

# 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 1.6 million in 2001. The diamond sector, which continued to be the mainstay of the economy, accounted for about 35% of the gross domestic product, 45% of Government revenues, and 85% of export earnings. Botswana was the world's largest producer of diamond by value. Copper, nickel, and soda ash production also played significant though smaller roles in the national economy. The mining and quarrying sector accounted for 8,300 jobs, or about 3% of the total formal sector workforce in 2001 (International Monetary Fund, 2002<sup>1</sup>).

The value of mineral production in 2001 was approximately \$2.21 billion, of which diamond accounted for \$1.94 billion, or 88%; copper-nickel-cobalt for \$234 million; and soda ash for \$40 million. The value of coal and salt production is about \$12 million. For the major commodities, the value of production was approximately equal to the value of mineral exports. Diamond production increased by 13% between 1999 and 2001 to more than 26 million carats because of the new Orapa Mine expansion, which came onstream in May 2000. During this period, copper and nickel smelter production declined by 8% and 2%, respectively, affected chiefly by weak global demand and prices. Demand for most metals is typically cyclical and follows global business and economic cycles.

HIV/AIDS remained a major economic, health, and social problem for Botswana. At the end of 2001, Botswana had the highest infection rate in the world; 38.8% of adults between 15 and 49 years of age was infected by the disease, with 26,000 AIDS deaths in 2001. HIV/AIDS was having an increasing impact on overall economic growth and on agricultural and industrial productivity with 18% of the workforce expected to be lost to AIDS by 2005 and more than 30%, by 2020 (Joint United Nations Programme on HIV/AIDS, 2002§).

## Government Policies and Programs

The Ministry of Minerals, Energy and Water Affairs has responsibility for coordinating development and operational activities in the energy, minerals, and water sectors. Specific program responsibilities are carried out by Ministry departments, which include Geological Survey Mineral Promotion, Mines and Water Affairs, and two parastatal organizations, Botswana Power Corp. and the Water Utilities Corp. Mining was governed by the Mines and Minerals Act No. 17 of July 1999, which was designed to promote new foreign investment in exploration and mine development. The new Act continues to vest all mineral rights in the State but has

introduced a new "Retention License" that guarantees security of tenure from exploration to development but allows a company to retain its rights for a 3-year period, renewable once for not more than 3 years if then-current market conditions are not favorable to exploit the deposit. The Act sets out guidelines for prospecting and mining licenses, environmental protection measures, royalties, and mining taxation. The Government retains an option to acquire up to a 15% interest in new ventures on commercial terms, thus abolishing its previous free equity participation (News Africa.com, 2001§). Oil and gas exploration and development is governed by the Petroleum (Exploration and Production) Act of May 1983. Investment in diamond mining is subject to a negotiated agreement with the Government. The Precious and Semi-precious Stones (Protection) Act of 1969 provides for the protection of the precious stones industry and regulates dealings in precious stones and semiprecious stones.

## Structure of the Minerals Industry

The Government maintained an equity position in most of the major mining companies, but the industry was operated, for the most part, on a privately owned, free market basis. In a 50-50 joint partnership with De Beers Centenary AG, Government-owned Debswana Diamond Co. (Proprietary) Ltd., which was the country's largest mining company, Anglo American plc of the United Kingdom and Government held equity positions in several other major mining companies, which included the nickel-copper-cobalt producers Bamangwato Concessions Ltd. (BCL) (Government 35%; Anglo American, 23%) and Tati Nickel Mining Co. (Pty.) Ltd. (Anglo American, 43.35%; LionOre Mining International Ltd. of Canada, 41.65%; Government, 15%) and the soda ash company Botswana Ash (Pty.) Ltd. (Government, 50%; Anglo American, 21%). In June 2000, AngloAmerican sold its interest in Morupule Colliery (Proprietary) Ltd., which was the country's only coal mine, for \$2.8 million to Debswana, which then had a 93% controlling interest in Morupule. In addition to these major operations, the mining industry consisted of a number of medium- and small-scale mines that produced agate, aggregates, brickmaking clay, gold, and dimension stone.

## Commodity Review

### Metals

**Cobalt, Copper, and Nickel.**—BCL owned and operated the Phikwe, Selebi, and Selebi North cobalt-copper-nickel mines and a smelter at Selebi-Phikwe about 350 kilometers (km) northeast of the capital of Gaborone. In addition to treating its own ore, BCL toll-smelted concentrate and ore for Tati Nickel. During 2001, BCL produced 14,900 metric tons (t) of copper

<sup>1</sup>A reference that includes a section twist (§) is found in the Internet References Cited section.

and 12,600 t of nickel metal contained in concentrates; thus was down from 16,300 t of copper and 13,400 t of nickel in concentrates in 2000. High costs and weak metal prices led the Government to commission a strategic review of BCL's operations in December 2001. The report will be due in March 2002 and will make recommendations on the future directions of BCL, which had sufficient remaining resources to remain open until 2010 (Murray, 2002). Reserves and resources as of yearend 2001 at BCL, prorated from Anglo American's 23% share, totaled 29.1 million metric tons (Mt) of proved and probable reserves at a grade of 0.87% copper and 0.76% nickel plus additional measured and indicated resources estimated to be 30.4 Mt at a grade of 0.74% copper and 0.62% nickel (Anglo American plc, 2002§).

