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The Mineral Industry of Congo (Kinshasa)

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The Democratic Republic of the Congo [Congo (Kinshasa), also known as the DRC] played a globally significant role in the world's production of cobalt, copper, diamond, gold, tantalum, and tin. In 2016, the country's share of the world's mined cobalt production amounted to 58%; copper, 4%; tin, 2%; and gold, 1%. Congo (Kinshasa) also was the world's leading producer of tantalum. Congo (Kinshasa) accounted for about 49% of the world's cobalt reserves. Crude petroleum production also played a significant role in the domestic economy. The country was not a globally significant consumer of minerals or mineral fuels (République Démocratique du Congo Ministère des Mines, 2017, p. 17; Anderson, 2018; Flanagan, 2018; George, 2018; Olson, 2018a, b; Papp, 2018; Shedd, 2017, 2018).

Minerals in the National Economy

The manufacturing sector accounted for an estimated 18.9% of the gross domestic product (GDP) in 2016, and the mining and mineral processing sector, 17.8%. The value of output in the mining sector decreased by 0.7% in 2016 compared with an increase of 4.8% in 2015 (Banque Centrale du Congo, 2017, p. 37, 45).

In 2015 (the latest year for which data were available), large-scale mines employed at least 75,572 Congolese nationals. Copper and cobalt mining accounted for the majority of reported formal mining employment. The top five copper producers in Congo (Kinshasa) employed 31,850 Congolese nationals in 2015. The large-scale gold mines employed 6,502 Congolese nationals, and the large-scale diamond mines, 3,259 Congolese nationals (Moore Stephens LLP, 2017, p. 121–123).

About 450,000 artisanal miners were estimated to be employed in diamond mining in Congo (Kinshasa) in 2016. An additional 100,000 artisanal miners were estimated to be employed in cobalt mining. Between 2013 and 2015, a survey of a total of 1,615 mine sites was conducted in the former Katanga Province (which was divided into Haut-Katanga, Haut-Lomami, Lualaba, and Tanganyika Provinces in 2015), in Maniema, Nord-Kivu, and Sud-Kivu Provinces, and in Ituri Province (formerly the Ituri Interim Administration of Orientale Province) by the International Peace Information Service (IPIS). Gold mining was reported to employ about 193,000 miners; tin mining about 32,000 miners; niobium and tantalum mining, about 15,500 miners; diamond, about 4,100 miners; tourmaline, about 3,900 miners; and tungsten, about 1,800 miners. Niobium, tantalum, tin, and tungsten mining employed a total of about 42,800 miners; some mines produced at least two different minerals (Frankel, 2016; James, 2016; Weyns and others, 2016, p. 15–16).

Government Policies and Programs

The mining sector was governed by law No. 007/2012 of July 11, 2002, which replaced law No. 81–013 of April 2, 1981. The revised mining code encourages private sector development of the mineral industry; the principal role of the Government is to encourage and regulate the development of the industry. Mining rights are vested with the Government. At the end of 2016, the petroleum sector still was governed by law No. 81–013 of April 2, 1981 and law No. 86–008 dated December 27, 1986.

In 2015, the Government was considering a new mining code that would increase its free-carried and nondilutable share in mining projects to 10% from 5%. The proposed mining code would increase the corporate tax rate to 35% from 30% and introduce a 50% windfall profits tax. Royalty rates on cobalt and copper would increase to 3.5% from 2%; on gold and other precious metals, to 3.5% from 2.5%; and on diamond and other gemstones, to 6% from 4%. In 2016, the Government suspended the planned revision of the mining code because of low metal prices on world markets (Kavanagh, 2015; James, 2016).

In April 2013, the Government issued a decree that banned the export of cobalt and copper concentrates to promote domestic downstream processing of cobalt and copper. Companies were given a moratorium to comply with the ban; the moratorium was scheduled to expire at the end of 2015. In December 2015, the Government extended the moratorium until the end of 2016 because power shortages limited downstream processing of concentrates (Thomson Reuters, 2016).

Congo (Kinshasa) was a signatory to the Kimberley Process, which is a certification system that became effective on January 1, 2003, to reduce the trade in conflict diamond. In 2015, the Diamond Development Initiative (DDI) was engaged in a program to formalize artisanal diamond mining. By yearend, DDI had registered more than 108,000 artisanal diamond miners and increased the number of known diamond mining sites by 260 (Diamond Development Initiative, 2016).

In July 2010, the U.S. Congress passed the Dodd-Frank Wall Street Reform and Consumer Protection Act (Dodd-Frank Act), which contains provisions concerning the use of minerals to finance military operations in eastern Congo (Kinshasa). The U.S. Securities and Exchange Commission (SEC) issued regulations in final form in accordance with the Dodd-Frank Act in August 2012.

