



2019 Minerals Yearbook

MOZAMBIQUE [ADVANCE RELEASE]

THE MINERAL INDUSTRY OF MOZAMBIQUE

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In 2019, Mozambique was estimated to be the world's second-ranked producer of graphite after China, accounting for 10% of the world's production. It was also the world's fifth-ranked producer of ilmenite, accounting for 8% of the world's production; the third-ranked producer of beryllium, accounting for 6% of the world's production; and the fourth-ranked producer (tied with the United States) of zirconium, accounting for 7% of the world's production. Other minerals produced in Mozambique included aluminum, bauxite, cement, clays, coal, diatomite, gemstones (aquamarine, dumortierite, garnet, ruby, spinel, and tourmaline), gold, graphite, gravel, natural gas, natural gas condensate, niobium, quartz, refined lead, rutile, salt, sand, stone (crushed and dimension stone), and tantalum (table 1; Gambogi, 2021; Jaskula, 2021; Olson, 2021; Sangine, 2021).

Minerals in the National Economy

In 2019, the mining sector's contribution to the gross domestic product decreased by 3.7% compared with an 11% increase in 2018. Total export revenues decreased by 9.2% to \$4.7 billion owing to the decrease in the international price of goods, including coal, aluminum, and natural gas, as well as a reduction in the volume of the country's main export products. In 2019, coal accounted for about 27% of Mozambique's total exports; aluminum, 21%; heavy sands, 7%; natural gas, 6%; and gemstones (emerald, sapphire, and ruby), 3% (Banco de Moçambique, 2020, p. 14, 57; Instituto Nacional de Estatística, 2020, p. 119, 121).

The Ministério dos Recursos Minerais e Energia (MIREME) [Ministry of Mineral Resources and Energy] is responsible for the implementation of Government policies regarding geologic research, the mining of minerals, and energy resources, and the development and expansion of energy infrastructure projects for the supply of electricity, natural gas, and petroleum products. The Instituto Nacional de Minas (INAMI) [National Mining Institute], whose functions are overseen by the MIREME, is the regulatory body responsible for establishing guidelines for public and private participation in the exploration, mining, processing, and trade of minerals and their derivatives in accordance with the Mining Law (law No. 20/2014 and Decree No. 34/2019) and the Petroleum Law (law No. 21/2014) (Ministério dos Recursos Minerais e Energia, 2015, p. 1448 — (3), (6); 2020a, b; Instituto Nacional de Minas, 2020).

Production

In 2019, significant decreases in mineral commodity production included that of sand and gravel (silica), by 86%; crushed limestone, by 83%; gravel, by 67%; sand, by 65%; zirconium (mineral concentrate, zircon), by 40%; metallurgical coal, by 36%; tourmaline, by 32%; bituminous coal, by 28%; ruby, by 24%; titanium (ilmenite and leucogene), by 23%; bauxite, by 19%; garnet, by 17%; gold (Au content) and

natural gas (condensate), by 15% each; aquamarine, by 11%; and niobium (gross weight), by 10%. Significant increases in mineral commodity production included that of granite, by 167%; graphite, by 43%; natural gas (gross weight) and niobium (content), by 20% each; and lead (secondary), by 15%. Data on mineral production are in table 1.

Structure of the Mineral Industry

Most of Mozambique's mining and mineral processing operations were privately owned. The mineral industry also included a number of small-scale and artisanal mining operations that produced construction materials, gemstones, gold, niobium, and tantalum. Table 2 is a list of the major mineral industry facilities in Mozambique.

Commodity Review

Metals

Aluminum.—In 2019, Mozambique produced 565,000 metric tons (t) of aluminum compared with 571,000 t in 2018. The Mozal aluminum smelter, which was located 20 kilometers (km) west of Maputo and operated by South32 Ltd. of Australia, was the only aluminum smelter in Mozambique and the second largest aluminum smelter in Africa. South32 held a 47.1% share in the smelter; Mitsubishi Corporation Metals Holding GmbH of Japan held a 25% share; Industrial Development Corporation of South Africa Ltd., a 24% share; and the Government of Mozambique, the remaining 3.9% share. The smelter had a capacity of 572,000 metric tons per year (t/yr) (table 1; South32 Ltd., 2019, p. 9).

