

# THE MINERAL INDUSTRY OF TANZANIA

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

In 2004, Tanzania's nominal gross domestic product (GDP) based on purchasing power parity amounted to \$24.7 billion; the per capita GDP was about \$700. The real GDP grew by 6.7% in 2004 compared with 7.1% in 2003. Manufacturing accounted for 8.8% of the GDP; construction, 4.6%; mining and quarrying, 3.2%; and electricity and water, 1.6% (Bank of Tanzania, 2004, p. 34; International Monetary Fund, 2005, p. 212; 2005<sup>§1</sup>).

The value of output in the mining sector grew by nearly 16% in 2004 after rising by 18% in 2003. From 1999 to 2004, the value of output in the mining sector grew by an average of 15% per year because of substantial increases in gold production (table 1). During the same period, the value of output in the construction and electricity and water sectors rose by an average of 11% and 4%, respectively (Bank of Tanzania, 2004, p. 36).

## Trade

Tanzania's mineral exports have risen substantially since 2000. Most of the increase was attributable to gold exports, which increased in value to \$597 million in 2004 from \$504 million in 2003 and \$121 million in 2000. From 2000 to 2004, gemstone exports increased in value to \$26.9 million from \$18.5 million and diamond exports fell to \$33.7 million from \$46 million. Exports of other minerals, which included copper and silver, amounted to \$15.9 million in 2004. The share of minerals in total exports was 52% in 2004 (Kafumu, 2005).

The Bank of Tanzania (2004, p. 77) reported that imports of petroleum products rose in value to \$416 million in 2004 from \$403 million in 2003 and \$143 million in 2000. From 2000 to 2004, imports of fertilizers rose in value to \$59.4 million from \$16.8 million. Petroleum products accounted for nearly 17% of total imports, and fertilizers, 2%.

## Commodity Review

### Metals

**Cobalt, Copper, and Nickel.**—The Kahama Mining Corp. Ltd. (KMC) (100% owned by Barrick Gold Corp.) produced copper as a coproduct at the Bulyanhulu gold mine. Copper production increased to 4,133 metric tons (t) in 2004 from a revised 3,715 t in 2003 (table 1). In early 2004, Barrick and

Falconbridge Ltd. signed an agreement for the exploration and development of the Kabanga nickel sulfide deposit in northwestern Tanzania. The companies planned drilling and other exploration work at Kabanga and other nearby targets; a feasibility study was expected to be completed by early 2007. Resources at Kabanga were estimated to be 26.4 million metric tons (Mt) at grades of 2.6% nickel, 0.27% copper, and 0.16% cobalt (Tassell, 2004a; Kafumu, 2005).

In January 2004, Albidon Ltd. was awarded the Kitai, the Mbinga, the Mhangaji, the Peramiho, and the Pitu River licenses, which make up the Southwest Tanzania Reconnaissance Project. Albidon planned to spend \$1 million during a period of 2 years on exploration for copper, nickel, and platinum group metals (PGM) at these properties. The Kitai, the Mbinga, and the Mhangaji properties are located near Lake Malawi; the Peramiho property, to the east of Songea; and the Pitu River property, between Songea and Njombe. In 2004, Albidon formed a joint venture with WMC Resources Exploration Pty. Ltd. to explore at the Southwest Tanzania Reconnaissance Project (Albidon Ltd., 2004a; 2004b, p. 13, 61-72).

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 in 2004. The company had joint-venture agreements with Lonmin plc of the United Kingdom for these projects, which included conducting a feasibility study. Exploration work at Mibango focused upon nickel sulfide resources in 2004. According to preliminary data from the company's drilling program, nickel resources at Mibango were estimated to be 89.2 Mt at grades of 1.08% nickel, 0.14% copper, 0.058% cobalt, and 0.45 grams per metric ton (g/t) combined PGM and gold. Goldstream also started exploration work at its new Nachingwea copper-platinum project in southeastern Tanzania and the Morogoro copper-gold-platinum project west of Morogoro (Goldstream Mining NL, 2004, 2005).

**Gold.**—Tanzania's gold production increased to 51,010 kilograms (kg) in 2004 from 48,018 kg in 2003 and 43,320 kg in 2002. Tanzania became the third ranked gold producer in Africa in 2003. The Buhemba, the Bulyanhulu, the Geita, the Golden Pride, and the North Mara mines had a combined capacity to produce about 56,800 kilograms per year (kg/yr) of gold. Tanzania's resources amounted to nearly 1,500 t of contained gold, of which nearly 780 t was reserves (tables 1, 2, and 3).

Geita Gold Mining Ltd. was a joint venture between AngloGold Ltd. of South Africa and Ashanti Goldfields Co. Ltd. of Ghana. In April 2004, the companies merged to form AngloGold Ashanti Ltd. The Geita open pit gold mine produced about 21,500 kg of gold in 2004 compared with nearly 20,600 kg of gold in 2003; the increase in production was mostly attributable to higher ore grades. Cash costs rose to \$250 per troy ounce of gold in 2004 from \$183 per troy ounce of gold in 2003 because of higher contractor and diesel costs. In 2005,

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

production at Geita was expected to fall to about 19,500 kg at a cash cost of \$253 per troy ounce of gold (AngloGold Ashanti Ltd., 2005, p. 45).

AngloGold Ashanti spent \$5 million on exploration in Tanzania in 2004, most of which was spent at Geita. The company also had a joint-venture agreement with Tan Range Exploration Corp. of Canada for the Kigosi North property. Exploration activities at Kigosi North were temporarily suspended because of permitting issues (AngloGold Ashanti Ltd., 2005, p. 56).