In March 2011, the government of Katanga Province and the International Tin Research Institute (ITRI) started the ITRI Tin Supply Chain Initiative (iTSCI), which is a traceability mechanism for domestically produced tantalum, tin, and tungsten to meet end users' requirements under the Dodd-Frank Act and Organisation for Economic Co-operation and Development due diligence guidelines. By December 2016, 272 mine sites were covered by iTSCI in the former Katanga Province, of which 114 were active (International Tin Research Institute, 2016).

In Maniema Province, 276 mine sites were covered by the iTSCI in December 2016, of which 216 were active. Mine sites were covered in Territories that included Kailo, Lubutu, Pangi, and Punia. In Sud-Kivu Province, 83 mine sites were covered by the iTSCI, of which 72 were active. Mine sites were covered

in Territories that included Idjwi, Kalehe, Mwenga, Uvira, and Walungu. In Nord-Kivu Province, 117 mine sites were covered by the iTSCI, of which 88 were active. Mine sites were covered in Territories that included Lubero, Masisi, and Walikale (International Tin Research Institute, 2015, p. 3; 2016).

The International Peace Information Service reported that between 2013 and 2015, armed groups were present at 64% of the artisanal and small-scale gold mines and 21% of tantalum, tin, and tungsten mines in eastern Congo (Kinshasa). Armed groups present at mines included Congolese military units, Mai-Mai militia, and various rebel groups. Armed groups reportedly engaged in illegal taxation of artisanal miners at 42% of the 1,615 mine sites surveyed between 2013 and 2015, and they practiced forced labor at 5% of the mine sites (Weyns and others, 2016, p. 4, 21).

Production

In 2016, the production of tungsten increased by an estimated 46%; tin, by an estimated 42%; tantalum, by an estimated 22%; and niobium, by an estimated 20%. Between 2012 and 2016, niobium output increased by an estimated 200%; tantalum by an estimated 184%; gold, by an estimated 125%; tungsten, by an estimated 109%; refined copper, by 71%; and mined copper, by an estimated 53%. Increased tin production in 2016 could be attributable to higher prices on world markets. Data on mineral production are in table 1.

Lead production decreased by 85% in 2016; silver, by 65%; tourmaline, by an estimated 50%; cement, by 48%; germanium, by an estimated 29%; and black copper (Cu content), by an estimated 26%. Refined cobalt production ceased in 2016. Between 2012 and 2016, silver production decreased by 93%; black copper (Cu content), by 57%; and cement, by 50%. In 2016, decreased cement production was partially attributable to competition from imports. Decreased tourmaline production was the result of reduced artisanal mining activity (table 1).

Structure of the Mineral Industry

La Générale des Carrières et des Mines SA (Gécamines), which was a state-owned company, produced cobalt and copper. Other cobalt and copper mining companies were privately owned; Gécamines held shares of between 5% and 40% in numerous operations. Private companies held majority shares in the cement producers; Gécamines held a 49.73% share in Ciment et Matériaux du Katanga. The Government held an 80% share in the large-scale diamond producer Société Minière de Bakwanga (MIBA). Table 2 is a list of major mineral industry facilities.

Artisanal and small-scale miners accounted for most Congolese output of diamond, niobium, tantalum, tin, and tungsten. Artisanal and small-scale miners also played a significant role in the country's cobalt and gold mine production. Before the Kibali Mine's first full year of production in 2014, artisanal and small-scale miners accounted for most domestic gold output. In IPIS' survey, gold was produced in Ituri, Maniema, Nord-Kivu, and Sud-Kivu Provinces as well as the former Katanga Province at a minimum of 1,220 mines; niobium, tantalum, tin, and tungsten, at a minimum of 390 mines; and tourmaline, at a minimum of 9 mines. Capacity, location, ownership, and production information were not readily available for many artisanal and small-scale operations (International Peace Information Service and SaveActMine, 2016, p. 18; Weyns and others, 2016, p. 15–16, 32, 38).

Mineral Trade

Total reported exports were valued at $10 billion in 2016, and imports, $10.2 billion. Copper accounted for 56% of the value of Congo (Kinshasa)'s exports; cobalt, 21%; gold, 13%; and crude petroleum and diamond, 3% each. Most of the gold exports from artisanal production were undeclared. Other mineral exports included germanium, lead, niobium, tantalum, tin, tourmaline, tungsten, and zinc. Cobalt and copper were exported to countries that included China and India; gold, to countries that included South Africa; and tantalum, tin, and tungsten to countries that included Belgium, China, and Malaysia. Mineral fuels accounted for about 5% of total imports in 2016 (Banque Centrale du Congo, 2017, p. 121–123).

