

MOZAMBIQUE

By Thomas R. Yager

In recent years, the mineral industry of Mozambique has produced aluminum, gold, and tantalum and such industrial minerals as bauxite, bentonite and other clays, gemstones, graphite, and salt. The country has also produced coal and natural gas and such building materials as cement, gravel, limestone, marble, and sand. Deposits of asbestos, copper, diatomite, feldspar, fluorspar, gypsum, iron ore, manganese, mica, nepheline syenite, perlite, phosphate rock, rare earths, silica sand, and titanium are also known to occur.

The International Monetary Fund (2003, p. 180) estimated that Mozambique's gross domestic product (GDP) grew by 8.3% in 2002, compared with 13% in 2001, 1.5% in 2000, and 7.5% in 1999. In 2001, construction accounted for 11.7% of the GDP; manufacturing, 10.7%; electricity and water, 2.1%; and mining, 0.3%. GDP at purchasing power parity amounted to \$20.7 billion in 2002, and per capita GDP at purchasing power parity was about \$1,100 (International Monetary Fund, 2002, p. 6; 2003¹).

The value of output in the mining sector rose by 2.1% in 2002 after rising by 12.4% in 2001. Higher production of bauxite, brick clay, coal, and limestone and the resumption of tantalum mining offset declining bentonite and gold production. In 2002, the electricity and water sector grew by 20.9%; construction, 15.6%; and manufacturing, 13% (World Bank, 2003, p. 8).

Legislation

In 2002, the Government passed legislation that provided guarantees to owners of mining concessions, allowed small-scale and artisanal miners to be given exclusive rights on a specific zone, and appropriated funds for geologic maps showing mineral resources. The Government hoped to increase the mining sector's share of GDP to 10% (Africa Mining Intelligence, 2002).

Commodity Review

Metals

Aluminum.—The Mozal aluminum smelter, which used alumina imported from western Australia as raw material, increased output to 273,200 metric tons (t) in 2002 from 266,000 t in 2001 and 53,800 t in 2000 (table 1). Mozal was jointly owned by BHP Billiton plc, Mitsubishi Corporation, Industrial Development Corporation of South Africa Ltd., and the Government of Mozambique. The Mozal 2 project will double Mozal's rated capacity to 506,000 metric tons per year

(t/yr) by early 2004, with the first ingots being produced in late 2003. The cost of this project was estimated to be \$860 million (Pelser, 2002§).

Mozal's aluminum was exported to Europe capitalizing on the duty-free status of Mozambican goods. In 2002, exports of aluminum ingots produced at Mozal amounted to \$361 million; this was about 49% of total export earnings from goods. Without the higher output from Mozal, total exports of goods would have increased by 11.6% instead of 113.5% in 2001. By 2006, aluminum exports were expected to rise to \$894 million; the share of aluminum in total exports of goods was expected to fall to 42% (World Bank, 2003, p. 7; Pelser, 2002§).

A small bauxite mine in Manica Province was operated by E.C. Meikles (Pty.) Ltd., Zimbabwe. In 2002, output increased to 9,119 t from 8,592 t in 2001 (table 1). All of Mozambique's bauxite production was exported in 2001 and 2002 (Estevao Rafael, National Directorate of Mines, written commun., June 27, 2003).

Columbium (Niobium) and Tantalum.—Hegemony Resources operated the Naquissupa open pit tantalite mine, which was located in the Gilé District of Zambezia Province. National production of tantalite increased to 46,900 kg in 2002 from 27,000 kg in 2001; exports rose to 45,300 kg from 27,000 kg. In 2002, the value of tantalite produced in Mozambique amounted to \$1.16 million (Estevao Rafael, National Directorate of Mines, written commun., August 15, 2003).

In 2002, rehabilitation work was carried out at the Marupine (also known as Marropino), Moiane, and Morrua tantalite mines in the Alto Ligonha District; the Government announced that the mines would reopen by yearend. The Marupine deposit had resources of about 22 million metric tons (Mt) containing more than 5,500 t of columbium (niobium) oxide (Afonso and Marques, 1998; Africa Mining Intelligence, 2002).

