



# 2011 Minerals Yearbook

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BOTSWANA [ADVANCE RELEASE]

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# THE MINERAL INDUSTRY OF BOTSWANA

By Harold R. Newman

Botswana's mineral resources were formed during several geologic periods. The mineral resources produced included base metals, coal, diamond, salt, sand and gravel, semiprecious gemstones, and soda ash. Unexploited mineral resources included asbestos, chromium, feldspar, graphite, gypsum, iron, and manganese. These unexploited mineral resources were located mostly in remote areas and (or) beneath a thick sequence of Kalahari sands. The geology of most of the country is largely obscured by aeolian sands (Afrbiz.info, 2011).

The Great Kalahari basin, which is the second largest basin in southern Africa after the Main Karoo basin, stretches from Namibia (Aranos basin) through Botswana (Kalahari Karoo basin, or KKB) into Zimbabwe (Mid-Zambezi basin) and merges southeastward into South Africa (Ellisras basin). The northeast-southwest trending KKB in Botswana covers about 70% of the country. The KKB has been divided into four subbasins depending on the geologic settings and facies changes: the Central Kalahari, the Southwest Botswana, the Northeast Botswana, and the Northwest Botswana subbasins (Segwabe, 2008).

Mineral exploration and mining in Botswana are regulated by the Department of Geological Survey and the Department of Mines under the Ministry of Minerals, Energy and Water Resources (MMEWR). 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. The Department of Mines, in partnership with stakeholders, provides administrative services, sets policies, develops programs, and drafts legislation for mineral exploitation and works to prevent mining occupational diseases and injuries and to minimize degradation of the environment (Ministry of Minerals, Energy and Water Resources, 2011).

## Minerals in the National Economy

All mineral rights in Botswana are vested in the state. Exploration and exploitation permits are granted by the Government, and these permits allow mineral resources to be investigated and exploited. Botswana was a leading producer of diamond in 2011, and production of gem-quality diamond continued to be the foundation of Botswana's economy; the country accounted for about 31% of world diamond production in terms of volume. The country's mining industry constituted the bulk of the country's earnings. In 2011, diamond extraction accounted for 75% of the country's export earnings, 50% of Government revenue, and about 40% of the gross domestic product (Hancock, 2011; Olson, 2012).

## Production

Bamangwato Concessions Ltd. (BCL) of Botswana processed copper-nickel concentrate from its Selebi-Phikwe Mines. BCL also toll-smelted concentrate from Tati Nickel's Phoenix open

pit mine. IAMGOLD Corp. of Canada continued to produce gold from its Mupane Mine. Diamond production increased significantly to about 24 million carats in 2011 compared with 22 million carats in 2010. 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. Salt and soda ash production by Botswana Ash (Pty.) Ltd. decreased as did coal production by Morupule Colliery (Pty) Ltd. Data on mineral production are in table 1.

## Structure of the Mineral Industry

The Government maintained an equity position in most of the major mining companies; however, the mineral industry operated mainly on a free-market basis. The Government, Anglo American Corp. of South Africa Ltd. (AAC), Botswana RST Ltd., DeBeers Botswana Ltd., and LionOre Mining International Ltd. of Canada were significant partners in Botswana's mineral industry. DeBeers, which was an ACC-affiliated company, owned one-half of Debswana Diamond Co. (Pty) Ltd. AAC also had equity positions in Botswana RST Ltd., which was the Government's partner in the Selebi-Phikwe nickel-copper-cobalt mines, and in Morupule Colliery. The mineral industry also consisted of a number of small-scale mines and artisanal operations that produced agate, aggregates, bricks, dimension stone, and gold. Capacity, location, ownership, and production were not readily available for these operations. Major commodities and the companies that produced those commodities are listed in table 2.

## Mineral Trade

The Government exported a record \$4.34 billion worth of diamond in 2011. This was a record high for Botswana diamond exports. Total rough and polished diamond exports increased by 51.9% in actual exchange rates as the country was expecting to become a global trading center. In 2011, the DeBeers Group signed a 10-year deal to move its London, United Kingdom-based diamond-selling arm, the Diamond Trading Company (DTC), to Gaborone, Botswana. The deal would also enable the Government to sell 10% of DeBeers Botswana's production independent of the DTC and increase that amount to 15% in 5 years (Israeli Diamond Industry, The, 2012).