In 2016, the share of Congolese copper and cobalt production that was refined prior to export was 86% and less than 1%, respectively. Additional cobalt and copper mine production was exported after processing to intermediate products, such as cobalt carbonate, cobalt hydroxide, and black copper. The lower levels of domestic cobalt refining could be attributable to power shortages. Most or all Congolese diamond, niobium, tin, tantalum, and tungsten production was exported prior to downstream processing (table 1).

Commodity Review

Metals

Cobalt, Copper, Germanium, and Silver.—In 2016, output at the Tenke Fungurume Mine was 215,942 metric tons (t) of refined copper and 16,054 t of contained cobalt in hydroxide compared with 203,964 t of refined copper and 16,014 t of contained cobalt in 2015. The mine's rated capacity was 225,000 metric tons per year (t/yr) of refined copper and 16,000 t/yr of cobalt in cobalt hydroxide. At the start of 2016, Tenke Fungurume was a joint venture of Freeport McMoran Copper & Gold Inc. of the United States (56%), Lundin Mining Corp. of Canada (24%), and Gécamines (20%). Freeport McMoran sold its share to China Molybdenum Co. Ltd. in November (Lundin Mining Corp., 2017, p. 24).

Mutanda Mining SPRL (Glencore plc of Switzerland, 69%, and Fleurette Properties Ltd., 31%) operated a copper solvent extraction–electrowinning (SX–EW) plant at the Mutanda Mine with a rated capacity of 200,000 t/yr of copper. The capacity of cobalt in hydroxide was 23,000 t/yr. In 2016, output at Mutanda was 213,300 t of copper, of which about 196,100 t was refined. In 2015, production was 216,100 t of copper, of which about 210,400 t was refined. Cobalt output in concentrate and hydroxide increased to about 24,500 t in 2016 from 16,500 t in 2015 (Glencore plc, 2017, p. 11; Kibawa, 2016, 2017).

Eurasian Resources Group (ERG) of Luxembourg produced 107,000 t of copper in concentrate at the Frontier Mine in 2016 compared with 79,000 t in 2015. Increased output was attributable to greater operating efficiencies (Mining Review Africa, 2017).

Boss Mining SPRL (ERG, 70%, and Gécamines, 30%) produced copper and cobalt at the Mukondo Mountain Mine and the Luita SX–EW plant. Refined copper production at Luita decreased to 26,308 t in 2016 from 28,660 t in 2015. Boss Mining also produced 7,836 t of copper in concentrate in 2015; production increased to an estimated 9,700 t in 2016. Cobalt production decreased to an estimated 5,200 t in 2016 from 6,109 t in 2015 (Kibawa, 2016, 2017; Moore Stephens LLP, 2017, p. 150).

ERG was engaged in the construction of the Roan Tailings Retreatment (RTR) project at yearend; construction started in June 2015. In the first phase of the project, ERG planned to produce 70,000 t/yr of copper and 14,000 t/yr of cobalt by re-treating tailings from previous mining operations near Kolwezi. The company planned to increase production to 105,000 t/yr of copper and 21,000 t/yr of cobalt in the second phase of the project (Cann, 2017; Eurasian Resources Group, 2017).

MMG Ltd. of China operated the Kinsevere Mine and SX–EW plant. In 2016, production was 80,650 t of refined copper, which was an increase of 1% compared with that of 2015. Output exceeded the target of between 75,000 and 80,000 t. MMG planned to produce between 75,000 and 80,000 t of refined copper at Kinsevere in 2017 (MMG Ltd., 2017, p. 5–6).

In November 2015, Sicomines (China Railway Group Ltd. and Sinohydro Corp., 68%; and Gécamines and Société Immobilière du Congo, 32%) started production at its cobalt and copper mining operations. Refined copper production was 44,115 t in 2016; the company also produced copper in concentrate. China Railway Group and Sinohydro pledged to build infrastructure with a value of $3 billion in return for their stake in Sicomines. Initial planned copper output at the Mashamba West and Dikulwe deposits was 125,000 t/yr (Inside Mining, 2016; Kibawa, 2017).

Ruashi Mining SPRL (Jinchuan Group International Resources Co. Ltd., 75%) produced cobalt and copper from the Ruashi Mine; refined copper and cobalt hydroxide were produced at the company's SX–EW plant. In 2016, production was 32,129 t of refined copper and 3,391 t of contained cobalt compared with 35,066 t of refined copper and 4,344 t of contained cobalt in 2015. Reduced copper and cobalt output was attributable to characteristics of the ore that increased processing difficulties. Cobalt production also decreased because of lower ore grades. At yearend, reserves were 7.5 million metric tons (Mt) at grades of 2.1% copper and 0.4% cobalt (Jinchuan Group International Resources Co. Ltd., 2017a, p. 12, 18–19).

