

THE MINERAL INDUSTRY OF

ZAMBIA

By George J. Coakley

Zambia is a landlocked country in southern African with an area of 753,000 square kilometers, 9.6 million people, and a per capita gross domestic product (GDP) based on 1998 purchasing power parity estimates of \$880.¹ Overall, mining and quarrying accounted for about 6% of real GDP and about 10% of total employment. The mining sector was dominated by copper and cobalt production, with exports of these two commodities accounting for 77% of total exports of \$873 million in 1998 (Zambia Investment Center, April 19, 1999, Zambia—Country profile, accessed February 12, 2000, at URL <http://www.zic.org.zm/profile.htm>).

Zambia ranked as the world's largest producer of cobalt, 12th in copper, and as one of the top producers of gem-quality emeralds in 1998. Besides copper and cobalt, Zambia produced a wide variety of metallic and industrial mineral commodities, as well as coal. (See table 1.)

The Government has been successful in privatizing most of its state-owned mining assets, with the exception of the two largest producing divisions of Zambia Consolidated Copper Company Limited (ZCCM). Operational and financial problems at ZCCM, which led to a 29% decrease in refined copper production levels during 1998, and a 40% drop in world market prices for copper forced ZCCM to seek financial assistance from the Government by yearend to avoid the threat of bankruptcy. The Zambian Privatization Agency (ZPA) had been successful in selling off about half of ZCCM assets during 1997. These included the spinoffs of the Konkola Deep Mining Project to the Anglo American Corp.; the Konkola North Mine and the Chambishi cobalt plant to Anglovaal Minerals Ltd. (Avmin) of South Africa; the Kansanshi Mine to Cyprus Amax Minerals Co. of the United States; the Chibuluma Mine to Metorex Ltd., the Crew Development Corp. of Canada's South African subsidiary; the Luanshya Mine and Ndola Precious Metals Plant to the Indian zinc producer Binani Group; and the Chambishi Mine to the China National Non-Ferrous Metals Corp., operating under NFC Africa Mining plc, a new company (Mining Journal, 1999). During 1998, ZPA continued negotiations with the Kafue Consortium, which comprised Avmin, Phelps Dodge Corp. of the United States, Canada's Noranda Inc., and the Commonwealth Development Corp. of the United Kingdom, over the sale of the Nchanga and the Nkana Divisions. This package represented over half of ZCCM production capacity, which was equal to about 175,000 metric tons per year (t/yr) of copper cathode and 2,000 t/yr of finished cobalt and included five underground mines and one open pit mine, associated concentrator facilities, a tailings leach plant, a

copper smelter and refinery, an acid plant, and a cobalt plant. ZPA ended negotiations, and the Kafue Consortium disbanded in early June 1998 after the Government rejected the final Kafue offer to invest more than \$1 billion in the operations, saying the \$131 million cash component of the offer was too small (Noranda Inc, May 29, 1998, Phelps Dodge and Noranda withdraw from Kafue Consortium, press release, accessed June 2, 1998, at <http://www.newswire.ca/releases/May1998/29/c7207.html>). Anglo American, which retained a 27% interest in ZCCM through Zambia Copper Investments Ltd., its subsidiary, continued unsuccessfully to attract other international mining companies with which to submit a new joint venture bid on the Nkana-Nchanga package. Depressed copper and cobalt market prices and the increased political risk from wars in neighboring Angola and Congo (Kinshasa) contributed to the difficulty in attracting new investors.

Colossal Resources Ltd. of Canada shut down its Kabwe cobalt tailings retreatment plant after only 1 year of operation. Reunion Mining plc. of the United Kingdom increased gold production from its Dunrobin gold mine by more than 3½-fold from 1997 to 620 kilograms prior to being bought out by Anglo American. First Quantum Minerals Ltd. of Canada commissioned its Bwana Mkubwa copper mine in March 1998 and reached full operating capacity of 800 metric tons per month (t/mo) of cathode copper and 6,000 t/mo of surplus sulfuric acid by yearend (First Quantum Minerals Ltd., 1999). Prior to privatization of its assets, ZCCM provided a comprehensive listing of its copper and cobalt reserves (table 2) and resources (table 3) in its 1997 annual report.

For more extensive coverage of the mineral industry of Zambia, see the 1997 Minerals Yearbook, Volume III, Mineral Industries of Africa and the Middle East.

References Cited

- First Quantum Minerals Ltd., 1999, Annual report of First Quantum Minerals Ltd. for 1998: [Vancouver], First Quantum Minerals Ltd., 36 p.
Mining Journal, 1999, Zambia, *in* Africa annual review supplement: Mining Journal [London], v. 333, no. 8538, July 2, p. 67-70.