The diamond trade was expected to help expand Botswana's economy by 7% in 2012. Growth was aided by building activity associated with diamond mine expansion projects and the power industry. Diamond sales in 2011, aided by price rises of 35%, helped the country to return to a degree of financial stability after a period of financial deficits. A Government budget surplus was expected earlier than forecasted owing to the faster-than-expected recovery in diamond mining (Antwerp Facets, 2011a).

## Commodity Review

### Metals

**Copper.**—African Copper plc of the United Kingdom announced that four prospecting licenses held by its 100%-owned subsidiary Matsitama Minerals (Pty) Ltd. had been extended for an additional 2 years by the MMEWR. The four prospecting licenses totaled 1,989 square kilometers (km<sup>2</sup>) and covered much of the Matsitama Schist Belt in northeastern Botswana. Exploration was focused on iron-oxide-copper-gold (IOCG) mineralization in the Matsitama Schist Belt where it was believed that IOCG mineralization occurred. Three IOCG areas were identified by Matsitama Minerals; they were the Lepashe, the Matsitama West, and the Nakalakwana targets. These targets were identified by an aeromagnetic high, anomalous soil geochemistry, copper and gold mineralization, iron-oxide rich mineralization, numerous ancient artisanal copper and iron workings, and the presence of a north-south trending late tectonic high-strain zone. Matsitama Minerals also had two other prospecting licenses in the Matsitama Schist Belt, which collectively covered an area of 96 km<sup>2</sup> (Investigate, 2011).

Botswana Metals Ltd. of Australia announced that it had intersected high-grade copper and silver mineralization from its 6,000-meter (m) drill program that it had completed at the Dibete prospect. A total of 93 reverse-circulation drill holes were completed. The copper and silver mineralization at Dibete was intersected along two northwest-southeast trending structures, with mineralization open at depth. Highlights included 11 m grading 4.5% copper and 229 grams per metric ton (g/t) silver from 33 m, including 3 m grading 8.2% copper and 469 g/t silver, and 17 m grading 2.7% copper and 41 g/t silver, including 3 m grading 6.7% copper and 44.5 g/t silver, and also 3 m grading 45.7% copper and 107 g/t silver. Botswana Metals was encouraged by the close proximity of the Airstrip and Dibete copper and silver projects, which have similar primary and supergene mineralization (Botswana Metals Ltd., 2011).

Discovery Minerals Ltd. of Australia, which was developing the Boseto copper project in northwestern Botswana, announced that it would initiate production in 2012. Discovery Minerals stated that, as indicated in the 2011 bankable feasibility study (BFS) and Boseto development Plan (BDP), it favored rapid development as an initial open pit mining operation with throughput of 3 million metric tons per year (Mt/yr) of copper and silver ore over 5 years as stated in the BFS; mining of the open pit would continue for about 15 years. In midyear 2014, the Boseto Mine would be expanded into an underground operation and would deliver 1.5 Mt/yr of ore for an additional 11 years. Meanwhile, the open pit operation would be scaled back to 1.5 Mt/yr of ore. The deposit was estimated to have ore reserves of 24.1 million metric tons (Mt) grading 1.3% copper and 16.7% silver. The Boseto Mine, once commissioned, would be the first Botswana mine in the Kalahari Copper Belt. Discovery Minerals had the license for the Boseto project, along with 14 prospecting licenses on the Kalahari Copper Belt (African Mining, 2011).

### Industrial Minerals

**Diamond.**—Botswana was a participant in the Kimberley Process Certification Scheme, which is an initiative of the Governments of diamond-producing and diamond-importing countries, commercial diamond firms, industry associations, and nongovernmental organizations that have implemented a certification system for the international trade of rough diamond. The Kimberley Process is designed to stem the flow of rough diamond that could be used by rebel movements to finance wars against legitimate governments.

Botswana Diamonds plc of the United Kingdom announced that it would start a \$1 million 11,000-t bulk sampling program in the Orapa region in 2011. The bulk sampling program would focus on three kimberlites (AK8, AK9, and BK5) and was expected to take 9 months to complete. The focus would be on the BK5 kimberlite, which had an estimated size of 7 hectares. The BK5 was the largest known kimberlite in Botswana Diamonds' portfolio. A 9,000-t sample would be taken from the BK5, and samples of 1,000 t each would be taken from the AK8 and the AK9 kimberlites. The work was expected to help establish the potential revenue to be generated by improving the grade estimates per metric ton and by providing sufficient diamond to establish a reasonably accurate value for each carat (Smit, 2011).

