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The Mineral Industry of Botswana

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Production of gem-quality diamond continued to be the foundation of Botswana's economy. In 2006, Botswana was the world's leading producer of diamond (by value) and the world's second ranked producer of diamond (in terms of volume) after the Russian Federation. The country's nickel production accounted for about 2% of world production. Copper, gold, and soda ash production also had significant, though smaller, roles in the national economy.

Minerals in the National Economy

In 2006, mining accounted for about 16% of Botswana's real gross domestic product, and about 50% of Government revenues were derived from mining and mineral-processing activity. About 14,575 people were employed in the mining industry. During the 2006-07 financial year, mineral revenues were about 13% higher than for the previous period. The increase in revenue was attributable to high sales volume during the year. The sources of mineral revenue in 2006 were diamond dividends, 75%; diamond royalties, 21.6%; and other sources, 3.4%. The Government concluded negotiations with De Beers SA to renew for an additional 25 years the mining leases for three of the four diamond mines operated by Debswana Mining Corp. All the country's rough-diamond output was either through Debswana Mining or through Tswapong Mining Co. (Pty.) Ltd. (Department of Mines, 2006).

Botswana's ninth national development plan and long-term goals to sustain economic growth include the promotion of value-added processing of the country's minerals and other natural resources. Also included is a commitment to expand downstream activities through the processing of a proportion of locally mined rough diamond output by domestic gem-cutting and polishing firms (Mining Magazine, 2006).

In 2006, the nominal value (in U.S. dollars) of minerals produced in Botswana exceeded that of 2005 by about 40%. Much of the increase was attributable to higher international mineral prices. Diamond, copper-nickel matte, and gold, in order of value, accounted for most of the increase (Bank of Botswana, 2006).

Production

In 2006, diamond production totaled about 34.3 million carats and production of semiprecious stones totaled 65,000 kilograms (kg). (The semiprecious stones were mainly varieties of agate and carnelian and production was not reported separately.) Total matte production was 64,368 metric tons (t) that contained 26,762 t of nickel, 24,555 t of copper, and 303 t of cobalt. Salt production declined to 151,595 t owing to some flooding in the pans, and soda ash production of 255,677 t was 9% lower than the previous year. Coal production totaled 962,427 t. In 2006, 80 companies extracted a total of 5,945 million cubic meters of clay, crushed stone, gravel, and sand compared with 3,006 million cubic meters in 2005. Consumption of these materials depended on construction industry activities. Although Botswana is endowed with other minerals, exploration for these other minerals was difficult to accomplish because a major portion of the country's geology is poorly exposed. Exploration is done mainly by geophysical analysis (Department of Mines, 2006).

Structure of the Mineral Industry

The Government maintained an equity position in most of the major mining companies, but the industry operated mostly on a privately owned free-market basis. Debswana Mining was the major diamond producer; Tati Nickel Mining Co. (Pty.) Ltd. (a subsidiary of LionOre Mining International Ltd. of Canada) produced copper and nickel; Monarch Goldfields Botswana (Pty.) Ltd. produced gold; and Botswana Ash (Pty.) Ltd. produced salt and soda ash. In addition to these major operations, a number of medium- and small-scale mines produced agates, aggregates, clay, and dimension stone. Information was not readily available for these operations. Major commodities and the companies that produced them are listed in table 2.

Commodity Review

Metals

Copper and Nickel.—In eastern Botswana, about 200 kilometers (km) south of Francistown, the smelter operated by Bamangwato Concessions Ltd. (BCL) of Botswana processed copper-nickel concentrate from its Selebi-Phikwe Mines. Under an agreement signed in 2001 by Centametall AG of Switzerland and Falconbridge International Ltd. of Barbados, BCL also toll-smelted concentrate from the Phoenix open pit mine, which was operated by Tati Nickel Mining. During 2006, BCL and Tati Nickel Mining produced 64,638 t of nickel-copper-cobalt matte. Centametall and Falconbridge shipped the nickel matte to the Falconbridge Nikkelverk, AS refinery in Norway and to RioZim Ltd.'s Eiffel Flats refinery in Zimbabwe (Department of Mines, 2006).