Major Sources of Information

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¹Where necessary, values have been converted from Zambian kwacha (K) to U.S. dollars at the rate of K1,429=US\$1.00 for 1998 and K1,697=US\$1.00 for 1997.

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Major Publication

Investment Opportunities in the Mineral Sector of Zambia,
Ministry of Mines and Mineral Development, Lusaka,
Zambia, 1998, 4 p.

TABLE 1
ZAMBIA: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity	1994	1995	1996	1997	1998
METALS					
Beryllium: beryl e/ kilograms	857	1,000	1,000	800	800
Cobalt: 2/					
Mine output, Co content	3,600	5,908	6,959	6,037	11,900
Metal, Co content	2,639	2,934	4,611	4,386	5,011
Copper: 2/ 3/					
Mine output, Cu content:					
By concentration or cementation	289,800	254,000	276,000	288,900	230,000
Leaching (electrowon)	83,400	62,000	58,000	64,000	50,000
Total	373,200	316,000	334,000	352,900	280,000
Metal:					
Smelter, primary:					
Electrowon (low grade)	25,342	65,400	73,900	61,140	51,736
Other	241,036	234,500	250,300	220,327	206,871
Total	266,378	299,900	324,200	281,467	258,607
Refinery, primary:					
Electrowon	67,255	62,000	58,000	63,736	80,709
Other	284,784	266,000	276,000	268,553	248,820
Total	352,039	328,000	334,000	338,400	240,500
Gold: 2/ kilograms	124	91	119	290 e/	765 e/
Selenium, refined, gross weight 2/ do.	21,115	18,550	20,016	15,161	14,670
Silver: 2/ do.	10,002	8,676	9,410	6,684	8,363
INDUSTRIAL MINERALS					
Cement, hydraulic	280,000 4/	312,000 r/ 4/	348,000 r/ 4/	384,000 4/	351,000
Clays:					
Brick e/	3,000	3,000	3,000	3,000	3,000
Building, not further specified e/	27,000 4/	30,000	30,000	30,000	30,000
China and ball e/	200	200	200	200	200
Gemstones: e/					
Amethyst kilograms	366,000 4/	350,000 e/	1,198,354	699,343	800,000 e/
Aquamarine do.	21 4/	200	866	--	-- e/
Beryl do.	1,000 e/	2,000 e/	4,544	1,527	2,000 e/
Emerald do.	160 4/	180	6,000	7,000	7,000 e/
Garnet do.	5,000 e/	5,000 e/	13,701	2,467	3,000 e/
Tourmaline do.	--	2,000 e/	4,150	--	--
Gypsum e/	11,200	11,000	11,000	11,000	11,000
Lime, calcined e/ thousand tons	195 4/	200	200	200	200
Limestone (cement and lime) e/ do.	710	800	800	800	800
Magnetite, gross weight e/	1,070 4/	1,000	1,000	1,000	1,000
Nitrogen, N content of ammonia e/	3,000	3,000	3,000	3,000	3,000
Sand and gravel, construction e/ thousand tons	117 4/	200	200	200	200
Stone, construction:					
Limestone, crushed aggregate e/ do.	668 4/	700	700	700	700
Other e/ do.	700	700	700	700	700
Sulfur:					
Pyrite concentrate:					
Gross weight	55,572	69,228	78,971 r/	69,059	72,366
S content (42%) e/	22,062 4/	28,314 5/	33,200 r/	29,005	30,394
Sulfuric acid: 5/					
Gross weight	224,838 r/	218,252 r/	206,572 r/	178,482	134,000
S content (32.6%)	73,300 r/	71,150	67,340 r/	58,185	43,684
Total, S content	95,362 r/	99,464 r/	100,540 r/	87,190	74,078
Talc e/	76 4/	80	80	80	80
MINERAL FUELS AND RELATED MATERIALS					
Coal, bituminous e/ thousand tons	163 4/	141	100	10	50
Petroleum, refinery products e/ 2/ thousand 42-gallon barrels	5,300	5,000	5,000	5,000	5,000

e/ Estimated. r/ Revised.

1/ Table includes data available through December 15, 1999.

2/ Data are for year beginning April 1 of year stated.

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

4/ Reported figure.

5/ From ZCCM Nkana and Chambishi acid recovery plants.