In 2016, Jinchuan was engaged in reopening the Kinsenda Mine. The company completed the processing plant in 2015; the beginning of production was delayed from 2015 to 2017 because of flooding of the underground mine workings. Planned production was 24,000 t/yr of copper in concentrate. Jinchuan spent $51 million on reopening Kinsenda in 2016, most of which was attributable to tailings dam and power station construction. Reserves at Kinsenda were estimated to be 6.1 Mt at a grade of 4.8% copper (Jinchuan Group International Resources Co. Ltd., 2017a, p. 14, 18–19).

In 2014, Jinchuan completed a feasibility study of a new mine and SX–EW plant at the Musonoi project. Jinchuan planned to produce about 40,000 t/yr of copper and 7,000 t/yr of contained cobalt in hydroxide, depending on its scheduled approval of the project in 2017. Mining could start in 2021. Resources at Musonoi were estimated to be 31.7 Mt at grades of 2.8% copper and 0.9% cobalt (Jinchuan Group International Resources Co. Ltd., 2017a, p. 14–15, 18–19; 2017b, p. 8–9, 25).

The joint venture of Tiger Resources Ltd. of Australia (60%) and Gécamines (40%) mined copper at the Kipoi Central deposit; output from the mine's SX–EW plant amounted to 23,119 t in 2016. The original production target for 2016 was between 26,000 t and 28,000 t; production was limited by technical problems in the second quarter. Debottlenecking operations to increase capacity to 32,500 t/yr were completed in the fourth quarter of 2016. Tiger was considering the possibility of producing 1,000 t/yr of cobalt at Kipoi Central; the company was engaged in metallurgical test work in late 2016 (Lawson, 2016; Modern Mining, 2017c).

Gécamines operated the Kamfundwa, Kamoya Central, Kamoya South, Kilamusembu, and Shangalowe Mines. The company's total copper production was about 11,000 t in 2016 compared with 19,000 t in 2015. Refined copper production decreased to 10,039 t in 2016 from 15,347 t in 2015, and cobalt metal, to 50 t from 240 t. Gécamines planned to increase its total copper production to 50,000 t in 2017, 75,000 t in 2018, and 125,000 t/yr starting in 2019 (Cornish, 2017; Kibawa, 2016, 2017).

Gécamines and joint-venture partner Enterprise Generale Malta Forrest SPRL (EGMF) produced cobalt and copper at La Société pour le Traitement du Terril de Lubumbashi's (STL) Big Hill tailings treatment plant in Lubumbashi. Cobalt production was 5,065 t in 2015; output decreased by an estimated 29% in 2016. STL also produced germanium at the estimated rate of 21 t/yr in 2014 and 2015 and 15 t/yr in 2016 (table 1; Kibawa, 2016, 2017; Moore Stephens LLP, 2017, p. 151).

Chemaf SPRL (a subsidiary of Shalina Resources Ltd. of the United Arab Emirates) produced copper and cobalt at the Etoile Mine and the Usoke Avenue copper SX–EW and cobalt carbonate plants. In 2016, Chemaf produced 18,512 t of refined copper compared with 24,432 t in 2015. In 2014, the company produced 2,006 t of cobalt in carbonate and hydroxide. Cobalt production increased by an estimated 18% in 2015 before decreasing by an estimated 32% in 2016. By mid-2016, Chemaf planned to increase refined copper capacity to 50,000 t/yr from 31,500 t/yr, and cobalt capacity, to 6,200 t/yr from 2,400 t/yr. At yearend, it was unclear whether the expansion was completed (Shalina Resources Ltd., 2015a, b; Kibawa, 2015, 2016, 2017).

Mawson West started mining at the Kapulo project in the first quarter of 2015. By yearend, the company produced 13,790 t of copper and 2,072 kilograms (kg) of silver in concentrate. Mawson West produced 5,468 t of copper and 835 kg of silver at Kapulo in 2016 before placing the mine on care-and-maintenance status because of low copper prices. Mining was expected to restart at Kapulo in September 2017 (Mawson West Ltd., 2016, p. 1–2, 4).

Black copper, which is an intermediate product that has a copper content of between 80% and 98%, was produced by numerous companies in the former Katanga Province. Some companies produced black copper from concentrate produced at their own mines and others sourced concentrate from

artisanal miners. In 2016, Rubamin SPRL (a subsidiary of Rubamin Ltd. of India) produced nearly 14,000 t of copper in black copper and Congo Dong Fang International Mining SPRL (CDM) of China, about 8,300 t (Kibawa, 2017).