Debswana Diamond (Pty) Ltd. announced that it would reopen the Damtshaa Mine in 2012 following a 3-year shutdown. The Damtshaa Mine had been closed in the wake of the global economic crisis and remained closed in 2011, although Debswana's other three mines—Jwaneng, Letlhakane, and Orapa—were reopened in April 2009. Damtshaa would operate at full capacity when reopened; the mine had produced more than 500,000 carats in 2008 (Antwerp Facets, 2011b).

Gem Diamonds Ltd. of the United Kingdom announced that the Gagahoo Mine (formerly known as the Gope Mine) was being developed as an underground operation. Phase one would mine the deposit down to 175 m below the surface at a rate of about 180,000 carats per year. The design estimates in 2011 planned for phase two and phase three to be in production beginning in 2018 and 2026, respectively. Full production of all phases was expected to be about 700,000 carats per year (Mining Journal, 2011b).

Lucara Diamond Corp. of Canada announced that it had acquired African Diamond plc. Under the terms of the sale, Lucara received all the issued and outstanding shares of African Diamond, which included a 100% interest in the AK6 project, which was an advanced, high-value diamond development project located in the Letlhakane/Orapa kimberlite district. The AK6 project was on schedule for commissioning in the fourth quarter of 2011. AK6 was considered to have the potential to become a mine capable of producing 1 million carats per year. Earthwork was well advanced, and all major plant facilities were established (Antwerp Facets, 2011c).

### Mineral Fuels and Related Minerals

**Coal.**—The Government lifted a moratorium on new prospecting licenses for coal, coalbed methane, and related

minerals. The Government had suspended new licenses in June 2010 pending finalization of a new strategy for the coal sector. The Government was looking to diversify away from diamond mining. Botswana had an estimated 212 billion metric tons of coal reserves (Coal Age, 2011).

African Energy Resources Ltd. of Australia completed a concept study of its estimated 2.5-billion-metric-ton Sese coal deposit. The coal occurs in one main seam that averages 14 m in thickness, is close to the surface, and was expected to be amenable to low strip-ratio open pit mining at a production rate of 30 Mt/yr for domestic power stations and for washed coal for regional and export sales (Mining Journal, 2011a).

**Uranium.**—A-Cap Resources Ltd. of Canada reported that its ongoing exploration at the Letlhakane uranium project had resulted in the deposit being in rank of about the 10th largest undeveloped uranium deposit in the world. A study reported an estimated indicated resource of 221 Mt grading 153 parts per million uranium oxide ( $U_3O_8$ ) for 33,880 t of contained concentrate. The Letlhakane project involved the construction of Botswana's first uranium mine. The shallow-lying ore would be extracted using conventional open pit mining equipment. The crushed ore would be stacked on a specially designed leach pad and the  $U_3O_8$  yellowcake material would be recovered by implementing alkaline heap leaching, solvent extraction, and ion exchange. This type of ore mineralization typically has high grades and good metallurgical recoveries and is amendable to open pit mining. Exploration was continuing to test mineralization along the western boundary of the resource area (A-Cap Resources Ltd., 2011).

## Outlook

The mineral industry will continue to be a key sector of the country's economy. Revenues from diamond operations that were affected by the international financial crisis have recovered and are expected to remain high. International interest in exploration for diamond, base and precious metals, and uranium is expected to continue. The country's favorable mineral investment climate, low tax rates, and political stability are likely to continue to attract foreign mineral investment, and several international companies with active mineral exploration programs are likely to continue to operate in Botswana. Copper, gold, nickel, and soda ash production and processing are expected to continue to be positive factors to the country's economy. Additional coal resources are likely to be developed. The country's small domestic market, the cost of transportation to ports in South Africa, and the high incidence of HIV/AIDS will likely continue to limit the country's attractiveness to investments by foreign manufacturers.

