

TANZANIA

By Thomas R. Yager

In recent years, the mineral industry of Tanzania has produced gold, iron ore, and steel, such industrial minerals as bentonite, kaolin and other clays, calcite, diamond and other gemstones, graphite, gypsum, phosphate rock, salt, silica sand, and soda ash. The country has also produced coal, petroleum products, and such building materials as cement, gravel, limestone, and sand. Deposits of cobalt, copper, natural gas, nickel, and titanium are also known to occur in Tanzania.

In 2001, Tanzania's gross domestic product (GDP) at purchasing power parity amounted to \$22.3 billion. Per capita GDP at purchasing power parity was about \$650. The GDP at market exchange rates amounted to \$9.1 billion. The GDP grew by 5.6% in 2001, compared with 5.1% in 2000, 3.5% in 1999, and 3.7% in 1998. Manufacturing accounted for 7.7% of GDP; construction, 3.6%; mining and quarrying, 2.3%; and electricity and water, 1.7% (International Monetary Fund, 2002, p. 174; 2003, p. 101; 2002a§¹-c§). After increasing by 13.9% in 2000 and 9.1% in 1999, the value of output in the mining sector rose by 13.5% in 2001. From 1996 to 2001, the value of output in the mining sector grew by an average of 16% per year owing to substantial increases in diamond and gold production (table 1). During the same period, the value of output in the construction and electricity sectors increased by an average of 9.5% and 4.1%, respectively (International Monetary Fund, 2003, p. 101).

Trade

Tanzania's mineral exports have increased substantially from 1998 to 2001. Most of the increase was attributable to gold exports, which increased to \$262.6 million in 2001 from \$3.34 million in 1998. During the same period, diamond exports increased to \$30.55 million from \$12.11 million, and gemstone exports, to \$18.76 million from \$8.13 million. From 1998 to 2001, exports of tanzanite totaled \$48 million. The share of total exports attributable to minerals increased to 40% in 2001 from 27% in 2000; the share of total exports attributable to gold increased to 33% from 18% (Africa Mining Intelligence, 2001a; Mchihiyo, 2001, 2002; S.S. Salim, Tanzanian Ministry of Energy and Minerals, written commun., 2002).

The International Monetary Fund (2003, p. 127) reported that imports of fertilizers amounted to \$15.5 million in 2001, which was a decrease from \$16.8 million in 2000 and \$23.3 million in 1996. Tanzania imported \$220.7 million of petroleum products in 2001, which was an increase from \$142.6 million in 2000 and \$158.4 million in 1996.

Commodity Review

Metals

Cobalt, Copper, and Nickel.—Barrick Gold Corp. was

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

conducting a feasibility study on mining the Kabanga nickel sulfide deposits in northwestern Tanzania. In 2001, Barrick announced that it had discovered a new ore body at Kabanga that increased contained nickel resources to 600,000 metric tons (t) from about 400,000 t. Kabanga also had resources of cobalt and copper. In 2002, Barrick planned to increase resources to 1 million metric tons (Mt) of contained nickel. Previous owner Sutton Resources Ltd. had planned to produce about 17,000 metric tons per year (t/yr) of nickel, 1,600 t/yr of copper, and 1,200 t/yr of cobalt (Jones, 1999; Barrick Gold Corp., 2002b, p. 37).

In 2001, Barrick's Bulyanhulu gold mine produced 20,221 t of gold-copper concentrates that contained most of the 2,645 t of domestic copper output (table 1); these concentrates were exported to Japan for smelting. Small amounts of copper were also contained in the gold doré produced at Bulyanhulu. In 2002, Barrick expected a copper recovery rate of 88%; gold-copper concentrate production was expected to be 20,685 t (Barrick Gold Corp., 2002a, p. 71).

Goldstream Mining NL of Australia explored for cobalt, copper, and nickel at the Mibango Project near Lake Tanganyika and at the Luwumbu Project near Lake Malawi. The company also explored for copper and nickel at Mbozi and for nickel at Mwahanza. In 2001, Goldstream withdrew from the Rukwa property, where it had explored for copper, gold, iron ore, and lead. Goldstream planned exploration work on projects in areas south of Mibango in 2002 (African Mining, 2001c; Goldstream Mining NL, 2001, p. 5-6).

Gold.—In 2001, Tanzania's gold production increased to about 30,088 kilograms (kg) from 15,060 kg in 2000 and 4,767 kg in 1999. Tanzania became the third largest gold producer in Africa in 2001. The Bulyanhulu, Geita, and Golden Pride Mines had the capacity to produce about 33,600 kilograms per year (kg/yr) of gold. Tanzania's resources amounted to about 1,300 t of contained gold, of which more than 700 t was reserves (tables 1-3).

In 2001, the Geita open pit gold mine produced 16,969 kg of gold from 4.52 Mt of ore, compared with 5,500 kg of gold from 2.08 Mt of ore in 2000. Geita Gold Mines [owned by AngloGold Ltd. (50%) and Ashanti Goldfields Co. Ltd. (50%)] started production in 2000. The gold recovery rate increased to 93% in 2001 from 92% in 2000, and the operating cash cost fell to \$143 per troy ounce from \$145 per ounce (Ashanti Goldfields Co. Ltd., 2002, p. 14).

In 2001, only the Nyankanga and Lone Cone pits were being mined; production was expected to start at Kukuluma in the first quarter of 2002. Geita Gold Mines increased open pit reserves at Nyankanga and started a full feasibility study on mining the Nyankanga underground resources. The company conducted drilling at several locations on the Geita minesite, which includes Chipaka and Geita Hill. Anglo and Ashanti agreed to explore and develop jointly properties in Tanzania contributed

by either company. Geita Gold Mines was also planning a feasibility study on expanding plant capacity to 7 Mt/yr of ore from 4 Mt/yr (Resource Information Unit, 2001, p. 285; Ashanti Goldfields Ltd., 2002, p. 14).

Geita was on the outer arc of the greenstone belts south of Lake Victoria where the gold mineralization is associated with banded ironstone formations. The inner and outer arcs are separated by Archean basement rocks and intrusive granites. Unlike the Bulyanhulu Mine, Geita has little associated copper or silver mineralization. Nyankanga has the largest tonnage and the highest grade of the deposits at the Geita Mine; it is hosted in banded ironstones and diorite intrusive rocks. The ore at Nyankanga has a low sulfide content and was nonrefractory, which contributes to higher rates of recovery. The ore at Kukuluma is refractory, which contributes to a primary ore recovery rate of only 66%.

In 2001, the Golden Pride open pit mine, which was owned by Resolute Mining Ltd., produced 5,289 kg of gold from 1.84 Mt of ore milled at an average grade of 3.11 grams per metric ton (g/t). Production fell during 2001 because of lower head grades and the grindability characteristics of the ore. As part of its planned increase in plant capacity, Resolute purchased a new ball mill to resolve these issues. Resolute planned to increase the rated capacity of its processing plant to more than 3 Mt/yr from 1.65 Mt/yr. The upgrade was expected to cost \$10.6 million and be completed by September 2002 (Resolute Mining Ltd., 2001b, 2002).

