



# 2006 Minerals Yearbook

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BENIN, BURKINA FASO, AND SAO TOME E PRINCIPE

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# THE MINERAL INDUSTRIES OF BENIN, BURKINA FASO, AND SAO TOME E PRINCIPE

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## BENIN

Benin's economy was primarily based on agriculture; cotton accounted for about 80% of export earnings and about 40% of the gross domestic product (GDP) (U.S. Department of State, 2007). The mineral industry, which was limited to the production of cement, clay, gold, and sand and gravel, did not play a significant role in the country's economy.

### Structure of the Mineral Industry

Cement was produced by Ciments du Benin S.A., Société des Ciments d'Onigbolo, and Société des Ciments du Benin. These companies had a combined cement production capacity of 1.43 million metric tons per year (Mt/yr) (table 2). Gold was produced by artisanal miners from gold veins near the villages of Kwatena and Tchantangou, in the Atakora Mountains in northwestern Benin, and from alluvial sediments along the Perma River and its tributaries.

### Commodity Review

#### *Mineral Fuels*

**Petroleum.**—Benin ceased petroleum production from its Seme oilfield in 1998; however, at least one company, Kosmos Energy LLC of the United States, explored for petroleum in 2006. Kosmos, through its subsidiary Kosmos Energy Benin HC, had a 40% working interest in an exploration license for Block 4, which is located about 30 kilometers (km) offshore Benin. Kosmo's venture partners were Kerr-McGee Benin Consortium S.A. (an affiliate of Kerr-McGee Corporation of the United States) (40%) and Petronas Carigali Overseas Sdn Bhd of Malaysia (20%). In 2006, the partners conducted a 1,472-square-kilometer (km<sup>2</sup>) three-dimensional (3D) seismic survey of the Block's most prospective areas and were in the process of interpreting and reprocessing existing 3D seismic data (Kosmos Energy LLC, 2006).

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## BURKINA FASO

In 2006, mining did not play a significant role in Burkina Faso's economy. Production of mineral commodities was

limited to cement, dolomite, gold, granite, marble, phosphate rock, pumice and related volcanic materials, and salt.

### Structure of the Mineral Industry

Gryphon Minerals Ltd. of Australia, Cluff Gold plc and Randgold Resources Ltd. of the United Kingdom, and Canadian companies Channel Resources Ltd., Etruscan Resources Inc., Goldbelt Resources Ltd., Goldcrest Resources Ltd., High River Gold Mines Ltd., Orezone Resources Inc., Riverstone Resources Inc., and Semafo Inc. continued to explore for gold throughout the year. Etruscan also explored for copper.

### Commodity Review

#### *Metals*

**Gold.**—Cluff updated its bankable feasibility study for the Kalsaka gold project, which is located about 150 km northwest of the country's capital, Ouagadougou. Measured resources were estimated to be 6.5 million metric tons (Mt) at a grade of 1.6 grams per metric ton (g/t) gold, and indicated resources were estimated to be 2.7 Mt at a grade of 1.2 g/t gold. Following the completion of the bankable feasibility study, the company decided to continue with the development of the project and to bring it into production. In October, Ghana-based Banlaw Africa Ltd. was appointed as the mining contractor. Cluff held a 78% interest in the project; the remaining was held by IMARB Indústria Metalúrgica of Brazil (12%) and the Government (10%) (Cluff Gold plc, 2006; 2007, p. 10-11).

Etruscan continued with construction work activities at its 90% owned Youga gold property, which is located about 180 km southeast of Ouagadougou. Gold reserve estimates at the Youga Mine were reported to be 6.6 Mt at an average grade of 2.7 g/t gold. Commissioning of the mine was scheduled for mid-2007, and production was expected to be about 2,700 kilograms per year (kg/yr). As of November 30, 2006, the company had invested about \$21.7 million in the project, had made purchase commitments of about \$7 million for equipment and services, and had made additional purchase commitments of about \$10.2 million for ongoing development activities (Etruscan Resources Inc., 2007, p. 3-4, 28, 32).

High River continued with the construction of the Taparko-Boroum open pit gold mine and mill facilities, which are located about 200 km northeast of Ougadougou. The mine's first gold pour was scheduled for the second quarter of 2007. Initial production was expected to be about 3,100 kg/yr and to reach about 4,400 kg/yr by 2008. Measured and indicated resources were estimated to be about 12.6 Mt of ore at a grade of 2.77 g/t gold. The Taparko-Boroum Mine and mill would be operated by High River's subsidiary Société des Mines

de Taparko (Somita S.A.). High River held a 90% interest in the project, and the Government held the remaining 10%. In addition to Taparko-Boroum, High River held other exploration licenses in the country, including the 1,000-km<sup>2</sup> Bissa Group permits, which are located about 80 km north of Ouagadougou. Measured and indicated resources for the Bissa Group were estimated to be about 12 Mt of ore at a grade of 1.72 g/t gold. The company invested about \$2 million in exploration in 2006 and planned to invest an additional \$8 million in 2007 to test identified target areas at the Bissa Group properties (High River Gold Mines Ltd., 2007, p. 6, 10-11, 16).