Gold.—Mozambique's gold resources were located in lode and placer deposits throughout the country. Gold was produced in Manica, Nampula, Niassa, and Tete Provinces by artisanal miners. Officially reported production of gold fell to 17 kilograms (kg) in 2002 from 22 kg in 2001 (table 1); exports rose to 21 kg from 13 kg. Most of Mozambique's gold production was not included in official figures; actual output was estimated to be from about 360 kilograms per year (kg/yr) to 480 kg/yr (Dreschler, 2001, p. 46, 48; Estevao Rafael, National Directorate of Mines, written commun., June 27, 2003).

In Manica and parts of Niassa, mercury was used intensively to recover fine particles of gold; this caused air and water pollution. Other environmental problems associated with artisanal gold mining included soil erosion and water siltation. The Government is attempting to train miners to use less environmentally harmful methods of gold recovery (Dreschler, 2001, p. 42, 44, 54).

¹References that include a section mark (§) are found in the Internet References Cited section.

In 2002, African Eagle Resources plc of the United Kingdom (formerly known as Twigg Minerals plc) carried out a gold panning survey in the area near Majele (African Eagle Resources plc, 2003, p. 8).

Nickel.—African Eagle Resources explored for nickel at Mount Muazua in 2002. The company was awarded a full prospecting license over the area (African Eagle Resources plc, 2003, p. 8).

Titanium and Zirconium.—The Corridor Sands Project was based upon 10 deposits of heavy-mineral sands near Chibuto in southern Mozambique. WMC Resources Ltd. of Australia held a 100% interest in the project after buying the 40% share held by Southern Mining Corp. of Johannesburg, South Africa, in 2002. In May, the Government approved WMC's plans to start work on Corridor Sands (Africa Mining Intelligence, 2002; Willis, 2003).

Following a bankable feasibility study that yielded favorable results in July, WMC planned to commission the smelter at Corridor Sands in mid-2007. WMC hoped 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. By 2017, WMC planned to produce 1 million metric tons per year 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. At full production, Corridor Sands is expected to operate for 35 years. WMC estimated ilmenite resources in the West Block to be 73.1 Mt; zircon, 2.6 Mt; and rutile, 0.4 Mt (Willis, 2003; WMC Resources Ltd., 2003).

Kenmare Resources plc of Ireland held a mining license for the Moma mineral sands. The company planned to start production in 2005 and produce 610,000 t/yr of ilmenite, 24,000 t/yr of zircon, and 12,500 t/yr of rutile. Moma's projected lifetime was at least 20 years. Resources of ilmenite were estimated to be 63.2 Mt; zircon, 3.9 Mt; and rutile, 1.8 Mt. In 2002, Kenmare negotiated contracts with major consumers of ilmenite and zircon and sought funding from institutions and commercial banks (Kenmare Resources plc, 2003, p. 2-4, 7).

Mozambique's exports of ilmenite, rutile, and zircon were expected to be \$17 million in 2005 and \$474 million in 2006. The share of ilmenite, rutile, and zircon in total exports of goods was expected to be nearly 23% in 2006 (World Bank, 2003, p. 7).

Industrial Minerals

Cement.—Cimentos de Portugal, SGPS, SA held a 51% stake in Cimentos de Mocambique SARL, which was the country's only cement producer. The Dondo, Matola, and Nacala plants had a combined clinker grinding capacity of 595,000 t/yr. In 2002, Cimentos de Portugal overhauled the crushing plant and started production at a new clinker grinding facility at Matola (Cimentos de Portugal, SGPS, SA, 2002, p. 3, 61; 2003; p. 2).

National consumption of cement was estimated to have increased to 575,000 t in 2002 from 504,000 t in 2001 and 313,000 t in 1998; growth was particularly strong in central Mozambique in 2002. Cimentos de Portugal's share of the domestic market was 86%. More than one-half of domestic

cement demand was met through imports (Cimentos de Portugal, SGPS, SA, 2001, p. 78; 2002, p. 62; 2003, p. 65).

Clays and Shale.—Bentonite was mined at Boane in southern Mozambique by Cia Desenvolvimento Mineira. Formal production of crude bentonite ceased in 2002, but small amounts of bentonite were still processed. Exports of processed bentonite fell to 214 t in 2002 from 240 t in 2001 (Estevao Rafael, National Directorate of Mines, written commun., June 27, 2003).