Gold.—In January, Xtract Resources Plc of the United Kingdom, through its wholly owned Mozambican subsidiary, Explorator Lda., announced a mining agreement with Huafei Gold Resources Co. Lda. (Huafei) of China (formerly Sino Minerals Investment Company Ltd.). The agreement granted Huafei the exclusive right to mine alluvial gold deposits at Xtract's Manica concession, located in west central Mozambique, until the depletion of the alluvial deposits. In 2019, Xtract produced nearly 138 kilograms (kg) of gold compared with nearly 190 kg in 2018 (Xtract Resources Plc, 2020, p. 1, 9).

In May, Xtract entered into a collaboration agreement with Mutapa Mining and Processing LDA (MMP) for the mining and processing of the Fair Bride gold deposit in the Manica concession. Under the agreement, MMP would be responsible for financing, building, and operating a mine and carbon-in-leach plant and for conducting an exploration program to expand resources. The Fair Bride deposit was an open pit project with an estimated resource [in compliance with the South African Code for the Reporting of Exploration Results, Mineral Resources and Mineral Reserves (SAMREC Code)]

of 39,253 kg, of which 24,323 kg was measured and indicated. The agreement was set for a period of 10 years with an option to extend the time further. Commercial production was expected by mid-2020 (Xtract Resources Plc, 2019; 2020, p. 4).

Iron Ore, Iron and Steel, and Vanadium.—In 2019, Baobab Resources Ltd. of the United Kingdom (Baobab) continued with development of the Tete Iron & Steel and Vanadium Project (Tete project). Baobab had a mining concession located in Tete Province in northwestern Mozambique that contained a Joint Ore Reserves Committee (JORC)-compliant iron ore resource of more than 759 million metric tons (Mt). If commissioned, the Tete project was expected to have an initial production of 500,000 t/yr of construction steel (mostly rebar) and a coproduction of 2,500 t/yr of ferrovanadium (FeV). At yearend 2019, the company continued seeking financial investors and operational partners to develop the project (Baobab Resources Ltd., 2018; Agência Para a Promoção de Investimento e Exportações, 2019, p. 1).

Titanium and Zirconium.—Kenmare Resources plc of Ireland (Kenmare) produced ilmenite, rutile, and zircon at the Moma Mine in Nampula Province in northern Mozambique. In 2019, ilmenite production from the Moma Mine decreased by 7% to 893,000 t from 958,000 t in 2018; zircon production (primary and secondary) increased by 14% to 87,100 t from 76,600 t in 2018; and rutile production increased by 2% to 8,300 t. In 2019, Kenmare was developing an expansion program to increase ilmenite production to 1.2 million metric tons per year (Mt/yr) starting in 2021. To accomplish this, the company was planning to relocate a wet concentrator plant from the Namalope ore zone to the high-grade Pilivilo ore zone. Kenmare indicated that the increase in capacity could result in a 35% increase in production compared with that in 2019 (Kenmare Resources plc, 2020, p. ii, 8, 31–32).

Savannah Resources plc (Savannah), in joint venture with Rio Tinto plc of the United Kingdom, obtained two of four new mining concessions for the Mutamba Heavy Mineral Sands Project (Mutamba project). A third mining concession was conditionally awarded in November, bringing the mining concession area to a total area of 39,881 hectares; the mining concession was to be valid until 2044, with the possibility of an additional 25-year extension. The Mutamba project, which included three deposit areas (Jangamo, Dongane, and Ravene), had a mineral resource estimate of 4.4 billion metric tons at a grade of 3.9% total heavy minerals. At yearend 2019, Savannah was working towards the completion of a prefeasibility study which, upon delivery, would increase the company's interest in the Mutamba project to 35% from 20%; the interest would further increase to 51% upon delivery of a feasibility study (Savannah Resources plc, 2019a, p. 1; 2019b, p. 1; 2020a, p. 17, 25; 2020b).

