

# 2009 Minerals Yearbook

## **MOZAMBIQUE**

### THE MINERAL INDUSTRY OF MOZAMBIQUE

### By Thomas R. Yager

In 2009, Mozambique played a significant role in the world's production of aluminum, ilmenite, tantalum, and zircon. The country's share of world tantalum output was about 10%; ilmenite, about 4%; and aluminum and zircon, about 1% each. Other domestically significant mineral processing operations included cement and natural gas. Mozambique was not a globally significant consumer of minerals or mineral fuels (Bray, 2010; Gambogi, 2010a, b; Papp, 2010).

#### Minerals in the National Economy

In 2008 (the latest year for which data were available), the manufacturing sector accounted for 14.5% of the gross domestic product, and mining and quarrying, 1.6%. About 50,000 artisanal miners were estimated to be employed in the production of colored gemstones and gold. In the first 9 months of 2009, aluminum accounted for 47% of national exports; natural gas, 4%; and ilmenite, 2% (Lehto and Goncalves, 2008, p. 310; Mozambique News Agency, 2009a; Organisation for Economic Co-operation and Development, undated).

#### **Production**

In 2009, the production of beryl increased by 492%; limestone, 390%; sand, 75%; gold, 71%; and ilmenite, 68%. It is likely that ruby production also increased substantially. Marble slab output decreased by 97%; granite, by an estimated 94%; tourmaline, 92%; aquamarine, 81%; brick clay, by an estimated 80%; rutile, 74%; morganite, by an estimated 64%; bentonite, by an estimated 58%; garnet, 51%; zircon, 42%; dumortierite, 41%; bauxite, 34%; coal, 31%; and quartz, 11%. Marble block production shut down in 2009 (Government of Mozambique, 2010, p. 49; Eduardo Alexandre, Director, National Directorate of Mines, written commun., October 27, 2009).

#### Structure of the Mineral Industry

Most of Mozambique's mining and mineral processing operations were privately owned, including the cement plants, the Marropino tantalum mine, the Moma mineral sands mine, the Mozal aluminum smelter, and the Temane gas processing plant. Artisanal miners produced gold and gemstones. Carbomoc E.E., which was the country's only coal producer, was state owned.

#### **Commodity Review**

#### Metals

Aluminum and Bauxite.—Mozambique was Africa's second ranked producer of aluminum after South Africa. The Mozal aluminum smelter, which used alumina imported from Western Australia as raw material, produced 545,000 metric tons (t)

in 2009 compared with 536,000 t in 2008. Aluminum exports were valued at \$610 million in the first 9 months of 2009 compared with \$1.16 billion in the same period in 2008. Aluminum prices declined by 39% from September 2008 to the start of January 2009 because of the worldwide economic crisis; prices were still 26% below the September 2008 levels in October 2009 (BHP Billiton Ltd., 2009, p. 6; 2010, p. 6; Mozambique News Agency, 2009a).

E.C. Meikles (Pty) Ltd. of Zimbabwe operated the Moriangane bauxite mine in Manica Province. Most of the mine's output was exported to Zimbabwe for use in the production of aluminum sulfate. The decline in production from 2006 to 2009 may be attributable to lack of consistent power supplies or the economic crisis in Zimbabwe.

Copper and Gold.—Artisanal miners produced gold in central Mozambique. Recent increases in production may be attributable to more gold being mined through legal marketing channels. Agrupamento Mineiro (Companhia Mineira de Gile, 50%, and Metais de Moçambique of Angola, 50%) produced gold at the Mutamabarico Mine in the Manica District. The Mutamabarico Mine reportedly shut down in late February 2009 after the company's license was revoked and awarded to Companhia Mineira de Gile. Metais de Moçambique was engaged in a dispute over ownership of the mine with Companhia Mineira de Gile at yearend (Mozambique News Agency, 2009d; Escorpião, 2010).