Several copper and nickel exploration projects were underway. African Copper plc had two copper projects: the Dukwe and the Matsitama deposits. Dukwe contains a near-production copper deposit and several exploration targets. The Government granted African Copper a mining license for the Dukwe project in 2006, which allowed the company to begin construction of the mine. The copper deposit had been traced by drilling and surface sampling for a total strike length of 4,370 meters (m), of which the central 2,000-m section was being considered for selective underground mining. Production at the mine was planned to begin in 2008. The Matsitama deposit covers 4,000 square kilometers (km^2) of prospective terrain and has four large mineralized areas containing a number of promising copper anomalies (Wright Reports, 2006).

As noted above, Tati Nickel Mining operated the Phoenix open pit mine and the Selkirk underground mine in the Francistown area. Phoenix is a magmatic sulfide deposit hosted by a meta-gabbroic intrusion. Mineralization is a series of stacked subparallel, subhorizontal discontinuous massive sulfide lenses. Mineralogically, the ore is, on average, 70% pyrrhotite, 20% pentlandite, and 10% chalcopyrite. The grade of the massive sulfides can be as high as 8% nickel. The Selkirk Mine was closed in 2002, but was reopened in 2006 to allow pillar extraction and underground exploration of the ore body. Pillar extraction was expected to be completed in 2007 (LionOre Mining International Ltd., 2006).

Gold.—Iamgold Corp. of Canada acquired the Mupane gold mine from Gallery Gold plc in March 2006. The Mupane Mine, which was an open pit operation, was located about 30 km southwest of Francistown. In 2006, ore was sourced from the Tau open pit and from several small pits. Ore was processed in a 1-Mt/yr carbon-in-leach plant; a flotation circuit was commissioned in early 2006 to treat sulfides in the ore. Production from Mupane in 2006 was 2,325 kg. Exploration at Mupane was continuing to develop resources; increased resource estimates of the various prospects being investigated included the Molomolo and the Tekwane areas southeast of the mine (Iamgold Corp., 2006).

Industrial Minerals

Diamond.—Botswana is a participant in the Kimberley Process, which is an association of Governments of diamond producing and importing countries, commercial diamond firms, pan-industry associations, and nongovernmental organizations, that have implemented a certification system for the international trade of rough diamond. The Kimberley Process is designed to prevent so-called "blood" or "conflict" diamond from being shipped through legitimate trading channels.

Debswana (a 50-50 joint partnership of Swiss-based De Beers Centenary AG and the Government) accounted for most of the diamond production in Botswana from four mines—the Damtshaa, the Jwaneng, the Letlhakane, and the Orapa. The open pits are medium-scale to very large-scale operations. The concentrate from the Damtshaa, the Letlhakane, and the Orapa Mines goes to a multistory Complete Automated Recovery Plant (CARP) at Orapa, and the concentrate from the Jwaneng Mine to a similar facility on site. The Jwaneng CARP is part of the Aquarium project, which has a Fully Integrated Sort House to handle all diamond recovered by both CARPs. The Aquarium project is a fully hands-off recovery and sorting facility that uses x-ray and laser technology (SPG Media plc, 2006).

Debswana broke its own diamond production record in 2006 by producing about 34.3 million carats. Debswana's diamond production included 17.3 million carats from the Orapa Mine, 15.6 million carats from the Jwaneng Mine, 1.1 million carats from the Letlhakane Mine, and 228,000 carats from the Damtshaa Mine. The Jwaneng Mine was the world's leading producer by value, and the Orapa Mine was the world's leading producer by volume (Debswana Diamond Co. (Pty.) Ltd., 2006b).

