



2006 Minerals Yearbook

ZAMBIA

THE MINERAL INDUSTRY OF ZAMBIA

By Philip M. Mobbs

Zambia was a significant producer of cobalt, copper, and gem-quality emerald. The country's mines accounted for about 12% of total world cobalt production and 3% of copper production. Coal, a variety of mineral commodities for the construction industry, other semiprecious gemstones, gold, lime, refined petroleum, silver, and sulfur also were produced in Zambia. Zambia has no natural gas or crude oil production, and was dependent primarily on hydroelectric-generated electricity for most of the country's nontransportation power needs (Edelstein, 2008; Shedd, 2008).

The mining sector was regulated by the Mines and Mineral Act of 1995 and amendments. In 2006, the Zambia Development Agency Act was promulgated to encourage national economic growth and development by the promotion of trade and investment. Investment in most types of mineral operations were covered by the Zambia Development Agency Act, although minerals produced for the construction industry, such as clay, sand, and most types of stone, were excluded.

Minerals in the National Economy

Copper and cobalt exports were valued at about \$4 billion in 2006, and accounted for more than 70% of Zambia's merchandise exports. In 2006, the value of cobalt and copper exports tripled compared with that recorded in 2005. The increased value was attributed to the increase in international metal prices (Bank of Zambia, 2007, p. 8).

Production

Cement production and limestone mined for cement were estimated to have increased by about 50% and 60%, respectively, in 2006; copper ore, by about 15%; and refined copper, by 15%. An approximately 14% decline was posted for cobalt production. Estimated coal production declined by almost 60%. Data on mineral production are provided in table 1.

Structure of the Mineral Industry

The mining sector was administered by the Geological Survey Department, the Mines Development Department, and the Mines Safety Department of the Ministry of Mines and Minerals Development. The Ministry of Commerce, Trade and Industry oversaw the industrial manufacturing sector.

Most of the assets of the former Government-controlled mining company had been privatized in past years. The Government retained minority interest in most of the large copper projects through its Zambia Consolidated Copper Mines Investments Holdings Plc. Data on the capacity and ownership of selected mineral operations are provided in table 2.

Commodity Review

The worldwide rise in the price of minerals has increased investor interest in undeveloped mineral resources in Zambia. A number of exploration projects for metals, which included cobalt, copper, gold, and manganese; industrial minerals, which included diamond and semiprecious gemstones; and mineral fuels and related materials, which included uranium, were underway in 2006. Companies with exploration projects in Zambia included African Eagle Resources plc of the United Kingdom on the Mkushi copper prospect; AIM Resources Ltd. of Australia on the Mumbwa copper and gold project; Albidon Ltd. of Australia on the Munali nickel and theimba copper, nickel, and platinum-group metals prospects; and the joint venture of Albidon and African Energy Resources Pty. Ltd. on the Chirundu and the Kariba Valley uranium projects. Caledonia Mining Corp. of Canada continued its evaluation of the Nama cobalt project.

Equinox Minerals Ltd. of Australia continued its development of Lumwana copper prospect. Concerns about the infrastructure in northwestern Zambia had long delayed the development of the prospect. The Government had recently completed the installation of a 330-kilovolt power line to Solwezi, which was to be extended to the Lumwana Mine site by 2007, and the Government planned to upgrade the highway that passed close by the mine site. Equinox planned to start mining operations at Lumwana in 2008.

Other exploration activity included Luri Gold Ltd. of Canada on the Dunrobin and the Matala Dome gold prospects, Mayfair Mining & Minerals Ltd. of Zambia on the Funzwe River and the Nansenga Stream gold licenses, OmegaCorp Ltd. of Australia on the Kariba uranium project, and Red Rock Resources plc of the United Kingdom on the Chiweuwe manganese prospect. The Canadian dredging company Spirit of the River evaluated diamond occurrences along the Barotse River in western Zambia. Zambezi Nickel Ltd., which was a subsidiary of Zambezi Resources Ltd. of Bermuda, drilled the Mitaba West nickel prospect, and Zambezi Resources explored the Cheowa copper, the Chalwenga gold, the Chumbwe gold, the Kanganluwi gold, and the Nkala and the Oryx uranium prospects.