KMC operated the Bulyanhulu underground gold mine. In 2004, the Bulyanhulu Mine produced nearly 10,900 kg of gold from 1.12 Mt of ore compared with 9,753 kg of gold from 980,000 t of ore in 2003. Recovery rates from 2003 to 2004 remained unchanged at 88%. Cash costs were \$270 per troy ounce of gold in 2004 compared with \$235 per troy ounce of gold in 2003. Increased ore dilution was more than offset by higher volumes of ore milled (Barrick Gold Corp., 2005, p. 22-23, 44). KMC also produced copper and silver as coproducts. The majority of gold was recovered from copper concentrates; the remainder was from gold doré.

In 2005, Barrick planned to produce about 10,000 kg of gold at Bulyanhulu; cash costs were expected to be between \$340 and \$350 per troy ounce of gold. The life of the mine was expected to be 24 years; further exploration to increase resources and reserves was planned for 2005 (Barrick Gold Corp., undated).

Barrick and its joint-venture partner Explorations Minières du Nord Ltée (MDN) of Canada were engaged in the construction of the Tulawaka open pit gold mine; capital costs amounted to \$48 million in 2004. Commercial production was expected to start at the mine in March 2005. The Tulawaka Mine was expected to produce 3,400 kg of gold in 2005 at an average cash cost of \$207 per troy ounce; recovery rates were expected to be 95%. Reserves in the East Zone of Tulawaka were estimated to be 1.39 Mt at a grade of 12.2 g/t gold. MDN engaged in exploration at the West Zone of Tulawaka and at properties near the mine; the company planned to complete a resource assessment for the West Zone in the first quarter of 2005 (Barrick Gold Corp., 2005, p. 45; Explorations Minières du Nord Ltée, 2005).

Barrick explored for gold at Buzwagi (formerly known as Chocolate Reef) in 2004; the company planned a scoping study and a \$5 million exploration program for 2005. Exploration was also planned for Golden Ridge and Nzega West in 2005. Barrick's land holdings in the Lake Victoria Goldfield amounted to about 9,000 square kilometers (km<sup>2</sup>) in 2004. The company reportedly acquired licenses that covered 4,600 km<sup>2</sup> in the Lupa Goldfield in southern Tanzania near Mbeya. Barrick was engaged in a joint venture with Mbeya Resources of South Africa for the Lupa properties (Tassell, 2004a; Barrick Gold Corp., 2005, p. 17).

Resolute Mining Ltd. of Australia owned the Golden Pride open pit mine. In 2004, the Golden Pride Mine produced 4,781 kg of gold from 2.88 Mt of ore compared with 5,188 kg of gold from 2.49 Mt in 2003. Gold recovery rates exceeded 94% throughout the year. Lower production was attributable to a decrease in ore grades (Resolute Mining Ltd., 2003; 2004a, b; 2005).

From 2004 to 2008, Resolute planned to produce nearly 5,000 kg/yr of gold at a cash cost of \$220 per troy ounce of gold. The company indicated that it expected to have a stockpile of 5 Mt of low-grade ore by 2009. Depending upon the price of gold, production from the stockpile could maintain milling operations for an additional year or two after the cessation of mining in 2008 (Tassell, 2004b).

Resolute explored at Golden Pride and at the Matinje and the Matinje West properties, which are located 30 kilometers (km) to the east of Golden Pride. The company also explored at the Kahama project, where it had a joint-venture agreement with Sub-Sahara Resources NL of Australia. Resolute, which held a 51% interest in Kahama, had the option to increase its share to 70% by contributing an additional \$5 million or by completing a feasibility study by the end of 2008. The company also had joint-venture agreements with Sub-Sahara for the Mkweni and the Mwagi Magi South properties. Resolute conducted exploration at the Nyakafuru project, which was a joint venture with Gallery Gold Ltd. of Australia; further exploration was planned for the first quarter of 2005. Nyakafuru had resources of about 3.6 Mt at a grade of 6.3 g/t gold (table 3; Resolute Mining Ltd., 2005).

East African Gold Mines Ltd. (EAGM) started production at the North Mara open pit gold mine during the third quarter of 2002. The North Mara project encompassed the Gokona, the Nyabigena, and the Nyabirama pits. Placer Dome Gold Inc. of Canada purchased North Mara in July 2003. In 2004, Placer Dome produced 6,485 kg of gold from nearly 2.13 Mt of ore. Cash costs increased to \$230 per troy ounce of gold from \$225 per troy ounce of gold in 2003, and the recovery rate fell to 92% from 93.5%. During the first 5 months of 2003, EAGM produced 2,481 kg of gold from 815,000 t of ore and during the last 5 months of the year, Placer Dome produced 2,785 kg of gold from 869,000 t of ore (Lion Selection Group Ltd., 2003; Placer Dome Gold Inc., 2005, p. 36).

In the fourth quarter of 2004, Placer Dome completed the expansion of its ore treatment capacity to 2.8 Mt/yr from 2 Mt/yr. As a result, production at North Mara was expected to increase to about 9,000 kg in 2005 at a cash cost of \$230 per troy ounce of gold (Placer Dome Gold Inc., 2005, p. 32).

In February 2003, the state-owned company Meremeta Ltd. started production at the open pit Buhemba Mine near Musoma. The company's monthly production amounted to between 240 and 250 kg of gold from nearly 100,000 t of ore; production of ore was expected to rise to 110,000 metric tons per month (t/mo) by early 2005. The expected life of the mine was 8 years. Meremeta also held the Kilamongo and the Mwizi deposits south of Buhemba and the Nyasanero deposit. The Buhemba Mine was developed at a cost of \$65 million; Meremeta planned additional expenditures for exploratory drilling at Kilamongo and Mwizi (Kafumu, 2004; Tassell, 2004b).