In 2019, Australia's MRG Metals Ltd. (MRG) acquired the Heavy Minerals Sand Project (HMS) in Gaza and Inhambane Provinces. The HMS project included the Corridor (Central and South), the Linhuane, and the Marao/Maruca heavy mineral sand deposits. Airborne magnetic and radiometric geophysical surveys conducted in 2019 revealed high-grade heavy mineral sands (more than 4.5% total heavy minerals) at the Koko Massava target at the Corridor (Central) deposit. At yearend 2019, MRG was conducting a mineral resource estimate to define grade and tonnage within the Koko Massava target (MRG Metals Ltd., 2019, p. 3–4, 12; 2020, p. 6).

Industrial Minerals

Cement.—In April, Cimentos de Mocambique closed one of its plants in the city of Matola owing to low demand; the Matola plant had been producing about 250,000 t/yr of cement. Cimentos de Sofala, Lda., together with Chinese investors, was planning to begin construction of a cement plant in the third quarter of 2019 in Muxungue, Sofala Province. The plant was expected to have a capacity of 500,000 t/yr and to start up in 2021 (AllAfrica, 2019; Global Cement, 2019; Macaclub, 2019b).

Gemstones.—Ruby production in Mozambique decreased to 452 kg from 593 kg in 2018. Montepuez Ruby Mining Lda. (MRM) (Gemfields plc of the United Kingdom, 75%, and Mwiriti Lda., 25%) owned the Montepuez ruby deposit in Cabo Delgado Province. Mining operations at the MRM deposit consisted of opencast pits in three main operating areas: the Mugloto Block, the Maninge Nice Block, and the Glass Block. During the year, production was focused on the Mugloto Block (69%), followed by the Maninge Nice Block (13%), and the Glass Block. In 2019, the Montepuez ruby deposit produced 440 kg of ruby and corundum with premium-quality ruby production of 16 kg (table 2; Gemfields plc, 2020, p. 8, 35–36; República de Moçambique, 2020, p. 400 — (12))

In 2019, Fura Gems Inc. of Canada (Fura) concluded a deal to buy a ruby prospecting license in the Montepuez district of Cabo Delgado Province from Azores Overseas Inc. (Azores). The agreement involved the transfer of 100% of Azores' shares in Mozambique Ruby Ltd., which was the company that owned license 5572L. By yearend 2019, Fura reported completion of the first phase of drilling (Macaclub, 2019a).

Garnet has been historically mined in Niassa Province in northwestern Mozambique. In 2019, garnet production was 128,738 kg compared with 154,864 kg in 2018. Tourmaline was produced in the Barue District of Manica Province in west-central Mozambique. Tourmaline production was 4,267 kg compared with 6,265 kg in 2018. Other than ruby, nearly all other gemstones in Mozambique were mined by artisanal miners (tables 1, 2).

Graphite.—Syrah Resources Ltd. of Australia (Syrah) continued to ramp up the Balama graphite operation towards its production capacity of 350,000 t/yr and produced 153,000 t of natural graphite in 2019. Syrah reported that production was lower than projected owing to market conditions caused by lower than expected end user demand for electric vehicles. In 2019, Syrah produced its first purified spherical graphite from its battery anode material plant in the United States, using natural graphite from the Balama graphite operation (Syrah Resources Ltd., 2020, p. 1, 3, 13–14).

In May, the Government granted a mining concession to Triton Minerals Ltd. of Australia (Triton) for the Ancuabe graphite project (Ancuabe). In December, Triton announced a \$19.5 million investment by Jinan Hi Tech of China (Jinan) to begin construction activities at Ancuabe; the agreement granted Jinan a 34% interest in Triton. Ancuabe had a JORC-compliant ore reserve of 24.9 Mt at a grade of 6.2% total graphitic carbon and was expected to produce approximately 60,000 t/yr of graphite concentrate for approximately 27 years. Full construction of Ancuabe was expected to start in 2020 (Triton Minerals Ltd., 2020, p. 2, 7).

In 2019, Battery Minerals Ltd. of Australia continued developing a strategy to finance the Montepuez graphite project

and bring it to commercial production. Battery Minerals owned the Montepuez Graphite and Balama Central graphite deposits in Cabo Delgado. In June, Battery Minerals submitted a mining concession application for its Balama Central graphite project to the Government; approval was expected by mid-2020. The Montepuez graphite project was expected to produce 50,000 t/yr of graphite flake concentrate at a grade of 96% total graphitic carbon. Balama Central was expected to produce 58,000 t/yr of graphite flake concentrate at a grade of 96% total graphitic carbon (Battery Minerals Ltd., 2020a, p. 2, 6, 9 18).

