

THE MINERAL INDUSTRY OF MOZAMBIQUE

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In 2004, the mineral industry of Mozambique produced aluminum, gold, and tantalum; such industrial minerals as bauxite, bentonite and other clays, beryl, diatomite, gemstones, graphite, and salt; and building materials that included cement, granite, gravel, limestone, marble, and sand. The country also produced coal and natural gas. Deposits of asbestos, copper, feldspar, fluorspar, gypsum, iron ore, manganese, mica, nepheline syenite, perlite, phosphate rock, rare earths, silica sand, and titanium have also been identified.

The International Monetary Fund (2005d, p. 208) estimated that Mozambique's real gross domestic product (GDP) grew by 7.8% in 2004 compared with 7.1% in 2003. In 2004, manufacturing accounted for 14% of the GDP; construction, 9.6%; electricity and water, 1.9%; and mining, 1.8%. The nominal GDP at purchasing power parity amounted to \$23.7 billion in 2004 (International Monetary Fund, 2005c, p. 41; 2005§¹).

Output in the mining sector increased by 216% in 2004 compared with 32% in 2003 and 52% in 2002. Most of the increase was attributable to the startup of the Temane natural gas project and increased production of tantalite. The production of gemstones, limestone, marble, and sand also increased; bauxite, beryl, coal, and gold production fell. In 2004, the manufacturing sector grew by nearly 13% as a result of higher aluminum production at the Mozal 2 project. With the completion of this project and the Mozambique Natural Gas Project, however, output in the construction sector fell by nearly 15%. In the electricity and water utility sectors, output increased by nearly 6% (International Monetary Fund, 2005a, p. 11, 19-22).

Commodity Review

Metals

Aluminum.—Mozambique was Africa's second leading producer of aluminum behind South Africa. The Mozal aluminum smelter, which used alumina imported from Western Australia as raw material, increased output to 549,000 metric tons (t) in 2004 compared with 407,000 t in 2003 and 273,000 t in 2002 (table 1). Production increased because of the completion of the Mozal 2 project in April 2003, which doubled Mozal's rated capacity to 506,000 metric tons per year (t/yr). Aluminum production was expected to increase by less than 1% in 2005 (International Monetary Fund, 2005b, p. 30).

Exports of aluminum rose to \$915 million in 2004 compared with nearly \$568 million in 2003. In 2004, aluminum accounted for 61% of Mozambique's total exports. From 2000 to 2004, aluminum accounted for 75% of the total growth in the country's exports (International Monetary Fund, 2005c, p. 69).

¹A reference that includes a section mark (§) is found in the Internet Reference Cited section.

E.C. Meikles (Pty.) Ltd. of Zimbabwe operated a small bauxite mine in Manica Province. In 2004, output was 6,723 t compared with 11,793 t in 2003 and 8,130 t in 2000. All of Mozambique's bauxite production was exported in 2004. Bauxite production was expected to rise by 17% in 2005 (International Monetary Fund, 2005b, p. 28; Estevao T. Rafael Pale, National Director, National Directorate of Mines, written commun., May 12, 2005).

Gold.—Mozambique's gold resources were located in lode and placer deposits throughout the country; gold was produced by artisanal miners. Officially reported production of gold was 56 kilograms (kg) in 2004 compared with 63 kg in 2003 and 23 kg in 2000. Gold production was expected to rise by 16% in 2005 because of Government support for artisanal miners and the rehabilitation of access routes to gold mining areas in Niassa (International Monetary Fund, 2005b, p. 28-29; Estevao T. Rafael Pale, National Director, National Directorate of Mines, written commun., May 12, 2005).

In July, Central African Mining and Exploration Company plc (CAMEC) was awarded 5-year prospecting and exploration licenses for gold in the Nhamatando District in Sofala Province. The company explored for gold at the Muda River project in the Nhamatando District in Zambezia Province. From December 2003 to April 2004, about 2,000 artisanal miners operated in the southern portion of the Muda River license area. The miners produced more than 20 kilograms per month of gold. CAMEC also explored for gold in the Gile District in Zambezia Province (Central African Mining and Exploration Company plc, 2004b).

