

THE MINERAL INDUSTRY OF

ZAMBIA

By Thomas P. Dolley and George J. Coakley

Zambia is a landlocked, southern African country with an area of 753,000 square kilometers (km²), nine million people and a per capita gross domestic product (GDP) of \$450.¹ Copper and cobalt production by the state-owned, Zambian Consolidated Copper Mines Ltd. (ZCCM) continued to be the major component of the minerals sector of the Zambian economy and its chief source of foreign exchange earnings in 1996. Zambia ranked as the world's 2d largest producer of cobalt, after Canada; 11th largest producer of copper, after Mexico; and as one of the top producers of gem-quality emeralds in 1996. Trade statistics by the International Monetary Fund indicated the estimated value of Zambian exports at \$982 million for 1996 (International Monetary Fund, 1997). Copper accounted for about 80% of export earnings in 1996. Gemstones, mostly emeralds, also recorded significant earnings, but probably an even larger amount bypassed official channels. (See table 1.) Resources of those minerals in production generally were extensive, including separate, unexploited deposits in various areas, and occurrences of other potentially valuable minerals were widespread geographically in this Texas-sized country.

The major import by far was petroleum, including crude and refined products principally from the Arabian Gulf States. Fertilizer components were the second largest mineral import, particularly phosphorus and potassium. South Africa was a principal source of imports, at least partly because of transshipments from overseas sources. Mining equipment was normally the largest import from the United States.

Zambia's economy was dependent on one commodity, copper; however, the Government's past practice of diverting mineral earnings for various social or other economic purposes, while neglecting the need for reinvestment in the industry, has led to a progressive decline in copper production and revenue. As part of the economic reform program and transition to a market economy, the Government began in 1994 to privatize most of the country's more than 100 companies. In late 1996, the Government proceeded with plans to privatize ZCCM, the country's major single enterprise. ZCCM had been formed in 1982 with the merger of Nchanga Consolidated Copper Mines Ltd. and Roan Consolidated Copper Mines Ltd., making it at the time the world's second largest copper company after Codelco-Chile.

During the year, ZCCM issued a document, Invitation to Pre-qualify, for the sale of majority interests in certain mining and

electricity distribution assets of the company by international tender. The assets for sale were partitioned into packages as follows:

Package A—Nchanga Division and Nkana Division (excluding the Kansanshi and Chambishi Mines, the Chingola refractory ore dumps and the Chambishi cobalt plant) and their respective social assets. This package includes 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. In the financial year 1995-96, approximately 11.1 million metric tons (Mt) of ore was mined and 175,000 metric tons (t) of copper cathode was produced at Nchanga/Nkana as well as 1,939 t of finished cobalt.

Package B—Luanshya Division (excluding the Ndola precious metals plant) and its associated social assets. Luanshya Division includes the underground mines at Luanshya and Baluba, associated concentrator facilities, the (currently nonoperational) Luanshya smelter and Ndola Copper Refinery. In 1995-96 approximately 2.9 Mt of ore was mined and 47,000 t of copper and 1,015 t of cobalt in concentrates were produced at the Luanshya Division.

Package C—The Mufulira underground mine and concentrator which in 1995/96 produced approximately 52,000 t of copper in concentrate.

Package D—The Chambishi copper mine (currently nonoperational) which has proven reserves of 33.5 Mt at 2.55% copper to the 900 meter (m) level, an existing production shaft to that level and additional resources estimated to exceed 100 Mt.

Package E—The Kansanshi copper mine (currently being operated on a small scale only) which has a resource, based on limited drilling, of 24.4 Mt at 2.90% copper (with a 1.5% cut-off).

Package F—The Nampundwe pyrite mine, which in 1995-96 fiscal year ending March 31, 1996, produced approximately 240,000 t of ore.

Package G—The Chambishi cobalt plant, which has a nominal capacity of 2,400 tons per year (t/yr) and produced 1,638 t of finished cobalt in 1995-96, and its associated acid plant.

Package H—The Ndola precious metals plant produces gold, silver, and selenium from copper refinery slimes.

Package J—Power Division (excluding the bulk transport fleet) that currently purchases electricity from the state-owned Zambia Electricity Supply Co. and sells it to ZCCM's mining operations and other customers. In 1995-96 ZCCM's own

¹Where necessary, values have been converted from Zambian Kwacha (K) to U.S. dollars at the rate of K1245=US\$1.00 for 1996.

power consumption was approximately 5,000 gigawatt-hours with a peak demand of 500 megawatt (MW). The Power Division distributed two-thirds of Zambia's electricity.