At the end of 2001, Resolute had increased its reserves to 13.77 Mt at a grade of 2.53 g/t gold from 5.8 Mt at a grade of 2.91 g/t gold. In June 2001, resources were reported to be 28.66 Mt at a grade of about 2.4 g/t gold (table 3). The increase in reserves at Golden Pride was expected to extend the life of the mine from 2004 to at least 2008 (African Mining, 2001b; Resolute Mining, 2001a, p. 19).

Kahama Mining Corp. Ltd. (KMC) (100% owned by Barrick) operated the Bulyanhulu underground gold mine, which started production in March 2001. Output amounted to 7,514 kg of gold from 705,738 t of ore; KMC also produced copper and silver as coproducts. In 2001, the average recovery rate for gold was 82%; recovery rates increased in the fourth quarter (Barrick Gold Corp., 2002a, p. 69, 71). The majority of gold was recovered from copper concentrates; the remainder was from gold doré.

In 2002, Barrick expected to recover 57% of the gold mined from copper concentrates and 32% from gold doré for an overall recovery rate of 89%. Gold recovery rates would be lower than those at Geita because of the complex metallurgy of the ore. Barrick expected to increase production to nearly 11,300 kg from 1.02 Mt of ore in 2002 and to 14,000 kg in 2004 and 2005; capacity would increase to 15,500 kg/yr from 12,400 kg/yr. Cash operating costs were expected to fall to \$173 per ounce of gold in 2002 from \$197 per ounce of gold in 2001 (Barrick Gold Corp., 2002a, p. 69, 71).

The Bulyanhulu deposit was located on the inner arc of the greenstone belts south of Lake Victoria. The inner arc, which did not have the banded iron formations found at Geita, was characterized by intermediate to mafic volcanic rocks, felsic pyroclastics, and a quartz-porphry intrusive. Reef 1, which was being mined in 2001, had most of the mine's reserves; it is hosted in 2.5-meters (m)-to-10-m-wide black argillite between a footwall basalt and a hanging wall felsic pyroclastic ash

associated with a quartz-vein system. Reef 0 also had reserves of gold; it is also associated with a quartz vein system. Reef 2, which was not as well-defined a zone of mineralization, is contained in basalt. The Bulyanhulu trend dips 75 to 80 degrees to the northeast and is open to 2000 m. The footwall basalt shows carbonate and sericitic alteration. Gold mineralization occurs as electrum and is enclosed in pyrite.

In 2000, Barrick acquired 100% ownership of the Golden Ridge project near the Bulyanhulu Mine. In spite of the proximity to Bulyanhulu and substantial resources of gold, Barrick had Golden Ridge on hold in 2001; the Tulawaka project had a smaller amount of contained gold, but the gold is a high grade (table 3). Tulawaka was a joint venture with Explorations Minières du Nord Ltee of Canada. Barrick spent \$3 million upon exploration at Tulawaka in 2001 and planned to spend an additional \$3 million in 2002. The company expected to finish a development plan for Tulawaka in the second half of 2002. Minières du Nord completed a resource assessment of Tulawaka in 2001 (African Mining Bulletin, 2001c; Resource Information Unit, 2001, p. 286-287; Barrick Gold Corp., 2002a, p. 68).

In 2001, Barrick also explored at the Baker and the Chocolate Reef properties near the Golden Pride Mine and at the Musoma area on the shore of Lake Victoria. Barrick held 26 licenses in the Sekenke district and 18 licenses near the Geita Mine. The company planned further exploration work at the Kirondatal property in the Sekenke district in 2002. Barrick expected to increase its total gold exploration spending in Tanzania to \$5 million in 2002 from \$4 million in 2001 (Resource Information Unit, 2001, p. 285-286, 296, 299; Barrick Gold Corp., 2002a, p. 76-77).

East African Gold Mines Ltd. (EAGM) announced plans to start production at the North Mara open pit gold mine in September 2002. The North Mara project encompassed the Nyabigena and the Nyabirama gold deposits; the development of Nyabirama would precede that of Nyabigena. EAGM expected North Mara to produce 2 Mt/yr of ore and about 5,300 kg/yr of gold. The mine was expected to have a life of 10 years with operating costs of \$200 per ounce and a gold recovery rate of 90%. EAGM also held an exploration area of 450 square kilometers (km²) that surrounded the mine properties; the company planned future exploration after securing a cash flow from North Mara (Lion Selection Group Ltd., 2002, p. 17).

Artisanal gold miners were known to operate in numerous locations in Tanzania; these included near Geita, Miyabi, and North Mara. Meremeta Ltd. bought gold from small-scale miners and rented out mining and processing equipment to the miners. The company also held a 70% interest in the Buhemba prospecting license, which included the Buhemba, Buhemba South, Kilamongo, Magunga, and Mwizi deposits. In 2001, the Government invited International Gold Exploration AB (IGE) of Sweden to assist in the establishment of small-scale gold mining and processing operations. IGE might also have opportunities to form joint ventures with major mining companies to explore for larger gold deposits (African Mining Bulletin, 2001b; Resource Information Unit, 2001, p. 281-282).

Spinifex Gold Ltd. held the licenses to the Buckreef/Rwamagaza, Kitongo, and Nyakafuru deposits, which had combined resources of nearly 57 t (1.8 million troy ounces) of contained gold (table 3). In 2001, a scoping study indicated that resources at these deposits had to be increased to reduce

operating costs. Throughput rates of 500,000 t/yr of sulfide ore and 800,000 t/yr of oxide ore would be needed for economies of scale. Spinifex was searching for joint-venture partners to develop Buckreef, Kitongo, and Nyakafuru and was considering infill drilling on the three projects. The company also held licenses at Ikina Reefs, Maji Moto, and Nyang'ombe (Lion Selection Group, 2001, p. 20-21; Resource Information Unit, 2001, p. 294, 298).

In 2001, Twigg Minerals plc engaged in drilling and established a resource of 2.06 Mt at a grade of 2.12 g/t gold at its Miyabi property (table 3). Twigg also explored its Kakumbi, Msasa/Ikuzi, and Nikonga properties and acquired the Mwabomba and Zanzui licenses. The company planned to conduct pitting and drilling at Kakumbi and to drop the Mulehe and Nyamirembe properties in 2002 (Twigg Minerals plc, 2002, p. 2-5).

Sub-Sahara Resources NL of Australia (formerly known as Maiden Gold NL) explored for gold at the Jubilee Reefs, Mwagi Magi, and Nyanzaga projects. In May 2001, the company took over Universal Gold NL and acquired the Bukome, Kahama, Mabale Hills, Ngula, and Nyamirembe Projects. Sub-Sahara also acquired a 35% share in Ikina Reefs Ltd., which held the Ikina Reefs prospecting license. By August, Anglovaal Mining Ltd. had terminated its joint venture with Sub-Sahara for Jubilee Reefs, Mwagi Magi, and Nyanzaga. Sub-Sahara sought new joint-venture partners for these projects as well as for the Musoma Mara and South Siga Hills Projects (Sub-Sahara Resources NL, 2001, p. 5, 7, 9- 11).

