

THE MINERAL INDUSTRIES OF

AFRICA

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The 55 independent nations and other territories of continental Africa and adjacent islands covered in this volume were home to 763 million people and encompass a land area of 30.3 million square kilometers, more than three times the size of the United States. For many of these countries, mineral exploration and production constitute significant parts of their economies and remain keys to future economic growth. The continent is richly endowed with mineral reserves and ranks first or second in terms of mineral concentration (about 20% to 89%) of world reserves of bauxite, chromite, cobalt, diamond, gold, manganese, phosphate rock, platinum-group metals, titanium minerals (rutile and ilmenite), vanadium, vermiculite, and zirconium.

In 1997, Africa witnessed a continued revival of mineral exploration and development stimulated by changes in the political climate that have enabled Angola and Mozambique to be reopened to exploration after years of civil war; a post-Apartheid South Africa looking outward toward the rest of Africa for mineral investment opportunities; efforts to privatize previously state-owned mineral holdings, such as the Zambia Consolidated Copper Mines (ZCCM); and the liberalization of mining and foreign investment laws in many countries. According to the Metal Economics Group of Halifax, Nova Scotia, Canada, \$662.6 million was expended in Africa; compared with the \$418 million spent on exploration in Africa in 1996, this was the largest percentage growth in exploration expenditure of any region in the world. In addition, plans for more than \$18 billion in potential new mineral developments in the region were announced, although realization of this full investment is contingent on completion of due diligence and political risk assessments for a number of announced projects.

The major targets of mineral exploration in Africa were the more easily mined surface deposits of diamond and gold; the availability of project funding shrank, however, as the year progressed. By yearend, the price of gold declined by 15%, battered by considerable sales of gold reserves by a number of Government central banks; increased gold mine production; and, in the later half of the year, reduced demand from Asia. Additionally, the negative impact on the global financial market of the 1997 sample enrichment (salting) scandal and alleged stock fraud associated with the Busang gold deposit in Indonesia by Bre-X Minerals Ltd. of Canada completely eclipsed the 1996 salting scandal at the Sitakili property in Mali by Timbuktu Gold Corp. of Canada and made it more difficult for the junior exploration and mining companies to raise risk capital. Civil war disrupted a number of African nations, including the Democratic Republic of the Congo [Congo (Brazzaville)], the Republic of the Congo [Congo (Kinshasa); formerly Zaire], Sierra Leone, and Sudan. Civil strife or military unrest affected sections of Algeria, Burundi, the Central African Republic, Nigeria, Rwanda, Senegal, Somalia, and Uganda.

In the case of mineral commodities, six African countries were considered to be major import sources for the U.S. mineral industry. Among these were Gabon for manganese; Guinea for bauxite; Madagascar for graphite; South Africa for antimony, ferrochromium, ferromanganese, fluor spar, platinum-group metals, and vanadium; Zambia for cobalt; and Zimbabwe for ferrochromium. In terms of imports of crude oil by the United States, Nigeria (5th among all crude oil importers, at 252 million barrels), Angola (6th), Gabon (10th), Congo (Brazzaville) (18th), and Egypt (19th) were among the largest suppliers. Algeria was the fourth largest supplier of petroleum products.

Much of the mineral exploration and development interest was directed toward southern Africa. The deep waters off the countries along the southwestern coast, including Angola, Cameroon, Congo (Brazzaville), Congo (Kinshasa), Gabon, and Namibia, remained an active petroleum exploration prospective area. Coal was produced by only a few countries in Africa, although reserves are quite large in southern Africa. South Africa was the world's third largest coal exporter.

With the return of foreign investment, two new diamond projects in Angola, the Luo and the Catoca kimberlite, came into commercial production. Official total diamond production was expected to increase significantly to nearly 5 million carats per year within 2 to 4 years. Two offshore petroleum discoveries, Cabinda Gulf Oil Co.'s Kuito and Elf Aquitaine Group's Dahlia Fields, were announced in 1997, as was the confirmation of Elf's Girassol Field. The Dahlia Field was estimated to contain more than 2 billion barrels. In 1997, Angola was the fifth largest producer of crude petroleum in Africa.

In Botswana, diamond exploration continued, as did gold exploration and gold mine development. A new mining law was being prepared. Diamond production increased when the diamond mines switched from a 6-day work week to 7-day-per-week operations. The open-pit operation at Martin's Drift became the country's fourth diamond mine, but the Monarch gold mine was closed because of the drop in the price of gold.