Tati Nickel Mining Company (Pty.) Ltd. (Tati) operated the Phoenix open pit nickel-copper mine, the Selkirk underground mine, and a magnetic separator plant near Francistown. During 2001 production at the Selkirk Mine was reduced to one-half capacity at 30,000 metric tons per year (t/yr) of ore feed as the deposit neared depletion. The mine was scheduled to be closed by mid-2002. The Phoenix Mine and dry magnetic separation plant treated 1.7 million metric tons per year (Mt/yr) of ore to produce 120,000 t/yr of nickel concentrates for direct smelting at the nearby BCL smelter. Construction of the \$66 million Phoenix expansion project began in early 2001 and was expected to be completed by mid-2002. The project involved development of the infrastructure needed to bring in the electric power and water needed to support a conventional flotation and concentration plant and doubling of mine capacity to 3.6 Mt/yr of ore feed. LionOre was also pilot testing its new proprietary Activox process for the hydrometallurgical oxidation of sulfide minerals which it felt would increase recoveries of copper, nickel, and platinum-group elements at Tati. The Activox process was a combination of fine grinding followed by pressure oxidation under mild conditions. Tati Nickel produced 6,304 t of nickel, 2,157 t of copper, 26 t of cobalt, and 4.4 kilograms (kg) of gold in 2001, all of which were significantly lower than those of 2002 as the Selkirk operation began to phase out. During 2001, the Phoenix Mine produced 124,564 t of concentrates at a grade of 5.91% nickel and 1.67% copper, and the Selkirk Mine delivered 31,341 t of ore at a grade of 2.6% nickel and 1.42% copper. The company also received byproduct credits for gold, palladium, platinum, and silver. As of December 31, 2001, mineral resources, almost entirely in the Phoenix open pit, were reported to be 165.6 Mt at a grade of 0.29% nickel and 0.20% copper, of which the mineral reserve component was 46.6 Mt at a grade of 0.56% nickel and 0.34% copper (LionOre Mining International Ltd., 2002§).

**Gold.**—Gallery Gold Limited of Australia, in which Lion Selection Group Limited of Australia held a 43% interest, held a significant land position in the Vumba and Tati greenstone Belts in eastern Botswana. Although the Mupane Gold deposit, which is located about 30 km southwest of Francistown, was its most advanced prospect, Gallery was also exploring the Tekwane area, near the Selkirk Mine, for platinum and nickel and for kimberlite pipes in the region. A positive prefeasibility study on the Mupane gold deposit was completed in early 2002. Capital costs for the development of the Mupane gold project were estimated to be \$25 million. The study proposed two open pits at Kwen and Tau with additional mill feed coming from the

nearby Signal Hill gold deposit. The study proposed two plant sizes of 750,000 t/yr of ore feed and one treating 1 Mt/yr. Gold recovery would range from 3,110 to 3,732 kilograms per year of gold depending on mill size. Ore reserve drilling was completed in September 2001, with results expected by December 2002. Gallery anticipated that reserves would be about 21,800 kg of gold and was continuing exploration to identify an additional 6,200 kg of gold resources. The final feasibility study was expected to be completed by March 2003 with the first gold pour anticipated by July 2004 (Lion Selection Group Limited, 2002§).

Another Australian junior Tawana Resources NL, which was evaluating the alluvial deposit at Somerset, which is located in the Vumba Greenstone belt near Francistown. Studies indicate a total mineral resource containing 1 Mt of superficial gravel. Tawana are carrying out several bulk samples to obtain an overall grade for the deposit. Previous workings reported an average grade of 2.85 grams per metric (g/t) of gold. Extensions of the Kraaipan Greenstone belt into southern Botswana from South Africa remain the focus of exploration by Ashanti Goldfields Corp. (MBendi Information Services (Pty) Ltd., 2002§).