In 2001, Tan Range Exploration Corp. explored at the Itetemia concession; the company focused its efforts upon the Golden Horseshoe Reef. Exploration work at the Luhala concession, which included the Kisunge Hill deposit (table 3), focused upon the Shilalo South Hill area. The company also held the Kabahalele property. Tan Range wrote off the Geita East property after completing a drilling program that started in August 2000 (Resource Information Unit, 2001, p. 285, 288-289, 292).

By March 2001, Lakota Resources Inc. of Canada held 40 properties in Tanzania; these included Busohgo, Bukombe, Mwamba, Ngula, and Siga Hills. Lakota planned preliminary exploration activities for some of the licenses. Tanzanian American International Development Corp. (Tanzam) held 100% ownership of 10 licenses and joint ventures in 41 licenses. In early 2001, Tanzam started exploration work on some licenses. Goldstream Mining explored for gold at the Manyawa and Tarani prospects near the Buhemba deposit (Resource Information Unit, 2001, p. 281, 291, 292).

Renewable Energy Corp. Ltd. of Australia explored for gold at the Buhingo, Bwenda River, Gilya, Imerwu, Kiabakari SW, Lupa, Maji Moto, Mawe Meru, Ngasamo, Nyawa, Samena I, Samena II, and Wamangola licenses. In mid-2000, the company put these properties up for sale and focused on its waste disposal business (Resource Information Unit, 2001, p. 282-283, 285, 291, 293- 294, 296-297, 300).

Conquest Resources Ltd. held the Ikungu license, which included the Forest Reef and the Phoenix deposits, and the Suguti license. Mincor Resources NL held the Imweru property, which was 50 kilometers (km) west of the Geita Mine. The company relinquished its interest in the Kianyari, Nyasiori, and Suguti licenses in December 2000 (Resource Information Unit, 2001, p. 281, 287, 299-300).

Iron and Steel.—Tanzania produced iron ore from the Itewe deposit near Chunya until 1997. Other iron ore deposits were found at Liganga and the Uluguru Mountains. The state-owned National Development Corp. (NDC) was seeking investors to help develop the Liganga deposit. Goldstream Mining was exploring for iron ore at Mwanhanza (African Mining, 2001c).

From 1996 to 2001, Tanzania's production of steel increased to 16,100 t from 4,800 t (table 1). In 2000, SITA Rollings Ltd. operated a plant that produced about 3,600 t of cold-rolled steel products. About 10% of the company's sales was exports. SITA planned to increase production to the plant's capacity of 14,000 t/yr. Aluminum Africa Ltd. (ALAF) operated a plant for galvanizing sheet steel. Jeje Industries planned to set up a plant for galvanizing sheet steel with a capacity of 30,000 t/yr; the cost of the plant was estimated to be \$2.5 million (United Nations Industrial Development Organization, 2000a, b; International Monetary Fund, 2003, p. 106). Other companies operated small rolling mills that produced rebar.

The International Iron and Steel Institute (2001, p. 81, 85) estimated that Tanzania's imports of semimanufactured and finished steel products amounted to 69,000 t in 2000; this was a decrease from 93,000 t in 1999 and an increase from 56,000 t in 1995. From 1995 to 2000, Tanzania's apparent consumption of crude steel rose to 77,000 t from 63,000 t.

Lead and Zinc.—Imports of refined zinc increased to 4,570 t in 2001 from 3,848 t in 2000 and 2,447 t in 1998. Zinc was consumed by ALAF for galvanizing sheet steel. Goldstream Mining explored for lead and zinc at Nachingwea in southeastern Tanzania and Wansisi near Lake Victoria (African Mining, 2001c; British Geological Survey, written commun., 2002).

Platinum-Group Metals.—In 2001, Goldstream Mining explored for platinum-group metals (PGMs) at the Mibango Project near Lake Tanganyika and at the Luwumbu Project near Lake Malawi. Other PGM exploration projects included the Mbozi and Wansisi. Goldstream Mining planned exploration work on projects in areas south of Mibango in 2002. Other companies that held prospecting licences for PGMs included Nyati Mining and Tumbili Ventures (African Mining, 2001c; Goldstream Mining NL, 2001, p. 5-6; Mchihyo, 2001).

Silver.—Tanzania produced silver as a coproduct of gold mining and refining. Domestic output of silver increased to 6,861 t in 2001 from 1,384 t in 2000 and 276 t in 1999 (table 1). In 2001, the Bulyanhulu Mine produced 20,221 t of copper concentrates that graded 270 g/t silver. The silver content of the gold doré produced at Bulyanhulu was about 35%. In 2002, Barrick expected a recovery rate of 65% for silver. Goldstream Mining explored for silver at Nachingwea in southeastern Tanzania (African Mining, 2001a, c; Barrick Gold Corp, 2002a, p. 71).

Titanium, Vanadium, and Zirconium.—Deposits of heavy-mineral sands, which contain ilmenite, rutile, and zircon, were found at Bagamoyo and Msimbati. Meremeta Ltd. held a license for a heavy-mineral sands project (Resource Information Unit, 2001, p. 282). NDC's investment promotion plans for the Liganga iron ore deposit included the possibility of producing titanium and vanadium concentrates.

Industrial Minerals

Cement.—In 2001, Tanzania's consumption of cement was estimated to be about 800,000 t/yr, which was an increase of nearly 6% from 2000. The majority of cement consumption was attributable to the housing sector, especially concrete block manufacturers (International Cement Review, 2001, p. 286; Holcim Ltd., 2002, p. 36). The backfill operation for the Bulyanhulu underground gold mine consumed about 25,000 t/yr of cement. From 1996 to 2001, Tanzania's production of cement increased to 900,000 t from 725,800 t because of gold mine development, infrastructure works, and large construction projects. Tanzania's three cement producers were Mbeya Cement Co. Ltd., Tanga Cement Co. Ltd., and Tanzanian Portland Cement Co. Ltd. (TPCC), which had a total clinker grinding capacity of 1.25 Mt/yr and a total cement production capacity of 1.55 Mt/yr (table 2). In recent years, cement has been exported to Burundi, Comoros, Rwanda, and Uganda (International Cement Review, 2001, p. 286; International Monetary Fund, 2003, p. 106).

Diamond.—Production at the Williamson Mine fell in 2001; diamond recovery fell to 190,634 carats from 286,124 carats in 2000. The decrease in diamond output was mostly attributable to a lower head grade. Ore treated fell to 2.87 Mt at a grade of 6.7 carats per 100 metric tons from 2.96 Mt at a grade of 9.7 carats per 100 tons (DeBeers Group, 2002, p. 35). The mine's entire diamond output was exported to the United Kingdom.

DeBeers Group was constructing a new processing plant that would increase the mine's ore treatment capacity to 5 Mt in 2002 and 6.5 Mt/yr in 2003 and subsequent years. The plant would process only tailings and use new technology to alleviate problems with high electricity and ferrosilicon costs. Production was expected to start at the new processing plant in June 2002.