In November 2008, Delta Trading Companhia Lda. was granted a mining license for the Monarch Mine. The company planned to reopen Monarch in 2009; it is unclear if the mine was reopened by yearend. Pan African Resources plc of the United Kingdom was considering the development of a new mine at the Manica project. Production was expected to be nearly 2,600 kilograms per year (kg/yr); the life of the mine was estimated to be 11 years. In June, Pan African decided to delay development because 93% of the mineralization at Manica is refractory, which would increase production costs. The company hoped to identify nearby oxide gold resources that could make the project profitable (Mining Journal, 2009b; Thompson, 2009).

African Queen Mines Ltd. of Canada explored for copper and gold at the King Solomon project in Tete Province in the second half of 2009. In July, African Queen formed a joint venture with Opti-Metal Trading Ltd. of Switzerland to explore at a property near the King Solomon project. The company also had joint ventures with Bobcat Mining Lda. to reopen the Bragnaza Mine and with Manica Minerals Ltd. to explore the Cazula project, from which it withdrew in December 2008 and February 2009, respectively (Thompson, 2009).

Iron and Steel.—In 2008, ArcelorMittal South Africa Ltd. restarted production at the Trem de Varao rolling mill in Maputo. The plant, which had a capacity of 35,000 metric tons per year (t/yr), processed billet imported from South Africa. ArcelorMittal also planned to complete a new bar and rod mill near Maputo. In September 2009, the company shut down the

MOZAMBIQUE—2009 31.1

Trem de Varao plant and suspended construction of the new plant (Bain, 2008; Thompson, 2009).

**Iron Ore.**—In September 2009, Baobab Resources plc of the United Kingdom completed its initial resource assessment for the Tete project. Inferred resources were estimated to be 47.7 million metric tons (Mt) at a grade of 25.3% iron, 9.69% titanium dioxide ( $\text{TiO}_2$ ), and 0.18% vanadium pentoxide ( $\text{V}_2\text{O}_5$ ). The company planned further exploration to increase the resource (Mining Journal, 2009a).

**Niobium and Tantalum.**—Noventa Ltd. operated the Marropino Mine, which produced columbite-tantalite concentrate until May 2009. The mine shut down because of processing difficulties, low recovery rates, high power costs because of delays in the delivery of grid power to the mine, and high transportation costs. Noventa planned to reopen the mine in April 2010 and to increase capacity to nearly 230,000 kg/yr of tantalum pentoxide ( $Ta_2O_5$ ) from 140,000 kg/yr by yearend. Production costs were expected to be reduced by equipment upgrades and substituting grid power for diesel generators (Noventa Ltd., 2010, p. 8-10, 12-13).

Depending on the success of reopening the Marropino Mine, Noventa planned to reopen the Morrua and the Mutala Mines. Resources at Morrua were estimated to be about 3,600 t of contained Ta<sub>2</sub>O<sub>5</sub>; Marropino, nearly 2,600 t; and Mutula, about 2,400 t. Noventa planned to complete an updated resource assessment at Marropino by July 2010 and to explore at Morrua and Mutala in 2010 (Noventa Ltd., 2010, p. 11, 13).

**Titanium and Zirconium.**—Kenmare Resources plc of Ireland produced ilmenite, rutile, and zircon at the Moma Mine. In 2009, ilmenite production was 551,695 t; zircon, 19,101 t; and rutile, 1,697 t. The company planned to increase production at Moma to its full capacity of 800,000 t/yr of ilmenite, 50,000 t/yr of zircon, and 14,000 t/yr of rutile in 2010. Depending on market conditions, Kenmare could expand capacity to 1.2 million metric tons per year (Mt/yr) of ilmenite, 80,000 t/yr of zircon, and 22,000 t/yr of rutile by the end of 2012. Resources at Moma were estimated to be 160 Mt of contained ilmenite, of which 20 Mt was reserves (Kenmare Resources plc, 2010, p. 4, 10, 12, 80; Government of Mozambique, 2010, p. 49).