Gallery Gold Ltd. held the Buckreef/Rwamagaza and the Kitongo deposits. The company planned to complete a feasibility study on the Buckreef Project in 2005. If the study were to yield favorable results, Gallery planned to start construction of open pit mines at Buckreef and Busolwa and an underground mine at Buckreef in 2005. Production was expected to start in the second half of 2006. The mines could

produce a total of between 3,700 and 5,600 kg/yr of gold. Resources at Buckreef and Rwamagaza were 35 t of contained gold (table 3); the project had an estimated life of 7 to 10 years. Gallery also conducted drilling and a resource assessment at Kitongo in 2005; resources were previously estimated to be 17 t of contained gold (Gallery Gold Ltd., 2004).

In 2004, African Eagle Resources plc of the United Kingdom carried out exploration at Miyabi that tripled resources to 8.3 Mt at a grade of 1.5 g/t gold. In 2005, African Eagle planned further exploration at Miyabi to increase resources and at its Dutwa, Gloria, Igurubi, and Msasa properties (African Eagle Resources plc, 2005, p. 6).

Shanta Gold Ltd. held the Mgusu deposit, which had resources of 6.2 Mt at a grade of 3.7 g/t gold (table 3). In August 2004, the company signed a joint-venture agreement with Placer Dome for exploration at the Tarime project near the North Mara Mine.

In 2004, Goldstream Mining was awarded six properties that were prospective for gold. The Morogoro copper-gold-platinum project comprised two properties west of Morogoro; and the Muipa gold project, three properties between the Lupa and the Mpanda goldfields. Exploration started at Morogoro and Muipa in 2004 (Goldstream Mining NL, 2004).

Sub-Sahara signed the Lake Victoria joint-venture agreement with Currie Rose Resources of Canada in 2004. This agreement covered the Jubilee Reef, the Mabale Hills, and the Nyamirembe project areas (Mining Review Africa, 2004).

Tan Range Exploration Corp. of the United States increased its holdings in the Lake Victoria goldfield to 121 prospecting licenses in 2004 from 78 in 2003. The company engaged in exploration at its Kibara, Luhala, and Shinyanga projects in 2004. Tan Range also had joint-venture agreements with Barrick for the Iltemia project, AngloGold Ashanti for the Kigosi project, and MDN for the Biharamulu and the Tulawaka projects (Tan Range Exploration Corp., 2005, p. 5-6, 22-26).

In 2004, Randgold Resources Ltd. signed a joint-venture agreement with Barrick for five of Barrick's properties in the Musoma Mara region. Randgold held an additional 10 licenses near Musoma. Lakota Resources Inc. of Canada commenced drilling on the Ikungu property; the company also explored for gold at the Tembo project (the Bemuda, the Ikina Reefs, and the Tannor properties) near the Bulyanhulu Mine. Midlands Minerals Corp. of Canada explored for gold at its Itilima property in the Lake Victoria goldfield.

**Iron and Steel, Titanium, and Vanadium.**—National production of rolled steel was 39,556 t in 2004 compared with 39,630 t in 2003 and 11,182 t in 2000. MM Integrated Steel Mills Ltd. remelted scrap steel for use in its rolling mill; the company produced steel bars and pipes. Other rolling mills included Aluminum Africa Ltd. (ALAF) and SITA Steel Rollings Ltd.; ALAF consumed most of its cold-rolled steel production in its galvanizing plant.

In 2003, the Government imposed a ban on exports of scrap aluminum, brass, iron, and steel because shortages of low-cost domestic scrap forced Tanzanian iron and steel producers to import high-cost billet. The Government experienced difficulty in enforcing the ban. In September 2004, the Government banned the export of all scrap metal (Kasumuni, 2004a).

The International Iron and Steel Institute (2004, p. 81, 85) estimated that Tanzania's imports of semimanufactured and finished steel products amounted to 147,000 t in 2003 compared with 134,000 t in 2002 and 60,000 t in 1998. From 1998 to 2003, Tanzania's apparent consumption of crude steel rose to 164,000 t from 67,000 t.

The state-owned National Development Corporation (NDC) planned to develop the Liganga iron ore project. In the first phase of the project, NDC planned to produce 120,000 t/yr of titanium concentrates and 5,000 t/yr of vanadium concentrates, and in the second phase, 500,000 t/yr of iron and steel products. Development of the Liganga project depended on the opening of the Mchuchuma coal mine; the cost of the project was estimated to be \$1.14 billion (Spatial Development Initiatives Support Programme, 2003).

**Platinum-Group Metals.**—In 2004, Goldstream Mining NL explored for PGM at the Mibango project near Lake Tanganyika and at the Luwumbu project near Lake Malawi. According to preliminary data from the company's drilling program, PGM resources at Mibango were estimated to be 9.3 Mt at grades of 1.6 g/t combined PGM and gold, 0.85% nickel, 0.22% copper, and 0.065% cobalt (Goldstream Mining NL, 2004, 2005).

Sub-Sahara signed a joint-venture agreement with Canyon Resources Ltd. of Tanzania in 2004. The Platinum Areas joint venture was an agreement to explore for copper, gold, nickel, and PGM on 12 properties that covered 16,000 km<sup>2</sup> in western Tanzania (Mining Review Africa, 2004). African Eagle and Shanta Gold Ltd. of Tanzania were engaged in a joint venture to explore for PGM at Zanzui in the Lake Victoria goldfield; Shanta withdrew in 2004.

**Silver.**—Tanzania produced silver as a coproduct of gold mining and refining. Domestic output of silver increased to 12,816 kg in 2004 from 7,986 kg in 2003 (table 1). The Bulyanhulu Mine produced concentrates that contained copper, gold, and silver; the recovery rate for silver was 65%. Contained silver resources at Bulyanhulu were estimated to be 300 t, of which nearly 260 t were reserves (Barrick Gold Corp., 2005, p. 129).