DeBeers was also conducting further exploration at the mine site. Reworked volcanoclastic kimberlite ore graded about 6.5 carats per 100 tons, and kimberlitic shale graded 4.5 carats per 100 tons. The shale has not been mined yet. A layer of pyroclastic kimberlite was found at a depth of 300 m. Most of the other diamondiferous kimberlites found in the vicinity of Shinyanga were subeconomic.

About 3,000 artisanal miners were estimated to be working in the vicinity of the Williamson Mine. The miners worked alluvial deposits of diamonds that resulted from the erosion of the local kimberlites. Resources in these deposits were estimated to grade around 1 carat per 100 tons.

Gemstones.—In 2001, the total production of gemstones fell to 96,866 kg from 150,800 kg in 2000. The production of amethyst, aquamarine, cordierite, garnet, ruby, and sapphire increased, and the production of tanzanite and other gemstones fell. The officially reported production of tanzanite fell to 5,473 kg from 5,516 kg in 2000. The value of tanzanite produced in 2001 amounted to \$15.93 million, which was 85% of the total value of gemstone production (S.S. Salim, Tanzanian Ministry of Energy and Minerals, written commun., 2002).

African Gem Resources Ltd. (Afgem) held the rights to mine for tanzanite in Block C of the Merelani mining area near Arusha. Indicated resources in Block C increased to 4.65 Mt at a grade of 22 carats per metric ton in 2001 from 2.24 Mt at a

grade of 22 carats per ton in 2000. In November, Afgem introduced a revised mine plan based on the new resource data. The company's processing plant had the capacity to treat 200 t during each shift; production would run on a single shift basis following the sinking of three mine shafts. Commercial production was expected to start in the third quarter of 2002 (African Gem Resources Ltd., 2002, p. 8, 11-13).

Afgem had lapidaries in South Africa and Tanzania; the latter facility may be expanded under the Export Zone Program. In 2002, Afgem planned to have a lapidary capacity of 147,200 carats per year, which was expected to increase to 230,000 carats per year in 2003 and 331,200 carats per year in 2004. The company expected to cut and polish about 10% of its highest quality rough tanzanite in South Africa and Tanzania. Afgem would also laser-inscribe, package, and certify the high-grade stones. The lower grade stones would be exported to cutting centers in China and India (African Gem Resources Ltd., 2000, p. 19-20; 2002, p. 17, 23).

Kilimanjaro Mines Ltd. held the license to Block A. There has been little activity on Block A in recent years; its remaining resources were believed to be subeconomic. Blocks B and D of the Merelani deposit were being mined by about 10,000 artisanal miners, who accounted for most of the country's tanzanite production. Ngorongoro Mining Enterprises Ltd. mined as deep as 200 m. Although Block C was believed to have the most abundant tanzanite resources, Block D had the highest quality.

In April 2001, three associations that represented miners in Blocks B and D sued Afgem; they challenged the legality of Afgem's mining license and accused the company of monopolizing the tanzanite market and engaging in misconduct towards small-scale miners. In August, the High Court of Tanzania ruled unanimously in Afgem's favor (African Mining Bulletin, 2001a). At the end of 2001, Afgem still faced the challenge of artisanal miners illegally tunneling into Block C from Blocks B and D.

The world market for polished tanzanite was more than \$400 million per year, of which \$300 million per year was consumed by the United States. About 10% of the rough tanzanite was cut domestically; the remainder was exported to Germany, India, and Israel for cutting. Rough exports of tanzanite were estimated to be from about \$150 million to \$160 million per year, most of which was sold by artisanal miners to middlemen and smuggled out of the country.

In November 2001, the Wall Street Journal reported that supporters of the al-Qaeda terror network were allegedly buying tanzanite in Tanzania and smuggling it to Dubai and Hong Kong for sale (Block and Pearl, 2001). The allegations led QVC Inc., Tiffany & Co., and Zale Corp. to boycott tanzanite. Sales of tanzanite, which were already weakened by the recession in the United States, fell further as a result. The U.S. Department of State reported that no evidence suggested that sales of tanzanite were funding al-Qaeda (Africa Mining Intelligence, 2002; African Gem Mining Ltd., 2002, p. 3, 23; Business Times Market & Economy, 2002).

Rhodolite and tsavorite garnet were found at numerous locations in Tanzania. In 2001, the production of garnet increased to 19,508 kg from 14,940 kg in 2000. The value of garnet produced amounted to \$1.01 million in 2001 (S.S. Salim, Tanzanian Ministry of Energy and Minerals, written commun., 2002).

Ngorongoro Mining Enterprises Ltd. mined rhodolite garnet at Landaban, Landanai, and Losoito. Tsavorite, which is a green grossularite garnet that obtains its color from trace amounts of chromium and vanadium, was found near Arusha, Lemshuku, Namungo, and Tunduru. In early 2000, tsavorite prices fell because of increased supply from the Namungo deposit. By February 2001, most of the alluvial resources at Namungo had been depleted. In the second half of 2001, the depletion of alluvial deposits at several tsavorite mines caused production to fall and prices to rise; deeper resources were much less accessible to artisanal miners. Additionally, the discovery of a new aquamarine deposit in Tanzania encouraged miners to leave the tsavorite mines and to pursue aquamarine mining (Henricus, 2001b, c; Jewellery News Asia, 2001).

Emerald has been produced at Manghola and Magara and in the Sumbawanga district. In early December 2000, new deposits of emerald and alexandrite were discovered in Mayoka, which was near the border of Manyara National Park. Large quantities of emerald and smaller amounts of alexandrite were recovered by the 800 miners who worked in the area. In mid-December 2000, the Government temporarily halted mining in the area for environmental reasons (Shigley and others, 2000, p. 311; Henricus, 2001a).

The primary ruby-producing districts have been the Mahenge, Matombo, Morogoro, and Tunduru. Sapphire has been produced particularly in the Songea, the Tunduru, and the Uмба Valley districts. The production of sapphire increased to 3,576 kg in 2001 from 2,531 kg in 2000, and ruby, to 1,174 kg from 1,070 kg. In 2001, the value of sapphire and ruby output amounted to \$490,000 and \$71,000, respectively (S.S. Salim, Tanzanian Ministry of Energy and Minerals, written commun., 2002).

In 2000, GTN Resources Ltd. of Australia formed a joint venture to explore for sapphire in the Songea and Tunduru districts. In November 2001, the company decided to relinquish its title to the area because of high costs and risks. Pacific Mining Corporation Pty. Ltd. held the Liparamba, Matemango, and Muhwesi gemstone concessions in Tunduru, upon which garnet, ruby, and sapphire have been discovered. In June 2001, Caesars Explorations Inc. of Canada acquired a 100% share in Pacific Mining. Caesars planned to start operations in the fourth quarter of 2001. Seab Gems Ltd. mined for ruby in the Mahenge and Morogoro districts and for sapphire in the Tanga district (Shigley and others, 2000, p. 314-315; Caesars Explorations Inc., 2001a, b; Jewellery News Asia, 2002).