De Beers and the Government agreed that some of De Beer's Diamond Trading Company's (DTC) operations would move from London, United Kingdom, to Gaborone, Botswana. Local marketing of domestically produced gemstones was expected to help the local diamond cutting and polishing companies. The joint venture of the Government and DTC would sort and value all the diamond production of Debswana. In 2006, Botswana had only four diamond manufacturers, all sightholders of the DTC. The number of manufacturers could increase, however, as more diamond becomes available for cutting and polishing. More major diamond sorting operations were moving to Botswana (Jewellery News Asia, 2006).

Numerous other companies were exploring for diamond in Botswana. Active exploration operations included Firestone Diamonds plc, which was the leading holder of diamond exploration rights with 17,000 km^2 in the Jwaneng and the Orapa areas; Gcwihaba Resources (Pty.) Ltd. (a subsidiary of Tsodilo Resources Ltd.); Helio Resources Corp.; and the joint venture of Rio Tinto Mining and Exploration Ltd. and Trivalence Mining Corp.

Mineral Fuels

Coal.—Coal resources in the eastern part of Botswana have been estimated to total 17 billion metric tons. The quality of the coal was suitable for power generation. Botswana coal forms part of the Permian Gondwana coals that occur in the Karoo Basins of southern Africa, which developed during late Carboniferous to early Jurassic times. The Karoo basins host all coal deposits in the region. In Botswana, coal occurs in sedimentary rocks that form part of the volcanic and sedimentary deposits assigned to the Karoo Supergroup and largely occur in the centrally located Kalahari Karoo Basin that also extends into southeastern Namibia and western Zimbabwe (Department of Geological Survey, 2006).

Anglo American Corp. operated the Morupule Colliery at Palapye. Much of the company's coal production was sold to the adjacent Morupule Power Station of Botswana Power Corp. Moruple Colliery signed a contract with a South African company to construct a wash plant to produce washed coal. Construction was initiated at yearend 2006 and was expected to be completed by yearend 2007. Morupule's sale of graded coal was expected to more than double once the wash plant is in operation (Debswana Diamond Co. (Pty.) Ltd., 2006a).

Outlook

International interest in exploration for diamond and base and precious metals is expected to continue. The country's favorable geologic environment, mineral investment climate, low tax rates, and political stability are expected to continue to make Botswana a foreign mineral investment magnet. The Government encourages mineral value-added processing, but the paucity of water in landlocked Botswana has deterred large-scale industrial development. The country's small domestic market, the cost of transportation to ports in South Africa, and the rampant Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome (HIV/AIDS) epidemic also limit the nation's attractiveness to investment by foreign manufacturers. High fuel costs would likely continue to affect

the cost of transportation of Botswana's imports and exports adversely.

Revenues from diamond operations are expected to continue to be the mainstay of the country's economy for the foreseeable future. Copper, gold, nickel, and soda ash production and processing also are expected to continue to be notable factors in the country's economy.

Given the country's extensive coal resources and projected regional power demand, Botswana has the potential to develop and support a small-scale coal-bed methane industry and additional coal-fueled electricity-generating plants that could supply power to the South African Power Pool through its land lines to South Africa.

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TABLE 1
BOTSWANA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2002	2003	2004	2005	2006
Clay[e]		50,000	50,000	50,000	50,000	50,000
Coal, bituminous		953,081	822,780	913,087	984,876	962,427
Cobalt, smelter output, Co content of matte[3, 4]		269	294	223	326	303
Copper:						
Mine output, Cu content of ore milled[e]		27,750	31,380	29,460	31,300	24,300
Smelter output, matte, gross weight[3]		56,625	51,983	54,448	68,637	65,000 [e]
Smelter output, Cu content of matte[3, 4]		21,590	24,292	21,195	26,704	24,255
Diamond[5]	thousand carats	28,397	30,412	31,125	31,890	34,293
Gemstones, semiprecious[6]	kilograms	127,000	102,000	99,000	165,000	65,000
Gold[7]	do.	8	9	161	2,709	3,020
Nickel:						
Mine output, Ni content of ore milled		28,600 [e]	38,230	35,163	39,305	38,000 [e]
Smelter output, matte, gross weight[3]		56,625	51,983	54,448	68,637	64,368
Smelter output, Ni content of matte[4]		23,896	27,400	22,292	28,212	26,762
Salt[8]		315,259	229,432	208,319	243,945	151,595
Sand and gravel[9]	thousand cubic meters	2,401	1,485	2,330	1,906 [r]	4,812
Soda ash, natural		283,197	309,350	263,358	279,085	255,677
Stone, crushed	thousand cubic meters	1,201	1,060	1,219	1,100	1,134

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

[1]Table includes data available through October 31, 2007.