In February 2004, Coeur d'Alene Mines Corp. of the United States was awarded 10 prospecting licenses for gold and silver in the Lake Victoria goldfield. Preliminary exploration work started in 2004; the company planned to spend \$300,000 on exploration in 2005.

### **Industrial Minerals**

**Cement.**—In 2004, Tanzania's cement production increased to 1.28 Mt from nearly 1.19 Mt in 2003 and 833,000 t in 2000 because of demand from 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); these companies used gypsum mined at Makanya in the Mwangi District as raw material.

In August 2004, Tanga Cement suspended exports to Madagascar and Mozambique because of high power and transportation costs. The company was producing at a rate of 250,000 t/yr. At the end of 2004, TPCC was increasing its

capacity to between 650,000 and 700,000 t/yr from 500,000 t/yr. TPCC produced about 60% of its own clinker and imported most of the remainder; the expansion would enable the company to become self-sufficient in clinker (Kenge, 2003; Ubwani, 2004; EastCoast Energy Corp., 2005, p. 4).

**Diamond.**—In 2004, national diamond production amounted to 303,920 carats compared with 236,582 carats in 2003 and 239,761 carats in 2002. Diamond exports were \$33.7 million in 2004 (Kafumu, 2005). The Williamson Mine, which was operated by DeBeers Group, accounted for a majority of Tanzania's diamond production. Artisanal miners mined alluvial deposits near the Williamson Mine.

Diamond recovery at the Williamson Mine rose to 285,778 carats in 2004 from 166,263 carats in 2003. Ore processed fell to nearly 3.42 Mt in 2004 from 4.54 Mt in 2003. The increase in production was partially attributable to greater efficiency in the production process and unexpectedly improved results from the reprocessing of recovery plant tailings. The capacity of the recovery plant was increased to compensate for technical problems with the high-pressure jig unit (DeBeers Group, 2005, p. 44, 50). The entire output of the mine was exported to the United Kingdom.

In January 2004, El Hillal Minerals Ltd. of Tanzania started pilot mining at Mwadui near the Williamson Mine; the new mine would be the second ranked diamond mine in Tanzania. The company planned to produce from 18,000 to 24,000 carats per year. El Hillal exported about 2,700 carats of diamond in 2004.

Sola Resources Corp. of Canada and Frontier Resources Ltd. of Tanzania were engaged in a joint venture to explore for diamond at the Eagle property near the Williamson Mine. In December 2004, Sola and Frontier reported that the Eagle One kimberlite was diamondiferous. The companies planned further exploration, including indicator mineral studies and geophysical surveys, followed by trenching and bulk sampling (Sola Resources Corp., 2004).

Tan Range signed an option agreement for prospecting licenses northwest of Mwadui; the company planned to explore for diamond in late 2004 and 2005 (Tan Range Exploration Corp., 2005, p. 7). Midlands Minerals Corp. of Canada explored for diamond at its Itilima property in the Lake Victoria goldfield.

**Gemstones.**—In 2004, the total production of gemstones rose to 1,610,000 kg from 1,530,000 kg in 2003 and 196,000 kg in 2002. The value of gemstone exports rose to \$26.9 million in 2004 from \$19.1 million in 2003 (Kafumu, 2005). Lower production of tanzanite was more than offset by rising tanzanite prices and increased production of other gemstones.

Merelani, which is near Arusha, was the world's only source of tanzanite. From 2001 to 2003, tanzanite accounted for 80% of the value of domestic gemstone production. In late 2003 and early 2004, tanzanite prices increased sharply because of decreases in production. The increasing depths of tanzanite mines led to higher production costs and a need for greater investment in equipment. Lower grades of tanzanite exacerbated these problems (Colored Stone, 2004b; S. S. Salim, Ministry of Energy and Minerals, written commun., September 17, 2002; Zacharia Makka, Commissioner for Minerals,

Ministry of Energy and Minerals, written commun., October 28, 2004).

In Blocks B and D of the Merelani deposit, as many as 10,000 miners working in small-scale mines accounted for most of the country's tanzanite production. Tanzanite Africa Ltd. (a subsidiary of IPP Ltd. of Tanzania) operated larger-scale mines in Blocks B and D. Kilimanjaro Mines Ltd. mined tanzanite in Block A (Henricus, 2003).

African Gem Resources Ltd. (Afgem) of South Africa held the rights to mine for tanzanite in Block C; the company started commercial-scale production during the first quarter of 2003. Afgem cut high-quality tanzanite at its lapidaries in South Africa and Tanzania. In May 2004, Afgem was purchased by TanzaniteOne Ltd.

During the last 7 months of 2004, TanzaniteOne produced 197 kg of tanzanite. The company's processing plant had a capacity of 10,000 t/mo; the plant operated at 20% of capacity in late 2004 because mining was restricted by shaft development. TanzaniteOne planned to increase production and complete upgrades to its mine shafts by late 2005. The company also planned an exploration program to increase the 12-year life of its mine to 20 years. Exploration for tanzanite at greater depths on Block C and on adjacent properties was expected to start in the first half of 2005. Resources in Block C were estimated to be between 12,600 kg and 16,600 kg of contained tanzanite in from 950,000 t to 1.26 Mt of ore (TanzaniteOne Ltd., 2004; 2005a, p. 1, 8; 2005b, p. 31).