CDM, Congo International Mining Corp. (CIMCO), La Minière de Kalumbwe Myunga (MKM), Minière du Katanga SPRL (Somika) of India, Shituru Mining Corp. SPRL, and other companies operated small copper refineries. Shituru Mining's production of refined copper increased to 33,583 t in 2016 from 32,232 t in 2015; CNMC Huachin Mining Mabende's, to 23,697 t from 18,015 t; Compagnie Minière de Luisha's, to 20,606 t from 10,309 t; Somika's, to 15,478 t from 13,808 t; CDM's, to 12,732 t from 11,447 t; Kai Peng Mining's, to 12,330 t from 8,181 t; and CIMCO's, to 11,926 t from 10,551 t. MKM's production decreased to 19,431 t in 2016 from 21,984 t in 2015, and Huachin Metal Leach's, to 12,046 t from 12,548 t (Kibawa, 2016, 2017).

CDM processed cobalt ore purchased from artisanal miners to cobalt concentrate and cobalt hydroxide. In 2016, the company produced an estimated 7,800 t of cobalt. Macrolink Jiayuan Mining produced nearly 1,600 t of cobalt in concentrate in 2016 (Frankel, 2016; Kibawa, 2016, 2017; Moore Stephens LLP, 2017, p. 153, 157).

Katanga Mining Ltd. of Switzerland produced copper and cobalt at the KOV open pit mine, the KTO underground mines, and the Luilu refinery. Production was 114,733 t of refined copper and 2,901 t of cobalt metal in 2015. In September 2015, the company placed its processing operations on care-and-maintenance status during the construction phase of its Whole Ore Leach project. The project was expected to be commissioned in the second half of 2017; Katanga planned to produce 300,000 t/yr of refined copper and 30,000 t/yr of cobalt in hydroxide (Katanga Mining Ltd., 2017, p. 12, 18).

In February 2016, Ivanhoe Mines Ltd. of Canada completed a prefeasibility study of a new mine at its Kamoa project. Planned production in the study was 100,000 t/yr of copper in concentrate in the first phase of mining. In the second phase, output could be 300,000 t/yr of blister copper from a new smelter (Cornish, 2016).

In January 2016, Ivanhoe discovered the Kakula deposit adjacent to Kamoa. The company completed a preliminary economic assessment (PEA) on a new mine at Kakula in late 2016. Under the PEA, planned production was about 209,000 t/yr of copper in concentrate in the first 5 years of mining. Ivanhoe planned to complete a new PEA on doubling production at Kakula in early 2017. The development of Kakula could precede Kamoa, depending on the outcome of further studies. In October, resources at Kamoa were estimated to be 937 Mt at a grade of 2.56% copper; and at Kakula, 227 Mt at a grade of 3.2% copper (Ivanhoe Mines Ltd., 2017; Modern Mining, 2017a).

Gold.—Artisanal and small-scale miners produced gold in Ituri, Maniema, Nord-Kivu, Sud-Kivu, and Tanganyika Provinces in eastern Congo (Kinshasa). Between 2013 and 2015, production by artisanal miners in eastern Congo (Kinshasa) was estimated to be nearly 12,000 kilograms per year (kg/yr) of gold (Weyns and others, 2016, p. 4).

Artisanal gold miners operated throughout Ituri Province. Gold mining in Djugu Territory employed 28,000 workers; the Mambasa Territory, nearly 11,000 workers; the Irumu Territory, 9,100 workers; the Mahagi Territory, 3,200 workers; and the Aru Territory, 2,100 workers. The IPIS reported that mining operations in Aru, Djugu, and Mahagi Territories were mostly free from interference by armed groups. In Irumu and Mambasa Territories, Congolese military units and rebel groups frequently interfered with mining operations (Weyns and others, 2016, p. 24–25; International Peace Information Service, 2017).

AngloGold Ashanti Ltd. of South Africa and Randgold Resources Ltd. of the United Kingdom started operations at the Kibali Mine in 2013. The companies produced 18,225 kg of gold in 2016 compared with 19,991 kg in 2015; decreased output was attributable to lower ore grades and recovery rates. Planned production was about 19,000 kg in 2017 and about 23,000 kg/yr starting in 2018 (Randgold Resources Ltd., 2017).

Banro Corp. of Canada operated the Twangiza Mine in Sud-Kivu Province; the company produced 3,248 kg of gold in 2016 compared with 4,216 kg of gold in 2015. In 2016, production decreased because of lower ore grades and recovery rates. The company also operated the Namoya Mine in Maniema Province; production increased to 2,900 kg in 2016 from 1,488 kg in 2015 as the mine ramped up to capacity. Banro planned debottlenecking operations to increase its milling capacity at Twangiza by between 10% and 15% (Banro Corp., 2017, p. 8, 10, 12).

