



2017–2018 Minerals Yearbook

TANZANIA [ADVANCE RELEASE]

THE MINERAL INDUSTRY OF TANZANIA

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Note: In this chapter, information for 2017 is followed by information for 2018.

In 2017, Tanzania played a significant role in the global production of gold, accounting for more than 1% of the world's gold mine output. The country was also the world's only producer of tanzanite, which is a gemstone variety of zoisite that gets its color from trace amounts of vanadium. Other domestically significant mining and mineral-processing operations included cement and natural gas. Tanzania was not a globally significant consumer of minerals or mineral fuels in 2017 (George, 2019; Godleader Shoo, Tanzania Ministry of Minerals, written commun., June 21, 2018).

Minerals in the National Economy

In 2017, the manufacturing sector accounted for 5.5% of the gross domestic product (GDP), and mining and quarrying, 4.8%. The value of output in the mining sector increased by 17.5% in 2017 compared with 11.5% in 2016. Large-scale mines employed about 12,000 workers in 2017; large-scale gold, tanzanite, and diamond mines employed a total of 6,501 workers in 2016 (the latest year for which data were available). As many as 1.5 million artisanal miners were estimated to produce bauxite, building materials, colored gemstones, copper, diamond, gold, tin, and other commodities (Tanzania Minerals Audit Agency, 2017, p. 32; Zavala, 2017; Bank of Tanzania, 2018, p. 22, 28).

In the first half of 2017, minerals accounted for 34.9% of Tanzania's recorded exports and at least 19.9% of its imports. Total recorded exports in the first half of 2017 were valued at \$2.23 billion. The share of gold in total recorded exports was 31.9% in the first half of 2017; diamond, 1.4%; and colored gemstones, copper, silver, and other minerals combined, 1.6%. Total imports in the first half of 2017 were valued at \$3.74 billion. Petroleum products accounted for 18.3% of the value of total imports, and fertilizers, 1.6% (Bank of Tanzania, 2017, p. 11, 65).

Tanzania is a signatory to the Kimberley Process Certification Scheme, which is a certification system established to reduce the trade in conflict diamond. At the end of 2016, the mining sector was governed by the Mining Act of 2010 and the Tanzania Extractive Industries (Transparency and Accountability) Act, 2015. Upstream natural gas and petroleum exploration and production were governed by the Petroleum Act 2015.

In June 2017, the Government banned the export of mineral concentrates. In July, the Government passed the Natural Wealth and Resources (Permanent Sovereignty) Act 2017, the Natural Wealth and Resources Contracts (Review and Re-negotiation of Unconscionable Terms) Act 2017, and the Written Laws (Miscellaneous Amendments) Act 2017. The new laws mandate at least 16% Government ownership in mining projects and allow the Government to renegotiate or terminate contracts with mining companies. The new laws also increase the royalty on

copper, gold, platinum, and silver exports to 6% from 4% and royalty on uranium exports to 6% from 5% (Solomons, 2017).

In October 2017, the Ministry of Energy and Minerals was divided into the Ministry of Energy and the Ministry of Minerals. The Ministry of Energy is responsible for regulating natural gas and petroleum exploration and production. The Mining Commission, which is part of the Ministry of Minerals, is responsible for licensing and mineral rights, mine inspections, and the regulation and promotion of artisanal and small-scale mining (Lewis, 2017).

Production

In 2017, coal production increased by 102%; tourmaline, by 41%; diamond, by 27%; and rolled steel, by 19%. Kaolin production also increased sharply. The production of lime decreased by 89% in 2017; bauxite, by 83%; aquamarine, by 81%; amethyst, by 78%; emerald, by 71%; pozzolanic materials, by 66%; quartz, by 51%; garnet, by 46%; gypsum, by 42%; salt, by 41%; construction sand, by 40%; silver, by 39%; tin, by 34%; phosphate rock, by 33%; marble, by 27%; and crushed limestone, by 21%. Diamond and coal output increased because of capacity expansions. Data on mineral production are in table 1 (Godleader Shoo, Tanzania Ministry of Minerals, written commun., June 21, 2018).

Structure of the Mineral Industry

Most of Tanzania's gold mines were privately owned; cement plants, natural gas operations, the Minjingu phosphate mine, and the Nyanza salt mine were also owned by private investors. The Government-owned State Mining Company (Stamico) operated the Biharamulo gold mine. The Government also held a 50% share in the large-scale tanzanite mining operations at Block C at Merelani and minority interests in the privately owned Ngaka coal mine and the Williamson diamond mine. The new mining laws passed in 2017 mandated at least 16% Government ownership in mining projects (Solomons, 2017).

Artisanal and small-scale mines accounted for most of the country's colored gemstone production; copper, crushed stone, diamond, and gold were also produced by artisanal miners. Capacity, location, ownership, and production information were not readily available for many of these operations. Table 2 is a list of major mineral industry facilities.