More than 98% of the gemstones exported from Tanzania were shipped in rough form to foreign cutting and polishing centers. India accounted for about 80% of the world's cutting and polishing of tanzanite. In July 2003, a ban was proposed on the export of all rough tanzanite by the end of 2005. This proposal was designed to encourage the growth of the Tanzanian lapidary industry. At the end of 2004, the Parliament of Tanzania had not taken action on the proposed ban. In August 2004, the Parliament increased the export tax on rough gemstones to 5% from 3% and eliminated the export tax on cut tanzanite. Additionally, the Parliament established a Gemstone Board to offer advice on the development of the lapidary industry. Licenses for dealing in gemstones were required to be accompanied by a statement indicating the capacity to engage in gemstone cutting (Kafumu, 2004; TanzaniteOne Ltd., 2004; Kondo, 2005).

Tsavorite, which is a green grossular garnet that obtains its color from trace amounts of chromium and vanadium, was mined near Merelani and Mtwara. Tanzania's production of tsavorite increased in early 2004. Domestic production of hessonite garnet also increased in 2004. Hessonite is an orange grossular garnet that obtains its color from trace amounts of iron and manganese. About 6% of the material was of high quality and a good orange color (Colored Stone, 2004a). Rhodolite garnet was mined in the Tunduru District and the Uмба Valley in the Tanga Region, and red garnet was found at Mwazye and Ng'ongo in the Sumbawanga District.

In recent years, ruby has been produced at the Longido Mine (Monduli District), the Losongonoi Mines (southeast of Arusha), the Naende Mines (Rukwa Region), in the Songea and the Tunduru Districts (Ruvuma Region), and in the Uмба

Valley. Sapphire was produced in the Songea and the Tunduru Districts and in the Uмба Valley.

Alexandrite was produced in the Manyara Region and in the Tunduru District; aquamarine was mined at Kalunga in the Nkasi District; emerald, in the Manyara Region and in the Sumbawanga District; spinel, in the Mahenge Region in south-central Tanzania and in the Tunduru District; and tourmaline, in the Naende ruby mines (Rukwa Region), in the Sumbawanga District, and in the Uмба Valley.

**Lime.**—Athi River Mining Ltd. (ARM) of Kenya operated a lime plant at Tanga with a capacity of 20,000 t/yr. The company produced lime for use in Tanzania's gold mining industry and planned to export some of its production to countries in the Common Market for Eastern and Southern Africa (COMESA) and the South African Development Community (Nation, 2004).

**Silica.**—Deposits of silica sand were found near Dar es Salaam and Bukoba, which was a port on Lake Victoria. Kioo Ltd. operated a glass plant in Dar es Salaam with a capacity of 36,000 t/yr. The company planned to increase its capacity to 50,000 t/yr in 2006; the expansion was expected to cost \$29 million. Kioo's export markets were limited by Tanzania's lack of membership in COMESA; nonmember countries were subject to tariffs of 50% to 52% (Gumbo, 2004).

### *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, the Mbalawala, the Mbuyura, and the Mchuchuma; other bituminous coalfields included the Gahula and the Njuga. In 2004, Tanzania's coal production was increased to 65,041 t from 54,610 t in 2003 in response to higher coal demand from Mbeya Cement.

The state-owned National Development Corp. (NDC) formed a joint venture with Grinaker-LTA and Siemens Ltd. to develop the Mchuchuma coal deposit. In the first phase of the project, the NDC planned to build a surface mine with a capacity of 1.5 Mt/yr and a coal-fired powerplant with a capacity of 400 megawatts (MW). In the second phase, coal production would rise to 3 Mt/yr, and in the third phase, to between 8 and 10 Mt/yr. The mine was expected to be commissioned in 2008; development was likely to start in early 2006. Costs for the project were estimated to be \$612 million; development depended upon Government approval of the project verification documents submitted in March 2004 and financial support from the World Bank Group (Spatial Development Initiatives Support Programme, 2003; Kasumuni, 2004b).

**Natural Gas.**—In July 2004, EastCoast Energy Corp. started the production of natural gas from Songo Songo Island. At the end of August, EastCoast was spun off by parent company PanOcean Energy Corp. Ltd. Production amounted to 119 million cubic meters of natural gas in 2004. The Ubungo power station in Dar es Salaam consumed 105 million cubic meters of Songo Songo's production, and the Wazo Hill cement plant operated by TPCC, 11 million cubic meters. Reserves at Songo Songo were estimated to be 10 billion cubic meters at the end of 2004 (EastCoast Energy Corp., 2005, p. 3, 7).

Starting in 2005, EastCoast planned to produce nearly 380 million cubic meters per year of natural gas. The Ubungo power station was likely to consume more than 290 million cubic meters per year, and the Wazo Hill cement plant, 45 million cubic meters per year. In September 2004, Kioo Ltd. and Tanzania Breweries Ltd. started purchasing gas from EastCoast; these companies were expected to consume an average of more than 14 million cubic meters per year. By the second quarter of 2005, ALAF and four other companies that signed contracts to purchase natural gas were expected to consume at the rate of more than 13 million cubic meters per year. Following the construction of a 9-km pipeline in the third quarter of 2005, Karibu Textile Mills Ltd. planned to consume an average of 8.3 million cubic meters per year (EastCoast Energy Corp., 2005, p. 9).

In May 2004, Artumas Group Inc. of Canada signed a production-sharing agreement (PSA) with the Government for development of the Mtwara Energy Project. This project involved the development of natural gas resources in Mnazi Bay in southeastern Tanzania, the construction of a 27-km pipeline, the installation of a 30-MW powerplant, and the upgrading of the local power transmission and distribution system. Capital costs were estimated to be \$97 million. Development of the Mtwara Energy Project started in December; construction was expected to start in July 2005. Production of natural gas for use in the power station was expected to begin in the first quarter of 2006, and the production of liquefied natural gas, in the fourth quarter of 2008. Mnazi Bay had estimated resources of between 2.1 billion and 6.1 billion cubic meters (Spatial Development Initiatives Support Programme, 2003; Artumas Group Inc., 2005, p. 8, 10-11).