The ZCCM Invitation to Pre-qualify instructed parties interested in prequalification to make submissions by September 27, 1996. Additionally, the document indicated that parties may bid for and acquire interests in one or more of Packages A through H; however, parties which acquire an interest in Package J may not acquire an interest in any of the other packages. Bids for the packages were to be submitted to the Zambia Privatisation Agency (ZPA) by February 28, 1997, except for Package E, due to ZPA by November 29, 1996 (Zambian Consolidated Copper Mines Ltd., 1996b). Subsequently, a total of 38 companies prequalified for the sale, including Australia's Western Mining Corp.; Canada-based Falconbridge, Indochina Goldfields, Noranda, and Teck; China's China National Non-ferrous Metals Corp.; the South African-based companies Gencor, Anglovaal, and Iscor; and Phelps Dodge and Cyprus Amax Minerals Co. of the United States (Metal Bulletin, 1996).

The Investment Act of 1993 established the Zambia Investment Center as a one-stop support facility for investors and offers incentives to investors in the mining sector. In December 1994, the Government announced its policy to no longer participate in exploration or become a shareholder in a mining company and to limit its functions to regulatory or promotional activities. Subsequently, the new December 1995 Mining Policy officially put in place a privatization program to encourage private development and diversification of the mining sector to promote small-scale mining; to promote development of gemstone mining and liberalization of gemstone marketing facilities; to promote exploitation of industrial and energy minerals and development of ferrous minerals; to promote reduction of ecological damage arising from mining; and to promote local value added processing of Zambia's mineral raw materials.²

The Government continued to promote actively the private sector and seek foreign investment, particularly in minerals. The Mines and Minerals Act of 1995, passed by Parliament as 1995 Act No. 31 on September 13, 1995, was aimed at attracting risk capital, technology, and entrepreneurial efforts to the mining sector. The law covers all mineral commodities and treats large-scale, small-scale, and gemstone operations separately as to mineral rights (prospecting and mining authorizations). Export of radioactive minerals, such as monazite, is illegal without special Ministerial approval. It also gives the Government leeway in negotiating individualized contracts with investors. Among other provisions reported were secure title to mining rights with provision to assign; right to market products; international arbitration; and exemption from import duties and sales taxes on material, at least for an initial period of exploration and development. Additionally, the law provides for royalty charges of 3% for large-scale mining license holders on the "net back value" of minerals free-on-board, less

²Ministry of Mines and Minerals Development. Zambia's Mining Policy, Lusaka, Dec. 1995, 13p.

transport, and smelting and refining costs.

Parliament's Environmental Protection and Pollution Control Act (No. 12) of 1990 (EPPCA) formed the basis for a Ministry of Environment and Natural Resources and also an Environmental Council of Zambia. The act formally came into full force in February 1992 and gave the Ministry overall responsibility for protecting the environment.

ZCCM had followed a self-regulatory approach to environmental protection for sometime. It established standards based on limits elsewhere in the world. After the EPPCA came into full force, ZCCM put into place an appropriate management structure with the help of consultants under a World Bank Technical Assistance package. In April 1994, ZCCM commenced a more intensive 2-year program of personnel education, discharge measuring, formal reporting, mass balance studies, monitoring stations installation, and conceptual rehabilitation planning. During 1996, the Government issued new Mines and Minerals Environmental Regulations to implement environmental protection provisions of the Mines and Minerals Act of 1995.

In 1996, ZCCM copper mine production of 334,000 t continued its decline, dropping to 55% of 1985 levels and 40% of the 1969 peak production of 825,000 t. It should be noted that for purposes of reporting statistical and other technical data on ZCCM for 1996 in this chapter information from ZCCM for the quarter ending March 31, 1997, which covers the fiscal year April 1, 1996, to March 31, 1997, has been used (Zambia Consolidated Copper Mines Ltd., 1997). The copper and cobalt resource base still needed substantial new capital investment to expand production, particularly from deeper ore bodies. Cobalt estimated mine production decreased to 63% and refined cobalt to 46% of 1995 levels, both still low by historical standards. Zambia is a major world supplier of emerald and amethyst and additionally produces gemstone quality aquamarine, tourmaline, and garnet. Most gemstone mining is done by small-scale, artisanal miners and production and export levels are poorly documented. Cement production increased over 1995 levels. Petroleum refinery products output probably were lower, based on reports of operating difficulties, but numerical information was not available for estimating any decline.