Ilmenite exports were valued at about \$32 million in the first 9 months of 2009 compared with \$14 million in the same period in 2008. European countries accounted for 51% of Mozambique's mineral sands exports; the United States, 32%; and Japan, 17% (Mozambique News Agency, 2009a; Kenmare Resources plc, 2010, p. 74).

In 2009, BHP Billiton decided to withdraw from the Corridor Sands Project at Chibuto in southern Mozambique, which the company considered to be subeconomic. Rio Tinto plc of the United Kingdom explored at a mineral sands project near Corridor Sands (Thompson, 2009).

#### **Industrial Minerals**

**Cement.**—Cimentos de Mocambique SARL [Cimentos de Portugal, SGPS, SA (Cimpor), 82.46%] produced cement at its Dondo, Matola, and Nacala plants, which together had a total capacity of about 960,000 t/yr. Cimpor planned to build a kiln

at Dondo with a capacity of about 550,000 t/yr and to increase the clinker grinding capacity at Dondo to 600,000 t/yr from 240,000 t/yr. The company also planned nearly to double the grinding capacity at the Matola plant. The expansion at Dondo was expected to be completed by 2010. In April 2009, Cimentos de Nacala S.A. restarted production at its cement plant at Nacala, which had a capacity of 250,000 t/yr (table 2; International Cement Review, 2008; Mozambique News Agency, 2009c).

National cement consumption increased to about 1 Mt in 2009 from about 0.9 Mt in 2008. Increased consumption was partially attributable to the construction of a new stadium near Maputo and the modernization of the Maputo airport. Production by domestic plants was insufficient to meet demand; cement imports increased in 2009 because of the suspension of the import tariff at the end of 2008 (Cimentos de Portugal, SGPS, SA, 2010, p. 96-97).

**Fluorspar.**—In October 2009, Globe Metals & Mining Ltd. of Australia entered into a joint-venture agreement to acquire the Mount Muambe fluorite deposit. Mount Muambe is a carbonatite deposit located 20 kilometers (km) southeast of the Moatize coal property in Tete Province. Globe engaged in chip sampling in the fourth quarter of 2009 and planned to start a drilling program in the second quarter of 2010 (Globe Metals & Mining Ltd., 2009).

Gemstones.—The production of most gemstones decreased sharply in 2009; the decline was probably attributable to reduced demand during the worldwide economic crisis. The decrease in tourmaline production was also partially attributable to the discovery of new ruby deposits that led artisanal miners to abandon elbaite tourmaline deposits in the Mavuco area and Government attempts to reduce illegal mining at Mavuco (Pardieu and others, 2009, p. 8).

Gem-quality ruby was discovered at the M'sawize deposit in the Niassa National Reserve in September 2008. Between 100 and 700 artisanal miners produced ruby, of which between 5% and 10% was high quality, until July 2009. By the end of August, production decreased sharply at M'sawize because of Government efforts to curtail illegal mining and the discovery of the Montepuez ruby deposit in Cabo Delgado Province. Mining started at Montepuez in April 2009 and increased sharply in June and July; several thousand miners and dealers worked at the deposit. By November, the Government awarded Mwiriti Lda. a mining license to Montepuez (Pardieu and others, 2009, p. 7-9).

Morganite, which is a pink beryl that obtains its color from trace amounts of manganese, was produced at the Marropino Mine. Noventa shut down mining operations at Marropino in May 2009; morganite production was not part of the company's plan to reopen the mine in April 2010. In June, Mozambique Gems started mechanized tourmaline mining operations at Mavuco; the company produced about 190 kilograms of tourmaline in the first 2 months of operation. Sociedade Mineira de Cuamba E.E. mined pyrope and pyrope-almandine garnet at Cuamba and Nampula in Niassa Province (Noventa Ltd., 2010, p. 3, 13).