**Petroleum.**—Tanzania's only refinery was shut down because of its outdated technology and high transportation costs; thereafter, the country has depended upon imported petroleum products to meet its petroleum requirements. In 2004, the joint venture of Aminex plc of Ireland, Bounty Oil and Gas NL of Australia, and Petrom SA of Romania drilled the Nyuni-1 exploration well on its Nyuni offshore field concessions. The companies planned further exploration on the license. Petrobras Group of Brazil was awarded an exploration license for Block 5 in the Mafia Basin. Maurel et Prom of France also negotiated a PSA with the Government for an area near the Nyuni License (Africa Energy Intelligence, 2004b; Aminex plc, 2004).

In 2003, Royal Dutch/Shell Group acquired four offshore blocks to the west of Pemba and Zanzibar. As of early November 2004, the Governments of Pemba and Zanzibar were blocking the signing of PSAs on these blocks because of a dispute with the national Government. Antrim Energy Ltd. of Canada held the Pemba-Zanzibar offshore block; the company's exploration activities were also on hold because of this dispute. In late November, the Government planned to launch a licensing round for Blocks 1, 2, 3, and 4 to the north of the block acquired by Petrobras and Blocks 6, 7, and 8, which extended to the border with Mozambique. These plans may be delayed because the Petroleum Act covered exploration only on the continental shelf (Africa Energy Intelligence, 2004a).

## Infrastructure

The state-owned utility Tanzania Electric Supply Company Ltd. (TANESCO) had powerplants with a combined capacity of 794 MW in its grid network, of which 557 MW was hydroelectric and 237 MW was thermal. Hydroelectric power stations included Kidatu, with a capacity of 200 MW; Kihansi, 180 MW; Mtera, 80 MW; Pangani Falls, 68 MW; Hale, 21 MW; and others, 8 MW. The Ubungo thermal plant had a capacity of 112 MW; Tegeta, 100 MW; and others, 25 MW. The Tegeta plant, which used heavy fuel oil, was owned and operated by Independent Power Tanzania Ltd.; the Government planned to convert Tegeta to a gas-fired plant in 2005. The Ubungo plant was converted from jet fuel to natural gas in July 2004 and reached full capacity in October. Capacity at Ubungo was expected to increase to 185 MW in the third quarter of 2005 (World Bank Group, 2004a, p. 8; EastCoast Energy Corp., 2005, p. 10, 13).

In addition to the plants in the grid network, isolated mini-hydroelectric generators supplied small amounts of output. At the Buhemba Mine, the isolated diesel powerplant had a capacity of 7 MW; demand was 4.5 MW of capacity. The Golden Pride and North Mara Mines had powerplants with capacities of 13 MW and 12 MW, respectively (Tassell, 2004a-c).

Tanzania's production of electricity rose to 3,067 gigawatt-hours (GWh) in 2003 from 2,801 GWh in 2002. The share of hydroelectric power, however, fell to 83% from 97% because of widespread droughts. The continuation of droughts into 2004 led to further hydroelectric production cuts at the Kidatu and the Mtera plants and forced TANESCO to purchase higher-cost electricity from the Tegeta and the Ubungo plants. In June 2004, the World Bank Group approved a loan of \$43.8 million to assist the Government in meeting domestic power requirements (World Bank Group, 2004a, p. 6, 7; 2004b).

In 2005, TANESCO was expected to continue to rely on thermal power stations because of the low water level in the Mtera reservoir. Thermal plants were expected to account for 51% of power generated in 2005, and hydroelectric plants, 49% (World Bank Group, 2004a, p. 7, 10).

TANESCO estimated that the consumption of electricity would increase by at least 7.5% per year from 2004 to 2008, and by at least 7.2% from 2009 to 2013. By 2027, peak demand would rise to 2,095 MW of capacity from 506 MW in 2003. The capacity of the Mchuchuma coal-fired powerplant was expected to be 200 MW at its commissioning in 2008, 300 MW in 2010, and 400 MW in 2012. Further expansion at Mchuchuma was planned for 2020. Other new power stations included the Ruhudji hydropower station, which was expected to be commissioned in 2025. TANESCO also planned to import as much as 200 MW from Zambia starting in 2023, and to develop geothermal and other renewable energy sources (Tuson, 2004).

Geothermal areas in Tanzania include Lake Eyasi, Lake Manyara, Lake Natron, Mbeya, Musoma, Ngorongoro Crater, and Rujiji. Resources of geothermal energy at Rujiji were estimated to be more than 100 MW, and at Mbeya, more than 50 MW. The Government planned to produce 5% of Tanzania's electricity requirements by 2010; the cost of geothermal

projects with a capacity of 55 MW was estimated to be about \$138 million. Most exploration for geothermal energy sources has been very preliminary because of abundant hydropower and plans to develop domestic coal and natural gas resources (Mwihava and others, 2003, p. 8-9).

About 10% of Tanzania's population had access to electricity; most rural energy requirements were supplied by firewood. National wood fuel consumption was estimated to be nearly 45 million cubic meters per year in 2003. Rural firewood consumption accounted for about 56%; urban charcoal consumption, about 40%; and brick and salt production, about 1% each. Small-scale brick producers consumed about 1 cubic meter of firewood for every 1,000 bricks produced. Small-scale salt producers were estimated to consume about 20 kg of firewood for every 1 kg of salt produced. To alleviate the environmental problems from deforestation, TANESCO promoted rural electrification (World Bank Group, 2004b; SADC Programme for Biomass Energy Conservation, 2005, p. 9, 11-12).

