



2009 Minerals Yearbook

BOTSWANA

THE MINERAL INDUSTRY OF BOTSWANA

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Botswana's mineral resources include base metals, coal, diamond, salt, and soda ash. Mineral exploration in Botswana is difficult because the geology of most of Botswana is poorly understood owing to extensive cover by recent sediments, and available geologic information was based mainly on drilling and geophysical surveys. Unexploited mineral resources include asbestos, chromite, feldspar, graphite, gypsum, iron, and manganese that are located mostly in remote areas or beneath a thick sequence of Kalahari sands.

The geologic evolution of Botswana took place during several important metallogenic epochs. In Botswana, the Zimbabwe craton hosts copper, gold, lead, nickel, and zinc mineralization and the Limpopo Mobile Belt contains copper, nickel, and minor occurrences of precious metals. The Transvaal Supergroup contains asbestos, iron, and manganese. The Molopo Farms Complex was thought to contain chromite and platinum-group metals. The Karoo Supergroup is the largest stratigraphic unit in southern Africa, covering almost two-thirds of the present land surface, including central Cape Province, almost all of Orange Free State, western Natal, and much of Malawi, Zambia, Zimbabwe, and Transvaal. Major deposits of coal and diamondiferous rocks occur in the Karoo. Deep sedimentary basins within the Damara Province were thought to be potential hydrocarbon traps. The Makgadikgadi Basin, which is a relatively young geologic feature, has deposits of salt and soda ash (Ministry of Minerals, Energy and Water Resources, 2009a).

Mineral exploration and mining in Botswana are regulated by the Department of Geological Survey and the Department of Mines. The Department of Geological Survey's role is to gather, collate, assess, and disseminate information related to the groundwater, rocks, and mineral resources of the country. It also administers those sections of the Mines and Minerals Act that concern mineral exploration. Three basic types of mining licenses are granted in Botswana—the reconnaissance permit, the prospecting license, and the mining lease. Mineral rights are the property of the state, irrespective of the ownership of the land on which they are found. Residents of communities in the areas of exploration and mining development cannot claim ownership of mineral rights from existing mines in the country, and the Basarwa are no exception. The Government's goal is to ensure that all the citizens have a common stake and enjoy common benefits from mineral revenues (Ministry of Minerals, Energy and Water Resources, 2009b).

The Department of Mines, in partnership with stakeholders, develops policy, legislation, and programs for mineral exploration, and provides administrative services. The Department works to prevent mining occupational diseases and injuries and to minimize degradation of the environment. The Department of Mines was reviewing the Mines and Minerals Act to ensure that mining license holders make adequate financial provision to fulfill the environmental obligation of rehabilitating the mines at the end of mine life (Ministry of Minerals, Energy and Water Resources, 2009c).

Minerals in the National Economy

In 2009, Botswana's mineral resource sector, which was the sector that was the most sensitive to financial shock, was negatively affected by international credit crunch. Exploitation of Botswana's rich mineral reserves, especially diamond, has been a significant driver of the country's economy. Although the country remained a leading producer of diamond (by value) and the world's third ranked producer of diamond (in terms of volume) after the Democratic Republic of the Congo [Congo (Kinshasa)] and Australia, it saw diamond production drop to 17.7 million carats in 2009 from 32.6 million carats in 2008. Diamond sales declined to \$1.7 billion in 2009 from \$2.8 billion in 2008 (Israeli Diamond Industry, 2010).

Production

With the exception of copper, diamond, and gold production, the mineral sector was not affected in a major way by the global economic downturn. Tati Nickel Mining Co. (Pty.) Ltd. (a subsidiary of OJSC MMC Norilsk Nickel of Russia) produced 28,595 metric tons (t) of nickel, 23,146 t of copper, and 330 t of cobalt from its nickel-copper matte. Bamangwato Concessions Ltd. (BCL) of Botswana processed copper-nickel concentrate from its Selebi-Phikwe Mines. Also, BCL toll-smelted concentrate from Tati Nickel's Phoenix open pit mine. IAMGOLD Corp. produced 1,530 kilograms (kg) of gold in 2009 compared with 3,176 kg in 2008 (table 1).