Semi-industrial gold mining operations in rivers in Ituri Province were estimated to produce at the rate of at least 2,000 kg/yr of gold in 2014. Chinese companies involved in semi-industrial mining included Coomid, Fametal, and Gold Dragon Resources. In February 2015, the Provincial government (which was at that time the government of Orientale Province) suspended all semi-industrial mining operations in Ituri because some of the producers were working illegally on other companies' licenses. As of the end of 2016, it was unclear whether the suspension had been lifted (Spittaels and others, 2014, p. 12, 21; Mthembu-Salter, 2015, p. 6, 13).

In February 2016, Armadale Capital plc of the United Kingdom completed a feasibility study on a new mine at its Mpokoto project. Planned production was about 800 kg/yr of gold during the 4-year first phase of mining. Resources were estimated to be 21 t of contained gold. At yearend, Armadale Capital planned to engage in metallurgical test work and refine its feasibility study (Modern Mining, 2017b).

Niobium (Columbium) and Tantalum.—In 2016, national production of columbite-tantalite increased to 2,414 t from a revised 2,102 t in 2015. Production increased to 1,220 t in 2016 from 940 t in Nord-Kivu Province and to 1,133 t from 1,061 t in the former Katanga Province. Maniema Province's production decreased to 32 t in 2016 from 73 t in 2015 (République Démocratique du Congo Ministère des Mines, 2016, p. 41–45; 2017, p. 26, 32).

IPIS' survey reported that Nord-Kivu Province had about 6,700 miners employed at 23 mines in Masisi Territory and about 500 employed at 8 mines in Lubero Territory. In the former Katanga Province, about 2,100 miners were employed at 20 mines in Nyunzu Territory (Tanganyika Province);

about 290 miners were employed at 5 mines in Kalemie Territory (Tanganyika Province); and about 250 miners were employed at 7 mines in Bukama Territory (Haut-Lomani Province). Columbite-tantalite also was produced as a coproduct of cassiterite in three mines each in Manono Territory (Tanganyika Province) and Malemba-Nkulu Territory (Haut-Lomami Province) that employed about 1,100 and 650 workers, respectively (International Peace Information Service, 2017).

Niobium and tantalum were also contained in cassiterite. Based on historical production of niobium and tantalum from slag at smelters in Congo (Kinshasa), the estimated tantalum and niobium content of cassiterite in 2016 was 180 t and 120 t, respectively. In 2015, the estimated tantalum and niobium content of cassiterite was 120 t and 81 t, respectively (World Mining, 1979; Ellis, 1981; République Démocratique du Congo Ministère des Mines, 2017, p. 25).

Société Minière du Kivu (Somikivu) planned to reopen the Lueshe pyrochlore mine in Nord-Kivu Province. In October 2015, the Government refused to renew Somikivu's license for Lueshe because of errors in the company's prefeasibility study and its lack of funds to restart mining operations. As of September 2016, the Government had not awarded a new license for Lueshe (République Démocratique du Congo Ministère des Mines, 2015).

Tin.—Artisanal and small-scale miners produced cassiterite in Haut-Katanga, Maniema, Nord-Kivu, Sud-Kivu, and Tanganyika Provinces. Cassiterite output increased to 11,824 t in 2016 from 8,304 t in 2015. Production in former Katanga Province increased to 5,631 t in 2016 from 3,482 t in 2015; Nord-Kivu Province, to 2,089 t from 427 t; and Sud-Kivu Province, to 1,944 t from 1,602 t. In Maniema Province, production decreased to 2,160 t in 2016 from 2,793 t in 2015 (République Démocratique du Congo Ministère des Mines, 2016, p. 41–45; 2017, p. 25, 32).

IPIS' survey reported that Maniema Province had about 3,000 artisanal miners employed in cassiterite mining in Punia Territory and about 1,800 in Lubutu Territory. In Haut-Katanga Province, nearly 5,100 artisanal miners were employed in cassiterite mining at 19 mines in Mitwaba Territory and about 400 at 8 mines in Pwerto Territory. In Sud-Kivu Province, about 2,300 miners were employed at 8 mines (International Peace Information Service, 2017).

In February 2016, Alphamin Resources Corp. of Mauritius completed a feasibility study on a new mine at the Mpama North deposit, which was part of the Bisie project in Nord-Kivu Province. The company updated its study in June. Alphamin planned to produce about 10,800 t/yr of tin in concentrate at Mpama North during the estimated mine life of nearly 12 years. Construction was expected to start in 2017, and mining, in 2019. Resources were estimated to be 5.14 Mt at a grade of 4.49% tin (Tassell, 2017).

Tungsten.—Wolframite was mined in Maniema, Nord-Kivu, Sud-Kivu, and Tanganyika Provinces. National production of wolframite increased to 154 t in 2016 from 106 t in 2015. Output remained far below the levels reached between 2005 and 2009 in spite of higher tungsten prices (République Démocratique du Congo Ministère des Mines, 2017, p. 27, 32).