Commodity Review

Metals

Gold and Silver.—In 2017, Acacia Mining plc of the United Kingdom produced 10,065 kilograms (kg) of gold at the North Mara Mine compared with 11,771 kg in 2016 because of

lower ore grades. At the Bulyanhulu Mine, output decreased to 5,458 kg in 2017 from 9,002 kg in 2016 because of the export ban on mineral concentrates, lower ore grades, and a drought that prevented the processing of tailings for 4 months. Production increased at the Buzwagi Mine to 8,360 kg in 2017 from 5,033 kg in 2016 because of higher ore grades (Acacia Mining plc, 2018, p. 2, 31, 33, 35).

Production at North Mara was likely to be about 10,000 kg in 2018. Buzwagi's output was expected to decrease to about 3,100 kg as mining operations shifted to processing stockpiles because of the depletion of the open pit reserves. The estimated remaining life of Buzwagi's operations was 3 years. Acacia planned to produce about 930 kg of gold from processing tailings at Bulyanhulu (Acacia Mining plc, 2018, p. 2, 31, 33, 35).

Geita Gold Mining Ltd. (a subsidiary of AngloGold Ashanti Ltd. of South Africa) produced about 16,800 kg of gold at the Geita Mine in 2017 compared with 15,200 kg in 2016. Increased production was attributable to higher ore grades (AngloGold Ashanti Ltd., 2018, p. 92, 120).

Shanta Gold Ltd. of the United Kingdom produced 2,475 kg of gold and 3,304 kg of silver at the New Luika open pit mine in 2017; production was 2,728 kg of gold and 3,937 kg of silver in 2016. Planned gold production at New Luika, which is located in Mbeya Region, was between 2,600 and 2,700 kg in 2018. Shanta planned to maintain gold production at an average of between 2,500 and 2,600 kilograms per year (kg/yr) until 2023. The company planned to develop underground mines that would extend the mine's life to 2023 from 2020 (Cornish, 2017c; Shanta Gold Ltd., 2018, p. 7, 12).

Shanta was considering the possibility of a further extension of New Luika's life until 2027 using resources of about 21,000 kg of gold that were not in the company's mining plan. The company also was considering starting pilot production at its Singida project in the Singida Region (Cornish, 2017c).

In late April 2017, Tanzanian Royalty Exploration Corp. of Canada and its joint-venture partner Stamico completed a feasibility study on a large-scale mine at the Buckreef project. Planned mine production for the study area was nearly 1,700 kg/yr of gold during an estimated 17-year mine life. Reserves were estimated to be about 33,000 kg of contained gold. As of yearend, it was unclear when production would start (Tanzanian Royalty Exploration Corp., 2017).

OreCorp Ltd. of Australia completed a scoping study on a new mine at the Nyanzaga project in August 2016 and a prefeasibility study in March 2017. Planned production in the study was about 6,600 kg/yr during an estimated 13-year mine life. Depending on the results of a feasibility study, OreCorp and joint-venture partner Acacia could start construction in 2018. Resources for the project were estimated to be 29.8 million metric tons (Mt) at a grade of 3.48 grams per metric ton gold (Cornish, 2017b).

Kibo Mining plc of Ireland divested its Imweru and Lubando projects into a new company called Katoro Gold plc (Kibo, 56.7%) in May 2017. Katoro was engaged in a prefeasibility study on a new mine at Imweru. Depending on the results of this prefeasibility and subsequent feasibility studies, gold production at Imweru could be nearly 1,600 kg/yr. Contained resources at Imweru were estimated to be 16,000 kg of gold (Katoro Gold plc, 2017).

Niobium (Columbium) and Tantalum.—In April 2016, Cradle Resources Ltd., of Australia completed a feasibility study on a new mine at the Panda Hill carbonatite deposit, which is located 35 kilometers southwest of Mbeya. The company planned to mine niobium, which would be processed into ferroniobium. Planned production during the estimated 30-year life of the mine was 8,200 metric tons per year (t/yr) of ferroniobium with a niobium content of about 66%. Mining was expected to start in the second quarter of 2018; Cradle planned to produce at full capacity starting in 2022. As of the end of 2017, development of the mine had not started (Cradle Resources Ltd., 2016, p. 1, 9, 30).

Titanium and Zirconium.—In 2017, Strandline Resources Ltd. of Australia completed a feasibility study on a new mine at the Fungoni mineral sands deposit near Dar es Salaam. Planned production in the study was about 43,000 t/yr of ilmenite, 14,000 t/yr of zircon, and 3,000 t/yr of rutile. The titanium dioxide content of the ilmenite was expected to be between 55% and 60%. Strandline estimated that reserves at Fungoni to be 12.3 Mt at grades of 1.65% ilmenite, 0.71% zircon, 0.17% rutile, and 0.05% leucoxene. The estimated life of the mine was 6 years. Production could start by late 2019, depending on mining licensing and financing (Andrews, 2016, 2018).