Gold production from northeastern Congo (Kinshasa) was severely disrupted by the civil war that ended in May 1997 when a new Government was installed. Gold output dropped to 394 kilograms (kg) in 1997 from 8,200 kg in 1996. By the end of the year, 10 companies had entered joint ventures with state-owned mining companies to revitalize the copper-cobalt, gold, manganese, and zinc industries. Potential investment, subject to a return to political stability, could exceed \$2 billion.

Exploration for diamonds in the Lihobong kimberlite pipes in Lesotho continued. In Mozambique, nearly \$12 billion in new mineral and infrastructure development projects were being considered by the Government and foreign investors in 1997. Proposed new investment included an aluminum smelter, a direct reduced iron plant, hot-briqueted iron plant, a steel plant, three

titanium mining and processing operations, reopening the Moatize coal mine, and development of the Buzi-Divinhe, the Pande, and the Temane natural gas fields and associated pipelines.

In Namibia, new Government policies have brought in a new wave of foreign investors interested in offshore diamond production, major capital investment was secured to upgrade the Rössing open-pit uranium mine, and the proposed development of the \$600 million Haib copper and the \$164 million Scorpion zinc deposits were under consideration. Copper and lead production dropped sharply since the closure of the Tsumeb Mine in 1996.

In South Africa, more than \$2.5 billion in planned new investment was proposed for a number of mineral industry projects, including the expansion of the Richards Bay coal export terminal and the Namakwa Sands titanium project, the modernization of Aluminium South Africa (Pty.) Ltd.'s Bayside aluminum smelter at Richards Bay and Iscor Ltd.'s aging steel plant at Vanderbijlpark, and the construction of a second coal terminal and associated infrastructure at Richards Bay, a \$1.5 billion 1.25-million-metric-ton-per-year (Mt/yr) steel plant at Saldhana Bay, an underground mine at the Palabora copper operation, a new titanium mine and plant near Richards Bay, and a new zirconium basic sulfate plant at Palabora.

Since 1994, the industry has been undergoing a major corporate restructuring, or "unbundling," aimed at simplifying a complex system of interlocking ownership, establishing separate core-commodity-focused profit centers, and diversifying and rationalizing nonperforming assets to make the newly restructured companies more competitive internationally. Anglo American Corp. spun off all its platinum-group metals operations as Amplats. JCI Ltd.'s major gold mines, chiefly H.J. Joel, were merged with AngloGold's operations to form the largest gold producer in the world with a production capacity of 187 metric tons per year (t/yr) of gold. JCI Ltd. was then split into JCI Projects and JCI Gold, with the latter retaining the Randfontein Estates and the Western Areas gold properties. In November 1997, Gencor Ltd. and Gold Fields of South Africa Limited announced their merger into a single company, Gold Fields Ltd., that will be the second largest gold producer in the world.

Although South Africa was the dominant gold producer in the world in 1997, gold production, at about 492 metric tons (t), was the lowest in 41 years. The extreme depths of new gold deposits in South Africa will add several years to underground development time. Four new major deep gold projects continued on track; namely, Avgold's Target project, JCI/Western Areas South Deep project, AngloGold's Moab project, and the development of Gold Field's Oryx Mine. The Oryx Mine, which was commissioned in 1996, was expected to produce at full capacity of 10,550 kilograms per year of gold by 1999.

The Nkomati nickel mine began commercial production in 1997, as did the country's first offshore oilfield, Oribi. The new Mine and Safety Act went into effect in 1997, and the Government was preparing new Environmental Management Policy and Minerals and Mining Policy papers.

In Zambia, privatization of state-owned coal and copper operations was underway. The Zambian Privatization Agency had divided the state copper company, ZCCM, into nine entities and offered them separately. During 1997, ZCCM successfully divested its controlling ownership in the Luanshya Division; the Chambishi, the Chibuluma, and the Kansanshi copper mines; and

the Power Division. The state-owned Maamba coal colliery was also sold. Zambia gained more than \$320 million in sales and new foreign investment commitments under these transactions; if new mines are developed at Konkola and Kansanshi, then Zambia can expect substantial additional foreign investment in the future. A consortium of U.S., Canadian, and South African mining companies was negotiating to acquire the Nkana and the Nchanga Divisions, representing more than 50% of national copper production. A plant at Nkana to recover cobalt from stockpiled smelter slag was opened in 1997, as was the Dunrobin gold mine.