**Zinc.**—Aim Resources Ltd. (AIM) of Australia continued with the development of the Perkoa zinc deposit, which is located about 120 km west of Ouagadougou. In December 2005, Snowden Mining Industry Consultants completed a bankable feasibility study for Perkoa. Production was expected to be about 130,000 t/yr of concentrate at a grade of 53% zinc. Overall zinc recovery to concentrate was projected to be 93%, and contained zinc production, to average 68,000 t/yr; zinc concentrates would be transported by railway to the Port of Abidjan in Côte d'Ivoire and by road to the Port of Tema in Ghana. The first shipment of zinc concentrate was expected to be delivered in 2008. In its 2006 annual report, AIM announced that it had signed letters of intent with Louis Dreyfus Commodities Metals Suisse S.A., Votorantim Metais of Brazil, and Switzerland-based Xstrata plc to finalize offtake agreements for the production of zinc concentrates from Perkoa. Xstrata planned to process Perkoa concentrates through either the San Juan de Nieva zinc smelter in Spain or the Nordenham zinc smelter in Germany. According to AIM company reports, the Government had upgraded the road that leads to the mine and had constructed a dam that would provide water for the project. As of yearend, measured and indicated mineral resources at Perkoa were estimated to be 6.72 Mt at grades of 16.4% zinc and 35.4 g/t silver at a 5% zinc cutoff grade (Mining Journal, 2006; Aim Resources Ltd., 2007, p. 2, 5-6, 9).

In November, Goldcrest signed an earn-in agreement with Phelps Dodge Exploration Corporation of the United States whereby Phelps Dodge could earn up to a 70% interest in some of the properties for which Goldcrest held exploration permits in Burkina Faso. The agreement was contingent upon Phelps Dodge funding the projects through the completion of a bankable feasibility study. These properties included the Danyoro, the Malba, and the Souhouera copper-gold prospects (Goldcrest Resources Ltd., 2006).

In February 2006, Semafo awarded the engineering, procurement, and construction contract for the development of the Mana gold mine to Genviar Consulting Group Inc. According to the company's 2006 annual report, measured resources were estimated to be about 2.1 Mt at a grade of 1.99 g/t gold and indicated resources were estimated to be 2.5 Mt at a grade of 2.03 g/t gold. Average production, which was expected to begin in late 2007, was estimated to be about 3,900 kg/yr of gold for the first 3 years and about 3,000 kg/yr for the remaining life of the mine. The company approved a \$3.5 million budget for the project for 2007 (Semafo Inc., 2006; 2007, p. 9, 18).

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## SAO TOME E PRINCIPE

Sao Tome e Principe's economy was primarily based on agriculture; cocoa accounted for about 95% of exports. Other economic activities included fishing and processing of local agricultural products (U.S. Department of State, 2007). Mining did not play a significant role in the country's economy.

### Production

Mineral production was limited to clay and volcanic rock; potential exists, however, for the development of the country's petroleum industry. All other mineral product requirements were imported.

### Commodity Review

#### *Mineral Fuels*

**Petroleum.**—According to an International Monetary Fund (2006) report, indications of the existence of hydrocarbons in Sao Tome e Principe were first noted in 1974, but attempts by the Portuguese Colonial Administration to sign a concession agreement with Ball & Collins North Sea consortium (a predecessor of Premier Oil of the United Kingdom) were abandoned following the country's declaration of independence in 1975. Other attempts to start petroleum exploration during the late 1980s and 1990s also failed. In 2003, Nigeria (60%) and Sao Tome e Principe (40%) agreed to jointly operate an overlapping maritime boundary located about 200 km offshore Nigeria known as the Joint Development Zone (JDZ). Activities in the JDZ were to be overseen by the Joint Development Authority (JDA). The JDZ was divided into nine blocks, and a licensing round was opened for bids in 2004, which resulted in the award of Block 1 to a consortium made up of Chevron Corporation of the United States (51%), Esso Exploration and Production Nigeria-Sao Tome (One) Ltd. (40%), and

Dangote Energy Equity Resources Ltd. (a joint-venture of the Dangote Group of Nigeria and Energy Equity Resources AS of Norway) (9%). The consortium signed a production-sharing agreement with the JDA in 2005 and, in January 2006, began drilling activities within the block. In May 2006, the consortium announced that it had encountered hydrocarbons in the Obo-1 exploration well in Block 1 and that it was in the process of evaluating reservoir rock and liquid samples to determine the next step of the appraisal process. Block 1 is located about 300 km north of Sao Tome e Principe and about 200 km south of the city of Port Harcourt in Nigeria (Chevron Corporation, 2006).