The major mineral exports by value were copper and cobalt. However, some observers believed gemstones were very significant in export value for some time, possibly second to copper, despite the absence of official records. The value of legally and illegally exported gemstones may be as much as \$250 million annually. Based on \$1.11 billion in ZCCM sales of copper and cobalt sales in the fiscal year ending March 31, 1997, 27.9% of shipments went to Japan, 19.3% to the European Community, 10.8% to India, 6.8% to Thailand, and 2.9% to the United States. The difference between export and sales values is accounted for by domestic sales and by metals bought by ZCCM to meet customer contracts.

The Government still dominated the industry, although the tempo of efforts at privatization appeared to be increasing. The state-owned Zambia Industrial and Mining Corp. Ltd. (ZIMCO), scheduled for phaseout in 1994, but apparently still functioning early in 1996, held a majority interest in all principal

commercial and industrial ventures other than those privatized. ZCCM, the largest entity in the minerals sector, was owned 60.3% by ZIMCO, 27.3% by Zambia Copper Investments Ltd. (owned 50% by Minorco S.A., in turn, owned more than 60% by the Anglo American Corp.-DeBeers Centenary AG Group), and 12.4% by the public, including institutions. A small mines development unit of ZCCM supported at least one mine for gemstones in the Eastern Province and one gold and one copper mine in the Western Province. Other units also produced lime and marble, and ZCCM also owned shares in several ventures not related to minerals.

Anglo American Corp. of South Africa Ltd. (AAC) began negotiations with the Government to acquire rights to develop the Konkola Deep Mining Project, which contains a known resource reported by ZCCM in the Kirila Bombwe part of the ore body at 297 Mt grading 3.8% copper and 0.07% cobalt. The Konkola Deep development is considered a key to maintaining or expanding future copper production in Zambia.

ZCCM reported resources as of March 31, 1996, at Chambishi of 136 Mt grading 2.4% copper. By January 1997, the Government announced it had signed a sale agreement and associated documentation with Cyprus Amax Minerals Company of the United States providing the company with an 80% interest in the Kansanshi copper mine and deposit. The Kansanshi deposit contains an estimated resource of 24.4 Mt at 2.9% copper. A 20% interest in the deposit will be maintained by ZCCM. In order for Cyprus to maintain its interest in Kansanshi, the company must proceed with a 3-stage exploration and development project costing about \$48 million. In the event that Cyprus does not proceed beyond stages one or two, the property ownership will revert to ZCCM and Cyprus Amax must pay ZCCM 5% of any shortfall in committed expenditures (Zambian Consolidated Copper Mines Ltd., 1996a).

Other ZIMCO subsidiaries in the minerals sector included wholly owned Reserved Minerals Corp., which, in turn, owned 100% of Mindeco Small Mines Ltd. (producer of several industrial minerals) and 55% of Kagem Mining Ltd. (reportedly the country's largest gemstone producer, 45% of which was owned by the Hagura organization, a private partnership); Chilanga Cement Co., 60% or more owned through Indeco Ltd., another wholly owned subsidiary of ZIMCO, with an unspecified share owned by Commonwealth Development Corp. of the United Kingdom (the Zambia Government's 60% was formally tendered for sale in late 1994); wholly owned Nitrogen Chemicals of Zambia Ltd., producer of ammonia and compounder of fertilizers and explosives; wholly owned Maamba Collieries Ltd., the country's sole coal producer; and Indeni Petroleum Refinery Co. Ltd., 50% owned through Indeco Ltd. with at least some portion believed owned by Agip SpA. of Italy, the operating manager.

Additionally, among more than 100 companies, ZIMCO also had majority or full ownership of some minerals-related businesses, such as crushed stone, glass, and ceramics firms; Metal Marketing Corp. of Zambia, a minerals and metals trading firm; as well as Tazama Pipelines Ltd. (the crude oil pipeline from Dar es Salaam), Zambia Railways Ltd., domestic and

international airlines, and electric utilities. Private entities operated a number of small mines for which little information was available. More than 20 such mines produced gemstones. Others produced limited quantities of gold, apparently mostly alluvial, as well as tin and a variety of industrial minerals.