Zinc.—In 2016, Ivanhoe completed a PEA on reopening the Kipushi zinc-copper mine, which is located 30 kilometers southwest of Lubumbashi. Depending on the results of prefeasibility and feasibility studies, Ivanhoe could produce about 280,000 t/yr of zinc in concentrate during the estimated 10-year life of the mine. The company planned to complete its prefeasibility study in the second quarter of 2017. Resources at the Big Zinc deposit at Kipushi were estimated to be 10.2 Mt at a grade of 34.9% zinc. Capital costs of reopening the mine were estimated to be $409 million (Engineering & Mining Journal, 2016; Ivanhoe Mines Ltd., 2017).

Industrial Minerals

Cement.—National cement production decreased to 207,619 t in 2016 from 398,749 t in 2015 and 456,600 t in 2011. In 2016, Cimenterie de Lukala (HeidelbergCement AG, 85%) shut down because of import competition from Angola. Forspak International of China operated a plant with a capacity of 300,000 t/yr at Dolosie (Global Cement, 2016; Banque Centrale du Congo, 2017, p. 55).

Lucky Cement Ltd. of Pakistan and Groupe Rawji were engaged in a joint venture to build a new cement plant with a capacity of 1.26 million metric tons per year (Mt/yr). The companies completed the plant at Songololo in Bas-Congo Province in October 2016. PPC Ltd. of South Africa and Barnet Group planned to complete a new plant with a capacity of 1 Mt/yr in Bas-Congo Province by February 2017 (International Cement Review, 2017).

Diamond.—Artisanal and small-scale miners accounted for most Congolese output of diamond. In 2016, artisanal and small-scale diamond production was nearly 12.4 million carats compared with 14.2 million carats in 2015. Miners in Kasai-Oriental Province produced 10.3 million carats in 2016; miners in Kasai Province, 1.22 million carats; miners in Kasai Central Province, about 566,000 carats; miners in Kwango Province, about 127,000 carats; and miners in Tshopo Province, about 116,000 carats (République Démocratique du Congo Ministère des Mines, 2016, p. 17; 2017, p. 8).

Société Anhui-Congo d'Investissement Minier SPRL (SACIM) (Anhui Foreign Economic Construction Group of China, 50%, and Government-owned Société Congolaise d'Investissment Minier, 50%) produced diamond at the Tshibwe Mine in Kasai-Oriental Province. In 2016, SACIM produced about 2.76 million carats compared with 1.19 million carats in 2015. The company planned to increase its output to 6 million carats per year (République Démocratique du Congo Ministère des Mines, 2016, p. 18; 2017, p. 4; undated, p. 12, 14).

MIBA mined mostly industrial and near-gem-quality diamond at Mbuji-Mayi in Kasai-Oriental Province. In 2015, the company produced 273,300 carats from its alluvial deposits. Production increased in November because of the purchase of new mining equipment. MIBA planned to increase production to 900,000 carats per year because of the new equipment; the company's output decreased to 188,376 carats in 2016. Société Minière de Lupatapata (SMDL) started diamond production in November 2015; the company produced 28,099 carats by yearend. In 2016, SMDL produced 198,259 carats (Agence Congolaise de Presse, 2015; République Démocratique du Congo Ministère des Mines, 2016, p. 18; 2017, p. 4).

Gemstones.—Artisanal miners produced amethyst and tourmaline at Rwangara and Shakubangwa in Nord-Kivu Province. In the first half of 2015, the miners produced tourmaline at an estimated rate of 48 t/yr compared with 74 t/yr in the last 5 months of 2014. Production decreased significantly in February 2015; further decreases in August were attributable to low tourmaline prices and difficult mining conditions. In 2016, production was estimated to be 14 t compared with 28 t in 2015. Amethyst production was sporadic. Tourmaline also was mined in Sud-Kivu Province (International Peace Information Service and SaveActMine, 2016, p. 22, 24).

Outlook

Cobalt and copper output in Congo (Kinshasa) are expected to increase. At least eight companies planned to increase copper mining, and at least five planned to increase cobalt mining. Additionally, at least five companies planned to increase their refined copper production. New mines or expansion of existing cobalt and copper mines included Kinsenda and Musonoi. Gold production is also likely to increase in 2017 and 2018 because of higher output at the Kibali and the Twangiza Mines. The Bisie project could increase tin mining starting in 2019. The opening of new plants is expected to result in increased cement production between 2017 and 2019. Diamond mining also could increase because of the expansion at Tshibwe.

The development of these projects depends heavily upon political and economic stability and favorable conditions in world markets. The outlook for gold, niobium, tantalum, tin, and tungsten is particularly dependent upon political stability because of continued civil unrest in eastern Congo (Kinshasa) and upon international concerns about the reported use of minerals to finance armed groups.

