	2000 e/
PARAGUAY 3/						
Cement, hydraulic	thousand tons	675	675	620 r/	640 r/	650
Clays: e/						
Kaolin		66,500 4/	66,700	66,700	66,600	66,500
Other	thousand tons	1,900	2,000	2,000	2,000	2,000
Gypsum e/		4,500	4,500	4,500	4,300	4,400
Iron and steel:						
Pig iron		103,562	78,615	79,000 e/	79,000 e/	79,000
Steel, crude		95,543	65,542	56,243	70,000 e/	68,000
Lime e/		100,000	100,000	100,000	100,000	90,000
Petroleum, refinery products: e/						
Liquefied petroleum gas	thousand 42-gallon barrels	7 4/	7	10	10	10
Gasoline	do.	223 4/	255	250	250	250
Jet fuel	do.	-- 4/	71	110	100	100
Kerosene	do.	52 4/	50	50	50	50
Distillate fuel oil	do.	526 4/	593	600	600	600
Residual fuel oil	do.	354 4/	422	450	450	450
Unspecified	do.	29 4/	35	35	37	37
Total	do.	1,191 4/	1,430 r/	1,510 r/	1,500 r/	1,500
Pigments, mineral, natural, ocher e/		300	300	300	300	300
Sand, including glass sand e/		7,000	10,000	10,000	10,000	10,000
Stone: e/						
Dimension	thousand tons	70	70	70	70	70
Crushed and brokened:						
Limestone (cement and lime)	do.	600	600	600	600	600
Marble	do.	750	750	750	750	750
Other	do.	2,000	2,000	2,000	2,000	2,000
Talc, soapstone, pryophyllite e/		200	200	200	200	200
URUGUAY						
Aluminum, secondary e/		45	45	45	45	45
Barite		15 e/	40	65	144 e/	140
Bentonite		58	60	60 e/	55 e/	60
Cement, hydraulic		685,000	781,000	750,000 r/	720,000 r/	700,000 4/
Clays, unspecified		40,796	59,434	41,371	38,192	39,000
Coke, gashouse e/		8,000	6,000	6,000	5,000	5,000
Feldspar		2,100	3,229	2,240	1,556	1,600
Gemstones, semiprecious:						
Agate		154	74	270	362 e/	360
Amethyst		67	49	48	45 e/	50
Gold	kilograms	1,000	2,177	1,985	2,400 e/	2,300
Gypsum		130,175	942,755	1,123,376	1,049,597	1,040,000
Iron and steel:						
Iron ore		845	5,527	8,618	3,837	4,000
Metal:						
Ferroalloys, electric furnace ferrosilicon crust e/		200	200	200	200	200
Steel, crude		33,555	39,070	51,000 e/	50,000 e/	49,000
Semimanufactures		28,376	35,120	47,000 e/	48,000 e/	48,000
Lime e/		12,000	12,000	10,000	10,000	10,000
Petroleum, refinery products: e/						
Liquefied petroleum gas	thousand 42-gallon barrels	427 4/	400	425	395	400
Gasoline	do.	2,099 4/	2,250	2,100	2,150	2,200
Kerosene	do.	617 4/	460	500	525	500
Distillate fuel oil	do.	4,500 4/	3,100	4,200	4,150	4,100
Residual fuel oil	do.	3,964 4/	3,450	3,600	3,620	3,600
Unspecified	do.	288 4/	240	260	280	280
Total	do.	11,895 4/	9,900	11,100	11,100	11,100
Sand and gravel:						
Sand, common	thousand tons	1,775	2,135	2,753	2,506	2,500
Gravel	do.	17,700	40,109	40,192	49,887	49,000

See footnotes at end of table.

TABLE 1--Continued
PARAGUAY AND URUGUAY: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Country and commodity		1996	1997	1998	1999	2000 e/
URUGUAY--Continued						
Stone:						
Flagstone		3,795	4,502	4,000	4,100 e/	4,000
Granite:						
Dimension		7,552	77,281	22,955	6,397	6,400
Crushed and brokened		389,000	418,200	450,000 e/	440,000 e/	400,000
Dolomite		21,930	21,847	17,440	8,439	8,500
Limestone	thousand tons	789	1,240	1,523	1,471	1,500
Marble, in blocks and broken:						
Onyx		39	123	100 e/	119 e/	115
Traventine		10	11	11 e/	15 e/	15
Other, unspecified		134	141	340	192 e/	190
Marl		23,909	44,775	68,810	33,387	35,000
Quartz		23	49	52	260 e/	250
Other, including ballast	thousand tons	2,104	2,852	2,690 e/	2,500 e/	2,400
Sulfir, elemental, byproduct e/		2,000	2,000	2,874	3,119	3,000
Talc, soapstone, pyrophyllite		898	1,133	972	2,905	2,900
Tuff, tufa		975,929	691,151	865,860	800,000 e/	800,000

e/ Estimated. r/ Revised. -- Zero.

1/ Includes data available through April 2001.

2/ Estimated data are rounded to no more than three significant digits; may not add to totals shown.

3/ In addition to the commodities listed, construction materials (clays, miscellaneous rock, sand and weathered tuffs) were presumably produced. Available information is inadequate to make reliable estimates of output levels.

4/ Reported figure.