Nickel.—African Eagle Resources held a prospecting license for the Muazua nickel project in northern Mozambique. The company carried out sampling and mapping at Muazua in late 2004.

Columbium (Niobium) and Tantalum.—National production of tantalite increased to 712,095 kg in 2004 from 188,695 kg in 2003 and 46,900 kg in 2002; the value of tantalite production amounted to \$15.7 million in 2004. Rising production may have been partially attributable to the Marropino Mine, which reopened in April 2003. Fleming Family & Partners owned a majority stake in the mine; the company planned to produce about 110,000 kilograms per year (kg/yr) of tantalum oxide (Ta₂O₅) (Metal Bulletin, 2003; Estevao T. Rafael Pale, National Director, National Directorate of Mines, written commun., May 12, 2005).

In 2004, CAMEC started tantalite production. By September, the company was producing at a rate of about 17,000 kg/yr of Ta₂O₅. CAMEC planned to spend \$500,000 to upgrade its production facilities; output was expected to reach 27,000 kg/yr of Ta₂O₅ by May 2005 and 54,000 kg/yr of Ta₂O₅ by December 2005. In July, the company was granted prospecting and exploration licenses for tantalum and associated minerals in the Alto Molocue, Lugela, and Mocuba Districts in Zambezia Province and for tantalum and tin in the Nhamatando District

in Sofala Province (Central African Mining and Exploration Company plc, 2004a, c).

In September, TAN Mining and Exploration of South Africa decided to proceed with the reopening of the Muiane Mine. The company planned to restart mining in mid-2005 at a cost of \$5 million. TAN planned to produce 82,000 kg/yr of Ta₂O₅ in concentrate from 420,000 t/yr of ore; the tantalite recovery rate would be about 60%. The expected life of the mine was 5 years (Mining Review Africa, 2005).

Titanium and Zirconium.—The Corridor Sands Project was based upon 10 deposits of heavy-mineral sands near Chibuto in southern Mozambique. Starting in 2007, WMC Resources Ltd. of Australia planned to produce 375,000 t/yr of titanium slag, 184,300 t/yr of high-purity pig iron, 21,500 t/yr of zircon, 5,100 t/yr of rutile, and 2,700 t/yr of leucoxene in the initial phase of the project. Production could eventually rise to 1 million metric tons per year (Mt/yr) of titanium slag, 491,100 t/yr of high-purity pig iron, 62,500 t/yr of zircon, 12,200 t/yr of rutile, and 6,400 t/yr of leucoxene. The initial phase of the project was expected to cost \$500 million. In 2004, WMC spent \$8.6 million on Corridor Sands; uncertainty over the price of electricity for the project delayed the startup date for the project until at least 2008. The company was considering the use of natural gas from the Pande and Temane gasfields as a power source (African Energy, 2004; WMC Resources Ltd., 2003; 2005, p. 29).

Kenmare Resources plc of Ireland started construction of the Moma mineral sands mine in August. The company planned to start production in the second half of 2006 and to produce 615,000 t/yr of ilmenite, 60,000 t/yr of zircon, and 17,000 t/yr of rutile. Moma's projected lifetime was 20 years. Capital costs were expected to be \$348 million; annual revenues, \$85 million, and annual operating costs, \$23 million. Kenmare signed contracts for the purchase of 50% of the ilmenite production in the first 5 years of operation (Industrial Minerals, 2004; Mining Journal, 2004; Kenmare Resources plc, 2005, p. 4).

Industrial Minerals

Clay and Shale.—Mozambique had deposits of bentonite, brick clay, and kaolin. Brick clay production rose to 108,231 t in 2004 compared with 100,176 t in 2003. Cia. Desenvolvimento Mineira resumed mining bentonite at Boane in southern Mozambique; production had been shut down by flooding. In 2004, the company produced 3,336 t of crude bentonite and 578 t of processed bentonite (Estevao T. Rafael Pale, National Director, National Directorate of Mines, written commun., May 12, 2005).

