

# THE MINERAL INDUSTRY OF BOTSWANA

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The Republic of Botswana is a landlocked nation in southern Africa surrounded by Namibia to the west, South Africa to the east and south, and Zambia and Zimbabwe to the north. It covers an area of 600,379 square kilometers and supported a population of 1.56 million in 2003. The gross domestic product (GDP) based on purchasing power parity was estimated to be \$14.2 billion<sup>1</sup> in 2004 with an estimated real growth rate of 7.2% and a 9.2% rate of inflation. The per capita GDP based on purchasing power parity was estimated to be \$9,000. The per capita GDP level was one of the highest in Africa and placed Botswana in the category of middle-income countries. The mining sector was dominated by diamond production, which continued to be the mainstay of the economy; it accounted for about 36% of the GDP and about 50% of Government revenues. The minerals industry employed more than 13,000 workers, of which about 50% were in mining and quarrying. Botswana was the world's leading producer of diamond by value. Copper, nickel, and soda ash production also played significant though smaller roles in the national economy (Bank of Botswana, 2004§<sup>2</sup>; U.S. Central Intelligence Agency, 2004§).

The value of all merchandise export trade for 2003 was \$3.04 billion, of which diamond accounted for \$2.48 billion; copper and nickel matte, \$154 million; and soda ash, \$47 million. The values of coal and salt production were \$5.2 million and \$8 million, respectively. The value of all merchandise imports for 2003 was \$2.39 billion, which gave a positive balance of payments of \$645 million. Fuel imports amounted to \$167 million, and metal and metal products, \$184 million.

For the major commodities, the value of production was approximately equal to the value of mineral exports. Mineral production statistics are listed in table 1.

## Commodity Review

**Coal.**—Debswana Diamond Company (pty.) Ltd., which was a 50-50 joint partnership of De Beers Centenary AG and the Government, operated the Moropule Colliery, which supplied coal to Bamangwatu Concessions Ltd.'s (BCL) copper-nickel mine, the Sua Pan soda ash operation, and the Moropule Power Station. The Moropule coalfield contains more than 5 billion metric tons of reserves. During 2003, 822,780 metric tons (t) of coal was mined, and 824,160 t was sold [Debswana Diamond Co. (Pty.) Ltd., 2004§].

**Copper and Nickel.**—The copper and nickel industry was controlled by BCL and Tati Nickel Mining Co. (Proprietary) Ltd. (a subsidiary of LionOre Mining International Ltd. of Canada). The Government retained a 35% minority interest in BCL and a

15% interest in Tati. During 2003, Tati's Phoenix Mine extracted 2.93 million metric tons (Mt) of ore at an average grade of 0.60% nickel. The concentrator treated 3.07 Mt at a grade of 0.63% to yield 11,509 t of nickel and 8,141 t of copper contained in 280,746 t of concentrates. Tati expected to reach its full capacity of 3.6 Mt of ore during 2004. Tati concentrates were sent to the nearby BCL smelter for treatment. The BCL smelter closure for 6 weeks during February and March 2003 forced Tati to stockpile concentrates. By yearend, however, all stockpiled material had been treated at BCL or other facilities. BCL also planned a major smelter shutdown during June and July 2004 for refurbishment of its boiler, flash furnace and electric furnaces, and precipitators.

LionOre committed \$10 million to set up a pilot plant at Tati during 2004 to test its proprietary Activox process for the hydrometallurgical oxidation of sulfide minerals, which it felt would increase recoveries of copper, nickel, and platinum-group elements. The Activox process is a combination of fine grinding followed by pressure oxidation under mild conditions. As of December 31, 2003, mineral resources at the Phoenix Mine were reported to be 145 Mt at grades of 0.29% nickel and 0.17% copper, of which reserves were estimated to be 37.6 Mt at grades of 0.55% nickel and 0.34% copper (LionOre Mining International Ltd., 2004§). During 2003, BCL treated 2.68 Mt of ore at average grades of 0.75% nickel and 0.80% copper from its mining operations at Selebi Phikwe. The finished matte product at BCL contained 27,400 t of nickel and 24,289 t of copper, which were sent for refining in Norway and Zimbabwe.