Other gemstone occurrences included opal in the Kasulu district; olivine at Kingiti in the Gelai district; scapolite in the Dodoma district; spinel in the Mhuva, Songea, and Tunduru districts; topaz in the Longido, Magagoni, and Mhuva districts; tourmaline in the Daluni, Mpwapwa, Ngomeni, and Uмба Valley districts; and zircon at Muhwesi in the Tunduru district (Shigley and others, 2000, p. 319-323, 325).

Kaolin and Other Clays.—Notable deposits of kaolin occurred at Pugu, which was to the west of Dar es Salaam. Domestic production of kaolin ceased in 1997, but other clays were produced for use in the construction sector (table 1).

Limestone and Other Stone.—The Tanga and Wazo Hill limestone deposits have been developed for use in the cement industry; another substantial limestone deposits is Lindi.

Marble from the Mbarali deposits has been used for the production of lime. During a visit in February 2002, the author observed numerous small-scale crushed stone operations in rural areas that used labor-intensive production processes.

The production of crushed limestone increased to nearly 2.27 Mt from 1.5 Mt in 2000 and 1.2 Mt in 1996. The output of pozzolanic materials increased to 57,014 t in 2000 from 2,274 t in 1999 before falling to 41,468 t in 2001. According to official statistics, about 108,000 t/yr of stone and aggregate were produced in the area of Dar es Salaam; other estimates run as high as three times this figure. The extraction of coral, limestone, and sand has caused damage to the environment through the diversion of streams and rivers. About 130,000 t/yr of waste rock was crushed and mixed with cement to use as backfill in the Bulyanhulu underground mine (Menda, 2002; S.S. Salim, Tanzanian Ministry of Energy and Minerals, written commun., 2002).

Salt.—Substantial deposits of rock salt were found near Mandawa. The domestic demand for salt was about 120,000 t/yr. Tanzania's salt production declined to 65,000 t in 2001 from 70,000 t in 2000 and 86,700 t in 1996 (S.S. Salim, Tanzanian Ministry of Energy and Minerals, written commun., 2002). Domestic salt producers included H.J. Stanley & Sons Ltd., Mtawanya Saltworks Ltd., Mtwara Oceanic Products Ltd., and Nyanza Salt Mines (T) Ltd. In 2001, KfW Bankengruppe of Germany offered a \$9 million loan to Nyanza Salt Mines that would allow the company to increase its production to 60,000 t/yr. The company planned to export some of its output; export revenues were expected to be \$4.5 million per year.

Silica Sand.—High-quality silica sands were located near Bukoba, which was a port on Lake Victoria. During a visit in February 2002, officials from the Government of Tanzania informed the author that private investors had expressed some interest in mining the Bukoba deposits. Silica sands were also found at Pugu. Kioo Ltd. operated a plant in Dar es Salaam that produced glass bottles and containers.

Mineral Fuels

Coal.—The Kiriwa coalfield produced small amounts of bituminous coal, most of which were consumed at a powerplant near the mine. Bituminous coal deposits in the Ruhuhu coalfield included the Ketewaka, Mbalawala, Mbuyura, and Mchuchuma; other bituminous coalfields included the Gahula and Njuga. The largest subbituminous coalfields were the Mhukuru and Ufipa. In 2001, Tanzania's coal production fell to 77,789 t from 79,184 t in 2000 and 52,000 t in 1996 (British Geological Survey, written commun., 2002; S.S. Salim, Tanzanian Ministry of Energy and Minerals, written commun., 2002).

The NDC held a prospecting license for Mchuchuma and Ketewaka; the company sought assistance from investors to finance a new opencast coal mine at Mchuchuma with a capacity of 1.5 Mt/yr of coal and a coal-fired powerplant with a capacity of 400 megawatts (MW). The feasibility study conducted by the NDC established the viability of the project (Mchihiyo, 2001).

Natural Gas.—Tanzania had substantial resources of natural gas at Songo Songo Island. The Songo Songo Project would deliver natural gas from the Songo Songo field to the Ubungo powerplant in Dar es Salaam, which was operated by Tanzania Electric Supply Company Ltd., and to TPCC's cement plant at Wazo Hill. The project would involve installing a gas processing plant on Songo Songo Island with a capacity of about 410 million cubic meters per year; constructing a 248-km pipeline to Dar es Salaam and Wazo Hill; and converting the 112-MW Ubungo plant from diesel to natural gas (Stell, 2001, p. 85; World Bank, 2002, p. 2).

AES Corp. of the United States was the private sponsor of the Songo Songo project. In October 2001, the World Bank approved a \$183 million loan for the project; the European Investment Bank would provide an additional \$40 million and CDC Capital Ventures of the United Kingdom, \$18 million. Production was expected to start in October 2003 (Africa Energy Intelligence, 2001b).

Petroleum.—Tanzania had a petroleum products refinery with a capacity of 14,900 barrels per day that was operated by Tanzanian & Italian Petroleum Refining Co. Ltd. The refinery shut down because of its outdated technology and high transportation costs; production was unprofitable even after subsidies. In 2001, the Government authorized Antrim Energy Ltd. and Canop Worldwide Corp. to start exploration work. Antrim held the Pemba-Zanzibar block, which covered 14,060 km² in the Indian Ocean. The company finalized negotiations with the Government to drill three wells in 2002 at an expected cost of \$1.2 million. As of October 2001, Antrim was still negotiating the production-sharing agreement. Canop held an 80% share of the exploration licenses for Dar es Salaam Platform, Kiasangire, and Mafia Island. In the first half of 2002, Canop and its partner Paladin Resources Ltd. planned to drill a well on the Bigwa field, which is part of the Dar es Salaam Platform. Dublin International Petroleum (Tanzania) Ltd. continued to explore on the Mandawa block (Africa Energy Intelligence, 2001a).

Infrastructure

Tanzania had installed capacity of 901 MW in 2001, of which hydroelectric power accounted for 561 MW. Hydroelectric power stations included Kidatu, with a capacity of 204 MW; Kihansi, 180 MW; Mtera, 80 MW; Pangani Falls, 68 MW; and Hale, 21 MW. Thermal power stations included Ubungo with a capacity of 112 MW and Tegeta, 100 MW. The state-owned utility TANESCO produced most of the country's electricity. In 2000, Tanzania generated 2,488 gigawatt hours (GWh) of electricity, which was an increase from 2,325 GWh in 1999 and 1,991 GWh in 1996. Hydroelectric power sources provided 86% and fossil fuels, 14% (Africa Energy & Mining, 1999, 2000; World Bank, 2002, p. 4; Tanzania Investment Centre, undated§).