Industrial Minerals

Cement.—Tanzania's cement production increased to 4.2 Mt in 2017 from a revised 4.07 Mt in 2016 and 2.58 Mt in 2012 because of the opening of new plants and expansion of existing plants. As of yearend, the country had seven cement producers with a total capacity of 10.3 million metric tons per year (Mt/yr) (tables 1 and 2).

Lake Cement Ltd. of India operated a plant with a capacity to produce 500,000 t/yr of cement at Kimbiji. The company planned to complete a new cement plant with a capacity of 1.4 Mt/yr at Bagamoyo by 2019. In 2017, Sungura Cement Co. was building a new cement plant with a capacity of 300,000 t/yr in Mawani. Hengyuan International Engineering Group of China planned to start construction of a new cement plant at Tanga with a capacity of 7 Mt/yr in May 2017. About 70% of the company's production was expected to be exported to countries that included the Democratic Republic of the Congo [Congo (Kinshasa)], Sudan, and Uganda, and 30% was expected to be sold domestically. As of yearend, construction had not yet started (Global Cement, 2016; International Cement Review, 2017; 2018a, b).

Diamond.—Petra Diamonds Ltd. of the United Kingdom operated the open pit Williamson Mine, which accounted for most of the diamond produced in Tanzania. The company produced 293,205 carats of diamond from open pit and alluvial operations in 2017 compared with 223,859 carats in 2016. Petra planned to increase production to nearly 340,000 carats per year by mid-2018. Resources at Williamson were estimated to be 39 million carats (Petra Diamonds Ltd., 2017a, p. 16; 2017b; 2018, p. 19).

Gemstones.—Tanzania produced a variety of gemstones that included alexandrite, amethyst, aquamarine, cordierite, emerald, garnet, quartz, ruby, sapphire, spinel, tanzanite, and tourmaline. In recent years, tanzanite accounted for a majority of the value of domestic gemstone mining. Merelani, which is located near

Arusha, was the world's only source of tanzanite. Artisanal and small-scale miners operated in Blocks B and D of the Merelani deposit. TanzaniteOne Mining Ltd. (Sky Associates Group Ltd., 50% and STAMICO, 50%) mined tanzanite in Block C.

Amethyst was mined at Matombo. In 2017, national amethyst production decreased to 19,937 kg from 88,636 kg in 2016. Alexandrite and emerald were mined near Lake Manyara. Emerald production decreased to 12 kg in 2017 from 42 kg in 2016, and alexandrite production was less than 1 kg/yr in 2016 and 2017. Tsavorite, which is a green grossular garnet that obtains its color from trace amounts of chromium and vanadium, was mined near Merelani. Total production of all types of garnet decreased to 131,278 kg in 2017 from a revised 244,490 kg in 2016 (Godleader Shoo, Tanzania Ministry of Minerals, written commun., June 21, 2018).

The Mundarara Mine near Longido was the leading ruby producer in Tanzania. Ruby and sapphire also were produced by artisanal miners at Kibuko, Kiswila, Songea, Tunduru, Winza, and other locations. Since 2009, ruby and sapphire production were at relatively low levels in Tanzania because of the discovery of the Montepuez ruby deposits in Mozambique.

Graphite.—In April 2016, Magnis Resources Ltd. of Australia completed a feasibility study on the Nachu project. The production target was 220,000 t/yr of concentrate at a grade of between 97% and 99% graphite during an estimated 15-year mine life. Production was planned to be 240,000 t/yr during the first 12 years. Mining could start in 2019. Reserves were estimated to be 76 Mt at a grade of 4.8% graphite. Magnis expected to sell about 140,000 t/yr to the spherical graphite and lithium battery markets, 77,000 t/yr to the jumbo-flake (flakes larger than 300 microns) and expandable graphite markets, and 22,000 t/yr to the super-jumbo-flake (flakes larger than 500 microns) and aerospace markets (Washbourne, 2016b; Magnis Resources Ltd., 2018, p. 33, 37).

Kibaran Resources Ltd. of Australia was engaged in the development of a new mine at the Epanko project. In mid-2017, the company completed a feasibility study on expanding its planned production to 60,000 t/yr of graphite concentrate from 40,000 t/yr. Concentrate from Epanko was expected to have a grade of between 96% and 97% graphite. Estimated capital costs for an 18-year mine life were nearly \$89 million. Depending on financing, Kibaran planned to start production by the end of 2018 and to reach full capacity in 2019. Kibaran had offtake agreements for 44,000 t/yr of production from Epanko (Cornish, 2017a).