**Diamond.**—Debswana accounted for all diamond production from its four mines. During 2003, Debswana treated 30.2 million Mt of ore to yield 30.4 million carats, which was up 10% from 2002. The Orapa Mine reached full production with an output of 16.3 million carats following its 2002 expansion. At the Jwaneng Mine, 8.9 Mt of ore was treated to yield 12.8 million carats of salable diamond. Jwaneng was the richest diamond mine in the world by value. In its first full year of production, the Damtshaa Mine produced 292,000 carats, which was 17% higher than planned. The Letlhakane Mine produced 1,061,000 carats during the year. Despite the increase in production and sales, domestic revenues declined by 6% to \$2.1 billion as the pula strengthened by 25% against the dollar [De Beers Consolidated Mines Ltd., 2004§; Debswana Diamond Co. (Proprietary) Ltd., 2004§].

**Gold.**—Gallery Gold Limited of Australia, in which Lion Selection Group Limited of Australia held a 43% interest, was developing the Mupane gold deposit, which is located about 30 kilometers (km) southwest of Francistown. The \$28 million Mupane gold project was expected to be commissioned in October 2004. Mupane will recover 3,100 kilograms per year of gold from the processing of 1 million metric tons per year (Mt/yr) of ore. The project was based on a mineral resource estimated as of June 30, 2004, to be 13.34 Mt at a grade of 3.17 grams per metric ton gold. The resource contained a total of 42,270 kilograms (kg) of gold, of which more than 20,400 kg was classified as reserves (Lion Selection Group Limited, 2004§).

<sup>1</sup>Where necessary, values have been converted from the Botswana pula (P) to U.S. dollars (US\$) at the rate of P5.00=US\$1.00 for 2003, P6.238=US\$1.00 for 2002, and P5.814=US\$1.00 for 2001.

<sup>2</sup>References that include a section mark (§) are found in the Internet References Cited section.

**Salt and Soda Ash.**—Botswana Ash Proprietary Ltd. (Botash) operated a brine mining and treatment facility at Sua Pan, which is located 173 km northwest of Francistown. Botash increased production of soda ash to 309,350 t of soda ash, which was a 61% increase compared with flood-impacted 2000. Salt production declined by 30% to 190,000 t in 2003. Botash pumped salt brines from nearly 100 wells to nearby large evaporation ponds at a rate of about 2,400 cubic meters per hour. More than 300 metric tons per day of carbon dioxide recovered from an associated coal cogeneration plant was used in carbonation of the brines to produce the soda ash. Finished products were railed to Francistown for shipment to markets in South Africa, Zambia, and Zimbabwe.

### Outlook

Revenues from diamond mining and cutting are expected to continue to be the mainstay of the economy for the foreseeable future; Debswana's identified diamond resources will be sufficient to maintain 2003 production levels for at least 25 to 30 years. Nickel and copper, which were jointly mined, earned the second largest amount of foreign exchange. Although they have a more-limited life, they should continue to provide approximately 25,000 to 30,000 metric tons per year of nickel until 2011. The end-of-life of the BCL operations at Pikwe-Selebi was expected in 2011, and that of the Tati operations, in 2017 at the earliest. The country's favorable geologic environment, mineral investment climate, low tax rates, and political stability are expected to continue to make Botswana a target for foreign mineral investment. Exploration was ongoing for diamond and base and precious metals. The continued appreciation of the pula against the dollar could be a negative factor in terms of dollar-denominated commodity sales bringing in less local currency to meet domestic operating costs.

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### Major Sources of Information

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### Major Publications

- Carney, J.M., Aldiss, D.T., and Lock, N.P., 1994, The geology of Botswana: Gaborone, Botswana, Geology Survey Department, 113 p.
- Department of Mines, Republic of Botswana, Gaborone, Annual report.
- Department of Mines, Republic of Botswana [undated], Mineral development and investment opportunities: Gaborone, 10 p.