Tanzania had about 85,000 km of roads, of which approximately 4,000 km was paved. The rail network covered about 3,600 km. The country had 982 km of crude petroleum pipelines and 246 km of natural gas 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 mineral industry, particularly gold mining, is likely to grow in the near future. With increased production from the North Mara Mine and the development of such projects as Buckreef and Tulawaka, Tanzania's gold production is expected to rise to about 55 t in 2005, and 59 t in 2007. Artisanal tanzanite production is likely to fall because of resource depletion; it is unclear to what extent increased production by TanzaniteOne will offset the decline. The development of nickel and PGM resources depend heavily upon world market conditions. The International Monetary Fund (2005, p. 208) predicted that Tanzania's GDP would grow by 6.5% in 2005 and 7% in 2006. If similar rates of growth happen in the construction industry, the production of construction materials such as brick clay, gypsum, limestone, and sand and gravel could increase substantially.

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TABLE 1  
TANZANIA: PRODUCTION OF MINERAL COMMODITIES<sup>1</sup>

(Metric tons unless otherwise specified)

Commodity <sup>2</sup>	2000	2001	2002	2003	2004
Calcite <sup>e</sup>	40	40	40	40	40
Cement, hydraulic	833	900	1,026	1,186	1,281
Coal, bituminous	79,184	77,789	79,210	54,610	65,041
Copper, contained in concentrates and doré	--	2,645	4,191 <sup>r</sup>	3,715 <sup>r</sup>	4,133
Diamond <sup>3</sup>	354,388	254,271	239,761	236,582	303,920
Gemstones, excluding diamond: <sup>4</sup>					
Amethyst <sup>e</sup>	239 <sup>5</sup>	277 <sup>5</sup>	270	270	280
Aquamarine	205	454	600 <sup>e</sup>	278	290 <sup>e</sup>
Cordierite (iolite) <sup>e</sup>	158 <sup>5</sup>	312 <sup>5</sup>	310	310	330
Garnet	14,940	19,508	13,000 <sup>e</sup>	5,911	6,200 <sup>e</sup>
Ruby	1,070	1,174	1,800 <sup>e</sup>	2,675	2,800 <sup>e</sup>
Sapphire	2,531	3,576	2,400 <sup>e</sup>	1,338	1,400 <sup>e</sup>
Tanzanite	5,516	5,473	6,461	4,490	2,300 <sup>e</sup>
Other <sup>e</sup>	126,141 <sup>5</sup>	66,092 <sup>5</sup>	171,000	1,520,000	1,600,000
Total	150,800	96,866	196,000	1,530,000	1,610,000
Gold	15,060	30,088	43,320	48,018	51,010
Gypsum and anhydrite, crude	60,000	72,000	73,000	33,232 <sup>r</sup>	59,200
Natural gas	--	--	--	--	119
Petroleum products	177,000	--	--	--	--
Phosphate minerals:					
Apatite	5,100	4,000	1,182	3,738	6,570
P <sub>2</sub> O <sub>5</sub> content	1,500	1,200	350	1,100	1,900
Salt, all types	70,000	65,000	71,200	58,978	57,061
Silver, contained in concentrates and doré	1,384	6,861	7,669	7,986	12,816
Steel, semimanufactured	11,182	16,340	25,418	39,630 <sup>r</sup>	39,556
Stone, sand, and gravel:					
Aggregates	NA	NA	20,223	107,960	120,000 <sup>e</sup>
Dolomite	NA	NA	NA	2,197	2,500 <sup>e</sup>
Limestone, crushed	1,500,000	2,269,359	2,856,711	1,206,000 <sup>r</sup>	1,391,000
Pozzolan materials	57,014	41,468	52,000	105,910 <sup>r</sup>	152,679
Sand	NA	NA	503,485	2,035,960	2,400,000 <sup>e</sup>

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

<sup>1</sup>Includes data available through October 31, 2005.

<sup>2</sup>In addition to the commodities listed, modest quantities of lime, silica sand, and crude construction materials, including brick clay, are produced, but information is insufficient to estimate production.

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

<sup>4</sup>Other precious and semiprecious stones produced include alexandrite, chrysoprase, emerald, kyanite, moonstone, opal, peridot, quartz, spinel, and tourmaline. Does not include smuggled artisanal production.

<sup>5</sup>Reported figure.