In early 2017, Walkabout Resources Ltd. of Australia completed a feasibility study on a new mine at its Lindi Jumbo project, which was located to the west of Mtwara. Planned production in the study was 40,000 t/yr of graphite concentrate, of which jumbo-flake would account for 55% and large-flake (flakes between 180 and 300 microns), 20%. Walkabout planned to start mining in 2018; the estimated life of the mine was 20 years (Cornish, 2017d).

Black Rock Mining Ltd. of Australia completed a scoping study on a new mine at its Mahenge project in 2016 and a prefeasibility study in 2017. In the 2-year first stage of mining, production was expected to be 83,000 t/yr of concentrate at a grade of 98.5% graphite; production would increase to

167,000 t/yr in the 3-year second stage; and 250,000 t/yr in the third stage. Depending on the results of a feasibility study, mining could start in 2019. Jumbo-flake graphite was likely to account for 21% of production, and large-flake, 30%. The estimated life of the mine was 32 years. Reserves were estimated to be 69.6 Mt at a grade of 8.5% graphite (Black Rock Mining Ltd., 2017a, p. 1, 6–8; 2017b).

Volt Resources Ltd. of Australia completed a prefeasibility study on a new mine at its Bunyu project (formerly the Namangale project) in December 2016. The company planned to complete a feasibility study on the first stage of mining in the first quarter of 2018, and on the second stage, in the second half of 2018. Depending on the results of the studies, Volt could produce 20,000 t/yr of concentrate at a grade of 95% graphite in the first stage and 170,000 t/yr in the second stage. The first stage of mining could start in the second half of 2018, and the second stage, in the second half of 2020. Reserves were estimated to be 127 Mt at a grade of 4.4% graphite (Volt Resources Ltd., 2017, p. 4–5, 7, 9, 18).

In November 2015, Indiana Resources completed a prefeasibility study on a new mine at its Chilalo graphite project. Depending on the results of a feasibility study, production could be nearly 70,000 t/yr, with an estimated mine life of 10 years. In June 2016, Chilalo was spun off into a new company called Graphex Mining Ltd. of Australia. Graphex received a mining license for Chilalo in November 2016 and updated its resource estimate in February 2017. Resources at the Shimba deposit at Chilalo were estimated to be 53.5 Mt at a grade of 5.6% graphite, and reserves, 4.7 Mt at a grade of 11% graphite. As of November 2017, the company had not started the feasibility study (Washbourne, 2016a, 2017).

At the end of 2016, Armadale Capital Plc of the United Kingdom estimated that resources at its Mahenge Liandu project were 40.9 Mt at a grade of 9.4% graphite. Armadale Capital planned to start a feasibility study on a new mine by the second quarter of 2018 (Kotze, 2017).

Rare-Earth Elements.—In April 2017, Peak Resources completed a feasibility study on a new mine at its Ngualla project; the study was updated in August. Planned production was 14,700 t/yr of rare-earth oxides from bastnaesite during an estimated 26-year mine life; mining could start in late 2019. Rare-earth concentrates from Ngualla would be processed at a refinery in the United Kingdom. Resources were estimated to be 214 Mt at a grade of 2.15% rare-earth oxides, and reserves, 18.5 Mt at a grade of 4.8% rare-earth oxides (Peak Resources Ltd., 2017, p. 1, 7, 12, 15, 28; Robson, 2018).

In Strandline's feasibility study on the Fungoni mineral sands project, planned monazite production was more than 1,000 t/yr. Reserves were estimated to be 12.3 Mt at a grade of 0.06% monazite. Production could start by late 2019, depending on mine licensing and financing (Andrews, 2016, 2018).

Mineral Fuels and Related Materials

Coal.—Tanzania's coal production increased in 2017 to 558,553 metric tons (t) from a revised 276,030 t in 2016. Intra Energy Corporation Ltd. of Australia and its joint-venture partner National Development Corp. (owned by the Government) operated a mine at the Ngaka coalfield in

Ruvumu District that accounted for most of the country's coal production. In 2017, the mine's capacity increased to 960,000 t/yr from 480,000 t/yr (Intra Energy Corporation Ltd., 2017, p. 5; Godleader Shoo, Tanzania Ministry of Minerals, written commun., June 21, 2018).

In October 2017, Edenville Energy plc of the United Kingdom started coal production at its Rukwa Mine. The company planned to produce 120,000 t/yr starting in January 2018. As of mid-November, Edenville and its joint-venture partner Sinohydro Corp. of China were engaged in negotiations with the Government-owned power company Tanesco regarding the construction of a new coal-fired power station at Rukwa (Edenville Energy plc, 2017).

In January 2017, Kibo completed a feasibility study on a new mine and coal-fired power station at the Mbeya Coal to Power project in southwestern Tanzania. The initial planned capacity of the power station was between 250 and 300 megawatts (MW), which could be expanded to 600 MW. The initial planned coal consumption was about 1.5 Mt/yr. Construction of the power station could be completed in 3 years. Coal resources were estimated to be 122 Mt, and the estimated life of the mine was 30 years (Kibo Mining plc, 2017).