Significant exploration was being conducted throughout the country. More than 70 separate licenses were in effect covering large areas, especially the northwest, southeast, and much of the areas surrounding ZCCM's mine sites. In addition to copper-cobalt and lead-zinc ores, the companies targeted gold and nickel minerals, diamonds and other gemstones, fluor spar, and phosphate. Several international mining groups were involved, such as BHP and Western Mining Corp. Ltd. from Australia; SouthernEra Resources Ltd. from Canada; AAC, Gencor, Johannesburg Consolidated Investment Co. Ltd. (JCI), and Trans Hex Group Ltd. of South Africa; RTZ; Phelps Dodge; and a number of smaller ventures.

Additionally, recovery of cobalt, copper, lead, and zinc from tailings and slag dumps on ZCCM and other properties were of interest to several companies. Colossal Resources Corp. of Vancouver, Canada, which acquired a 60% interest in the slag processing venture of the Zambian firm, Qasim Mining Enterprises Ltd. in 1994 commenced with the reprocessing of 8.6 Mt of cobalt slag grading 0.70% to 0.81% cobalt and 1.15% copper from ZCCM's Nkana Slag Dump. In August 1996, Colossal initiated processing of the slag and began sales of the recovered cobalt by yearend. The company's expectations are to process 4,000 to 6,000 t of slag per month during the first year of operation, resulting in 50 t of recovered cobalt per month (Colossal Resources Corp., 1996).

First Quantum Minerals Ltd. of Vancouver, Canada, announced the formal acquisition of a 100% interest in the Bwana M'kubwa Copper Project (BMCP) on June 21, 1996. The company also reported that construction work had also begun on the BMCP. The BMCP is based on a renewable 10-year mining license covering about 5,800 hectares near Ndola in the Zambian Copperbelt. The BMCP mining license is the first such license to be issued by the Government since enacting the new Mines and Minerals Act of 1995. The first stage of the project comprises the building of a leach, solvent extraction, electrowinning (SX-EW) treatment plant to recover and treat copper from the No. 4 Tailings Dam at Bwana M'kubwa. The plant will take 14 months to build at a capital cost of \$32 million and will produce 9,720 t cathode copper, 234 t of rough copper, and 60,000 t of sulfuric acid for sale yearly (First Quantum Minerals Ltd., 1996).

Caledonia Mining Corp. of Toronto, Canada, acquired two additional exploration licenses, Ngosa and Luamafula, adjacent to its Nama license. The Nama area covers 93 km² and is located about 10 kilometers (km) west of ZCCM's Konkola copper property in the Copperbelt. Exploration during 1995 and 1996 identified 14 cobalt geochemical anomalies. In the Nama area, results of the drilling produced an estimate of indicated and inferred reserves of 849 t at 0.029% cobalt equivalent. Additionally, Caledonia's exploration at the Kadola West copper oxide deposit have indicated an inferred mineral resource of 74 Mt grading 0.95% total copper equivalent. The

Kadola deposit is approximately 40 km south of the Luanshya Mine on the southern end of the Zambian Copperbelt (Caledonia Mining Corp., 1996).

In Zambia, ZCCM operates one of the largest copper mining complexes in the world through five divisions, Nchanga, Mufulira, Nkana, Luanshya, and Konkola. The Nchanga Division operates one underground and one cobalt-rich open pit copper mine, the Nchanga mill, and a tailings leach plant. As reported by ZCCM, Nchanga produced 157,623 t of copper contained in ore and reclaimed tailings in 1996. Total production of cobalt at ZCCM's operations was 5,126 t for 1996 (Zambian Consolidated Copper Mines Ltd., 1997).

The Mufulira Division operates one major underground mine, a mill, smelter, and refinery. In 1996 Mufulira produced 65,775 t of copper contained in ore and reclaimed tailings.

The Nkana Division mines ore from four underground zones, Mindola, Central Shaft, South Ore Body, and Chibiluma and operates a mill, smelter, refinery, two cobalt recovery plants and two sulfuric acid plants at Nkana and Chambishi. In 1996, the Nkana Division produced 53,895 t of copper contained in ore and reclaimed tailings.

The Luanshya Division operates the Luanshya and cobalt-rich Baluba underground mines, two mills, and the Ndola precious metals refinery. In 1996, the Luanshya Division produced 51,584 t of copper contained in ore and reclaimed tailings.

The Konkola Division operates a mill and the Konkola underground mine. Konkola, one of the wettest mines in the world, pumps out 275,000 cubic meters a day of water and is becoming a major input to the local water supply. In 1996, Konkola produced 56,256 t of copper contained in ore and reclaimed tailings.