Despite the drop in the price of gold, gold exploration and mine development continued in Zimbabwe. Many small-scale gold mines were operating and a significant number of people were involved in informal gold panning. Despite the opening of the Bubi and the Beehive gold mines, national gold output failed to increase for the first time in years. The major gold mining companies were restructuring their operations, and the number of gold mine closures increased as the gold price dropped. The Asian financial crisis was blamed for the drop in demand for asbestos and ferrochromium, for which Zimbabwe was a major contributor to the world supply. The Hartley platinum mine was commissioned in June, and the first platinum-group metal shipment from the operation was made in October. A base metals refinery also was opened at Hartley. Buchwa Iron Mining Co. (BIMCO) commissioned its sinter plant at Redcliff, and the rehabilitation of the No. 4 blast furnace of BIMCO's parent, Zimbabwe Iron and Steel Company (Pvt.) Ltd., got underway. In 1997, the Government sent out mixed signals by proposing partial divestment of state-owned mineral companies while pursuing an indigenization policy to increase local interest in multinational mining operations.

In West Africa, gold exploration continued in Benin, Burkina Faso, the Central African Republic, Côte d'Ivoire, Ghana, Guinea, Mali, Niger, and Senegal. The search for oil continued with exploration offshore of Benin, Côte d'Ivoire, Equatorial Guinea, Ghana, Guinea-Bissau, Nigeria, and Senegal. Burkina Faso got a new mining code, and Benin, Cameroon, and Liberia were revising or reviewing their mining laws.

In Guinea, the dispute within the ownership consortium of Société d'Economie Mixte Friguia bauxite and alumina operation resulted in the company being declared bankrupt by the Government. The Government was studying the restructuring of its interest in the bauxite industry. Besides gold and diamond exploration, there also was bauxite, iron, and nickel exploration during 1997.

In Ghana, the Damang and the Obotan gold mines were brought into production during 1997; the Wassa, the Bibiani, and the Tarkwa gold mines were scheduled to startup in 1998. Because of the major domestic energy crisis, Ghana was examining alternatives to its irregular hydroelectric power, most likely a new natural-gas-powered plant. As a result of the energy shortages, the Volta Aluminum Co. Ltd. aluminum smelter operated at only 20% of capacity during the year. The Government declared a 6-month moratorium on prospecting and reconnaissance licenses.

The Sadiola Hill gold mine, which began operations in 1997, significantly increased Mali's gold production. Diamond, gold, and oil exploration continued in Mali. Exploratory drilling for oil was underway in Niger. In Nigeria, Africa's largest oil producer and the world's ninth largest producer of crude oil by volume, the

Government was encouraging the diversification of the mineral industry. Interest in mineral development increased at the local level. The Government was trying to formalize operations at mineral deposits developed by unlicensed small-scale miners and was considering restructuring its interest in state-owned mineral concerns. During 1997, the Aluminum Smelter Co. of Nigeria started one potline, a liquefied petroleum gas extraction plant was opened at Escravos, and the Ima and the Ukpokiti oilfields came on-stream.

Gold was the object of exploration efforts and mine development in the eastern African countries of Djibouti, Eritrea, Ethiopia, Kenya, Tanzania, and Uganda. International and local petroleum companies explored oil and natural gas prospects offshore Eritrea and Mozambique. Kenya, Tanzania, and Uganda were revising or reviewing their mining laws. The Ethiopian Government privatized the Lega Dembi gold mine and put the Adola gold placer operation up for bids. Bids were also solicited for the petroleum refinery in Madagascar.

The petroleum refinery in Eritrea was closed for renovation. In Ethiopia, a kaolin mine and a feldspar and quartz mine were opened. A 730,000-t/yr cement plant was under construction near Mekele, in northern Ethiopia. Phelps Dodge Corp. announced discovery of a nickel laterite deposit in Madagascar. In Tanzania, exploration results through the end of 1997, as reported by seven of the most active operators, identified approximately 300 t (9.6 million troy ounces) of drill measured and indicated gold resources and an additional 250 t (8.1 million troy ounces) of inferred gold resources. Given the depressed level of gold prices, companies have been cautious about moving exploration results

from the resource to the reserve category until full bankable feasibility studies have been completed. The majority of discoveries to date have been focused on near-surface deposits grading from 2 grams per ton (g/t) to 5 g/t. One deeper high-grade deposit with grades ranging from 12 to 14 g/t was reported at Bulyanhulu. The Government remained optimistic that several of these projects will be brought into production during the next 5 years. In November 1997, construction began on the \$47 million Golden Pride gold development.