Metals

Copper.—In 2006, First Quantum Minerals Ltd. of Canada completed an expansion of its sulfide ore treatment capacity at the Kansanshi Mine to 8 million metric tons per year (Mt/yr). The Kansanshi Mine was also able to process 4 Mt/yr of oxide ore. By 2008, First Quantum planned to expand the mine's sulfide ore treatment capacity to 12 Mt/yr. First Quantum also completed construction of a high-pressure leach (HPL) facility at Kansanshi. The HPL facility included two 52,500-metric-ton-per-year (t/yr)-capacity autoclaves, which were to process concentrated sulfide ore, and a 35,000-t/yr-capacity solvent

extraction-electrowinning plant, which would produce copper cathode (First Quantum Minerals Ltd., 2007a, p. 15, 17; 2007b, p. 7).

Mopani Copper Mines plc completed the construction of an ISASMELT smelter at Mufulira; the smelter had an initial nominal copper concentrate processing capacity of 720,000 t/yr. The new smelter replaced an electric arc furnace facility that had a processing capacity of about 420,000 t/yr. Commissioning of the ISASMELT smelter, which was designed to be expandable to process 850,000 t/yr of copper concentrate, was underway at yearend (First Quantum Minerals Ltd., 2007a, p. 29).

In 2006, production of milled ore at the Chibuluma South Mine reached the plant's 40,000-metric-ton-per-month (t/mo) design capacity. Metorex Ltd. of South Africa began an evaluation of the expansion of the plant's capacity to 50,000 t/mo. Metorex also recommissioned the Sable processing complex at Kabwe; the old Sable Zinc plant had been converted to process copper concentrate imported from Congo (Kinshasa) (Metorex Ltd., 2006, p. 6).

In 2006, Sino-Metals Leach Zambia Ltd. started copper cathode production. Sino-Metals processed tailings from the Chambishi Mine and other locally produced oxide ore, and expected to ramp up operations to the plant's 8,000-t/yr design capacity in 2007 (Kordosky, 2007, p. 50).

Zinc.—In 2006, Metorex continued its evaluation of the possibility of producing zinc metal from the zinc oxide and sulfide dumps at Kabwe. Metorex began the construction of a 5,000-t/yr-capacity zinc leach and electrowinning plant at its Sable processing complex; the plant was expected to begin operations in 2007 (Metorex Ltd., 2007).

Industrial Minerals

Gemstones.—Gemfields Resources PLC of the United Kingdom initiated mine development of the Mbuva-Chibolele emerald mine at the beginning of the year and began trial mining in July 2006. Mayfair Mining & Minerals, Inc. of the United States and local partners were developing an amethyst mining operation in the Mapatizya area, near the Kariba amethyst mine of Kariba Minerals Inc.

Outlook

Zambia has many deposits and occurrences of metals; the mining industry, however, historically has been dominated by the copper sector. The surge in international mineral prices during the past few years has increased investor interest in ascertaining the economic potential of deposits of metals, such as gold, nickel, and zinc; industrial minerals and commodities, especially semiprecious gemstones and sulfuric acid; and mineral fuels and related materials, such as uranium.

Zambia faces several internal and external obstacles to successful and sustained mineral resource development. These include cyclical world commodity prices; high transportation costs; limited national infrastructure, particularly west of the Copperbelt; increased cost of imported equipment and supplies; and the threat that high HIV/AIDS rates in the region pose to maintaining a skilled labor force.