In October, Battery Minerals signed a memorandum of understanding with Urbix Resources LLC of the United States (Urbix) to establish a joint venture and develop a graphite purification facility in Mozambique. Urbix specializes in refinement and purification of natural graphite and advanced graphite derivatives and was expected, along with Battery Minerals, to complete all necessary feasibility study work for the proposed joint venture (Battery Minerals Ltd., 2020b, p. 3–4).

Mineral Fuels

Coal.—Vale S.A. of Brazil operated the Moatize Mine in Tete Province in northern Mozambique. The mine had been producing since 2011 and had a coal production capacity of 22 Mt/yr. The mine was connected to the Port of Nacala through the Nacala corridor, which includes rail and port infrastructure. The corridor stretches for more than 900 km and passes through Mozambique and Malawi. In 2019, the Moatize Mine produced 4.0 Mt of metallurgical-grade coal and 4.7 Mt of thermal coal compared with 6.2 Mt and 5.4 Mt, respectively, in 2018. The decrease was attributed to decreased productivity at the coal processing plants throughout the year (Vale S.A., 2020, p. 18; 2021).

Natural Gas.—In May, the Government of Mozambique approved the Rovuma liquefied natural gas (LNG) project development plan for the production, liquefaction, and marketing of natural gas from three complex fields located in Area 4 of the Rovuma Basin. Activities for the marketing of LNG were expected to start in 2024. Area 4 was operated by Mozambique Rovuma Venture S.p.A. (MRV), which was an incorporated joint venture owned by a consortium of Exxon Mobil Corp. of the United States, Eni S.p.A of Italy, and China National Petroleum Corp. of China (70%) alongside a consortium of Empresa Nacional de Hidrocarbonetos E.P., Galp Energia, SGPS, S.A. of Portugal, and Korea Gas Corp. (KOGAS) of the Republic of Korea (30%). ExxonMobil would lead the construction and operation of the natural gas liquefaction and associated facilities on behalf of MRV, and Eni would lead the construction and operation of the upstream facilities (Exxon Mobil Corp., 2019; Eni S.p.A, 2020),

In September, Total S.A. of France acquired Anadarko Petroleum Corp. of the United States 26.5% stake in Mozambique LNG. The project planned to liquefy gas from the Golfinho and the Atum fields, both located within Offshore Area 1, by building a two-train liquefaction plant with a total capacity of 12.9 Mt/yr. The project was expected to commence operations by 2024 (Total S.A., 2019; 2020, p. 9, 34).

Outlook

Preliminary projections from the Government of Mozambique suggest economic growth of 2.2% for 2020, supported mostly by the agriculture, construction, and mining sectors. The mineral industry is expected to grow by 1.5% in 2020, supported by the production of clay, coal, graphite, heavy-mineral sands (ilmenite and zircon), natural gas, and ruby. The further development of graphite, heavy-mineral sands, and LNG projects could have a positive effect on the domestic economy; however, this will be dependent on the outcome of recent events associated with military conflicts in the central and northern parts of the country, world market conditions, and the effects of the coronavirus disease 2019 (COVID-19) pandemic on mineral supply chains (República de Moçambique, 2020, p. 400 — 9, 11).

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TABLE 1
MOZAMBIQUE: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons, gross weight, unless otherwise specified)