**Graphite.**—In December 2008, TIMCAL Ltd. of Switzerland was awarded the license to reopen the Ancuabe graphite mine in Cabo Delgado Province. The Ancuabe Mine, which operated

from 1994 to 1999, shut down because of high power costs. In February 2009, the mine was connected to the power grid; power costs were expected to decline sharply as electricity from the Cahora Bassa hydroelectric plant was substituted for diesel generators. TIMCAL planned to reopen the mine in 2010 after replacing obsolete mining equipment used during previous operations (Mozambique News Agency, 2009b).

#### Mineral Fuels and Related Materials

Coal.—Vale S.A. of Brazil planned to produce 8.5 Mt/yr of coking coal and 2.5 Mt/yr of thermal coal at the Moatize Mine in Tete Province starting in December 2010. The coking coal was likely to be consumed by steel plants in Brazil; thermal coal would be consumed by a new coal-fired powerplant built by Vale at Moatize with a capacity of more than 1,500 megawatts (MW). Reserves at Moatize were estimated to be 838 Mt. Capital costs of the project were estimated to be \$1.3 billion. Development of the Moatize Mine depended upon the reopening of the railway from Moatize to Beria, which had been severely damaged during the civil war of the 1980s. The railway was expected to be reopened in January 2010 (Gleeson, 2009; Mozambique News Agency, 2009d, e).

Riversdale Mining Ltd. of Australia and its joint-venture partner Tata Steel Ltd. of India planned to open the new Benga Mine in Tete Province in the fourth quarter of 2010. Production in the first stage of the project was expected to be 5.3 Mt/yr and would increase to 10.6 Mt/yr after about 5 years. Subsequent increases to 20 Mt/yr depended on the availability of transportation infrastructure. Riversdale planned to use coal from Benga in its new powerplant, which would have an initial capacity of 500 MW. Resources at Benga were estimated to be 4 billion metric tons (Gt), of which 273 Mt was reserves. Capital costs of the project were estimated to be more than \$800 million (African Mining, 2009; Gleeson, 2009).

In October 2009, Riversdale completed its first resource assessment at the Zambeze project, which was located adjacent to Benga. Indicated resources were estimated to be 1.7 Gt. In April, Central African Mining and Exploration Company plc of the United Kingdom announced that resources at its 871L property in Tete Province amounted to 1.03 Gt. In March, the Government awarded state-owned Coal India Ltd. the A1 and A2 licenses in Tete Province, which had estimated resources of 1 Gt of coal (Africa Mining Intelligence, 2009; Gleeson, 2009; Thompson, 2009).

Natural Gas.—Production of natural gas from the Pande and the Temane gasfields decreased to about 2.8 billion cubic meters in 2009 from 3.04 billion cubic meters in 2008. Sasol Ltd. of South Africa, which operated the project, exported most of its output through an 865-km pipeline to supply its South African chemical plants. The company planned to increase production capacity to 4.77 billion cubic meters per year from 3.13 billion cubic meters per year by 2011. Sasol planned to use the increased output to supply its expanded synthetic fuels plant in South Africa and a new gas-fired power station in Mozambique (Government of Mozambique, 2010, p. 49; Sasol Ltd., 2010, p. 3; Eduardo Alexandre, Director, National Directorate of Mines, written commun., October 27, 2009).

In November 2009, Sasol acquired exploration rights for the M-10 and the Sofala offshore licenses adjacent to Blocks 16 and 19, which were already held by Sasol and its joint-venture partners. The state-owned Empresa Nacional de Hidrocarbonetos announced plans to drill its first well at the Buzi Block in 2011. Anadarko Petroleum Corp. of the United States also planned to explore for natural gas in Mozambique (Thomson Reuters, 2009; Sasol Ltd., 2010, p. 3).

From 2004 to 2008, nearly 96% of Mozambique's natural gas production was exported to South Africa; the remainder was used to generate electricity in the northern districts of Imhambane Province and to replace fuel oil in the Mozal smelter and the Matola cement plant. Natural gas exports were valued at about \$58 million in the first 9 months of 2009 compared with \$116 million in the same period in 2008. The decrease was attributable to reduced demand from South Africa (Mozambique News Agency, 2009a, d).