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TABLE 1
ZAMBIA: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity	2002	2003	2004 ^e	2005 ^e	2006 ^e
METALS					
Cobalt:					
Mine output, Co content	10,000 ^e	11,300	10,000	9,300	8,000
Metal, Co content	6,144	6,620	5,791	5,422 ²	4,665
Copper:³					
Mine output, Cu content:					
By concentration or cementation	258,000	269,000	344,300 ²	341,000	370,000
Leaching, electrowon	83,000	79,000	82,600 ²	106,000	144,000
Total	341,000	348,000	426,900 ²	447,000	514,000
Metal:					
Smelter, primary, includes low-grade electrowon	253,500	268,000	280,100 ²	270,000	290,000
Refinery, primary:					
Electrowon	83,700	109,000 ^e	124,000	155,000	200,000
Other	253,100	241,000 ^e	286,000	244,000	260,000
Total	336,800	350,000 ^e	410,000	399,000	460,000
Gold kilograms	--	--	--	440	800
Silver do.	--	--	--	2,000	3,500
INDUSTRIAL MINERALS					
Cement	230,379	350,000 ^e	390,000	435,000	650,000
Clays:^e					
Brick	3,000	3,000	3,300	3,300	3,300
Building, not further specified	30,000	30,000	33,000	33,000	33,000
China and ball	200	200	200	200	200
Gemstones:^e					
Amethyst kilograms	1,064,606 ²	1,000,000	1,100,000	1,100,000	1,200,000
Beryl do.	8,551 ²	8,000	8,000	10,000	10,000
Emerald do.	1,860 ²	2,000	2,100	2,500	2,600
Garnet do.	NA ²	NA	NA	NA	NA
Tourmaline do.	25,755 ²	25,000	26,000	26,000	27,000
Lime, calcined thousand metric tons	151	145 ^e	150	150	150
Limestone, for cement and lime do.	330	690 ^e	750	750	1,200
Limestone, crushed aggregate do.	450	600 ^e	650	650	700
Sand and gravel, construction ^e do.	200	200	220	220	300
Sulfur:^e					
Gross weight:					
Pyrite concentrate	225,870 ²	226,000	280,000	285,000	290,000
Sulfuric acid ⁴	10,000	10,000	12,000	12,000	15,000
Sulfur content:					
Pyrite concentrate (42% S)	94,900	95,000	118,000	120,000	122,000
Sulfuric acid (32.6% S)	3,260 ^r	3,260 ^r	3,910 ^r	3,910 ^r	4,890
Total, S content	98,200 ^r	98,300 ^r	122,000 ^r	124,000 ^r	127,000
MINERAL FUELS AND RELATED MATERIALS					
Coal, bituminous	71,700	71,800	240,000	240,000	100,000
Petroleum, refinery products ^e thousand 42-gallon barrels	--	5,000	6,200	5,000	5,000

^eEstimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. ^rRevised. NA Not available. -- Zero.

¹Table includes data available through November 16, 2007.

²Reported figure.

³Terms used are as defined by the International Copper Study Group.

⁴From the Chambishi and the Nkana acid recovery plants.