Helium.—Helium One Ltd. explored for helium in southwestern Tanzania. In June 2016, the company announced an initial resource estimate of 1.5 billion cubic meters of helium under Lake Rukwa. In 2017, Helium One revised its resource estimate to 2.8 billion cubic meters. Helium One planned to produce 10 million cubic meters per year at Lake Rukwa starting in 2020; production could increase to nearly 60 million cubic meters per year (Moore, 2016; Helium One Ltd., 2017).

Natural Gas.—In 2017, Orca Exploration Group Inc. produced 849 million cubic meters of natural gas from Songo Songo Island, which was nearly unchanged from production in 2016. Gas-fired power stations and cement plants were the leading consumers of natural gas from Songo Songo. The capacity of Orca's natural gas processing plant was 1.14 billion cubic meters per year, and the capacity of the pipeline from the plant to the mainland, 1.05 billion cubic meters per year (Orca Exploration Group Inc., 2017, p. 12; 2018, p. 4, 10, 13–14).

Etablissements Maurel et Prom SA of France and its joint-venture partners operated the Mnazi Bay offshore natural gas project in the Rovuma Basin. In 2017, the companies produced 369 million cubic meters compared with 325 million cubic meters in 2016. In 2019, the new Kinyerezi-I Extension and Kinyerezi II power stations were expected to consume an additional 660 million cubic meters per year from the Mnazi Bay project, and Dangote Cement's kilns, between 210 million and 260 million cubic meters per year (Wentworth Resources Ltd., 2018, p. 3–4).

Royal Dutch Shell plc of the Netherlands, Statoil ASA of Norway, and their joint-venture partners were considering the development of a liquefied natural gas (LNG) plant near Mtwara that would use natural gas from offshore Blocks 1, 2, and 4. The plant would have a capacity of at least 10 Mt/yr of LNG, which was equivalent to 13.8 billion cubic meters per year of natural gas. As of October 2017, the investment decision for the plant was not expected until at least late 2022; production could start by late 2027 at the earliest (Musarra, 2014; Houreld, 2016; Lewis, 2017).

Uranium.—Uranium One Inc. of Canada, which was a subsidiary of the Russian Government-owned Rosatom, planned to start mining at the Mkuju River project by 2018. A previous feasibility study estimated that Mkuju River could support a new mine with average production of 1,900 t/yr of uranium oxide (U_3O_8) during an estimated 12-year mine life. In July 2017, the company suspended development until at least 2020 because of weak demand for uranium on world markets (Thompson, 2011; Guardian, The, 2017).

MINERAL INDUSTRY HIGHLIGHTS IN 2018

In 2018, the GDP of Tanzania was about \$57 billion. The mining and quarrying sector accounted for about 5.1% of the GDP (Bank of Tanzania, 2019, p. 21). The principal mineral exports were (in decreasing order of value) gold, diamond, and colored gemstones.

In January 2018, the Government passed new regulations mandating that Tanzanian companies have at least 5% equity in mining operations in addition to the Government's free-carried interest. The regulations also mandate that priority be given to Tanzanian companies when mining licenses are issued (Ng'wanakilala, 2018).

Kaolin production increased by 836% in 2018; gypsum, by 95%; coal, by 30%; diamond, by 26%; rolled steel, by 22%; raw steel and natural gas, by 20% each; pumice, by 16%; and silver, by 10%. The production of tin decreased by 91% in 2018; salt, by 64%; bauxite, by 41%; copper, by 37%; and limestone, by 11%. Phosphate rock mining shut down in 2018 (table 1; National Bureau of Statistics, 2019, p. 60). Diamond and coal output increased because of capacity expansions.

Gold output at the Geita Mine increased to about 17,500 kg in 2018 from 16,800 kg in 2017. Increased output was attributable to higher ore grades (AngloGold Ashanti Ltd., 2019, p. 92).

In 2018, Acacia's production at the North Mara Mine increased to 10,452 kg from 10,065 kg in 2017. The company's production at Buzwagi decreased to 4,524 kg in 2018 from 8,360 kg in 2017, and at Bulyanhulu, to 1,259 kg from 5,458 kg because of its dispute with the Government regarding the export of gold concentrates (Acacia Mining plc, 2019, p. 13, 39, 41, 43).

Acacia's planned production at North Mara in 2019 was about 11,500 kg; at Buzwagi, about 3,600 kg; and at Bulyanhulu, about 1,100 kg. Depending on the resolution of its dispute with the Government, the company could produce between 9,300 and 11,000 kg/yr of gold at Bulyanhulu during an estimated 18-year mine life (Acacia Mining plc, 2019, p. 37, 39, 41, 43).