A second licensing round for Blocks 2 through 6 was opened for bids in 2005. Energy Inc. of the United States (ERHC) won the rights to these blocks and, in March 2006, the company signed a series of production-sharing agreements with the JDA and several petroleum and gas companies, among which were Addax Energy Nigeria Limited, Addax Petroleum (Nigeria offshore 2) Limited, Addax Petroleum Resources Nigeria Limited, Sinopec International Petroleum Exploration and Production Corporation Nigeria, and several other petroleum and gas companies whose names were not disclosed. Following inquiries by the Petroleum Affairs Commission, the National

Petroleum Council recognized deficiencies in the awarding process and ordered a formal investigation. The Attorney General, after concluding that the procedures used in selecting petroleum companies was flawed, recommended a restructuring of the procedures for future bidding rounds that would conform to international standards. The Attorney General's report also called for the reexamination of ERHC's preferential rights for Blocks 2, 3, 4, 5, and 6 within the JDZ (ERHC Energy Inc., 2006, International Monetary Fund, 2006).

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TABLE 1  
BENIN AND BURKINA FASO: PRODUCTION OF MINERAL COMMODITIES<sup>1</sup>

(Metric tons unless otherwise specified)

Country and commodity		2002	2003	2004 <sup>c</sup>	2005 <sup>c</sup>	2006 <sup>c</sup>
<b>BENIN</b>						
Cement, hydraulic		250,000	250,000	250,000	250,000	250,000
Clay <sup>c</sup>		19,000	21,000	21,000	21,000	21,000
Gold	kilograms	20 <sup>e</sup>	20	20	20	20
Gravel	cubic meters	26,000 <sup>e</sup>	28,500	29,000	29,000	29,000
<b>BURKINA FASO<sup>2</sup></b>						
Cement <sup>c</sup>		30,000	30,000	30,000	30,000	30,000
Dolomite <sup>c</sup>	cubic meters	3,000	3,000	3,000	3,000	3,000
Gold	kilograms	209	770	1,125 <sup>3</sup>	1,397 <sup>3</sup>	1,571 <sup>3</sup>
Granite <sup>c</sup>	cubic meters	300,000	300,000	300,000	300,000	300,000
Phosphate rock:						
Gross weight		2,350	2,400 <sup>e</sup>	2,400	2,400	2,400
P <sub>2</sub> O <sub>5</sub> content		650	650 <sup>e</sup>	650	650	650
Pumice and related volcanic materials <sup>c</sup>		10,000	10,000	10,000	10,000	10,000
Salt <sup>c</sup>		5,000	5,000	5,000	5,000	5,000
Stone, marble <sup>c</sup>		100,000	100,000	100,000	100,000	100,000

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

<sup>1</sup>Table includes data available through July 13, 2007.

<sup>2</sup>In addition to the commodities listed, sand and gravel and other construction materials are produced, but information is inadequate to make reliable estimates of output.

<sup>3</sup>Reported figure.

TABLE 2  
BENIN: STRUCTURE OF THE MINERAL INDUSTRY IN 2006

(Metric tons unless otherwise specified)

Country and commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
<b>BENIN</b>				
Cement		Société des Ciments d'Onigbolo (Amida Group, 100%)	Onigbolo plant	450,000 cement; 500,000 clinker.
Do.		Ciments du Benin S.A. (Scancem International of Norway, 48.7%)	Cotonou plant	275,000 cement.
Do.		Société des Ciments du Benin (Government, 50%, and LaFarge Group, 50%)	do.	700,000 cement.
<b>BURKINA FASO</b>				
Gold	kilograms	Société des Mines de Taparko (High River Gold Mines Ltd., 90%, and Government, 10%)	Taparko-Boroum Mine (under development)	4,350.
Do.	do.	Cluff Gold plc, 78%; IMARB Indústria Metalúrgica, 12%; Government, 10%	Kalsaka Mine (under development)	NA.
Do.	do.	Etruscan Resources Inc., 90%, and Government, 10%	Youga Mine (under development)	2,700.
Do.	do.	Semafo Inc., 90%, and Government, 10%	Mana mine (under development)	3,900.
Zinc		Aim Resources Ltd., 90%, and Government, 10%	Perkoa Mine (under development)	130,000 concentrate.

NA Not available.