### **Industrial Minerals**

**Diamond.**—The major news of the year involved the delisting of De Beers Centenary AG (De Beers) in June from the Johannesburg Stock Exchange and its conversion to a privately owned company in a transaction valued at \$19 billion. The restructured De Beers was owned by DB Investments (45%) (an Oppenheimer family consortium), Anglo American (45%), and the Government of Botswana (10%) (Namibia Economist, 2001§). During 2001, Debswana recovered 13,056,000 carats at an average value of \$110 per carat from the Orapa Mine, 12,339,000 carats of diamond at an average value of \$50 per carat from the Jwaneng Mine, 1,021,000 carats at an average value of \$180 per carat from the Letlhakane Mine (Terraconsult, 2002§). Sales of diamond from mine production and stocks declined slightly to 25,244 carats in 2001 compared with 25,737 carats in 2000. Production was sold through the De Beers Diamond Trading Company (formerly the Central Selling Organization). Debswana owned subsidiaries for diamond sorting and valuation (Botswana Diamond Valuing Co.) and for value-added cutting and polishing diamond (Teemane Manufacturing Co.). Diamond production will level off at between 26 million and 27 million carats per year after the full commissioning of Debswana's new Damtshaa Mine. The \$38 million project will begin production in October 2002 with full production of around 700,000 carats per year of diamonds expected by March 2003. At the current design rate of 200 metric tons per hour of ore treated, the Damtshaa project life expectancy could be 32 years (Debswana Diamond Company, 2001§).

De Beers held a 60% interest in the Botswana Gope Exploration Company that discovered diamond at Gope in the Central Kalahari Game Reserve during the late 1990s. De Beers, which has abundant diamond resources in its other Botswana properties, placed the project on hold pending public discussion on the aboriginal rights of local Bushmen tribesmen who live in the area and the environmental impact of mining in a game reserve (Mogapi, 2001§).

**Salt and Soda Ash.**—After having recovered from the disastrous floods, financial liquidation, and restructuring of the late 1990s, Botswana Ash (Botash) continued to operate its brine mining and treatment facility at Sua Pan, which is located 173 km northwest of Francistown. Recovering from the heavy rains of 2000, Botash increased production of soda ash by more than 31% to 251,231 t in 2001; production of salt declined to 178,646 t from 184,753 t in 2000. 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 (Tassel, 2002§).

In February 2001, the South Africa Competition Commission ruled in favor of Botash in a long standing trade dumping case against the America Natural Soda Ash Corp. (Ansac), which was a joint venture of a number of U.S. soda ash producers that were selling into the South Africa market. Botash claimed that Ansac was selling soda ash into South African markets below the price charged to U.S. consumers and that this contributed to the financial liquidation of its predecessor company in 1995. Ansac will appeal the ruling (Cohen, 2001§).

### **Mineral Fuels**

**Coal.**—Morupule Colliery had a production capacity of about 1 Mt/yr. Between 1998 and 2001, it operated at a fairly consistent rate of 93% to 94% of capacity. Most of its output fed the nearby Botswana Power Corp. thermal powerplant at Morupule, which supplied more than 50% of Botswana's electricity requirements, or about 1,060 kilowatthours of energy. Other customers included the nickel and soda ash companies. The coal that was extracted underground from a 12-foot seam by using mechanized room-and-pillar-mining was sent to the surface on shuttle cars on an inclined ramp and was then conveyed to the Morupule powerplant. Reserves in the Morupule field were estimated to be 8 billion metric tons of steam coal with 18% to 24% ash and a calorific value of 23 to 25 megajoules per kilogram (Ministry of Minerals, Energy and Water Affairs, 1999§; Debswana Diamond Company, 2002§).

### **Infrastructure**

Transportation facilities were good on the eastern fringe of the country. The 850-km trans-Kalahari highway connected Gaborone, Botswana, to Gobabis, Namibia. Highways also connected landlocked Botswana with South Africa and Zimbabwe. A single-track railroad, which was operated by Botswana Railways, runs from north to south through the eastern part of the country and connects with the South African and the Zimbabwean rail systems. During 2001, additional investment on water and power infrastructure was made by Tati Nickel as part of its Phoenix Mine expansion.

### **Outlook**

Revenues from diamond mining and cutting are expected to continue to be the mainstay of the economy for the foreseeable future with Debswana's identified diamond resources sufficient

to maintain 2001 production levels for at least 25 to 30 years. Production of nickel and copper, which is the jointly mined commodities that earned the second largest amount of foreign exchange, have a more limited life and are expected to continue to be around 25,000 to 30,000 t/yr of nickel until the expected end-of-life of the BCL Ltd. operations at Pikwe-Selebi in 2011; the mine life of the Tati nickel operations is projected to last until at least 2017. The country's favorable geologic environment, mineral investment climate, political stability, and low tax rates are expected to continue to make Botswana a target for foreign mineral investment. Incentives provided in the new Mining Law of 1999 were aimed at helping the Government diversify the national economy and reduce its reliance on the diamond industry.