Cement.—Cimentos de Portugal, SGPS, SA (Cimpor) held a 65.4% stake in Cimentos de Moçambique SARL, which was the country's only cement producer. The company operated plants at Dondo, Matola, and Nacala. In 2004, Cimpor experienced operational problems at the Matola plant; sales fell by nearly 5% (Cimentos de Portugal, SGPS, SA, 2005).

Diatomite.—Production started at a diatomite mine in Manica Province in 2004. Production amounted to between 200 and 300 metric tons per month (t/mo) in 2004, and was expected

to increase to 500 t/mo in mid-2005 (National Directorate of Mines, oral commun., February 9, 2005). Resources of diatomite were estimated to be nearly 4 Mt in Manica Province and 2 Mt in the Boane District.

Gemstones.—The mine output of garnet rose to 2,686 kg in 2004 from 440 kg in 2003 and 1,136 kg in 2002 after recovering from rains that shut down production at the Cuamba Mine in 2003. Sociedade Mineira de Cuamba E.E., which held the rights to the Cuamba Mine, was in the process of being privatized. The production of aquamarine, dumortierite and tourmaline also increased sharply (table 1). Garnet production was expected to increase by 77% in 2005; dumortierite, 11%; aquamarine, 4%; and tourmaline, 1% (International Monetary Fund, 2005b, p. 28; Estevao T. Rafael Pale, National Director, National Directorate of Mines, written commun., May 12, 2005).

Stone, Crushed.—The production of limestone increased by 18% in 2004 compared with 4% in 2003 and 78% in 2002. Sand production rose by 4% in 2004 compared with 72% in 2003 and 71% in 2002. These increases may have been the result of rapid growth in the construction industry in 2002, which was partially attributable to the expansion of the Mozal smelter. In 2005, the production of limestone was expected to increase by more than 5%, and sand, by 14% (International Monetary Fund, 2005b, p. 28).

Stone, Dimension.—One of Mozambique's few large-scale marble quarries was located at Montepuez in Cabo Delgado Province. Marble from Montepuez was processed into finished products at a plant in Pemba, some of which were exported to Portugal. In 2004, the production of marble blocks increased by nearly 37%, and marble slabs, by nearly 34%. Granite production fell by 3%. Marble production has been limited in recent years by competition from South Africa. Granite production has fallen because of difficulty in finding markets. In 2005, the production of marble blocks and slabs was expected to rise by 10% and 12%, respectively, because of the expansion of the national electricity grid and the installation of new equipment in the quarries. Granite production was expected to rise by nearly 5% (International Monetary Fund, 2005b, p. 28-29; Estevao T. Rafael Pale, National Director, National Directorate of Mines, written commun., May 12, 2005).

Mineral Fuels

Coal.—The production of coal has been limited in recent years because damage to the Sena rail line during the civil war in the 1980s cut off access from the Moatize coalfield to overseas markets. Output was 16,525 t in 2004 compared with 36,742 t in 2003 and 16,115 t in 2000. Production shut down in the first quarter of 2004 because of the installation of a new transportation system at the Chipanga XI Mine. Exports of coal rose to 30,288 t in 2004 compared with 15,138 t in 2003; coal was exported to Malawi. In 2005, coal production was expected to rise by 59% because of the completion of repairs at the Chipanga XI Mine and rising world demand for coal (International Monetary Fund, 2005a, p. 19; 2005b, p. 28; Estevao T. Rafael Pale, National Director, National Directorate of Mines, written commun., May 12, 2005).

In November, Companhia Vale do Rio Doce (CVRD) of Brazil won the bid to develop the Moatize coalfield. The company planned to conduct a feasibility study from January 2005 to January 2007. If the feasibility study yielded favorable results, CVRD planned to build a mine that would produce 14 to 15 Mt/yr of coal. Production was expected to start in 2009. CVRD also planned to build a coal-fired power station with a capacity of 1,500 megawatts (MW). The company agreed to market 15% of Moatize's production in Mozambique; most of the remainder would be consumed by steel plants in Brazil. Development of the Moatize Mine would also require rehabilitation of the railway from Beira to Tete, and the construction of a maritime export terminal at Beira. Total costs of the project were expected to be \$1 billion (Companhia Vale do Rio Doce, 2004; Mozambique News Agency, 2004a).