TABLE 2
ZAMBIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2006

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement	Chilanga Cement plc (Lafarge Group, 84%)	Lusaka and Ndola plants	700,000.
Do.	do.	New plant at Lusaka	750,000. ¹
Do.	Zambezi Portland Cement Ltd.	Ndola	330,000. ¹
Coal, bituminous	Maamba Collieries Ltd. (Government, 100%)	350 kilometers south of Lusaka in the Kanzie and Izuma Basins	800,000.
Do.	Collum Coal Mining Industries Ltd.	Sinazongwe	120,000.
Copper and cobalt:			
Ore and concentrate	Kansanshi Mining plc (Kansanshi Holdings Ltd., ² 79.4%, and Zambia Consolidated Copper Mines Investments Holdings Plc, 20.6%)	Kansanshi Mine	12,000,000 ore.
Do.	Konkola Copper Mines plc (Vedanta Resources plc., 51%; Zambia Copper Investments Ltd., 28.4%; Zambia Consolidated Copper Mines Investments Holdings Plc, 20.6%)	Nchanga open pit	4,500,000 ore.
Do.	do.	Nchanga underground mine	2,800,000 ore.
Do.	do.	Konkola underground mine	2,400,000 ore.
Do.	do.	Fitwaola open pit	NA.
Do.	Mopani Copper Mines plc (Carlisa Investments Corp., ³ 90%, and Zambia Consolidated Copper Mines Investments Holdings Plc, 10%)	Nkana Mine	5,500,000 ore.
Do.	do.	Mufulira Mine	2,500,000 ore.
Do.	Luanshya Copper Mines Ltd. (Enya Holdings BV, ⁴ 85%, and Zambia Consolidated Copper Mines Investments Holdings Plc, 15%)	Baluba underground mine	1,400,000 ore.
Do.	NFC Africa Mining plc (China Nonferrous Metal Mining Corp., 85%, and Zambia Consolidated Copper Mines Investments Holdings Plc, 15%)	Chambishi Mine	800,000 ore, which yields about 50,000 copper in concentrate.
Do.	Chibuluma Mines plc (Metorex Ltd., 65%, and Industrial Development Corp. of South Africa Ltd., 35%)	Chibuluma South Mine, about 20 kilometers from Kitwe	480,000 ore, which yields about 15,000 copper in concentrate. ⁵
Smelter and refinery	Konkola Copper Mines plc (Vedanta Resources plc., 51%; Zambia Copper Investments Ltd., 28.4%; Zambia Consolidated Copper Mines Investments Holdings Plc, 20.6%)	Tailings leach plant at Chingola	80,000 copper cathode.
Do.	KCM (Smelterco) Ltd. (Vedanta Resources plc., 51%; Zambia Copper Investments Ltd., 28.4%; Zambia Consolidated Copper Mines Investments Holdings Plc, 20.6%)	Nkana copper smelter	240,000 blister copper/anode.
Do.	do.	Nkana copper refinery	180,000 copper cathode.
Do.	Mopani Copper Mines plc (Carlisa Investments Corp., ³ 90%, and Zambia Consolidated Copper Mines Investments Holdings Plc, 10%)	Mufulira in situ leach and SX-EW ⁶ plant	17,000 copper cathode.
Do.	do.	Mufulira (ISASMELT) smelter ⁷	200,000 copper anode.
Do.	do.	Mufulira refinery	275,000 copper cathode.
Do.	do.	Nkana heap leach	38,000 copper cathode.
Do.	do.	Nkana cobalt refinery	2,500 cobalt metal.
Do.	Chambishi Metals plc (Enya Holdings BV, ⁴ 90%, and Zambia Consolidated Copper Mines Investments Holdings Plc, 10%)	Chambishi cobalt plant and Nkana slag dump	27,000 copper cathode, 7,000 cobalt metal.
Do.	First Quantum Minerals Ltd.	Bwana Mkubwa SX-EW ⁶ plant, which treats ore from the Lonshi Mine, Congo (Kinshasa)	52,000 copper cathode.

See footnotes at end of table.

TABLE 2--Continued
ZAMBIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2006