Mozambique also had deposits of brick clay and kaolin. Brick clay production increased by 33%; the value of brick clay produced in Mozambique amounted to nearly \$800,000 in 2002 (Estevao Rafael, National Directorate of Mines, written commun., August 15, 2003).

Gemstones.—Alvorada de Mozambique Lda. held mining licenses for the Maria III and Maria Norte Mines, which produced aquamarine, emerald, garnet, and tourmaline. PGM Gem Trading (Pty.) Ltd. of South Africa operated a mine that produced garnet and tourmaline.

In 2002, mine output of garnet, which had ceased in 2001, amounted to 1,136 kg. The production of tourmaline rose, and the production of aquamarine and dumortierite fell (table 1). In 2002, the reported value of aquamarine, dumortierite, garnet, and tourmaline mined in Mozambique amounted to less than \$100,000 (Estevao Rafael, National Directorate of Mines, written commun., August 15, 2003).

Graphite.—The Ancuabe graphite mine, which was located in Cabo Delgado Province, remained on care and maintenance in 2002. Kenmare continued to seek potential investors for the mine (Kenmare Resources plc, 2003, p. 8).

Limestone and Other Stone.—Resources from the Muanza, Nacala, and Salamanga limestone deposits have been used for cement production at the Dondo, the Nacala, and the Matola cement plants, respectively. In 2002, limestone production increased sharply, rising by 78.4%. Growth in construction materials output was broadly based; the production of granite, gravel and crushed rock, and sand also rose (table 1). The increase in construction materials output may be partially attributable to the Mozal 2 project. In 2002, the value of limestone produced in Mozambique amounted to \$11.46 million; sand, \$1.41 million; gravel and crushed rock, \$347,000; marble, \$144,000; and granite, \$135,000 (Estevao Rafael, National Directorate of Mines, written commun., August 15, 2003).

Mineral Fuels

Coal.—The production of coal has been limited in recent years because the Moatize coalfield has not had access to overseas markets. Exports of coal rose to 35,770 t in 2002 from 32,272 t in 2001 (Estevao Rafael, National Directorate of Mines, written commun., June 27, 2003).

In May, the Government issued a call to tender for the reconstruction and management of the Sena railway, which linked Moatize to the Port of Beira. Work on the railway could begin as early as 2003; repair costs were expected to be \$350 million. The Government also announced plans to privatize Empresa Nacional de Carvao de Mocambique, which was the

state-owned coal mining company (Africa Mining Intelligence, 2002; Katerere, 2002§).

Natural Gas.—Mozambique had natural gas reserves of 127 billion cubic meters, most of which were in the Pande and Temane gasfields. The new pipeline to transport gas from Pande and Temane to South Africa was expected to be completed in October 2003; the first gas would be supplied by January 2004. Sasol Ltd. of South Africa planned to use gas from Temane to supply its chemical plants. The cost of developing Pande and Temane was estimated to be \$1.2 billion, including \$308 million for a processing facility at Temane. The project was expected to have a life of 25 years and to increase Mozambique's GDP by more than 20%. By 2006, exports of natural gas were expected to be \$236 million, or 11% of total exports of goods (Radler, 2002, p. 115; World Bank, 2003, p. 7; Agência de Informação de Moçambique, 2002b§; Claasen, 2002§).

Petroleum.—Mozambique produced neither crude petroleum nor refined petroleum products and relied on imports. In 2002, Petronas of Malaysia announced plans to sign a production-sharing agreement with the Government. Petronas would spend \$70 million exploring for petroleum in the Zambezi Basin in central Mozambique.

Infrastructure

Hydroelectrica de Cabora Bassa of Portugal operated the Cabora Bassa Dam, which had a capacity of 2,075 megawatts (MW). Most of the dam's electricity continued to be exported to South Africa and Zimbabwe. In 2002, exports of electricity amounted to \$107 million, or 14% of Mozambique's total exports of goods (World Bank, 2003, p. 7; Agência de Informação de Moçambique, 2002a§).

By 2015, Mozambique's demand for electricity was expected to rise to the equivalent of 3,000 MW of capacity; the Mozal 2 and Corridor Sands Projects were likely to be substantial factors in the increase. Proposals for increasing capacity included another power station at Cabora Bassa and a new 2,400-MW dam at Mepanda Uncua. The latter project was more likely to be developed; construction could start in 2005 (Agência de Informação de Moçambique, 2002a§).