Shanta produced 2,547 kg of gold and 3,323 kg of silver at New Luika in 2018; production was 2,475 kg of gold and 3,304 kg of silver in 2017. Planned production at New Luika was between 2,500 and 2,600 kg of gold in 2019 (Shanta Gold Ltd., 2019, p. 5, 10).

In the fourth quarter of 2018, Strandline completed an updated feasibility study on Fungoni. Planned production in the study was about 32,000 t/yr of ilmenite, 13,500 t/yr of zircon, 2,500 t/yr of rutile, 1,500 t/yr of monazite, and 500 t/yr of leucogene during a mine life of slightly more than 6 years. Mining was expected to start in 2019 (Strandline Resources Ltd., 2018).

In 2018, Tanzania's cement production increased to 4.51 Mt from 4.2 Mt in 2017. Kisarawe Cement Ltd. was engaged in the expansion of its plant's capacity to 162,000 t/yr from 108,000 t/yr; the company also planned a subsequent increase to 450,000 t/yr. ARM Cement Ltd. of Kenya entered bankruptcy proceedings in August; its plant at Tanga was unprofitable because of power rationing, coal shortages, and competition from other producers (International Cement Review, 2018a; Obulutsa, 2018; Bank of Tanzania, 2019, p. 30).

Petra produced 380,689 carats of diamond at the Williamson Mine in 2018 compared with 293,205 carats in 2017. Increased production was mostly attributable to higher ore grades (Petra Diamonds Ltd., 2018, p. 19; 2019, p. 15).

Volt completed a feasibility study on the first stage of mining at Bunyu in late July 2018. The company planned to start production at the rate of 23,700 t/yr of graphite concentrate in the second half of 2019. Volt also planned to complete a feasibility study on the second stage of mining in the first half of 2020. Depending on the results of the study, production could increase to 170,000 t/yr starting in the second half of 2021. The estimated life of the mine was at least 22 years (Volt Resources Ltd., 2018, p. 7, 10–12).

In October 2018, Black Rock completed a feasibility study on a new mine at the Mahenge project. Black Rock planned to start construction of the first stage of the mine in the second quarter of 2019 and to begin mining in the fourth quarter of 2020. Depending on the results of further feasibility studies, the second stage of mining could start in 2023, and the third stage, in 2025. Planned production in the first stage was 83,000 t/yr of concentrate at a grade of 96% graphite; the second stage, 167,000 t/yr; and the third stage, 250,000 t/yr. The estimated life of the mine was 32 years (CPC Project Design Pty Ltd. and Black Rock Mining Ltd., 2018, p. 21, 38).

Kibaran was seeking financing for Epanko in 2018. The company could start mining in 2021 and produce 60,000 t/yr of graphite concentrate. The postponement of the project was partially attributable to delays in issuing mining licenses by the Government (Gordon, 2018, p. 1).

In September 2018, Graphex completed an updated prefeasibility study on the Chilalo project. Planned production in the study was 58,000 t/yr of concentrate at a grade of 93% graphite in the first 2 years of mining and 108,000 t/yr subsequently. Jumbo-flake graphite was likely to account for 57% of production, and large-flake graphite, 9%. The estimated life of the mine was between 6 and 7 years. Graphex planned to complete a feasibility study in the second quarter of 2019; mining could start in the second quarter of 2020, depending on the results (Graphex Mining Ltd., 2018, p. 1, 15, 19).

Armadale Capital completed a scoping study on a new mine at Mahenge Liandu in March 2018. Planned production in the study was 50,000 t/yr of concentrate at a grade of 98% graphite during an estimated 32-year mine life. Jumbo-flake graphite was likely to account for 24.5% of production, and large-flake graphite, 23.6%. The company initiated a feasibility study in May and planned to make an investment decision by early 2019 (Armadale Capital plc, 2018a, b).

In December 2018, Walkabout estimated that resources at Lindi Jumbo were 41.8 Mt at a grade of 10.8% graphite. The company

planned to complete an updated feasibility study on Lindi Jumbo in early 2019 (Walkabout Resources Ltd., 2018, p. 1).

National coal production increased to 725,911 t in 2018 from 558,553 t in 2017 (table 1). Increased output was attributable to the expansion of the Ngaka Mine in 2017.

Outlook

Tanzania's production of cement, coal, and natural gas is expected to increase in the near future. Cement output is likely to increase from 2019 through 2021 because of the recent opening of new plants and expansion of existing plants. Coal production is expected to increase in 2019 because of the opening of the Rukwa Mine and the expansion of the Ngaka Mine. The outlook for natural gas production is to increase from 2020 through 2022 because of higher capacity utilization at Mnazi Bay.

Helium production could start in 2020. Gold production could increase at Bulyanhulu, depending on the resolution of the dispute between Acacia and the Government; higher production at Bulyanhulu would more than offset the closure of the Buzwagi Mine in 2021.