Natural Gas.—In 2004, Mozambique's production of natural gas rose to nearly 1.3 billion cubic meters from 1 million cubic meters in 2003 with the opening of the Temane Gas Project. Exports of natural gas to South Africa amounted to \$31.3 million in 2004, or about 2% of total exports. Sasol Ltd. of South Africa, which operated the project, used gas from Temane to supply its chemical plants. The Mozal smelter and other Mozambican industrial establishments were expected to purchase gas from Temane and Pande in the future. Natural gas production was expected to rise by 91% in 2005. Sasol indicated that additional production increases to more than 3.1 billion cubic meters could be achieved without further investment (Sasol Ltd., 2003; International Monetary Fund, 2005b, p. 28; 2005c, p. 69).

In July, Det Norske Olje-Selskap (DNO) of Norway abandoned its exploration activities at Savane in Sofala Province. The company planned to conduct further exploration at Chinapamimba, which was also located in Sofala (Mozambique News Agency, 2004b).

Petroleum.—Mozambique produced neither crude petroleum nor refined petroleum products and relied on imports. DNO explored for petroleum in the Inhaminga onshore block north of Beira (Petroleum Economist, 2004). Petronas of Malaysia explored for petroleum in an offshore block near the Zambezi Delta.

Infrastructure

The Governments of Mozambique and Portugal were the main shareholders in Hidroelétrica Cahora Bassa (HCB). The Cahora Bassa hydroelectric plant had a capacity of 2,075 MW. In 2004, the plant was undergoing rehabilitation that was expected to be complete in 2005. In February, the Government of Portugal announced plans to sell its share to the Government of Mozambique (Africa Energy Intelligence, 2004b; African Energy, 2004).

The production of electricity increased by 6% in 2004. Production for the domestic market increased by 12%; demand increased because of economic growth and rural electrification. Production for export to Botswana, Zimbabwe, and other countries fell in 2004. Sales to Zimbabwe, which absorbed 450 MW of capacity, were reduced because of Zimbabwe Electricity Supply Authority's inability to pay its debts. Exports

of electricity amounted to \$102 million in 2004, or 7% of total exports. The production of electricity was expected to rise by nearly 15% in 2005; the electricity grid was likely to be expanded to 20 district capitals and solar power systems were to be installed in 10 localities (Africa Energy, 2004; International Monetary Fund, 2005a, p. 21-22; 2005b, p. 30-31; 2005c, p. 69).

The state-owned company Electricidade de Mocambique (EDM) received numerous loans for rural electrification in 2004. The World Bank Group loaned \$67 million to EDM; Exim Bank of India, \$18 million; and the Swedish International Development Agency, \$18 million. KfW of Germany loaned \$11 million to EDM for electrification in Sofala Province, and the Nordic Development Fund, \$8 million for electrification in Zambezi Province. The Africa Development Fund, the African Development Bank, and the Danish International Development Agency of Denmark offered loans to connect suburbs to urban grids (Africa Energy Intelligence, 2004a).

By April, Mozambique's state-owned rail company had rebuilt 40 kilometers (km) of the 650-km railway from Beira to Tete, which linked the Moatize Mine to the Port of Beira. The railway has been inoperable since 1984 because of civil war and a lack of funds for rehabilitation. In September, the World Bank Group agreed to provide financing for the rehabilitation of the railway; Icon International of India and Rites Ltd. of India won the contract to rebuild the line (Africa Mining Intelligence, 2004; Mozambique News Agency, 2004c).