In 2009, there was a significant decrease in diamond production. Almost all the country's rough-diamond output was by Debswana Diamond Co. (Pty) Ltd. (Debswana), which was a 50-50 joint venture of the De Beers Group of South Africa and the Government. Production of semiprecious stones totaled about 30,000 kg. The semiprecious stones were mainly varieties of agate and carnelian, and production was not reported separately. Botswana Ash (Pty.) Ltd. produced salt and soda ash. Soda ash production was more or less the same as in 2008 and had a significant though small role in the national economy. In 2009, companies extracted clay, crushed stone, gravel, and sand from different areas of the country. Production of these industrial materials depended on consumption by the construction industry. Coal production in 2009 was about the same as in 2008 (Ministry of Minerals, Energy and Water Resources, 2009c).

Structure of the Mineral Industry

Although the Government maintained an equity position in most of the major mining companies, the mineral industry operated mainly on a privately owned free-market basis. In addition to these major operations, a number of medium- and small-scale mines produced agates, aggregates, clay, and dimension stone. Production information was not readily

available for these operations. Major commodities and the companies that produced those commodities are listed in table 2.

Commodity Review

Metals

Copper.—Messina Copper (Botswana) (Pty) Ltd., which was a wholly owned subsidiary of Africa Copper Ltd., announced that it had restarted shipments of copper concentrate from the Mowana Mine. The feed grade continued to be about 20% above the forecast grade of 1.2% copper. Since the restart of the Mowana Mine in August 2009, 1,353 t copper concentrate at an average grade of 25% copper had been produced. The circuit and concentrate specification was further optimized by yearend 2009 (Swanepoel, 2009).

Discovery Metals Ltd. of Australia continued to focus efforts on its Boseto copper project in northwestern Botswana. The Zeta site was one of the prospects drilled in 2009 as a part of the bankable feasibility study at Boseto. Discovery Metals announced that the total estimated resource at Zeta was 35.4 million metric tons (Mt) grading 1.4% copper and 22.3 grams per metric ton (g/t) gold at an average grade of 25% copper at a cutoff grade of 0.6% copper. The estimate incorporated drill results from holes that intersected mineralization at depths of up to 350 meters (m) across strike lengths of more than 1,500 m. The drilling targeted the near-surface area of Zeta considered to be amenable to open pit mining (McCrea, 2009).

The Boseto project is located within a belt of significant copper-silver mineralization that extends from the Zambian Copper Belt across northwest Botswana and into Namibia. The poorly explored and relatively undeveloped portion of this belt in northwest Botswana is known as the Kalahari Copper Belt. The copper at Boseto occurs predominately in chalcocite, with minor amounts of bornite and other copper sulfides. At shallow depths, chrysocolla and malachite exist in significant proportions within some areas (Discovery Metals Ltd., 2009).

Hana Mining Ltd. of Canada announced that it had identified significant deposits of copper and silver ore across an area of about 2,200 square kilometers (km²) at its Ghanzi project. The project consists of five license blocks that contained sediment-hosted copper-silver mineralization across a 600-kilometer (km) cumulative strike length. Hana believes the deposit to be similar to the copper-silver mineralization of the Central African Copper Belt of Zambia. Hana stated that initial mining would be by open pit, which would be easier to mine and less costly (Chombah, 2009).

Nickel.—Albidon Ltd. of Australia announced that it would resume exploration at its Selebi-Phikwe prospect after a 6-month hiatus following a slump in nickel prices. Albidon owns 21 contiguous prospecting licenses that covered 11,262 km² in the Selebi-Phikwe Central District area and had recorded some positive results through a drilling program that covered four nickel prospects. The main targets were massive sulfide nickel mineralization and gabbro-hosted mineralization such as occur at the Phoenix Mine and the Selkirk Mine at Selebi-Phikwe (Moseki, 2009).

Discovery Metals' Dikoloti nickel project comprised four prospecting licenses that covered a 612-km² area that surrounds the three nickel deposits of BCL in the Selebi-Phikwe region of northeastern Botswana. The project had an estimated inferred resource of 4.1 Mt with a grade of 0.7% nickel and 0.5% copper. Discovery Metals signed a joint-venture agreement with Japan Oil, Gas and Metals National Corp. (JOGMEC) for the Dikoloti project. The agreement provided for funding by JOGMEC of A\$3 million (\$2.7 million¹) for exploration on the Dikoloti prospecting areas. JOGMEC had the right to earn a joint venture interest of up to 60% (London Stock Exchange plc, 2009).

Industrial Minerals

Diamond.—Botswana is a participant in the Kimberley Process Certification Scheme, which is an association of the 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.