In March 1996, Reunion Mining of the United Kingdom acquired the Dunrobin gold project from JCI. Dunrobin was last mined in the 1930's and Reunion Mining was to commence open pit mining, crushing, agglomeration, and heap leaching by mid-1997. Reunion Mining has a target production rate of 567 kilograms of gold per year. Gold reserves were sufficient for 3 years of production, pending the discovery of reserves which would further extend the life of the mine. There were indications that the gold potential of the property was below the JCI corporate threshold for development (Reunion Mining Plc., 1996).

The Ministry of Mines and Mineral Development continued a program to further develop production of gemstones other than diamonds found in many parts of the country. Training and other assistance were being provided to small local mine operators. The Ministry believed the sector should also be attractive to foreign investment in mining, processing, and marketing. Emeralds, mostly produced about 200 km north of Lusaka (Ndola rural area), were estimated to normally comprise about 80% of total gemstone production in value. In volume, however, amethyst output, mostly from a location about 300 km south-southwest of Lusaka (Kalomo area), usually was the largest reported. Additionally, there was production of aquamarine and tourmaline, mostly from a location about 600 km northeast of Lusaka (Lundazi area), as well as garnet, agate, and other gemstones at a number of locations. Of the 30 to 40

registered gemstone operations reported, two were larger-size, mechanized mines that were joint ventures with the Government. From 200 to several thousand small, unregistered mining operations were estimated to be operational.

Cobalt reserves associated with copper ore at three of ZCCM's mines totaled 123 Mt averaging 0.15% cobalt and 2.33% copper. This did not include reserves at Nchanga totaling 8 Mt at 0.62% cobalt.

Gold ore resources were being studied by several groups but were yet to be fully defined. Many occurrences were located throughout the country, some around and to the east of Lusaka.

Nickel resources at the Munali sulfide deposit were put at 10.4 Mt at 1.1% nickel with minor copper, gold, silver, and platinum-group-metal content. The Kalumbila deposit had resources estimated at 8 Mt at 0.55% nickel. Neither deposit was fully defined and extensions were to be explored. Additional resources are projected at other sites.

A large variety of other metallic minerals deposits, including iron, molybdenum, and tin-tantalum also were known, but needed further exploration.

Of the many industrial mineral resources that were being exploited or studied by commercial groups, gemstones were of the most value, but others included clays for brick and tile, refractories; fluorspar; gypsum; limestone for cement and lime manufacture; magnetite for special purposes; marble; phyllite, probably for cement manufacture; silica, mostly for glassmaking; and talc. Phosphate resources were known, but only of low grade, one of which was a carbonatite deposit in the northeast, the subject of continuing studies by Government agencies.

Coal reserves of 78.2 Mt remained at Maamba, 60.2 Mt in the proven category and 18 Mt in the probable category. Petroleum resources remained conjectural with no known activity after some surveys in 1990 along the Zambesi River east from Victoria Falls to Mozambique.

A reasonably adequate truck road and railway network existed within the country and externally for access to ocean and lake ports for international trade. Major highways generally paralleled the rail lines. About 20% of the main roads were paved and about 20% were gravel or stabilized earth. In 1993, the World Bank's affiliated IDA considered the road system to be essential to economic growth but neglected for years, and gave an \$8.5 million credit to restructure the Government system and begin planning for rehabilitation. In early 1995, this resulted in \$800 million in pledges for rehabilitation from the World Bank and other donors.

The principal rail routes were northeast to and from the port of Dar es Salaam, Tanzania—nearly 2,000 km from Ndola in the Copperbelt—mostly on the Tanzania Zambia Railways Authority (Tazara) line; and south through Zimbabwe to and from South African ports—more than 2,500 km from Ndola—using the Zambia Railways Ltd. line in Zambia. The roughly 2,000-km rail link southeast to the port of Beira, Mozambique, through Zimbabwe, became generally available after a long hiatus due to civil war in the port country; but ocean ship availability at Beira was apparently limited. The more than 2,200-km rail link north into Zaire and west to the port of

Benguela (Lobito), Angola, remained unavailable during the 17-year civil war in Angola; however, the end of the conflict appeared in-sight and the route may become available again in the next few years. The rail system, in general, still had some rolling stock shortages, and track maintenance on internal routes was of concern, but equipment rentals and donor aid programs helped to improve the situation.