TABLE 2  
TANZANIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Cement		Tanzania Portland Cement Co. Ltd. (HeidelbergCement, 41%)	Plant at Wazo Hill	500,000 cement; 800,000 clinker.
Do.		Tanga Cement Co. Ltd. (Holcim Ltd., 60%, and Saruji Corp., 40%)	Plant at Tanga	500,000 cement; 500,000 clinker.
Do.		Mbeya Cement Co. Ltd. (LaFarge Group, 58%).	Plant at Mbeya	250,000 cement; 250,000 clinker.
Coal, bituminous		Tanzania-China Kiwira Coal and Power (Hunan International Economic and Technical Cooperation Co., 62%, and Government, 38%)	Kiwira Mine	150,000 run of mine; 93,000 washed.
Copper, in concentrates and doré		Kahama Mining Corp. Ltd. (Barrick Gold Corp., 100%).	Bulyanhulu Mine near Kahama	5,300.
Diamond		Williamson Diamonds Ltd. (DeBeers Group, 75%, and Government, 25%)	Mwadui Mine near Shinyanga	7,060,000 ore processing.
Do.	carats	do.	do.	300,000 diamond.
Do.	do.	El Hillal Minerals Ltd.	Near Mwadui Mine	24,000. <sup>c</sup>
Glass		Kioo Ltd.	Dar es Salaam	36,000.
Gold		Geita Gold Mining Ltd. (AngloGold Ashanti Ltd., 100%)	Geita Mine near Nyakabale	6,000,000 ore processing.
Do.	kilograms	do.	do.	24,000 gold.
Do.		Kahama Mining Corp. Ltd.	Bulyanhulu Mine near Kahama	1,095,000 ore processing.
Do.	kilograms	do.	do.	15,100 gold.
Do.		Placer Dome Gold Inc.	North Mara Mine in Tarime District	2,800,000 ore processing.
Do.	kilograms	do.	do.	10,000 gold.
Do.		Resolute Mining Ltd.	Golden Pride Mine near Isanga	2,600,000 ore processing.
Do.	kilograms	do.	do.	4,400 gold.
Do.		Meremeta Ltd. (Government of Tanzania)	Buhemba Mine 47 km southeast of Musoma	1,200,000 ore processing.
Do.	kilograms	do.	do.	3,300 gold.
Lime		Athi River Mining Ltd.	Plant at Tanga	20,000.
Natural gas	million cubic meters	EastCoast Energy Corp.	Gasfield on Songo Songo Island	720.
Petroleum products <sup>1</sup>	thousand 42-gallon barrels	Tanzanian and Italian Petroleum Refining Co. Ltd.	Refinery at Dar es Salaam	5,440.
Phosphate rock		Minjingu Phosphate Co. Ltd.	Mine at Minjingu	30,000.
Silver	kilograms	Kahama Mining Corp. Ltd.	Bulyanhulu Mine near Kahama	12,000.
Steel		SITA Rollings Ltd.	Plant at Dar es Salaam	14,000 rolled.
Do.		MM Integrated Steel Mills Ltd.	do.	2,000 rolled.
Do.		Aluminum Africa Ltd.	do.	40,000 galvanized.
Do.		MM Integrated Steel Mills Ltd.	do.	36,000 galvanized.
Tanzanite		TanzaniteOne Ltd.	Mine at Merelani, Block C <sup>2</sup>	120,000 ore processing.
Do.	kilograms	do.	do.	1,600 tanzanite.
Do.	do.	Tanzanite Africa Ltd. (IPP Media Ltd.)	Mine at Merelani	NA.
Do.	do.	Kilimanjaro Mines Ltd.	Mine at Merelani, Block A	NA.
Do.	do.	Small-scale and artisanal miners	Mines at Merelani, Blocks B and D	NA.

<sup>c</sup>Estimated. NA Not available.

<sup>1</sup>Shut down in 2000.

<sup>2</sup>Formerly the graphite processing plant at Merelani operated by Phoenix Minerals Ltd.

TABLE 3  
TANZANIA: GOLD RESOURCES AND RESERVES IN 2004

Project	Major operating companies	Tonnage (million metric tons)	Grade (grams per metric ton)	Contained gold (metric tons)
<b>Reserves:</b>				
Bulyanhulu <sup>1</sup>	Kahama Mining Corp. Ltd. (Barrick Gold Corp., 100%)	23.9	13.8	330
Geita <sup>2</sup>	Geita Gold Mining Ltd. (AngloGold Ashanti Ltd., 100%)	70.6	4.0	281
North Mara <sup>2</sup>	Placer Dome Gold Inc.	34.1	3.6	122
Golden Pride <sup>2</sup>	Resolute Mining Ltd.	14.9	1.7	25
Tulawaka <sup>1</sup>	Barrick Gold Corp., 70%, and Exploration Minières du Nord Ltée, 30%	1.4	12.2	17
<b>Total</b>		<b>144.9</b>	<b>5.3</b>	<b>775</b>
<b>Resources:</b>				
Geita	Geita Gold Mines	169.8	3.3	564
Bulyanhulu	Kahama Mining Corp. Ltd.	28.2	14.5 <sup>3</sup>	408
North Mara	Placer Dome Gold Inc.	48.8	3.3	158
Golden Ridge	Kahama Mining Corp. Ltd.	49.0	1.4	68
Buzwagi <sup>4</sup>	do.	27.9	2.3	64
Golden Pride	Resolute Mining Ltd.	28.5	1.8	51
Buhemba	Meremeta Ltd. (Government of Tanzania)	11.4	2.0	23
Mgusu	Shanta Gold Ltd.	6.2	3.7	23
Nyakafuru	Gallery Gold Ltd.	3.6	6.3	23
Tulawaka	Barrick Gold Corp., 70%, and Exploration Minières du Nord Ltée, 30%	1.9	11.3	21
<b>Buckreef/Rwamagaza:</b>				
Buckreef	Gallery Gold Ltd.	4.7	4.1	19
Busolwa	do.	3.5	2.5	9
Rwamagaza Reefs	do.	0.6	6.7	4
Bingwa and Tembo	do.	0.2	13.7	3
<b>Kitongo:</b>				
Main Zone	do.	10.5	1.4	15
Isegenghe Hill	do.	0.2	14.4	2
Miyabi	African Eagle Resources plc	8.3	1.5	13
Kisunge Hill	Tan Range Exploration Corp.	9.4	1.0	9
Ikungu	Lakota Resources Inc.	2.5	2.3	6
<b>Total</b>		<b>415</b>	<b>3.6</b>	<b>1,480</b>

<sup>1</sup>Definitions of resources and reserves are based on National Instrument 43-101, as required by Canadian securities regulatory authorities.

<sup>2</sup>Definitions of resources and reserves are based on the Australasian Code for the Reporting of Identified Mineral Resources and Ore Reserves issued by the Joint Committee for the Australasian Institute of Geoscientists and the Australian Mining Industry Council.

<sup>3</sup>Note that, in most cases, the grade of resources is lower than the grade for reserves, but in this case, the grade of the less economic material is higher, leading to the paradox of a higher resource grade.

<sup>4</sup>Formerly known as Chocolate Reef.

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