In spite of the recent additions to Tanzania's power generating capacity, 93% of energy needs were met by traditional fuels, such as firewood. Out of the country's rural population, which was about 85% of the total population, less than 1% had access to electricity. Estimates of deforestation ranged from 1,460 to 4,000 square kilometers per year; fuel accounted for about 97% of Tanzania's wood consumption. TANESCO was establishing a rural electrification fund and

developing its Rural Electrification Master Plan. In July 2001, the African Development Fund awarded Tanzania a grant of \$2.3 million to finance the study on rural electrification (United Nations Environment Programme, undated; TOMRIC News Agency, 2000§; North South Associates Co. Ltd., 2001§).

In 2001, TANESCO was negotiating with the Zambia Electricity Supply Corporation to link the power grids of Tanzania and Zambia by 2004. This would connect Tanzania's grid to the South African Power Pool and increase stability of supply (Africa Energy Intelligence, 2001c). The Government was also exploring the feasibility of connecting to the Kenyan grid; the cost was estimated to be \$50 million.

TANESCO also planned to build new gas-fired powerplants and substitute natural gas for diesel in other plants. In addition to the Songo Songo project, TANESCO's Power Sector Master Plan also included the conversion of the 100-MW Tegeta powerplant to natural gas and the addition of 150 MW of new gas-fired capacity from 2003 to 2005 (World Bank, 2002, p. 4-5).

Geothermal areas in Tanzania include Kisaki Tagalala, Mbeya, and Ngorongoro. Most exploration for geothermal energy sources has been very preliminary because of abundant hydropower and plans to develop domestic coal and natural gas resources. The Government sought donor support for village level solar electrification (United Nations Environment Programme, undated).

About 30% of electricity was consumed by the Government; nonpayment of utility bills by Government agencies caused TANESCO substantial financial difficulties. The cement and steel industries consumed between 60 and 120 MW of capacity per year, and the Bulyanhulu Mine, 12 MW. National demand for electricity was growing by 11% to 13% per year; peak demand was expected to reach 850 MW of capacity by 2005 (United Nations Environment Programme, undated; Mande and Mwamunyange, 2001§).

Tanzania had about 85,000 km of roads, of which approximately 4,000 km was paved. Only 14% of the unpaved roads was in good condition; the Government planned to rehabilitate 4,500 km of roads by 2004. The rail network covered about 3,600 km. The country had 982 km of crude petroleum pipelines. Lake Nyasa, Lake Tanganyika, and Lake Victoria were the principal waterways. Ports and harbors were Bukoba, Dar es Salaam, Kigoma, Kilwa Masoko, Lindi, Mtwara, Mwanza, Pangani, Tanga, Wete, and Zanzibar.

Outlook

Tanzania's minerals industry, particularly gold mining, is likely to grow substantially in the near future. With the start of production at the North Mara Mine and the increased output at Bulyanhulu, Tanzania's gold production was expected to rise to about 37 t in 2002. If the capacity expansions at Bulhanhulu, Geita, and Golden Pride are carried out and Nyakafuru is developed, then gold production could rise to 44 t in 2003 and 52 t in 2005. Mineral exports were expected to rise to more than \$400 million in 2002 from \$312 million in 2001; gold exports were predicted to increase to \$326 million from \$262.6 million in 2001 (African Mining Intelligence, 2001b).

Investments by Afgem and DeBeers are likely to lead to higher output of diamond and tanzanite; the outlook for these commodities also depends heavily upon world markets. The smuggling of tanzanite is likely to remain a serious issue in the

short term because of export taxes, the value of tanzanite, and the ease of concealment. In the long term, the problem is likely to diminish because of resource depletion in Blocks B and D.

The International Monetary Fund (2002, p. 174) predicted that Tanzania's GDP would grow by 5.8% in 2002 and 6% in 2003. If similar rates of growth occur in the construction industry, then the production of such construction materials as brick clay, cement, gypsum, limestone, and sand and gravel could increase substantially.