In northern Africa, Libya was the second largest producer of crude petroleum in Africa, followed by Algeria and Egypt. Petroleum exploration continued in Algeria, Egypt, Libya, Mauritania, Morocco, and Tunisia. There was a natural gas discovery in Morocco, and several new petroleum discoveries in Algeria were being evaluated for commercial production. In Egypt, in 1997, there were 15 oil and 20 natural gas discoveries, and the Abu Tartor phosphate mine was opened. Morocco was the third leading phosphate rock producer in the world. Gold exploration continued in Egypt, Mauritania, and Morocco. Exploration for diamond was active in Mauritania. Société Nationale de Sidérurgie opened a new steel billet plant in Morocco. Alexandria National Iron and Steel Co. completed an expansion to raise capacity to 1.6 Mt/yr. Of the state-owned Aluminum Co. of Egypt, 20% was offered to employees and investors.

Natural resource development has proved vital to the economies of African nations because of its role in generating employment and foreign exchange and in providing the stimulus to develop the power and transportation infrastructure of the region.

TABLE 1
AFRICA: PRODUCTION OF SELECTED MINERAL COMMODITIES, 1997 1/

(Thousand metric tons unless otherwise specified)

Country	Alumi- num e/	Cement e/	Chromite	Coal, anthracite and bitu- minous	Cobalt, mine Co con- tent e/ (metric tons)	Copper, mine Cu con- tent	Diamond (thousand carats) e/ 2/	Gold e/ (kilograms)
Algeria	--	6,900	--	22 e/	--	--	--	--
Angola	--	301 3/	--	--	--	--	1,234 3/	--
Benin	--	550	--	--	--	--	--	--
Botswana	--	--	--	777	348 3/	23	20,111 3/	28 3/
Burkina Faso	--	--	--	--	--	--	--	1,450
Burundi	--	--	--	--	--	--	--	10
Cameroon	82	600	--	--	--	--	--	1,000
Central African Republic	--	--	--	--	--	--	500	90
Congo (Brazzaville)	--	121	--	--	--	--	--	10
Congo (Kinshasa)	--	125	--	50	3,500	40	22,200	394
Cote d'Ivoire	--	500	--	--	--	--	307 3/	2,419 3/
Egypt	178 3/	19,700 3/	1	300 e/	--	--	--	--
Equatorial Guinea	--	--	--	--	--	--	--	--
Eritrea	--	50 3/	--	--	--	--	--	350
Ethiopia	--	700	--	--	--	--	--	3,000
Gabon	--	200	--	--	--	--	500	70
Ghana	152	1,400	--	--	--	--	715 3/	54,446 3/
Guinea	--	--	--	--	--	--	205	7,000
Kenya	2	1,000	--	--	--	--	--	300
Liberia	--	--	--	--	--	--	150	500
Libya	--	3,500	--	--	--	--	--	--
Madagascar	--	60	137 p/	--	--	--	--	500
Malawi	--	140	--	56	--	--	--	--
Mali	--	10	--	--	--	--	--	19,000
Mauritania	--	125	--	--	--	--	--	200
Morocco	--	8,000	--	506	722 3/	15 e/	--	450
Mozambique	--	200	--	30	--	--	--	100 3/
Namibia	--	--	--	--	--	20	1,416 3/	2,433 3/
Niger	--	30	--	140	--	--	--	1,000
Nigeria	3	6,000	--	7 e/	--	--	--	6
Rwanda	--	10	--	--	--	--	--	26
Senegal	--	590	--	--	--	--	--	--
Sierra Leone	--	--	--	--	--	--	104	10
Somalia	--	30	--	--	--	--	--	--
South Africa	673 3/	7,490 3/	5,740	218,617	450	153	10,041 3/	491,680 3/
Sudan	--	380	10 e/	--	--	--	--	5,000
Swaziland	--	--	--	203	--	--	70	--
Tanzania	--	800	--	35	--	--	116	300
Togo	--	350	--	--	--	--	--	--
Tunisia	--	4,431 3/	--	--	--	--	--	--
Uganda	--	150	--	--	--	--	--	3,000
Zambia	--	384	--	10	4,386	353 e/	--	290
Zimbabwe	--	965	670 e/	5,301	100	9 e/	421 3/	24,244 3/
Total, Africa 4/	1,090	65,792	6,558	226,054	9,506	613	58,090	619,306
Total, world	21,400	1,551,000	12,500	4,734,009	27,000	11,400	109,900	2,420,000
Share of world total	5%	4%	52%	5%	35%	5%	53%	26%
United States	3,600	84,244 3/ 5/	--	988,770	--	1,940	4	360,000

See footnotes at end of table.