Mozambique had about 30,400 kilometers (km) of roads, of which approximately 5,700 km was paved. The rail network covered about 3,100 km, of which 50% was functional in 2002 (Katerere, 2002§). The country had 306 km of crude petroleum pipelines and 289 km of petroleum products pipelines; the pipeline from Beira to Harare carried petroleum products to Zimbabwe. Ports and harbors were Beira, Inhambane, Maputo, Nacala, Pemba, and Quelimane; navigable waterways covered about 3,750 km.

Outlook

The International Monetary Fund (2003, p. 180) predicted that Mozambique's GDP would increase by 7% in 2003 and 8% in 2004. The expansion of the Mozal smelter was expected to result in economies of scale; the break-even costs to produce a ton of aluminum would fall to \$575 from \$740. Cement consumption was expected to rise at double-digit rates in 2003; imports from South Africa were likely to fall because of the appreciation of the

rand (Cimentos de Portugal, 2003, p. 94; Pelsler, 2002§). Demand for other building materials, such as clays, gravel and crushed rock, limestone, and marble could increase as well.

The outlook for titanium minerals and tantalum depended heavily upon global market trends. Demand for titanium dioxide pigment is expected to increase by about 3% per year from 2002 to 2006. However, increases in supply from new projects are likely to offset the rise in demand. Global tantalum demand was expected to decline until mid-2003, when the market would start to recover (Gambogi, 2003, p. 79.6; Metal Bulletin, 2002).

References Cited

- Afonso, R.S., and Marques, J.M., 1998, Recursos minerais da Republica de Mocambique [Mineral resources of the Republic of Mozambique]: Maputo, Mozambique, Direcção Nacional de Geologia, 150 p.
- Africa Mining Intelligence, 2002, Mozambique—Mining industry overhaul: Africa Mining Intelligence, no. 38, May 22-June 4, p. 1.
- African Eagle Resources plc, 2003, Annual report 2002: Lymington, United Kingdom, African Eagle Resources plc, 24 p.
- Cimentos de Portugal, SGPS, SA, 2001, Annual report 2000: Lisbon, Portugal, Cimentos de Portugal, SGPS, SA, 214 p.
- Cimentos de Portugal, SGPS, SA, 2002, Annual report 2001: Lisbon, Portugal, Cimentos de Portugal, SGPS, SA, 157 p.
- Cimentos de Portugal, SGPS, SA, 2003, Annual report 2002: Lisbon, Portugal, Cimentos de Portugal, SGPS, SA, 199 p.
- Dreschler, Bernd, 2001, Small-scale mining and sustainable development within the SADC region: London, United Kingdom, International Institute for Environment and Development, 165 p.
- Gambogi, Joseph, 2003, Titanium, in Metals and minerals: U.S. Geological Survey Minerals Yearbook 2001, v. I, p. 79.1-79.16.
- International Monetary Fund, 2002, Republic of Mozambique—Statistical appendix: Washington, DC, International Monetary Fund, July 9, 38 p.
- International Monetary Fund, 2003, World economic outlook—Public debt in emerging markets: Washington, DC, International Monetary Fund, April, 254 p.
- Kenmare Resources plc, 2003, Annual report—2002: Dublin, Ireland, Kenmare Resources Plc, 36 p.
- Metal Bulletin, 2002, Tantalum market to bottom out in 2003—MBR: Metal Bulletin, no. 8722, November 7, p. 8.
- Radler, Marilyn, 2002, Worldwide reserves increase as production holds steady: Oil & Gas Journal, v. 100, no. 52, December 23, p. 113-145.
- Willis, Mark, 2003, Ti-ming it right: Industrial Minerals, no. 424, January, p. 40-45.
- WMC Resources Ltd., 2003, Corridor Sands brochure—January 2003: Southbank, Australia, WMC Resources Ltd., 9 p.
- World Bank, 2003, Mozambique—Country assistance strategy: Washington, DC, World Bank Report No. 26747-MOZ, October 20, 122 p.