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
<u>Copper and cobalt--Continued</u>				
Smelter and refinery--Continued		Sable Zinc Kabwe Ltd. (Metorex Ltd., 100%)	Sable copper leach and electrowinning plant at Kabwe treats feed imported from concentrates produced from the Ruashi stockpiles, Congo (Kinshasa)	14,000 copper cathode, 300 cobalt carbonate.
Do.		Sino-Metals Leach Zambia Ltd. (China Nonferrous Metals Mining Co. Ltd., Sino-Africa Mining Investments Ltd., NFC Africa Mining Plc, and China Hainan Construction Co. Ltd.)	Chambishi	8,000 copper cathode.
<u>Gemstones:</u>				
Amethyst	metric tons	Kariba Minerals Ltd. (Gemfields Resources PLC, 50%, and Government, 50%)	Kariba Mine, about 500 kilometers from Kaloma	150.
Do.	do.	Mayfair Mining & Minerals Ltd. (Mayfair Mining & Minerals, Inc.)	Mapatizya area, about 500 kilometers from Kaloma	100.
Do.	do.	Various artisanal operations	Krystal Mine in Kaloma; Mumbwa area, near the Zimbabwean border	NA.
Aquamarine	kilograms	do.	Katete and Petauke areas	NA.
Beryl	do.	do.	Eastern Province pegmatites	NA.
Citrine	do.	do.	Iteshi Teshi, Mumbwa, and Eastern Province	NA.
Emerald	do.	Kagem Minerals Ltd. (Hagura Mining Ltd., 75%, and Government, 25%)	Kagem Mine, Ndola Rural Emerald Restricted Area	1,000. ^c
Do.	do.	Gemfields Resources PLC	Mbuva-Chibolele Mine, Ndola Rural Emerald Restricted Area	1,000. ^c
Do.	do.	Numerous artisanal and small mining operations	Ndola Rural Emerald Restricted Area	600. ^c
Garnet	do.	Various artisanal operations	Eastern Province pegmatites, Mazabuka, Siavunga, Chikankata, Gwemba Valley	NA.
Tourmaline	do.	do.	Kalunga Wbeba Mine, Eastern Province	NA.
Do.	do.	do.	Hofmeyer Mine near Nyimba	NA.
Do.	do.	Jagoda Gems Ltd.	Jagoda Mine, Mkushi	NA.
Do.	do.	Various artisanal operations	Eastern Province	NA.
<u>Gold:</u>				
Content of ore	do.	Kansanshi Mining plc (Kansanshi Holdings Ltd., ² 79.4%, and Zambia Consolidated Copper Mines Investments Holdings Plc, 20.6%)	Kansanshi Mine	1,000.
Refined	do.	NA	Ndola Precious Metals Plant (processes copper refinery slimes)	150 refined gold.
Lime, quicklime		Ndola Lime Company Limited (Zambia Consolidated Copper Mines Investment Holdings Plc, 100%)	Ndola	300,000. ⁸
Petroleum, refined	42-gallon barrels	Indeni Petroleum Refinery Limited (Total Outre Mer, 50%, and Government, 50%)	Indeni refinery at Ndola	3,500,000.
<u>Sulfur:</u>				
Pyrite ore, gross weight		Konkola Copper Mines Plc	Nampundwe Mine, 48 kilometers west of Lusaka	300,000.
Sulfuric acid		do.	Nkana No. 3 and No. 4 acid plants	380,000.
Do.		do.	Nchanga Acid plant	180,000.
Do.		First Quantum Minerals Ltd.	Bwana Mkubwa acid plant	350,000.

See footnotes at end of table.

TABLE 2--Continued
 ZAMBIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2006

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Zinc	Sable Zinc Kabwe Ltd. (Metorex Ltd., 100%)	Zinc treatment plant at Kabwe to process Kabwe-area zinc oxide and sulfide tailings	5,000. ¹

^cEstimated. NA Not available.

¹Under construction.

²Subsidiary of First Quantum Minerals Ltd.

³Carlisa Investments Corp. is owned by Glencore International AG, 81.2%, and First Quantum Minerals Ltd., 18.8%.

⁴Enya Holdings BV is owned by International Mineral Resources AG and Beny Steinmetz Group Resources.

⁵Also includes some cobalt content.

⁶Solvent extraction-electrowinning.

⁷Construction of the ISASMELT smelter that had a copper-in-concentrate input capacity of 720,000 metric tons per year (t/yr) was completed at Mufulira and commissioning began in late 2006. The ISASMELT smelter replaced the old 420,000-t/yr-copper-in-concentrate-input-capacity smelter at Mufulira that had an output capacity of 160,000 t/yr of copper anode.

⁸Plant has the capacity to produce up to 5,000 metric tons of hydrated lime (slaked) from quicklime.