A crude oil pipeline ran from Dar es Salaam about 1,700 km southeast to a refinery in Ndola. It was owned and operated by Tazama Pipelines Ltd., a joint venture of the Zambian and Tanzanian Governments.

Electric power capacity was adequate, furnished about 70% from hydroelectric, 20% from oil, and 10% from coal plants. Expansion of hydro sources was planned despite the effect of periodic droughts. Coal was available from domestic deposits. The energy source for mobile equipment continued to be imported petroleum, mostly refined products, although a significant amount imported was crude that was refined in the state-owned facility at Ndola. The household energy source was wood, which continued to be the country's largest single source of energy.

Zambia's ability to turn around its economic difficulties appeared to be tied to the future success of its proposed privatization plan. The economy should benefit from the likely infusion of new foreign investment and technology. In addition, much promise of success can be found in the availability of good agricultural, mineral, and water resources; and a market-oriented Government. With continued political stability and passage of the improved mining and mining investment legislation, the international mining community could be expected to act more vigorously on the opportunities. A number of minerals appeared ready for development. Copper-cobalt output in the short term was likely to decline owing to restructuring and operating problems, however, when the ZCCM privatisation is complete, a reinjection of new capital and technology is expected to restore production to more historical levels. The gemstone sector also has the potential to generate a larger value added industry in Zambia.

References Cited

- Caledonia Mining Corp., 1996, Caledonia announces initial tonnage and grade for its Kadola West Copper Oxide Deposit in Zambia: Caledonia Mining Corp. press release, December 6. (Accessed March 16, 1998, on the World Wide Web at URL <http://www.caledoniamining.com>)
- Colossal Resources Corp., 1996, Colossal announces initial melting of cobalt/copper slag at the Kabwe Plant (KMPP) in Zambia: Colossal Resources Corp. press release, September 4. (Accessed March 19, 1998, on the World Wide Web at URL http://www.colossal-cobalt.com/09_04_96.html)
- First Quantum Minerals Ltd., 1996, Completed the formal acquisition of a

- 100% interest in the Bwana M'kubwa Copper Project: First Quantum Minerals Ltd. press release, December 4. (Accessed March 19, 1998, on the World Wide Web at URL http://www.first-quantum.com/news_96/120496.html)
- International Monetary Fund, 1997, Total world exports, by Eastern and Southern African countries: International Monetary Fund, August 6. (Accessed March 16, 1998, on the World Wide Web at URL <http://206.65.85.110/Stats/Trade/regional/worldexp.htm>)
- Metal Bulletin, 1996, ZCCM receives 38 bids: Metal Bulletin [London], November 11, no. 8128, p. 18.
- Reunion Mining Plc., 1996, Annual Report 1996: Reunion Mining Plc. press release. (Accessed on the World Wide Web at URL <http://www.dspace.dial.pipex.com/town/place/py31/>)
- Zambia Consolidated Copper Mines Ltd., 1996a, Chairman's letter to all shareholders of the company: Zambia Consolidated Copper Mines Ltd., 4 p.
- 1996b, Invitation to pre-qualify: Zambia Consolidated Copper Mines Ltd., 1 p.
- 1997, Report for fourth quarter 1996/97: Zambia Consolidated Copper Mines Ltd., 5 p.

Major Sources of Information

- Zambia Investment Centre
5th Floor, Ndeke House
Haile Selassie Avenue
P.O. Box 34580
Lusaka, Zambia
Telephone: 260-1-252130 or 252133
Fax: 260-1-252150
E-mail: invest@zamnet.zm
- Ministry of Mines and Minerals Development
Permanent Secretary
P.O. Box 31969
Lusaka, Zambia
Telephone: 260-1-254107
Fax: 260-1-251224
- Director, Mines Development Department
P.O. Box 31969
Lusaka, Zambia
Telephone: 260-1-251719
Fax: 260-1-252916
- Director, Geological Survey Department
P.O. Box 50135
Lusaka, Zambia
Telephone: 260-1-251570
Fax: 260-1-251973

Major Publication

- Investment Opportunities in the Mineral Sector of Zambia,
Ministry of Mines and Mineral Development, Lusaka,
Zambia.