[2]In addition to commodities listed, platinum, palladium, and silver were produced, and exported in the nickel-copper-cobalt matte; copper and nickel cathodes also were produced at a pilot plant, but information was inadequate to estimate output.

[3]Smelter product was granulated nickel-copper-cobalt matte.

[4]Included some product from direct smelting of ore; that is, ore not reported as milled.

[5]Assumed to contain about 70% gem and near gem.

[6]Principally agate. Reported as sales.

[7]Reported as bullion; historically included silver estimated to be about 2%. Includes artisanal production.

[8]Byproduct of natural soda ash production.

[9]Includes clay (for brick and tile).

TABLE 2
BOTSWANA: STRUCTURE OF THE MINERAL INDUSTRY IN 2006

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Clay[1]		Lobatse Clay Works (Pty.) Ltd. (Botswana Development Corp. and Interkiln Corp. joint venture)	Lobatse, 70 kilometers south-southwest of Gaborone	50,000.[e]
Do.		Makoro Brick and Tile (Pty.) Ltd.	Makoro, 10 kilometers south of Palapye	20,000.[e]
Coal		Morupule Colliery (Pty) Ltd. (Anglo American Corp. of South Africa Ltd. and related firms, 93.3%)	Morupule, 270 kilometers north-west of Gaborone	1,000,000.
Diamond	thousand carats	Debswana Diamond Co. (Pty.) Ltd. (Government, 50%, and De Beers Centenary AG, 50%)	Jwaneng Mine, 115 kilometers west of Gaborone	12,000.
Do.	do.	do.	Orapa Mine, 375 kilometers north of Gaborone	13,000.
Do.	do.	do.	Letlhakane Mine, 350 kilometers north of Gaborone	1,000.
Do.	do.	do.	Damtshaa Mine (opened late 2002)	670.
Do.	do.	Tswapong Mining Co. (Pty.) Ltd. (De Beers Prospecting Botswana Ltd., 85%, and Government, 15%)	Tswapong Mine, 275 kilometers northeast of Gaborone	3.
Gemstones, semiprecious	kilograms	Agate Botswana (Pty.) Ltd.	Processing plant at Pilane, 45 kilometers north of Gaborone	60,000.
Gold	do.	Iamgold Corp.	Mupane Mine, near Francistown	3,100.
Nickel-copper-cobalt		Bamangwato Concessions Ltd. (BCL), (Government, 15%, and Botswana RST Ltd., 85%, of which LionOre Mining International Ltd., 12.65%)	Selebi-Phikwe Mines, 350 kilometers northeast of Gaborone	3,000,000 ore matte content (of which 30,000 nickel, 25,000 copper, 400 cobalt).
Do.		Tati Nickel Mining Co. (Pty.) Ltd. (LionOre Mining International Ltd., 85%, and Government, 15%)	Phoenix and Selkirk Mines, 23 kilometers east of Francistown	3,600,000 ore matte content (of which 15,000 nickel, 9,000 copper, 100 cobalt, 960 kilograms palladium, 145 kilograms platinum).
Do.		Masa Precious Stones (Pty.) Ltd.	Bobonong, east of Selebi-Phikwe	4,000.
Salt		Botswana Ash (Pty.) Ltd. (Government, 50%, and Anglo American plc, 50%)	Sua Pan, 450 kilometers north of Gaborone	650,000.
Soda ash		do.	do.	300,000.

[e]Estimated.
[1]For brick and tiles.