References Cited

- Africa Energy & Mining, 1999, Tanzania—On track for privatization: Africa Energy & Mining, no. 253, June 2, p. 6.
- Africa Energy & Mining, 2000, Tanzania—Kihansi a welcome contribution: Africa Energy & Mining, no. 280, July 26, p. 5.
- Africa Energy Intelligence, 2001a, Tanzania—New exploration push: Africa Energy Intelligence, no. 307, October 3, p. 4.
- Africa Energy Intelligence, 2001b, Tanzania—Songo Songo awarded \$250 million: Africa Energy Intelligence, no. 308, October 17, p. 7.
- Africa Energy Intelligence, 2001c, Zambia/Tanzania—Plans for interconnection: Africa Energy Intelligence, no. 294, March 7, p. 6.
- Africa Mining Intelligence, 2001a, Tanzania—Tanzanian sales hit \$32 million: Africa Mining Intelligence, no. 10, March 14, p. 3.
- Africa Mining Intelligence, 2001b, Tanzania—Year 2001 great for gold: Africa Mining Intelligence, no. 28, December 19, p. 1.
- Africa Mining Intelligence, 2002, Tanzania—Small-scale miners issue warning to Afgem: Africa Mining Intelligence, no. 34, March 20, p. 2.
- African Gem Resources Ltd., 2000, Unearthing Africa's wealth: Johannesburg, South Africa, African Gem Resources, Ltd., 39 p.
- African Gem Resources Ltd., 2002, Annual report 2002: Johannesburg, South Africa, African Gem Resources Ltd., 56 p.
- African Mining, 2001a, Bulyanhulu—Barrick's brilliant new star: African Mining, v. 6, no. 2, March-April, p. 46-49.
- African Mining, 2001b, Exploration—Tanzania: African Mining, v. 6, no. 6, November-December, p. 15-16.
- African Mining, 2001c, Goldstream finds platinum in Tanzania: African Mining, v. 6, no. 5, September-October, p. 21.
- African Mining Bulletin, 2001a, Tanzania—Court rules in favor of Afgem: African Mining Bulletin, no. 153, October 12, p. 2-3.
- African Mining Bulletin, 2001b, Tanzania—IGE to assist with small-scale gold mining: African Mining Bulletin, no. 143, May 25, p. 3.
- African Mining Bulletin, 2001c, Tanzania—Robust grades at Tulawaka: African Mining Bulletin, no. 152, August 21, p. 3.
- Ashanti Goldfields Co. Ltd., 2002, Annual report 2001: Accra, Ghana, Ashanti Goldfields Co. Ltd., 65 p.
- Barrick Gold Corp., 2002a, Barrick analyst briefing 2002: Toronto, Ontario, Canada, Barrick Gold Corp., 83 p.
- Barrick Gold Corp., 2002b, Annual report 2001: Toronto, Ontario, Canada, Barrick Gold Corp., 98 p.
- Block, Robert, and Pearl, Daniel, 2001, Underground trade—Much-smuggled gem called tanzanite helps bin Laden supporters: Wall Street Journal, November 16, p. A1, A8.
- Business Times Market & Economy, 2002, Reprieve for tanzanite industry: Business Times Market & Economy, February 15, p. 2.
- Caesars Exploration Inc., 2001a, Caesars Exploration Inc. announces acquisition: Surrey, British Columbia, Canada, Caesars Exploration Inc. press release, September 25, 2 p.
- Caesars Exploration Inc., 2001b, Title acquisition of Tanzanian gemstone properties 225 sq. kilometers: Surrey, British Columbia, Canada, Caesars Exploration Inc. press release, June 8, 2 p.
- DeBeers Group, 2002, Annual review 2001: Johannesburg, South Africa, DeBeers Group, 66 p.
- Goldstream Mining NL, 2001, Annual report 2001: West Perth, Australia, Goldstream Mining NL, 40 p.
- Henricus, Jennifer, 2001a, New gem rush in Tanzania: Jewellery News Asia, no. 197, January, p. 78-80.
- Henricus, Jennifer, 2001b, New large Tanzanian deposits help broaden appeal of tsavorite: Jewellery News Asia, no. 198, February, p. 58-64.
- Henricus, Jennifer, 2001c, Tsavorite is likely to become a mainstream stone if production keeps rising: Jewellery News Asia, no. 198, February, p. 64.
- Holcim Ltd., 2002, Annual report 2001: Zurich, Switzerland, Holcim Ltd., 47 p.
- International Cement Review, 2001, Tanzania, in The global cement report: Dorking, United Kingdom, Tradeship Publications, Ltd., p. 296.
- International Iron and Steel Institute, 2001, Steel statistical yearbook 2001: Brussels, International Iron and Steel Institute, 109 p.
- International Monetary Fund, 2002, World economic outlook—Trade and finance: Washington, D.C., International Monetary Fund, September, 235 p.
- International Monetary Fund, 2003, Tanzania—Selected issues and statistical appendix: Washington, D.C., International Monetary Fund, January 7, 136 p.
- Jewellery News Asia, 2001, Supplier notes tsavorite price increase: Jewellery News Asia, no. 207, November, p. 32.
- Jewellery News Asia, 2002, GTN cuts production, pulls out of Tanzania: Jewellery News Asia, no. 210, February, p. 94.
- Jones, Andrew, 1999, Africa lags in race for low-cost nickel: African Mining, v. 4, no. 6, November-December, p. 66-69.
- Lion Selection Group Ltd., 2002, Annual report 2001: Melbourne, Australia, Lion Selection Group Ltd., 65 p.
- Mchihiyo, E.P., 2001, Tanzania, in Mining annual review 2001: London, United Kingdom, Mining Journal Ltd. CD-ROM.
- Mchihiyo, E.P., 2002, Tanzania, in Mining annual review 2002: London, United Kingdom, Mining Journal Ltd. CD-ROM.
- Menda, Aloyce, 2002, Quarries threaten Dar's environment: Business Times Market & Economy, February 8, p. 10.
- Resolute Mining Ltd., 2001a, Annual report 2001: Perth, Australia, Resolute Mining Ltd., 52 p.
- Resolute Mining Ltd., 2001b, Report on activities for the quarter to 30 June 2001: Perth, Australia, Resolute Mining Ltd., 8 p.
- Resolute Mining Ltd., 2002, Report on activities for the quarter to 31 December 2001: Perth, Australia, Resolute Mining Ltd., 6 p.
- Resource Information Unit, 2001, Tanzania, in Register of African mining 2001/02: Subiaco, Australia, Resource Information Unit, p. 279-301.
- Shigley, J.E., Dirlam, D.M., Laurs, B.M., Boehm, E.W., Bosshart, George, and Larson, W.F., 2000, Gem localities of the 1990s: Gems & Gemology, v. 36, no. 4, Winter, p. 292-335.
- Stell, Jeannie, 2001, Worldwide construction: Oil & Gas Journal, v. 99, no. 16, April 16, p. 67-96.
- Sub-Sahara Resources NL, 2001, Annual report 2001: Perth, Australia, Sub-Sahara Resources NL, 44 p.
- Twigg Minerals plc, 2002, Annual report 2001: Lymington, United Kingdom, Twigg Minerals plc, 22 p.
- United Nations Environment Programme, [undated], Tanzania country assessment 2001: Paris, France, United Nations Environment Programme, 7 p.
- United Nations Industrial Development Organization, 2000a, Industrial investment and technology project profile—Nails, wire mesh, and corrugated iron (Jeje): Vienna, Austria, United Nations Industrial Development Organization, 10 p.
- United Nations Industrial Development Organization, 2000b, Industrial investment and technology project profile—Steel rolling (SITA): Vienna, Austria, United Nations Industrial Development Organization, 11 p.
- World Bank, 2002, United Republic of Tanzania—Songo Songo gas development and power generation project—Environment and social assessment and management plan summary: Washington, District of Columbia, World Bank, 27 p.

Internet References Cited

- International Monetary Fund, 2002a (April), Gross domestic product at current prices—All countries, World Economic Outlook Database, accessed August 14, 2002, via http://www.imf.org/external/pubs/ft/weo/2002/01/data/ngdgd_a.csv.
- International Monetary Fund, 2002b (April), Selected world aggregates, World Economic Outlook Database, accessed June 10, 2002, via URL <http://www.imf.org/external/pubs/ft/weo/2002/01/data>.
- International Monetary Fund, 2002c (April), Shares of aggregate GDP based on purchasing power parity (PPP) valuation of country GDP—Developing countries, World Economic Outlook Database, accessed June 10, 2002, via URL <http://www.imf.org/external/pubs/ft/weo/2002/01/data>.
- Mande, Mike, and Mwamunyange, Joseph, 2001 (July 30), Tanzanian industry divided over IPTL ruling, accessed September 24, 2002, at URL <http://www.nationaudio.com/News/EastAfrican/06082001/Regional/Regional20.html>.
- North South Associates Co. Ltd., 2001 (July 27), Fund injects \$2.34m into rural electrification program, accessed September 25, 2002, at URL <http://www.yourworldoffinancialservices.com/News/July/news55.asp>.
- Tanzania Investment Centre, [undated], Electricity supply, accessed September 25, 2001, via URL http://www.tic.co.tz/IPA_Information.asp?hdnGroupID=3&hdnLevelID=5.2.
- TOMRIC News Agency, 2000 (January 7), Deforestation in Tanzania alarming, accessed September 25, 2002, at URL <http://allafrica.com/stories/printable/200001070106.html>.