TABLE 1--Continued
AFRICA: PRODUCTION OF SELECTED MINERAL COMMODITIES, 1997 1/

(Thousand metric tons unless otherwise specified)

Country	Iron ore (gross weight)	Lead, mine Pb content (metric tons)	Manganese ore (gross weight)	Petroleum, crude (thousand barrels)	Phosphate rock e/ (gross weight)	Steel, crude e/ 3/	Uranium, concentrate U ₃ O ₈ 6/ (metric tons)	Zinc, mine Zn content (metric tons)
Algeria	2,250 e/	1,000 e/	--	466,100	1,068 3/	427 3/	--	6,000 e/
Angola	--	--	--	262,800	--	--	--	--
Benin	--	--	--	1,100 e/	--	--	--	--
Botswana	--	--	--	--	--	--	--	--
Burkina Faso	--	--	1 e/	--	--	--	--	--
Burundi	--	--	--	--	--	--	--	--
Cameroon	--	--	--	33,000	--	--	--	--
Central African Republic	--	--	--	--	--	--	--	--
Congo (Brazzaville)	--	--	--	64,000 e/	--	--	--	--
Congo (Kinshasa)	--	--	--	10,600	--	--	--	--
Cote d'Ivoire	--	--	--	5,334	--	--	--	--
Egypt	2,700	--	10	319,000	900 3/	2,717 3/	--	--
Equatorial Guinea	--	--	--	7,300	--	--	--	--
Eritrea	--	--	--	--	--	--	--	--
Ethiopia	--	--	--	--	--	--	--	--
Gabon	--	--	1,904	134,000	--	--	557	--
Ghana	--	--	1,000	--	--	10	--	--
Guinea	--	--	--	--	--	--	--	--
Kenya	--	5	--	--	--	20	--	--
Liberia	--	--	--	--	--	--	--	--
Libya	--	--	--	516,475	--	--	--	--
Madagascar	--	--	--	--	--	--	--	--
Malawi	--	--	--	--	--	--	--	--
Mali	--	--	--	--	--	--	--	--
Mauritania	11,700	--	--	--	--	5	--	--
Morocco	12	77,056	29	35	23,084 3/ 7/	7	--	89,248
Mozambique	--	--	--	--	--	--	--	--
Namibia	--	13,577	40	--	--	--	3,426	40,519
Niger	--	--	--	--	--	--	4,124	--
Nigeria	50 e/	--	--	800,000	--	--	--	--
Rwanda	--	--	--	--	--	--	--	--
Senegal	--	--	--	2 e/	1,340	--	--	--
Sierra Leone	--	--	--	--	--	--	--	--
Somalia	--	--	--	--	--	--	--	--
South Africa	33,225	83,114	3,153	4,380	2,732	8,311	1,297	71,062
Sudan	--	--	--	6,000	--	--	--	--
Swaziland	--	--	--	--	--	--	--	--
Tanzania	--	--	--	--	3	--	--	--
Togo	--	--	--	--	2,200	--	--	--
Tunisia	252	1,420	--	26,841	6,941 3/	195 3/	--	2,967
Uganda	200	--	--	--	--	15	--	--
Zambia	--	--	--	--	--	--	--	--
Zimbabwe	479	--	--	--	125	240	--	--
Total, Africa 4/	50,868	176,172	6,137	2,656,967	38,393	11,947	9,404	209,796
Total, world	1,040,000	3,010,000	22,700	*****	138,000	795,000	42,092	7,460,000
Share of world total	5%	6%	27%	11%	28%	2%	22%	3%
United States	63,000	459,000	--	2,354,980	45,400	94,651 3/	2,559	632,000

e/ Estimated. p/ Preliminary.

1/ Data may be different from that appearing in individual country production tables owing to availability of more current data. Table includes data available through January 1, 1999.

2/ Excluding synthetic diamond.

3/ Reported figure.

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

5/ Includes Puerto Rican data.

6/ Source: The Uranium Institute, London, England, written commun., 1999.

7/ Includes production from Western Sahara.