TABLE 2
ZAMBIA: ZAMBIA CONSOLIDATED COPPER MINES LIMITED
ORE RESERVES BY MINE, AS OF MARCH 31, 1997

(Thousand metric tons)

Mine, by type of development	Gross weight	Copper (percent)	Cobalt (percent)
Nchanga:			
Fully developed	7,596	5.37	--
Partly developed	10,878	5.16	--
Undeveloped	47,908	3.05	0.56
Total	66,382	3.66 1/	0.56
Konkola:			
Fully developed	1,293	3.82	--
Partly developed	5,989	4.17	--
Undeveloped	26,288	3.88	--
Total	33,570	3.93 1/	--
Mufulira:			
Fully developed	1,134	3.18	--
Partly developed	6,613	3.28	--
Undeveloped	24,229	2.97	--
Total	31,976	3.04 1/	--
Nkana:			
Fully developed	2,187	2.02	0.12
Partly developed	11,869	2.03	0.11
Undeveloped	65,420	2.32	0.15
Total	79,476	2.26 1/	0.14
Chibuluma:			
Fully developed	280	3.33	0.10
Partly developed	470	3.20	0.13
Undeveloped	685	4.70	0.12
Total	1,435	3.82 1/	0.12
Luanshya:			
Fully developed	569	2.15	--
Partly developed	2,758	2.25	--
Undeveloped	18,218	2.37	--
Total	21,545	2.35 1/	--
Baluba:			
Fully developed	1,450	2.71	0.20
Partly developed	2,658	2.56	0.23
Undeveloped	26,560	2.45	0.17
Total	30,668	2.47	0.18
Grand total:	265,052	2.96 1/	XX
Of which:			
Fully developed	14,509	XX	XX
Partly developed	41,235	XX	XX
Undeveloped	209,308	XX	XX

XX Not applicable.

1/ Weighted average.

Notes--Ore reserves are defined as those tonnages that meet the definition of ore and are available for mining existing or approved planned financed facilities. ZCCM's reserves are quoted as in situ grades and tonnages and are not factored for dilution and/or mineralization left in the ground owing to unfortunate shapes or attitude or as pillars.

Source: Zambia Consolidated Copper Mines Limited, 1997 company annual report, p. 58.

TABLE 3
ZAMBIA: ZAMBIA CONSOLIDATED COPPER MINES LIMITED 1/
MINERAL RESOURCES BY MINE, AS OF MARCH 31, 1997

(Million metric tons)

Mine, by type of development	Gross weight	Copper (percent)	Cobalt (percent)
Nchanga:			
Underground	41	3.0	--
Open pits	53	3.2	--
Unclassified (Open-pit or underground)	39	2.6	--
Refractory ore (CRO)	180	1.2	--
Tailings dumps--No. 2, 3, and 4)	104	0.8	--
Total	417	1.5 2/	--
Konkola:			
Kirila Bombwe	297	3.8	0.07
Konkola	30	2.5	--
Saddle Lode-Konkola North	50	2.6	0.09
Fitwaola	3	3.5	--
Konkola South	5	2.0	--
Total	385	3.5 2/	XX
Mufulira:			
Ore body extensions	41	3.1	--
Oxide mineralization--Mufulira East	4	2.6	--
Mufulira West	17	1.5	--
Total	62	2.6 2/	--
Nkana:			
Extensions	118	2.4	0.12
Oxide caps	11	3.1	--
Nkana slag dump	20	1.1	0.15
Total	149	2.3 2/	XX
Chibuluma:			
West	2	2.5	0.12
South	9	3.9	--
Total	11	3.6 2/	XX
Chambishi:			
Main	45	2.6	--
West	46	2.2	--
Southeast	45	2.4	--
Total	136	2.4 2/	--
Luanshya:			
Extensions	24	2.4	--
Mashiba	4	2.5	--
Oxide mineralization	8	2.6	--
Slag dump	9	0.7	0.40
Total	45	2.1 2/	XX
Baluba:			
Extensions	2	2.1	0.15
Oxide mineralization	23	2.3	--
Total	26	2.3	XX
Grand total	1,231	2.4 2/	XX

XX Not applicable.

1/ May not add to totals shown because of independent rounding.

2/ Weighted average.

Note--Mineral resources are defined as those materials which have been examined in sufficient detail to establish their mode of occurrence, size, and essential qualities and include reclamation material already mined or treated for which there is a reasonable expectation of future exploration. Before such mineral resources can be transferred to the ore reserve category, investigation into the feasibility of economic exploration must be made, and additional investments incurred. ZCCM's resources are quoted as in situ grades and tonnages and are not factored for dilution and/or mineralization left in the ground owing to unfortunate shapes or attitudes or as pillars.

Source: Zambia Consolidated Copper Mines Limited, 1997 company annual report, p. 58.