African Diamonds plc announced that two prospecting licenses (PL004 and PL007) had been renewed for 2 years and a new license, PL605, was issued. The licenses were held by Atlas plc, which was a wholly owned subsidiary of African Diamonds. License PL004 covered 1,112 hectares (ha) and included the AK8, AK9, and BK5 kimberlite pipes. AK8 is a 5-ha kimberlite pipe that contains an estimated 20 Mt of ore at a depth of 300 m below the surface with a grade of 3 to 7 carats per hundred metric tons (cpht) of ore. AK9 is a 3-ha kimberlite pipe that contains an estimated 11 Mt of ore at a depth of 250 m below the surface with a grade of 2.5 to 3.5 cpht. Geologic information regarding BK5 was very limited (African Diamonds plc, 2009).

African Diamonds was proceeding with development of the AK6 project. Mine development was planned to start in mid-2010, and first production was scheduled to start in 2011. African Diamonds considered that AK6 had the potential to become a mine capable of producing 1 million carats per year. Studies indicated that it would cost \$63 million to establish a 2-million-metric-ton-per-year (Mt/yr)-capacity operation capable of producing about 400,000 carats at a grade of 22 cpht. An additional \$25 million in capital expenditure would double the output (Creamer, 2009).

The De Beers Group and the Government together were expecting to spend as much as \$3 billion during the next 15 years to extend the life of the Jwaneng Mine. The expansion, named Cut-8, would be the largest-ever single capital investment in the private sector in Botswana. Jwaneng was owned by Debswana and was the leading diamond mine in the world in terms of production value. The extension would require the removal of about 700 Mt of waste, exposing another 78 Mt of diamond-bearing ore, and increasing the Jwaneng pit depth to 650 m. The Jwaneng Mine contributed about 70% of Debswana's revenue (Mining Weekly, 2009).

¹Where necessary, values have been converted from Australian dollars (A\$) to U.S. dollars (US\$) at a rate of A\$1.00=US\$0.88.

Debswana announced that it was extending the closure of its Damtshaa Mine to the end of 2010. In April 2009, Debswana resumed production at three of its mines but stated that Damtshaa would remain closed because of the uncertainty of the diamond market (Mining Review, 2009).

Firestone Diamonds plc of the United Kingdom announced that it intended to commence development of commercial mining operations on its BK11 kimberlite which is located about 20 km southeast of Debswana's Orapa Mine and about 7 km northwest of Debswana's Letlhakane Mine. Full production capacity of 1.5 Mt/yr was planned to be in place by the third quarter of 2010. Results of the final phase of bulk sampling increased the overall diamond value to \$137 per carat and diamond from the KW zone of BK11 had a higher modeled value of \$157 per carat. Mining would start in the KW zone of BK11, which was expected to result in revenues of about \$24 million per year at operating margins of 60%. Initial production was planned to be about 650,000 t/yr. The project was estimated to have resources of 12 Mt containing 800,000 carats to a depth of 120 m (MBendi Information Services (Pty) Ltd., 2009b).

Soda Ash.—Chlor-Alkali Holdings (Pty) Ltd. of South Africa announced plans to become a joint-venture partner with Botswana Ash (Pty) Ltd. (BotAsh) and the Government. BotAsh was planning to sell its private shareholding (50%) to Chlor-Alkali and the Government would hold the remaining 50%. The proposed transaction would be subject to approval from competition authorities. About 60% of BotAsh's production was sold to South Africa for glass manufacturing (O'Driscoll, 2009).

Mineral Fuels and Related Materials

Coal.—Morupule Colliery (Pty) Ltd. was considering proposals to triple its annual output at the Morupule Mine to about 2.7 Mt/yr by 2010, provided the Government could deal with the power supply shortage to the mine. Morupule Mine's production was expected to increase to about 2.7 Mt/yr by 2010. Botswana Power Corp. (BPC) planned to build a 600-megawatt (MW)-capacity coal-fired powerplant with four units of 150 MW each. The Morupule B plant would be located adjacent to the existing Morupule A plant and would be connected to the national grid by two transmission lines (MBendi Information Services (Pty) Ltd., 2009a).