Commodity ²		2015	2016	2017	2018	2019
METALS						
Aluminum:						
Bauxite		4,985	1,451	3,182	9,912 ^r	8,024
Aluminum, metal, primary		558,000	571,000	577,000	571,000	565,000
Beryl	kilograms	35,400	180,700	53,200	381,000	380,000 ^e
Gold, mine, Au content	do.	242	201	166	507	430
Lead, refinery, secondary ³		2,310	2,494	3,828	3,422 ^r	3,943
Niobium and tantalum, mineral concentrate, columbite-tantalite:						
Gross weight	kilograms	62,607	91,661	114,325	146,435 ^r	131,557
Nb content	do.	2,735	4,005	3,700 ^e	5,000 ^{r, e}	6,000 ^e
Ta content	do.	12,818	18,767	26,000 ^r	30,000 ^r	30,000 ^e
Titanium, mineral concentrates:						
Ilmenite and leucoxene		828,893	1,340,330	1,197,419	1,283,075	990,000 ^e
Rutile		5,981	7,781	9,137	8,830	8,264
Zirconium, mineral concentrate, zircon		57,858	215,222	124,022	202,022	121,768
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand metric tons	1,585 ⁴	2,446	2,350	2,400 ^e	2,610 ^e
Clay:						
Bentonite:						
Crude		70,917	71,000 ^e	71,000 ^e	84,276	77,734
Processed		3,300 ^e	1,250	2,847	4,000 ^e	4,000 ^e
Brick clay		588,758	645,917	328,725	330,000 ^e	330,000 ^e
Diatomite		80 ^e	1,305	4,539	5,000 ^e	5,000 ^e
Gemstones:						
Aquamarine	kilograms	--	343	508	9	8
Garnet	do.	383,963	125,078	159,143	154,864	128,738
Ruby	do.	2,018	1,250	1,135	593	452
Tourmaline	do.	20,169	1,135	1,932	6,265	4,267
Graphite, crystalline flake		--	--	1,042	106,773	153,000
Salt, sea ^e		160,000	170,000	170,000	170,000	170,000
Sand and gravel, industrial, silica	kilograms	580	580	197,665	361,390	50,572
Stone, sand, and gravel, construction:						
Sand and gravel:						
Gravel, including crushed stone	cubic meters	2,855,148	1,270,051	819,556	2,902,761	958,587
Sand		3,109,690	2,612,252	1,656,281	4,237,944	1,492,077
Stone:						
Crushed, limestone		844,111	728,431	437,501	1,052,912	178,498
Crushed, rhyolite		1,973	-- ^e	--	--	--
Dimension, granite		60 ^e	160 ^e	468	564	1,504
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Bituminous		4,786,611	3,862,959	7,113,341	6,891,201	4,983,146
Metallurgical		1,813,717	2,203,430	4,400,813	8,355,292	5,356,390
Natural gas:						
Gross weight	million cubic meters	4,975	5,077	3,731	4,171	4,990
Condensate	thousand 42-gallon barrels	467	477	311	386	329

^eEstimated. ^rRevised. do. Ditto. -- Zero.

¹Table includes data available through December 15, 2020. All data are reported unless otherwise noted. Estimated data are rounded to no more than three significant digits.

²In addition to the commodities listed, other gemstones may have been produced, but available information was inadequate to make reliable estimates of output.

³Production is based on fiscal year, with a starting date of April 1 of the year shown.

⁴Reported cement sales by Cimentos de Mocambique SARL only.