New Tanzanian mines could have substantial effects upon world markets for graphite and rare earths. Graphite production could restart in 2019, with total planned production of 880,000 t/yr by 2024. World graphite production was estimated to be more than 1.1 Mt in 2018. Rare-earth production could start at Fungoni and Ngualla in 2019 and increase to about 16,000 t/yr. World rare-earth production was estimated to be 190,000 t of rare-earth-oxide (REO) equivalent content in 2018 (Gambogi, 2020; Olson, 2020).

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TABLE 1
TANZANIA: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons, gross weight, unless otherwise specified)

Commodity ²	2014	2015	2016	2017	2018
METALS					
Bauxite	25,641	50,000 ^{r,e}	72,779 ^r	12,090	7,140
Copper, mine, concentrates, Cu content	16,400	16,800	17,400	15,800	10,000
Gold, mine, Au content	kilograms 40,964	43,780 ^r	45,883 ^r	43,490	39,300
Iron and steel, steel:					
Raw steel ^e	190,000	210,000	230,000 ^r	250,000	300,000
Products, rolled	129,555	142,963 ^r	154,079 ^r	183,337	224,402
Silver, mine, Ag content	kilograms 14,493	15,569	17,984 ^r	10,911	12,041
Tin, mine, Sn content	79 ³	179 ³	138 ^{r,3}	91	8
INDUSTRIAL MINERALS					
Cement, hydraulic	thousand metric tons 2,809	3,135	4,071 ^r	4,200	4,509
Clay, kaolin	3,809	1,953	656 ^r	13,816	129,383
Diamond, gem and industrial ⁴	carats 252,875	216,491	239,896 ^r	304,456	383,391
Gemstones, excluding diamond:					
Alexandrite	kilograms 1	-- ^{r,e}	-- ^{r,5}	1	1 ^e
Amethyst	do. 28,925 ^r	59,000 ^{r,e}	88,636 ^r	19,937	20,000 ^e
Aquamarine	do. 1,540 ^r	16,000 ^{r,e}	31,161 ^r	5,967	6,000 ^e
Emerald	do. 138	90 ^e	42	12	12 ^e
Garnet	do. 6,204 ^r	130,000 ^{r,e}	244,490 ^r	131,278	130,000 ^e
Quartz	do. 40,178	90,000 ^e	145,785	71,275	71,000 ^e
Ruby ^e	do. 3,100 ^r	2,900 ^r	2,800 ^r	2,800	2,800
Sapphire ^e	do. 3,100 ^r	1,900 ^r	860 ^r	850	850
Sunstone	do. 31,349	20,000 ^e	10,298	9,377	9,400 ^e
Tanzanite	do. 4,065 ⁶	2,396 ⁶	2,400 ^{r,e}	2,400 ^e	2,400 ^e
Tourmaline	do. 73,575 ^r	49,000 ^{r,e}	23,464 ^r	33,041	33,000 ^e
Gypsum, including anhydrite, crude	200,179	239,302	213,744 ^r	123,645	241,259
Lime	16,710 ^r	88,617 ^r	238,776 ^r	26,918	27,000 ^e
Phosphate rock:					
Gross weight	75,000 ^{r,e}	50,000 ^{r,e}	23,658 ^r	15,896	--
P ₂ O ₅ content	22,000 ^{r,e}	14,000 ^{r,e}	6,900 ^{r,e}	4,600 ^e	--
Pumice and related materials, pozzolan	68,925	342,628	230,045 ^r	79,085	91,645
Salt, all types	74,967 ^r	92,158	170,553 ^r	100,017	36,392
Stone, sand, and gravel, construction:					
Sand and gravel, sand	7,283,177	10,000,000 ^{r,e}	12,916,978 ^r	7,743,254	8,300,000 ^e
Stone:					
Crushed, limestone	1,116,827	4,443,600 ^r	4,170,057 ^r	3,300,899	2,940,000
Other, size and shape unspecified:					
Calcite	-- ^r	-- ^{r,e}	1 ^r	1	1 ^e
Marble	27,000 ^{r,e}	43,000 ^{r,e}	58,512 ^r	42,729	43,000 ^e
MINERAL FUELS AND RELATED MATERIALS					
Coal, bituminous	246,128 ^r	255,884	276,030 ^r	558,553	725,911
Natural gas, marketable	million cubic meters 958	1,053	1,173	1,218	1,463

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

¹Table includes data available through October 24, 2019. All data are reported unless otherwise noted. Estimated data are rounded to no more than three significant digits.

²In addition to the commodities listed, such gemstones as spinel, and raw construction materials, including brick clay, may have been produced, but available information was inadequate to make reliable estimates of output.

³Reported exports.

⁴About 85% gem quality and 15% industrial quality.

⁵Production was less than 1/2 kilogram.

⁶Reported sales by TanzaniteOne Tanzanite Mine.