Anglo Coal SA (formerly Anglo America Metallurgical Coal) initiated a major exploration effort to discover sufficient coalbed methane (CBM) gas reserves to feed a proposed gas-to-liquids synthetic fuel (synfuels) plant. The aim was to delineate gas reserves totaling 4 trillion cubic feet or more, which would be sufficient to justify construction of a dedicated synfuels plant. Anglo Coal started exploring for CBM in 2007 and had since been granted 34 prospecting licenses. Anglo Coal's main exploration regions lie north of Nata and extend towards Kasane and Pandamatenga. Anglo Coal had a major drilling camp that was located 50 km north of Nata and another drilling camp located about 100 km north near the Pandamatenga border post between Botswana and Zimbabwe (Miningmx, 2009).

Uranium.—Impact Minerals Ltd. announced that it had been granted exploration licenses for about 20,000 km² in eastern

Botswana. The licenses cover about 350 km of strike extensions of rocks that host deposits and prospects near the Foley and the Serule prospects. Preliminary interpretation of airborne radiometric data indicated a large number of radiometric anomalies for a followup study with ground prospecting (Mining Top News, 2009).

Outlook

Revenues from diamond operations that were affected by the international financial crisis are expected to recover starting in 2010. International interest in exploration for diamond and base and precious metals and uranium is expected to continue. The country's favorable mineral investment climate, low tax rates, and political stability are expected to continue to make Botswana an attractive country for foreign mineral investment. The several international companies that have active mineral resource exploration programs are expected to continue to operate in Botswana. Copper, gold, nickel, and soda ash production and processing are expected to continue to be factors in the country's economy.

Given the country's extensive coal resources and projected regional power demand, additional coal-fueled electricity-generating plants will be constructed to supply power to Botswana and the southern Africa power pool. Botswana is expected to continue to encourage and support CBM resource activities.

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TABLE 1
BOTSWANA: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity ²	2005	2006	2007	2008	2009 ^e	
Clay ^c	50,000	50,000	50,000	50,000	50,000	
Coal, bituminous	984,876	962,427	828,164	909,511	910,000	
Cobalt, smelter output, Co content of matte ³	326	303	242	337	330 ⁴	
Copper:						
Mine output, Cu content of ore milled	31,300 ^e	24,255 ⁵	24,400 ^r	28,800 ^r	27,700 ⁴	
Smelter output, matte, gross weight	68,637	64,368	53,947	48,000 ^e	38,000	
Smelter output, Cu content of matte ³	26,704	24,255	19,996	23,146	13,600 ⁴	
Diamond ⁶	thousand carats	31,890	34,293	33,639	32,595	17,700 ⁴
Gemstones, semiprecious ⁷	kilograms	165,000	65,000	48,000 ^e	50,000 ^e	30,000
Gold ⁸	do.	2,709	3,020	2,722	3,176	1,530
Nickel:						
Mine output, Ni content of ore milled	39,305	38,000 ^e	27,600 ^e	28,940	28,595 ⁴	
Smelter output, matte, gross weight	68,637	64,368	53,947	54,000 ^e	54,000	
Smelter output, Ni content of matte ³	28,212	26,762	22,844	24,000 ^e	24,000	
Salt ⁹	243,945	151,595	165,710	170,994	170,000	
Sand and gravel ¹⁰	thousand cubic meters	1,906	4,812	2,866	3,000 ^e	3,000
Soda ash, natural	279,085	255,677	279,625	263,566	265,000	
Stone, crushed	thousand cubic meters	1,100	1,134	1,200 ^e	1,200 ^e	1,200

^eEstimated; estimated data are rounded to no more than three significant digits. ^rRevised. do. Ditto.

¹Table includes data available through April 30, 2010.

²In addition to commodities listed, palladium, platinum, and silver were produced, and exported in nickel-copper-cobalt matte; copper and nickel cathodes also were produced at a pilot plant, but information is inadequate to make reliable estimates of output.

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

⁴Reported figure.

⁵Included some product from direct smelting of ore; that is, ore not reported as milled.

⁶Assumed to contain about 70% gem and near gem.

⁷Principally agate. Reported as sales.

⁸Reported as bullion; historically included silver estimated to be about 2%. Includes artisanal production.

⁹Byproduct of natural soda ash production.

¹⁰Includes clay (for brick and tile).

TABLE 2
BOTSWANA: STRUCTURE OF THE MINERAL INDUSTRY IN 2009

(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 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, 220 kilometers west of Francistown	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. (BotAsh) (Government, 50%, and Anglo American plc, 50%)	Sua Pan, 450 kilometers north of Gaborone	650,000.
Soda ash		do.	do.	300,000.

^eEstimated. Do., do. Ditto.

¹For brick and tiles.