TABLE 1
ZAMBIA: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/	1992	1993	1994	1995	1996
METALS					
Beryllium: Beryl kilograms	504	178	857	1,000 e/	1,000 e/
Cobalt: 3/					
Mine output, Co content	6,910	4,840	3,600	5,908	7,900 e/
Metal, Co content	4,610	4,211	2,482	3,577	5,126
Copper: 3/ 4/					
Mine output, Cu content:					
By concentration or cementation	349,100	344,200	289,800	268,900	278,800
Leaching (electrowon)	80,400	84,100	83,400	54,800	55,000
Total	429,500	428,200	373,200	323,600	333,700
Metal:					
Smelter, primary:					
Electrowon (low grade)	63,900	62,400	25,342	22,455	25,000 e/
Other	356,400	305,100	241,036	234,457	250,300
Total	420,300	367,600	266,378	256,912	275,300
Refinery, primary:					
Electrowon	43,700	48,800	67,255	45,713	54,600
Other	428,500	363,200	284,784	275,572	270,300
Total	472,200	412,100	352,039	321,285	324,900
Gold 3/ kilograms	271	235	123 r/	91	100 e/
Lead: 3/					
Mine output, Pb content	4,446	7,027	--	--	--
Metal, refined	3,030	2,000	--	--	--
Manganese concentrate (e/ 48% Mn), gross weight	292	--	--	--	--
Selenium, refined, gross weight 3/ kilograms	31,800	26,700	21,115	18,550 e/	20,000 e/
Silver 3/ do.	21,000	18,000	10,002	8,676	9,700 e/
Tin concentrate:					
Gross weight (65% to 72% Sn)	3	--	--	--	--
Sn content	2	--	--	--	--
Zinc: 3/					
Mine output, Zn content of ore milled	14,706	16,704	--	--	--
Metal, refined	7,290	3,450	--	--	--
INDUSTRIAL MINERALS					
Cement, hydraulic e/	347,000	310,000	280,000 5/	250,000	350,000
Clays:					
Brick e/	3,000	3,000	3,000	3,000	3,000
Building, not further specified e/	2,000	2,000	27,000 5/	30,000	30,000
China and ball e/	200	200	200	200	200
Feldspar	113	100 e/	--	--	--
Gemstones:					
Amethyst kilograms	479,000	398,000	366,000	350,000 e/	350,000 e/
Aquamarine do.	254	74	21	200 e/	200 e/
Emerald do.	453	138	160	180 e/	180 e/
Gypsum e/	13,900	14,000	11,200	11,000	11,000
Lime, calcined thousand tons	193	206	195	200 e/	200 e/
Limestone (cement and lime) e/ do.	800	770	710	800	800 e/
Magnetite, gross weight	417	1,250	1,070	1,000 e/	1,000 e/
Nitrogen: N content of ammonia e/	7,000	5,000	3,000	3,000	3,000
Sand and gravel, construction e/ thousand tons	500	500	117 5/	200	200
Stone, construction:					
Limestone, crushed aggregate e/ do.	680	632 5/	668 5/	700	700
Other e/ do.	700	700	700	700	700
Sulfur: 3/					
Pyrite concentrate:					
Gross weight (e/ 42% S)	78,200	80,800	55,572	69,228	70,000 e/
S content e/	32,400	33,400	22,062 5/	28,314 5/	26,000
In sulfuric acid from: e/					
Pyrite roaster gas, S content	29,000	30,000	19,900	25,500	20,000
Metallurgical gas, S content	70,000	56,000	40,700 5/	71,150 5/	60,000
Total, S content	99,000	86,000	60,600 5/	96,650 5/	80,000
Talc	366	62	76	80 e/	80

See footnotes at end of table.

TABLE 1--Continued
 ZAMBIA: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/	1992	1993	1994	1995	1996
MINERAL FUELS AND RELATED MATERIALS					
Coal, bituminous	422	301	163	141 e/	100 e/
Petroleum, refinery products: e/ 3/	5,300	5,300	5,300	5,000 e/	5,000 e/

e/ Estimated.

1/ Table includes data available through June 15, 1997.

2/ In addition to commodities listed, the following were probably produced but information is inadequate to reliably estimate output: fluorspar, tourmaline, additional crude construction materials at artisanal operations (clays for brick and tile; sand, gravel, and stone for aggregate and fill; dimension stone; et al), and clay and/or shale normally used for cement manufacture. Some "industrial sand" and minor amounts of "phyllite" and "silicate" production also was reported but not further defined.

3/ Data are for year beginning Apr. 1 of year stated.

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

5/ Reported figure.