Outlook

The International Monetary Fund (2005d, p. 208) predicted that Mozambique's GDP will increase by 7.3% in 2005 and 6.5% in 2006. Rising natural gas and tantalite production were expected to contribute to economic growth in 2005. The Moma Mine was expected to increase economic growth in 2006 and 2007; the outlook for titanium minerals in Mozambique depended heavily upon global market trends and reliable domestic power supplies. The development of the Moatize Mine depended upon global market trends and the rehabilitation of infrastructure. Demand for construction materials could increase with the development of the Corridor Sands, Moatize, and Moma projects.

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TABLE 1
MOZAMBIQUE: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity		2000	2001	2002	2003	2004
Aluminum:						
Bauxite		8,130	8,592	9,119	11,793	6,723
Metal, refined		53,800	266,000	273,000	407,000	549,000
Beryl	kilograms	18,600	800	54,300	78,300	45,200
Cement, hydraulic	thousand metric tons	270	265	285	362	350 ^e
Clays:						
Bentonite:						
Crude		16,144	1,357	--	--	3,336
Processed		274	254	580	684	578
Brick		61,884	63,125	84,024	100,176	108,231
Coal, bituminous		16,115	27,600	43,512	36,742	16,525
Columbium (niobium) and tantalum, columbite-tantalite concentrate:						
Gross weight	kilograms	25,000	27,000	46,900	188,695	712,095
Nb content ^e	do.	3,100	3,300	5,500	23,000	87,000
Ta content ^e	do.	7,200	7,700	13,000	54,000	205,000
Diatomite		--	--	--	--	3,000 ^e
Gemstones:						
Aquamarine	kilograms	154	47	26	8 ^r	18
Dumortierite		60	50	40	65	113
Garnet	kilograms	547	--	1,136	440	2,686
Tourmaline	do.	77	18	124	581	1,570
Gold ²	do.	23	22	17	63	56
Natural gas	million cubic meters	1 ^r	1 ^r	2 ^r	1 ^r	1,295
Quartz	kilograms	NA	24,765	31,363	30,985 ^r	173,478
Salt, marine ^e		7,000	10,000	80,000	80,000	80,000
Sands	cubic meters	299,540	464,684	795,813	1,372,032	1,429,743
Stone:						
Granite	do.	796	662	670	539	521
Gravel and crushed rock	do.	602,141	503,716	795,733	800,000 ^{r,e}	800,000 ^e
Limestone		585,590	729,230	1,301,232	1,348,372	1,593,450
Marble:						
Block	cubic meters	454	320	453	452	617
Slab	square meters	14,640	15,303	9,980	10,227	13,666

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

¹Table includes data available through August 25, 2005.

²Does not include unreported production; total output of gold was estimated to be roughly 360 to 480 kilograms per year.

TABLE 2
MOZAMBIQUE: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Aluminum		Mozal SARL (BHP Billiton plc, 47.11%)	Maputo	506,000.
Bauxite		E.C. Meikles (Pty) Ltd. of Zimbabwe	Monte Snuta	12,000. ^c
Bentonite		Cia. Desenvolvimento Mineira	Boane	17,000. ^c
Cement		Cimentos de Mocambique, SARL (Cimentos de Portugal, SGPS, SA, 51%)	Dondo, Matola, and Nacala	760,000.
Coal, bituminous		Carbomoc	Chipanga XI Mine at Moatize	60,000.
Garnet	kilograms	Sociedade Mineira de Cuamba E.E.	Cuamba	4,400. ^c
Graphite		Kenmare Resources plc ¹	Ancuabe	10,000.
Marble, block	cubic meters	Marmonte E.E.	Montepuez	1,500.
Natural gas	million cubic meters	Sasol Ltd. (50%)	Temane	3,100.
Columbium (niobium) and tantalum, tantalite concentrate	kilograms	Fleming Family & Partners	Marropino	315,000. ^c 110,000 Ta ₂ O ₅ .
Do.	do.	Central African Mining and Exploration Company plc	Zambezia Province	48,000; 17,000 Ta ₂ O ₅ .
Do.	do.	Hegemony Resources	Naquissupa	NA.

NA Not available.