Internet References Cited

- Agência de Informação de Moçambique, 2002a (October 10), Mozambique will need 3,000 megawatts by 2015, accessed November 21, 2002, at URL <http://allafrica.com/stories/printable/200210100490.html>.
- Agência de Informação de Moçambique, 2002b (November 15), Temane gas to reach Secunda by early 2004, accessed November 21, 2002, at URL <http://allafrica.com/stories/printable/200211150297.html>.
- Claasen, Larry, 2002 (May 6), Pipeline will give Sasol alternative to coal, accessed May 16, 2002, at URL <http://allafrica.com/stories/printable/200205060125.html>.
- International Monetary Fund, 2003 (September), World economic outlook database, accessed October 1, 2003, via URL <http://www.imf.org>.
- Katerere, Frederico, 2002 (July 29), Sena railway line to be revived, accessed July 30, 2002, at URL <http://allafrica.com/stories/printable/200207290946.html>.
- Pelsler, Hendri, 2002 (July 8), Mozal 2 smelter expansion well ahead of schedule, accessed July 30, 2002, at URL <http://allafrica.com/stories/printable/200207080138.html>.

TABLE 1
MOZAMBIQUE: PRODUCTION OF MINERAL COMMODITIES ^{1,2}

(Metric tons unless otherwise specified)

Commodity ³	1998	1999	2000	2001	2002	
Aluminum:						
Bauxite	6,130	7,883	8,130	8,592 ^r	9,119	
Metal, refined	--	--	53,800	266,000	273,200	
Cement, hydraulic	thousand tons	212	216	270	265	274
Clays:						
Bentonite:						
Crude	10,448	10,828	16,144	1,357 ^r	--	
Processed	NA	360	274	254 ^r	580	
Brick	NA	NA	NA	63,125	84,024	
Coal, bituminous	--	8,573	16,115	27,600 ^r	43,512	
Gemstones:						
Aquamarine	kilograms	NA	NA	NA	47	26
Dumortierite		NA	NA	NA	50	40
Garnet	kilograms	NA	NA	NA	--	1,136
Tourmaline	do.	NA	NA	NA	18	124
Gold ⁴	do.	17	19	23	22 ^r	17
Graphite, concentrates		5,889	4,007	--	--	--
Natural gas ^e	million cubic meters	1 ^{r,e}	1 ^{r,e}	1 ^{r,e}	1 ⁵	2 ⁵
Salt, marine ^e		88,000	82,000	7,000	10,000	15,000
Sands	cubic meters	NA	NA	NA	464,684	795,813
Stone:						
Granite	do.	NA	NA	NA	662	670
Gravel and crushed rock	do.	282,832	265,000 ^c	187,000 ^c	12,979 ^r	24,183
Limestone		NA	NA	NA	729,230	1,301,232
Marble:						
Block	cubic meters	117	110 ^c	75 ^c	320 ^r	453
Slab	square meters	2,736	2,600 ^c	1,800 ^c	15,303 ^r	9,980
Tantalite	kilograms	-- ^c	-- ^c	--	27,000	46,900

^eEstimated. ^rRevised. NA Not available. -- Zero.

¹Estimated data are rounded to no more than three significant digits.

²Data available through September 12, 2003.

³In addition to the commodities listed, construction materials (other clays, sand and gravel, and stone) and tantalum were produced. However, output is not reported quantitatively, and information was insufficient to make reliable estimates.

⁴Does not include unreported production; total output of gold was estimated to be roughly 360 to 480 kilograms per year.

⁵Reported figure.

TABLE 2
MOZAMBIQUE: STRUCTURE OF THE MINERALS INDUSTRY IN 2002

(Metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity	
Aluminum	Mozal SARL (BHP Billiton plc, 47%; Mitsubishi Corporation, 25%; Industrial Development Corporation, 25%; Government, 4%)	Maputo	253,000	
Bauxite	E.C. Meikles (Pty.) Ltd.	Monte Snuta	8,500	
Bentonite ¹	Cia Desenvolvimento Mineira	Boane	NA	
Cement	Cimentos de Mocambique, SARL (Cimentos de Portugal, SGPS, SA, 51%)	Dondo, Matola, and Nacala	595,000	
Coal, bituminous	Carbomoc	Moatize	60,000	
Graphite ²	Kenmare Resources plc	Ancuabe	10,000	
Marble, block	cubic meters	Marmonte E.E.	Montepuez	1,500

NA Not available.

¹Capacity of crude bentonite was estimated to be at least 16,000 t/yr based on recent production data.

²On care and maintenance since 1999.