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

(Metric tons unless otherwise specified)

| Commodity <sup>2</sup>                                   | 2007                  | 2008                | 2009               | 2010                 | 2011 <sup>c</sup>   |        |
|--|-----------------------|---------------------|--------------------|----------------------|---------------------|--------|
| Clay <sup>e</sup>  | 50,000                | 50,000              | 50,000             | 50,000               | 50,000              |        |
| Coal, bituminous   | 828,164               | 909,511             | 737,798            | 988,240 <sup>r</sup> | 900,000             |        |
| Cobalt, smelter output, Co content of matte <sup>3</sup> | 242                   | 337                 | 342                | 252 <sup>r</sup>     | 300                 |        |
| Copper:  |                       |                     |                    |                      |                     |        |
| Mine output, Cu content of ore milled <sup>4</sup>       | 24,400                | 28,800 <sup>r</sup> | 28,595             | 20,833 <sup>r</sup>  | 22,000              |        |
| Smelter output, matte, gross weight                      | 53,947                | 48,000 <sup>e</sup> | 38,000             | 44,138 <sup>r</sup>  | 45,000              |        |
| Smelter output, Cu content of matte <sup>3</sup>         | 19,996                | 23,146              | 13,600             | 7,170 <sup>r</sup>   | 7,200               |        |
| Diamond <sup>5</sup>                                     | thousand carats       | 33,639              | 32,595             | 17,734               | 22,019 <sup>r</sup> | 24,000 |
| Gemstones, semiprecious <sup>e,6</sup>                   | kilograms             | 48,000              | 50,000             | 30,000               | 30,000              | 30,000 |
| Gold <sup>7</sup>  | do.                   | 2,722               | 3,176              | 1,626                | 1,774 <sup>r</sup>  | 1,800  |
| Nickel:  |                       |                     |                    |                      |                     |        |
| Mine output, Ni content of ore milled <sup>5</sup>       | 27,600                | 28,940              | 28,595             | 23,053 <sup>r</sup>  | 26,000              |        |
| Smelter output, matte, gross weight                      | 53,947                | 54,000 <sup>e</sup> | 54,000             | 53,000               | 53,000              |        |
| Smelter output, Ni content of matte <sup>3</sup>         | 22,844                | 24,000 <sup>e</sup> | 29,616             | 29,000               | 29,000              |        |
| Salt <sup>8</sup>  | 165,710               | 170,994             | 241,114            | 364,761 <sup>r</sup> | 300,000             |        |
| Sand and gravel <sup>9</sup>                             | thousand cubic meters | 2,866               | 3,000 <sup>e</sup> | 3,000                | 3,000               | 3,000  |
| Soda ash, natural  | 279,625               | 263,566             | 215,118            | 240,898 <sup>r</sup> | 230,000             |        |
| Stone, crushed <sup>e</sup>                              | thousand cubic meters | 1,200               | 1,200              | 1,200                | 1,200               | 1,200  |

<sup>c</sup>Estimated; estimated data are rounded to no more than three significant digits. <sup>r</sup>Revised. do. Ditto.

<sup>1</sup>Table includes data available through March 31, 2012.

<sup>2</sup>In 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.

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

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

<sup>5</sup>Assumed to contain about 70% gem and near gem.

<sup>6</sup>Principally agate. Reported as sales.

<sup>7</sup>Reported as bullion; historically included silver estimated to be about 2%. Includes artisanal production.

<sup>8</sup>Byproduct of natural soda ash production.

<sup>9</sup>Includes clay (for brick and tile).



TABLE 2  
BOTSWANA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Metric tons unless otherwise specified)

| Commodity               |                 | Major operating companies and major equity owners   | Location of main facilities                                  | Annual capacity  |
|-------------------------|-----------------|---|--|--|
| Clay <sup>1</sup>       |                 | Lobatse Clay Works (Pty.) Ltd.<br>(Botswana Development Corp. and Interkiln Corp. joint venture)  | Lobatse, 70 kilometers south-southwest of Gaborone           | 50,000. <sup>e</sup>   |
| Do.                     |                 | Makoro Brick and Tile (Pty.) Ltd.   | Makoro, 10 kilometers south of Palapye                       | 20,000. <sup>e</sup>   |
| Coal                    |                 | Morupule Colliery (Pty) Ltd.<br>[Anglo American Corp. of South Africa Ltd. (ACC) and related firms, 93.3%]                              | Morupule, 270 kilometers northwest of Gaborone               | 1,000,000.   |
| Diamond                 | thousand carats | Debswana Diamond Co. (Pty.) Ltd.<br>(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, 220 kilometers west of Francistown            | 670.   |
| Do.                     | do.             | Tswapong Mining Co. (Pty.) Ltd.<br>(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),<br>(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.<br>(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.<br>(Government, 50%, and Anglo American plc, 50%)  | Sua Pan, 450 kilometers north of Gaborone                    | 650,000.   |
| Soda ash                |                 | do.   | do.  | 300,000.   |

<sup>e</sup>Estimated. Do., do. Ditto.

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