¹On care and maintenance since 1999.

TABLE 3
MOZAMBIQUE: MINERAL RESOURCES IN 2004¹

Commodity	Deposit	Tonnage	Grade	Mineral content
Bentonite	Boane	7.1 Mt	NA	NA.
Beryllium	Monea, Morrua, and Muiane	NA	NA	3,100 t BeO.
Coal	Minjova	7,100 Mt	NA	NA.
Do.	Mucanha-Vuzi	3,600 Mt	NA	NA.
Do.	Moatize	2,400 Mt	NA	NA.
Do.	Maniamba	230 Mt	NA	NA.
Columbium (niobium) and tantalum	Marropino	22 Mt	108 g/t Nb ₂ O ₅ ; 254 g/t Ta ₂ O ₅	2,400 t Nb ₂ O ₅ ; 5,600 t Ta ₂ O ₅ .
Do.	Morrua	7.5 Mt	88 g/t Nb ₂ O ₅ ; 661 g/t Ta ₂ O ₅	660 t Nb ₂ O ₅ ; 5,000 t Ta ₂ O ₅ .
Do.	Muiane	2 Mt	320 g/t Ta ₂ O ₅	640 t Ta ₂ O ₅ .
Gold:				
Placer	Chimezi, Inhamurra, Muza, and Revue Rivers	110 million cubic meters	0.25 grams per cubic meter	28 t Au.
Lode	Chimezi, Chua, Mangota, and Penhalonga/Revue	3.5 Mt	6.7 g/t Au	23 t Au.
Graphite	Cabo Delgado Province	33 Mt	15% graphite	5 Mt graphite.
Do.	Satemua	5.6 Mt	6.3% graphite	350,000 t graphite.
Natural gas	Pande and Temane	130 billion cubic meters	NA	NA.
Titanium and zirconium	Corridor Sands:			
Do.	West Block	1,800 Mt	4.14% ilmenite; 0.02% rutile; 0.15% zircon	73 Mt ilmenite; 350,000 t rutile; 2.6 Mt zircon.
Do.	East Block	910 Mt	3.8% ilmenite	34.5 Mt ilmenite.
Do.	Other areas	14,000 Mt	NA	NA.
Do.	Moma	2,370 Mt	3% ilmenite; 0.08% rutile; 0.25% zircon	72 Mt ilmenite; 2 Mt rutile; 6 Mt zircon.

NA Not available.

¹Abbreviations used for commodities in this table include the following: Au, gold; BeO, beryllium oxide; Nb₂O₅, columbium (niobium) oxide; and Ta₂O₅, tantalum oxide. Abbreviations used for units of measure in this table include the following: g/t--grams per metric ton; Mt--million metric tons; and t--metric tons.

Sources: Afonso, R.S., and Marques, J.M., 1998, Recursos minerais da Republica de Mocambique [Mineral resources of the Republic of Mozambique]: Maputo, Mozambique, Direccao Nacionalde Geologica, 150 p.; Companhia Vale do Rio Doce, 2004, CVRD wins concession to explore coal in Mozambique: Rio De Janeiro, Brazil, Companhia Vale do Rio Doce, November 12, 1 p.; Kenmare Resources plc, 2005, Annual reportand accounts 2004: Dublin, Ireland, Kenmare Resources plc, 44 p.; Mining Review Africa, 2005, TAN and the Muiane project: Mining Review Africa, no. 1, p. 28; Radler, Marilyn, 2003, Worldwide reserves grow; oil production climbs in 2003: Oil & Gas Journal, v. 101, no. 49, December 22, p. 43-47; Ruffini, Antonio, 1998a, Mozambican focus on heavy minerals, coal: African Mining, v. 3, no. 1, January-February, p. 45-46, 52; Ruffini, Antonio, 1998b, Rehabilitating Mozambique's coal sector: African Mining, v. 3, no. 1, January-February, p. 47-48; WMC Resources Ltd., 2003, Corridor Sands: Southbank, Australia, WMC Resources Ltd. brochure, January, 9 p.