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

(Metric tons unless otherwise specified)

Commodity <sup>2</sup>	1999	2000	2001	2002	2003	
Coal, bituminous	945,316	946,900	930,374	953,081	822,780	
Cobalt, smelter output, Co content of matte <sup>3,4</sup>	331	308	325	269	281	
Copper:						
Mine output, Cu content of ore milled <sup>e</sup>	37,604 <sup>5</sup>	34,600 <sup>r</sup>	26,700 <sup>r</sup>	27,750 <sup>r</sup>	30,400 <sup>e</sup>	
Smelter output, matte, gross weight <sup>3</sup>	60,500	48,420	50,999	56,625	59,250	
Smelter output, Cu content of matte <sup>3,4</sup>	20,960	18,722	19,209	21,590	24,289	
Diamond <sup>6</sup>	thousand carats	22,898	24,635	26,416	28,397	30,400
Gemstones, semiprecious <sup>7</sup>	kilograms	84,000	80,000 <sup>e</sup>	76,000	127,000	102,000
Gold <sup>8</sup>	do.	2	4	2	8	8
Nickel:						
Mine output, Ni content of ore milled	37,605 <sup>r</sup>	38,420 <sup>r</sup>	26,700 <sup>r,e</sup>	28,600 <sup>r,e</sup>	32,740 <sup>e</sup>	
Smelter output, matte, gross weight <sup>3</sup>	60,500	48,420	50,999	56,625	59,250	
Smelter output, Ni content of matte <sup>4</sup>	22,898	21,446	22,454	23,896	25,018	
Salt <sup>9</sup>	233,069	184,753	178,646	315,259	190,000	
Sand and gravel	thousand cubic meters	1,466	1,070	2,141	3,602	2,529
Soda ash, natural	233,643	191,043	251,231	283,197	309,350	

<sup>e</sup>Estimated. <sup>r</sup>Revised.

<sup>1</sup>Table includes data available through October 2004.

<sup>2</sup>In addition to commodities listed, clay (for brick and tile), and silver were produced, but information was inadequate to estimate output.

<sup>3</sup>Smelter product was granulated nickel-copper-cobalt matte.

<sup>4</sup>Included some product from direct smelting ore; that is, ore not reported as milled.

<sup>5</sup>Reported figure.

<sup>6</sup>Assumed to contain about 70% gem and near gem.

<sup>7</sup>Principally agate. Reported as sales.

<sup>8</sup>Reported as bullion; historically included silver estimated to be about 2%.

<sup>9</sup>Byproduct of natural soda ash production.

Source: U.S. Geological Survey Minerals Questionnaires completed by Botswana Department of Mines.

TABLE 2  
BOTSWANA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Metric tons contained product unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Clay <sup>1</sup>		Lobatse Clay Works (Proprietary) Ltd. (Botswana Development Corp. and Interkiln Corp. joint venture)	Lobatse, 70 kilometers southwest of Gaborone	50,000. <sup>c</sup>
Do.		Makoro Brick and Tile (Proprietary) Ltd.	Makoro, 10 kilometers south of Palapye	20,000. <sup>c</sup>
Coal		Morupule Colliery (Proprietary) Ltd. (Anglo American Corp. of South Africa Ltd. and related firms, 93.3%)	Morupule, 270 kilometers northwest 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.	Lethakane Mine, 350 kilometers north of Gaborone	1,000.
Do.	do.	do.	Damtshaa Mine (opened late 2002)	670.
Do.	do.	Tswapong Mining Co. (Proprietary) Ltd. (De Beers Prospecting Botswana Ltd., 85%, and Government, 15%)	Tswapong Mine, 275 kilometers northeast of Gaborone	3.
Gemstones, semiprecious	kilograms	Agate Botswana (Proprietary) Ltd.	Processing plant at Pilane, 45 kilometers north of Gaborone	60,000.
Gold	kilograms	Gallery Gold	Mupane Mine	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 20,000 nickel, 20,000 copper, 40 cobalt).
Do.		Tati Nickel Mining Co. (Proprietary) Ltd. (LionOre Mining International Ltd., 85%, and Government, 15%)	Phoenix Mine, 23 kilometers east of Francistown	3,600,000 ore matte content (of which 15,000 nickel, 9,000 copper, 60 cobalt, 960 kilograms palladium, 145 kilograms platinum).
Do.	do.	Masa Precious Stones (Proprietary) Ltd.	Bobonong, east of Selebi-Phikwe	4,000.
Salt		Botswana Ash (Proprietary) Ltd. (Government, 50%, and Anglo American plc, 50%)	Sua Pan, 450 kilometers north of Gaborone	650,000.
Soda ash		do.	do.	300,000.

<sup>c</sup>Estimated.

<sup>1</sup>For brick and tiles.