TABLE 1
TANZANIA: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/	1997	1998	1999	2000	2001
Calcite e/	40	40	40	40	40
Cement, hydraulic thousand tons	621	778	833	833	900
Clays:					
Bentonite	-- r/	-- r/	-- r/	-- r/	--
Kaolin	898 r/	-- r/	-- r/	-- r/	--
Coal, bituminous	28,443 r/	45,073 r/	75,044 r/	79,184 r/	77,789
Copper, contained in concentrates and doré	--	--	--	--	2,645
Diamond 3/ carats	123,090 r/	97,830 r/	234,800	354,388 r/	254,271
Gemstones, excluding diamond 4/					
Amethyst e/ kilograms	155	180	230	239 5/	277 5/
Aquamarine e/ do.	125	140	200	205 5/	454 5/
Cordierite (iolite) e/ do.	100	120	155	158 5/	312 5/
Garnet e/ do.	14,000	14,100	14,100	14,940 5/	19,508 5/
Ruby e/ do.	900	1,000	1,000	1,070 5/	1,174 5/
Sapphire e/ do.	2,400	2,450	2,500	2,531 5/	3,576 5/
Tanzanite do.	810	1,226	5,216	5,516	5,473
Other e/ do.	491,000	29,300	71,800	126,141 5/	66,092 5/
Total do.	509,000	48,500	95,200	150,800	96,866
Gold, refined do.	232	427	4,890 r/	15,060	30,088
Graphite	11,000	--	--	--	--
Gypsum and anhydrite, crude	46,320 r/	59,066 r/	21,195 r/	60,000	72,000
Iron ore:					
Gross weight	91,200	--	--	--	--
Fe content	29,200	--	--	--	--
Limestone, crushed	--	1,181,233 r/	1,241,155 r/	1,500,000	2,269,359
Petroleum fuels	313,000	312,000	287,000	117,000	--
Phosphate minerals:					
Apatite	7,070 r/	4,790 r/	24,200 r/	17,000 r/	13,300
P ₂ O ₅ content	2,120 r/	1,437 r/	7,250 r/	5,100 r/	4,000
Pozzolanic materials	--	--	2,274	57,014	41,468
Salt, all types	72,511 r/	75,000	35,893 r/	70,000	65,000
Sand, glass e/	4,200	4,200	-- r/	-- r/	--
Silver, contained in concentrates and doré kilograms	--	--	276	1,384	6,861
Soda ash e/	-- r/	-- r/	-- r/	-- r/	--
Steel, semimanufactured	12,498	9,522	9,500 r/	11,182	16,100

e/ Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. r/ Revised. -- Zero.

1/ Includes data available through October 3, 2002.

2/ In addition to the commodities listed, modest quantities of unlisted varieties of crude construction materials (other clays, sand and gravel, and stone) presumably are produced, but output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels.

3/ Diamond figures are estimated to represent 85% gem-quality or semi-gem-quality and 15% industrial-quality stones. Does not include smuggled artisanal production

4/ Other precious and semiprecious stones produced included chrysoprase, emerald, peridot, and tourmaline.

5/ Reported figure.

TABLE 2
TANZANIA: STRUCTURE OF THE MINERALS INDUSTRY IN 2001

(Metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Cement		Tanzania Portland Cement Co. Ltd. (Heidelberg Cement, 41%)	Wazo Hill	500,000 mill; 800,000 kiln.
Do.		Tanga Cement Co. Ltd. (Holcim Ltd., 60%; Saruji Corp., 40%)	Tanga	500,000 mill; 500,000 kiln.
Do.		Mbeya Cement Co. Ltd. (LaFarge Group, 58%)	Mbeya	250,000 mill; 250,000 kiln.
Coal, bituminous		Tanzania-China Kiwira Coal and Power (Hunan International Economic and Technical Cooperation Co., 62%; Government, 38%)	Kiwira Mine	150,000 run of mine; 93,000 washed.
Copper, in concentrates		Kahama Mining Corp. Ltd. (Barrick Gold Corp., 100%)	Bulyanhulu Mine near Kahama	20,000 concentrate; 3,600 contained copper.
Diamond		Williamson Diamonds Ltd. (DeBeers Group, 75%; Government, 25%)	Mwadui Mine near Shinyanga	2,400,000 ore processing.
Do.	carats	do.	do.	160,000 diamond.
Gold		Anglogold Ltd., 50%; and Ashanti Goldfields Co. Ltd., 50%	Geita Mine near Nyakabale	4,000,000 ore processing.
Do.	kilograms	do.	do.	15,600 gold.
Do.		Kahama Mining Corp. Ltd.	Bulyanhulu Mine near Kahama	1,095,000 ore processing.
Do.	kilograms	do.	do.	12,400 gold.
Do.		Resolute Mining Ltd.	Golden Pride Mine near Isanga	1,650,000 ore processing.
Do.	kilograms	do.	do.	5,600 gold.
Petroleum products	thousand barrels	Tanzanian & Italian Petroleum Refining Co. Ltd.	Dar es Salaam	5,440.
Phosphate rock		Minjingu Phosphate Co. Ltd.	Minjingu	30,000.
Rhodolite		Ngorongoro Mining Enterprises Ltd.	Landanai	NA.
Do.		do.	Landaban	NA.
Do.		do.	Losoito	NA.
Steel		SITA Rollings Ltd.	Dar es Salaam	14,000 cold rolled.
Tanzanite		African Gem Resources Ltd.	Merelani, Block C	52,000 ore processing.
Do.	carats	do.	do.	1,144,000 tanzanite.
Do.		Ngorongoro Mining Enterprises Ltd.	Merelani, Block B	NA.

NA Not available.

TABLE 3
TANZANIA: GOLD RESOURCES AND RESERVES IN 2001

Project	Major operating companies	Tonnage (million metric tons)	Grade (grams per metric ton)	Contained gold (metric tons)
Reserves:				
Bulyanhulu	Kahama Mining Corp. Ltd. (Barrick Gold Corp., 100%)	28	13	374
Geita	Geita Gold Mines (Anglogold Ltd., 50%; and Ashanti Goldfields, 50%)	63	4	240
North Mara	East African Gold Mines Ltd.	19	3	65
Golden Pride	Resolute Mining Ltd.	14	3	35
Total		124	6	710
Resources:				
Bulyanhulu	Kahama Mining Corp. Ltd.	37	14	508
Geita	Geita Gold Mines	88	4	345
North Mara	East African Gold Mines Ltd.	50	3	128
Golden Pride	Resolute Mining Ltd.	29	2	69
Golden Ridge 1/	Kahama Mining Corp. Ltd.	NA	NA	68
Chocolate Reef	do.	26	2	59
Tulawaka:				
East Zone 2/	Barrick Gold Corp., 70%; and Exploration Minieres du Nord, 30%	1	28	27
West Zone	do.	1	3	2
Buhemba	Meremeta Ltd	11	2	23
Nyakafuru	Spinifex Gold Ltd.	4	6	23
Buckreef/Rwamagaza	do.	5	4	19
Kitongo	do.	11	6	15
Kisunge Hill	Tan Range Exploration Corp.	9	1	9
Ikungu	Conquest Resources Ltd.	3	2	6
Miyabi	Twigg Minerals plc	2	2	5
Total				1,300

NA Not available.

1/ Estimate of resources in December 1997 was 33.1 million metric tons (Mt) at a grade of 1.48 grams per ton (g/t), or 49 metric tons (t) of contained gold.

2/ Cutoff grade of 5 g/t gold. At a cutoff grade of 1 g/t gold, resources were 1.43 Mt at a grade of 19.5 g/t gold.

Sources: African Mining Bulletin, 2001c; Ashanti Goldfields Co. Ltd., 2002; Barrick Gold Corp., 2002b; Lion Selection Group Ltd., 2002; Resolute Mining Ltd., 2001a, 2002; Resource Information Unit, 2001; Twigg Minerals plc, 2002.