**Petroleum.**—Mozambique produced neither crude petroleum nor refined petroleum products and relied on imports. In December 2008, the Government awarded the contract for preliminary studies of a new petroleum refinery to Shell Global Solutions Inc. of the United States. Depending upon successful results of the studies, OilMoz Lda. planned to build a refinery in southern Mozambique with a capacity of 350,000 barrels per day (bbl/d). The refinery was expected to be completed by 2014 at an estimated cost of \$8 billion (Petroleum Economist, 2008; Koottungal, 2009).

Ayr Logistics Ltd. of the United States and its joint-venture partners planned to build a new refinery at Nacala. The refinery was expected to have a capacity of 300,000 bbl/d and to be completed by 2015. Costs were estimated to be \$5.5 billion. The refinery's capacity was substantially greater than Mozambique's petroleum products consumption; exports to southern African countries were likely (Mozambique News Agency, 2008).

**Uranium.**—Mantra Resources Ltd. of Australia started a drilling program at the Zambezi Valley project in the third quarter of 2009 after completing soil sampling in the second quarter. The company sold its Mavuzi and Murrupula properties to North River Resources plc of the United Kingdom and relinquished its Mucumbura, Murrupula, Niassa, and Zumbu properties. The Mavuzi property in northwestern Mozambique included the Mavuzi Mine, which produced uranium during the 1950s (Mantra Resources Ltd., 2009, p. 6).

#### Outlook

The mineral industry of Mozambique is likely to experience substantial growth in the near future. Growth is expected to be broadly based, with increased production of ilmenite, rutile, and zircon expected through 2013; cement, niobium, and tantalum, in 2010 and 2011; natural gas, in 2011 and 2012, and coal, from 2011 through 2016. By 2016, coal production could increase to as much as 21.6 Mt from about 26,000 t in 2009. New petroleum refineries could open in 2014 and 2015. Graphite mining could also restart in 2010. The outlook for coal, gemstones, ilmenite, niobium, rutile, tantalum, and zircon could be negatively affected by conditions in the world economy. The development of new coal mines also depends on the rehabilitation of the rail

MOZAMBIQUE—2009 31.3

network. New mines and related infrastructure could lead to increased consumption and production of local construction materials.

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### $\label{eq:table1} \textbf{TABLE 1} \\ \textbf{MOZAMBIQUE: PRODUCTION OF MINERAL COMMODITIES}^1 \\$

#### (Metric tons unless otherwise specified)

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000 56 000 1 583 <sup>r</sup> 3318 547 031 22	3,515 692 22,052 10,953	564,000 30,600 665 <sup>r</sup> 10,469 <sup>r</sup> 762 150,000 <sup>r, e</sup> 23,602	536,000 7,600 744 r  17,661 r 614 80,000 r,e	545,000 45,000 777 7,387 577
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	,	031	379 4	380
15 <sup>r</sup>	5,222 <sup>r</sup>	20,371 <sup>r</sup>	2,549 <sup>r</sup>	492
10	664	63	142 <sup>r</sup>	84
172	5,730	16,986 <sup>r</sup>	5,398 г	2,648
750	2,052	2,613	7,274	2,600
245 2	25,138	11,607 <sup>r</sup>	34,165 <sup>r</sup>	2,902
63	85	95 <sup>r</sup>	298	511
316 <sup>r</sup>	2,662 r	2,722 r	3,037 <sup>r</sup>	2,803
212 9	95,100	196,433 r	395,646 г	404,668
000	6,800	14,000	28,000	29,000
000 2	27,000	56,000	110,000	113,000
568 19	95,100	216,655 r	157,254 <sup>r</sup>	140,600
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<sup>&</sup>lt;sup>e</sup>Estimated; estimated data are rounded to no more than three significant digits. <sup>r</sup>Revised. do., Ditto. -- Zero.