TABLE 2
TANZANIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2018

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement		Dangote Cement plc	Plant at Mtwara	3,000,000.
Do.		Tanzania Portland Cement Company Ltd. (TPCC) (Scancem International DA, 69.3%)	Plant at Wazo Hill	2,200,000.
Do.		Tanga Cement Company Ltd. [Afrisam Consortium (Pty) Ltd., 62.5%]	Plant at Tanga	1,800,000.
Do.		ARM Cement Ltd.	Plant at Dar es Salaam ¹	1,600,000.
Do.		Mbeya Cement Company Ltd. (LafargeHolcim Ltd., 61.5%)	Plant at Mbeya	1,100,000.
Do.		Lake Cement Ltd.	Plant at Kimbiji	500,000.
Do.		Kisarawe Cement Ltd.	Plant at Nazimuzubwi	108,000.
Coal, bituminous		Intra Energy Corp. Ltd., 70%, and National Development Corp., 30%	Ngaka Mine in Ruvumu District	960,000.
Copper, mine		Artisanal and small-scale miners	Mine at Mbesa	12,000. ^e
Do.		Acacia Mining plc (Barrick Gold Corp., 63.9%)	Buzwagi Mine ¹	4,200.
Do.		do.	Bulyanhulu Mine near Kahama ¹	3,200.
Diamond	carats	Williamson Diamonds Ltd. (Petra Diamonds Ltd., 75%, and Government, 25%)	Williamson Mine near Shinyanga	340,000.
Do.	do.	El Hillal Minerals Ltd.	Near Shinyanga	17,000. ^e
Do.	do.	Artisanal and small-scale miners	do.	12,000. ^e
Gemstones:				
Alexandrite and emerald		do.	Mines near Lake Manyara	NA.
Garnet		do.	Mines near Merelani and other locations	NA.
Ruby and sapphire		do.	Mines at Kibuko, Kiswila, Songea, Tunduru, Winza, and other locations	NA.
Tanzanite	kilograms	TanzaniteOne Mining Ltd. (Sky Associates Ltd., 50%, and State Mining Corp., 50%)	Mine at Merelani, Block C	2,000. ^e
Do.		Tanzanite Africa Ltd. (IPP Media Ltd.)	Mine at Merelani, Block D Extension	NA.
Do.		Kilimanjaro Mines Ltd.	Mine at Merelani, Block A	NA.
Do.	kilograms	Artisanal and small-scale miners	Mines at Merelani, Blocks B and D	7,500. ^e
Gold	do.	Acacia Mining plc	North Mara Mine in Tarime District	11,500.
Do.	do.	do.	Bulyanhulu Mine near Kahama	10,500.
Do.	do.	do.	Buzwagi Mine	4,800.
Do.	do.	Geita Gold Mining Ltd. (AngloGold Ashanti Ltd., 100%)	Geita Mine near Nyakabale	16,700.
Do.	do.	Shanta Gold Ltd.	New Luika Mine in Mbeya Region	2,600.
Do.	do.	Stamigold Co. Ltd. (State Mining Corp.)	Biharamulo Mine	1,200. ^e
Do.	do.	Small-scale miners	At least 65 plants in various locations	1,500. ^e
Lime		Neelkanth Lime Ltd.	Plant at Tanga	180,000.
Do.		Athi River Mining Ltd. (ARM)	Plant at Tanga ¹	40,000.
Natural gas	million cubic meters	Etablissements Maurel et Prom SA, 48.06%; Wentworth Resources Ltd., 31.94%; Tanzania Petroleum Development Corp., 20%	Gasfield at Mnazi Bay in Ruvumu Basin	2,170.
Do.	do.	Orca Exploration Group Inc.	Gasfield on Songo Songo Island	1,140.
Phosphate rock		Minjingu Mines and Fertilizers Ltd. (Mac Group of Companies)	Mine at Minjingu ¹	100,000.
Salt		Nyanza Mines (Tanganyika) Ltd. (Mac Group of Companies)	Nyanza Mines at Uvinza	60,000.
Silver	kilograms	Acacia Mining plc	Bulyanhulu Mine near Kahama	8,900.
Do.	do.	do.	Buzwagi Mine	4,300. ^e
Do.	do.	do.	North Mara Mine in Tarime District	1,300. ^e
Do.	do.	Shanta Gold Ltd.	New Luika Mine in Mbeya Region	3,400. ^e
Do.	do.	Geita Gold Mining Ltd.	Geita Mine near Nyakabale	2,300. ^e
Steel		Aluminium Africa Ltd.	Plant at Dar es Salaam	70,000 ^e rolled.
Do.		MM Integrated Steel Mills Ltd.	do.	36,000 ^e rolled.
Do.		Aluminium Africa Ltd.	do.	70,000 galvanized.
Do.		MM Integrated Steel Mills Ltd.	do.	36,000 galvanized.

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

¹Not operating at the end of 2018.