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## **Major Sources of Information**

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## **Major Publications**

Botswana Department of Mines:

Mineral Development and Investment Opportunities

Annual Report

Carney, J.M., Aldiss, D.T., and Lock, N.P., 1994, The geology of Botswana: Gaborone, Botswana, Geology Survey Department, 113 p.

TABLE 1  
BOTSWANA: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/	1997	1998	1999	2000	2001
Coal, bituminous	776,920	928,100	945,316	946,900	930,374
Cobalt, smelter output, Co content of matte 3/ 4/	334	335	331	308	325
Copper:					
Mine output, Cu content of ore milled	22,840	25,043	37,604	22,218	20,355
Smelter output, Cu content of matte 3/ 4/	19,820	22,124	20,960	18,722	19,209
Diamond 5/                      thousand carats	20,111	19,772	22,898	24,635	26,416
Gemstones, semiprecious 6/                      kilograms	54,000	38,000 3/	84,000	80,000 e/	80,000 e/
Gold 7/                                      do.	28	1	2	4	2
Nickel:					
Mine output, Ni content of ore milled	19,860	21,700	33,733	20,286	18,585
Smelter output, matte:					
Gross weight 3/	50,570	56,732	60,500	48,420	50,999
Ni content 4/	20,157	22,851	22,898	21,446	22,454
Salt 8/	184,530	214,700	233,069	184,753	178,646
Sand, construction 9/                      cubic meters	110,000	90,000 e/	90,000	100,000 e/	150,000 e/
Soda ash, natural	199,990	189,700	233,643	191,043	251,231
Stone, crushed                      cubic meters	1,091,880	997,244	1,466,100	1,070,000	2,140,523

e/ Estimated.

1/ Table includes data available through October 2002.

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

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

4/ Included some product from direct smelting 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%.

8/ From natural soda ash production.

9/ Additional production of sand and gravel from small local operations was periodically reported, but information was inadequate to estimate output.

Source: U.S. Geological Survey Minerals Questionnaire for 2000-2001, prepared by Botswana Department of Mines.

TABLE 2  
BOTSWANA: STRUCTURE OF THE MINERAL INDUSTRY FOR 2001

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Clay 1/		Lobatse Clay Works (Proprietary) Ltd. (Botswana Development Corp. and Interkiln Corp. joint venture)	Lobatse, 70 kilometers south-southwest of Gaborone	50,000. e/
Do.		Makoro Brick and Tile (Proprietary) Ltd.	Makoro, 10 kilometers south of Palapye	20,000. e/
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.
Cobalt 2/		BCL Ltd., (Government, 15%; and Botswana RST Ltd., 85%, of which Anglo American plc, 12.65%)	Selebi-Phikwe, 350 kilometers northeast of Gaborone	500.
Copper 2/		do.	do.	26,000.
Copper ore		do.	do.	1,800,000.
Do.		Tati Nickel Mining Co. (Proprietary) Ltd. (Anglo American plc, 43.35%; LionOre Mining International Ltd., 41.65%; and Government, 15%)	Selkirk Mine, 23 kilometers east of Francistown and Phoenix Mine, near Francistown	1,560,000. 3/
Diamond	thousand carats	Debswana Diamond Co. (Proprietary) Ltd. (Government, 50%; 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 (opens 2003)	670.
Do.	do.	Tswapong Mining Co. (Proprietary) Ltd. (De Beers Prospecting Botswana Ltd., 85%, 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.
Do.	do.	Masa Precious Stones (Proprietary) Ltd.	Bobonong, east of Selebi-Phikwe	4,000.
Nickel 2/		BCL Ltd., (Government, 15%; Botswana RST Ltd., 85%)	Selebi-Phikwe, 350 kilometers northeast of Gaborone	23,000.
Nickel ore		do.	do.	1,800,000.
Do.	million metric tons	Tati Nickel Mining Co. (Proprietary) Ltd. (Anglo American plc, 43.35%; LionOre Mining International Ltd., 41.65%; and Government, 15%)	Phoenix open pit Mine (2003 expansion to 3.6 million metric tons of ore)	1.7 ore. 4/
Do.		do.	Selkirk UG Mine, Francistown (scheduled to close early 2002)	60,000. 5/
Salt		Botswana Ash (Proprietary) Ltd. (Government, 50%; Anglo American Corp. of South Africa Ltd., 50%)	Sua Pan, 450 kilometers north of Gaborone	650,000.
Soda ash		do.	do.	300,000.

e/ Estimated.

1/ For brick and tiles.

2/ In nickel-copper-cobalt smelter matte.

3/ Copper content estimated to be 1.5%.

4/ Phoenix Mine ships about 100,000 tons per year of concentrate grading about 5.5% nickel.

5/ Direct smelting ore grading about 2.6% nickel.