TABLE 2
MOZAMBIQUE: STRUCTURE OF THE MINERAL INDUSTRY IN 2019

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners		Location of main facilities	Annual capacity ¹
Aluminum	South32 Ltd., 47.1%; Mitsubishi Corporation Metals Holding GmbH, 25%; Industrial Development Corporation of South Africa Ltd., 24%; Government, 3.9%		Mozaal smelter at Beluluane, Maputo	572,000.
Bauxite	Mina Alumina Lda.		Mine at Vila de Manica, Manica Province	12,000. ^c
Bentonite	Minerais Industriais de Moçambique Lda.		Mine at Mafuiane, Maputo	30,000.
Beryl	African Rare Gemwood		Mine in Zambezia Province	NA.
Cement	Cimentos de Moçambique S.A.R.L. [Cimentos de Portugal, SGPS, SA (Cimpor), 82.46%]		Plants at Dondo, Matola, and Nacala Maputo, Nampula and Sofala, Provinces ²	2,900,000.
Do.	Cimentos de Beira (Ambrian plc, 100%)		Plant at Beira, Sofala Province	800,000.
Do.	Limak Holding		Plant near Maputo	700,000.
Do.	Austral Cimentos Sofala S.A. (HeidelbergCement AG, 100%)		Plant at Dondo, Sofala Province	400,000.
Do.	Cimentos de Nacala S.A. [Cimentos de Portugal, SGPS, SA (Cimpor), 100%]		Plant at Nacala, Nampula Province	350,000.
Do.	Cimento Nacional Lda.		Plant at Maputo	325,000.
Do.	Fabrica Cimentos de Cabo Delgado		Plant in Metuge District, Cabo Delgado Province	250,000.
Do.	S & S Cimentos		Plant at Matola, Maputo	210,000. ^c
Do.	Maputo Cement and Steel		Plant at Maputo	130,000.
Do.	Adil Cimentos		Plant at Tchumene, Maputo	120,000.
Coal, bituminous, and metallurgical	Vale Moçambique, Lda. [Vale S.A., 80.7%; Mitsui & Co., Ltd., 14.25%; Empresa Moçambicana de Exploração Mineira S.A. (EMEM), 5%]		Moatize Mine, Tete Province	22,000,000.
Do.	International Coal Ventures Private Ltd., 65%, and Tata Steel Ltd., 35%		Benga Mine, Tete Province	2,400,000.
Do.	Jindal Steel & Power Ltd.		Chirodzi Mine, Tete Province	3,000,000.
Do.	Beacon Hill Resources plc (BHR)		Minas Moatize Mine, Tete Province ³	880,000.
Diatomite	Diatomites de Moçambique Lda.		Diana quarry near Manica	4,800.
Gemstones:				
Aquamarine	kilograms	Mozambique Gems Ltd.	Mine near Mavuco ²	3,600. ^c
Garnet	do.	Sociedade Vision 2000 Lda.	Cuamba, Niassa Province	8,000. ⁴
Do.	do.	Artisanal miners	Various locations	NA.
Ruby	do.	Montepuez Ruby Mining Lda. (MRM) (Gemfields plc, 75%, and Mwiriti Lda., 25%)	Montepuez ruby mine, Cabo Delgado Province	1,600. ^c
Do.		Mustang Resources Ltd.	Montepuez ruby project, Cabo Delgado Province	40. ^c
Do.		Artisanal miners	Niassa Province	NA.
Tourmaline		do.	Various mines in Barue District, Manica Province	NA.
Gold	kilograms	do.	do.	600. ^c
Do.		Xtract Resources Plc (Explorator Lda., 100%)	Manica gold project, Manica Province	600. ^c
Graphite		GK Ancuabe Graphite Mine SA. [Graphit Kropfmühl GmbH, 90%, and Empresa Moçambicana de Exploração Mineira, S.A. (EMEM), 10%]	Ancuabe graphite mine, Cabo Delgado Province	9,000.
Do.		Syrah Resources Ltd. (Twigg Exploration and Mining Limitada, 100%)	Balama Graphite operation, Cabo Delgado Province	350,000.
Lead, refinery, secondary		Gravita Mozambique Lda. (Gravita India Ltd., 100%)	Plant at Maputo	4,500.
Natural gas	million cubic meters	Sasol Ltd., 70%, and Empresa Nacional de Hidrocarbonetos, E.P., 30%	Fields at Temane and Pande Inhambane Province	5,100.

See footnotes at end of table.

TABLE 2—Continued
 MOZAMBIQUE: STRUCTURE OF THE MINERAL INDUSTRY IN 2019

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity ¹
Niobium (columbium) and tantalum, columbite-tantalite, ore and concentrate	Noventa Ltd.	Mine at Marropino Zambezia Province ³	270 Ta ₂ O ₅ .
Do.	Artisanal miners	Mine at Muiane, Zambezia Province	34 Ta ₂ O ₅ .
Titanium, mineral concentrates	Kenmare Resources plc	Moma Mine at Topuito in Nampula Province	1,100,000 ilmenite; 21,000 rutile.
Do.	Haiyu (Mozambique) Mining Company Lda.	Mine at Sangage in Manica Province	80,000 ^c ilmenite.
Zirconium, mineral concentrate, zircon	Kenmare Resources plc	Moma Mine at Topuito in Nampula Province	75,000 zircon.
Do.	Haiyu (Mozambique) Mining Company Lda.	Mine at Sangage in Manica Province	14,000 ^c zircon.

^cEstimated; estimated data are rounded to no more than three significant digits. Do., do. Ditto. NA Not available.

¹Abbreviations used in this table for commodities include the following: Ta₂O₅—tantalum oxide.

²Cement plant in Matola closed in 2019.

³Not operating at yearend 2019.

⁴Gem-quality only.