MOZAMBIQUE—2009 31.5

<sup>&</sup>lt;sup>1</sup>Table includes data available through October 6, 2010.

<sup>&</sup>lt;sup>2</sup>Other gemstones, such as amethyst and ruby, were produced, but available information is insufficient to estimate production.

<sup>&</sup>lt;sup>3</sup>Cement sales by Cimentos de Moçambique SARL only.

<sup>&</sup>lt;sup>4</sup>Reported figure.

<sup>&</sup>lt;sup>5</sup>Does not include unreported production; total output of gold was estimated to be roughly 600 to 900 kilograms per year.

### $\label{eq:table 2} \text{MOZAMBIQUE: STRUCTURE OF THE MINERAL INDUSTRY IN 2009}$

#### (Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity <sup>1</sup>
Aluminum		Mozambique Aluminum SARL (BHP Billiton Ltd., 47%)	Mozal smelter at Beluluane	506,000.
Bauxite		E.C. Meikles (Pty) Ltd.	Monte Snuta	12,000.e
Bentonite		Minerais Industriais de Moçambique Lda	Mine at Mufiane	30,000.
Cement		Cimentos de Moçambique SARL (Cimentos de Portugal,	Plant at Matola	600,000.
		SGPS, SA (Cimpor), 82.46%)		
Do.		do.	Plant at Dondo	240,000.
Do.		do.	Plant at Nacala	120,000.
Do.		Cimentos de Nacala S.A. (Grupo INSITEC, 100%)	do.	250,000.
Coal, bituminous		Carbomoc E.E. (Government owned)	Chipanga XI Mine at Moatize	60,000.
Diatomite		Diatomites de Moçambique Lda	Diana quarry near Manica	4,800.
Garnet	kilograms	Sociedade Mineira de Cuamba E.E.	Cuamba and Nampula Mines	8,000.
Gold	do.	Agrupamento Mineiro (joint venture of Companhia	Manica District <sup>2</sup>	720.
		Mineira de Gile and Metais de Moçambique)		
Do.	do.	Artisanal miners	do.	600.
Graphite		TIMCAL Ltd.	Mine at Ancuabe <sup>2</sup>	10,000.
Marble, block	cubic meters	Marmonte Moçambique	Quarry at Pemba <sup>2</sup>	1,500.
Morganite	kilograms	Noventa Ltd. (Highland African Ventures Ltd., 36.7%)	Mine at Marropino <sup>2</sup>	5,000.e
Natural gas	million	Sasol Ltd. (70%)	Temane and Pande	3,130.
	cubic meters			
Niobium (columbium) and	kilograms	Noventa Ltd.	Mine at Marropino <sup>2</sup>	140,000 Ta <sub>2</sub> O <sub>5</sub> .
tantalum, columbite-tantalit	te,			
ore and concentrate				
Ruby		Mwiriti Lda.	Montepuez Mine in Cabo Delgado	NA.
			Province	
Steel, semimanufactured		ArcelorMittal South Africa Ltd.	Trem de Varao plant at Maputo <sup>2</sup>	35,000.
Titanium		Kenmare Resources plc	Moma Mine in Nampula Province	800,000 ilmenite;
				14,000 rutile.
Tourmaline	kilograms	Artisanal miners	13 kilometers northeast of Mavuco	2,600.e
D		<del></del>		274
Do.	do.	do.	3 kilometers northeast of Mavuco	NA.
Do.	do.	do.  Mozambique Gems Ltd.	3 kilometers northeast of Mavuco Mine near Mavuco	1,200. <sup>e</sup>

<sup>&</sup>lt;sup>e</sup>Estimated; estimated data are rounded to no more than three significant digits. Do., do. Ditto. NA Not available.

 $<sup>^1</sup>$ Abbreviations used in this table for commodities include the following:  $Ta_2O_5$ —tantalum oxide.

<sup>&</sup>lt;sup>2</sup>Not operating at the end of 2009.