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TABLE 1
CONGO (KINSHASA): PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons, gross weight, unless otherwise specified)

Commodity[2]		2012	2013	2014	2015	2016
METALS						
Cobalt:						
Mine, Co content[e]		52,000	55,000 [r]	62,000 [r]	66,000 [r]	64,000
Refinery		3,021	2,777	2,859	3,141 [r]	--
Copper:						
Mine, Cu content		670,000 [r, e]	922,016 [r]	1,030,129 [r]	1,039,007 [r]	1,023,687
Intermediate production, black:						
Gross weight		64,797	72,955	63,646	38,854	30,437
Cu content[e]		60,000	68,000	58,000	35,000	26,000
Refinery		473,000	684,937	877,966	885,935 [r]	809,385
Germanium, Ge content[e]	kilograms	15,000	18,000	21,000	21,000	15,000
Gold, mine, Au content[e]	do.	16,000 [r]	19,000 [r]	34,000 [r]	38,000 [r]	36,000
Lead, mine, Pb content		95	621	764	653	101
Niobium and tantalum, mine:						
Cassiterite concentrate:						
Gross weight		8,018 [3]	6,231 [r]	7,295 [r]	8,304 [r]	11,824
Nb content		80	61 [r]	71 [r]	81 [r]	120
Ta content[e]		120	93 [r]	110 [r]	120 [r]	180
Columbite-tantalite concentrate:						
Gross weight		586 [3]	500 [r]	1,140 [r]	2,102 [r]	2,414
Nb content[e]		100	87 [r]	200 [r]	370 [r]	420
Ta content[e]		130	110 [r]	250 [r]	460 [r]	530
Silver, mine, Ag content	kilograms	12,342	60,431	6,492	2,412	835
Tin, mine, cassiterite concentrate:						
Gross weight		8,018 [3]	6,231 [r]	7,295 [r]	8,304 [r]	11,824
Sn content[e]		4,800	3,700 [r]	4,400 [r]	5,000 [r]	7,100
Tungsten, mine, wolframite concentrate:						
Gross weight		71	115	16 [r]	106 [r]	154
W content[e]		35	55	8 [r]	50 [r]	73
Zinc, mine, Zn content		10,572 [r]	12,114 [r]	12,737 [r]	12,675 [r]	12,587
INDUSTRIAL MINERALS						
Cement, hydraulic		413,181	446,610	329,505	398,749	207,618
Diamond:						
Artisanal	thousand carats	19,154	16,653	14,689	14,248	12,377
Large-scale	do.	569	246	244	1,505	3,182
Gemstones, tourmaline		NA	NA	35 [e]	28 [e]	14 [e]
Stone, crushed, unspecified		356,900	361,200	285,100	290,000	290,000 [e]
Sulfur compounds, sulfuric acid[e]		1,600,000	2,300,000	3,000,000	3,000,000	2,800,000
MINERAL FUELS AND RELATED MATERIALS						
Coal, mine, bituminous		3,870	4,000	4,000	4,000	4,000 [e]
Petroleum, crude	thousand 42-gallon barrels	8,545	8,351	8,362	8,247	7,837

[e]Estimated. [r]Revised. do. Ditto. -- Zero.

[1]Table includes data available through January 4, 2018. All data are reported unless otherwise noted. Estimated data are rounded to no more than three significant digits; may not add to totals shown.

[2]In addition to the commodities listed, amethyst and crude construction materials, including brick clay, may have been produced in Congo (Kinshasa), but available information was inadequate to make reliable estimates of output.

[3]Reported exports.

TABLE 2
CONGO (KINSHASA): STRUCTURE OF THE MINERAL INDUSTRY IN 2016

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement	Lucky Cement Ltd. and Groupe Rawji	Plant at Songololo in Kongo Central Province	1,260,000.
Do.	Cimenterie de Lukala (HeidelbergCement AG, 85%)	Lukala plant[1] near Kinshasa	420,000.
Do.	Cimenterie Nationale SARL (Nova Cimangola, 58%)	Kimpese plant, 40 kilometers south of Kinshasa[1]	300,000.
Do.	Forspak International	Plant at Dolosie	300,000.
Do.	Ciment et Matériaux du Katanga [Enterprise Malta Forrest SPRL (EGMF), 50.27%, and Générale des Carrières et des Mines SA (Gécamines), 49.73%]	Lubudi plant in Lualaba Province	87,000.
Do.	Interlacs (HeidelbergCement AG, 85%)	Kabimba plant near Lubumbashi	50,000.
Coal	La Générale des Carrières et des Mines SA (Gécamines)	Luena Mine in former Katanga Province	NA.
Copper and cobalt:			
Mine	Katanga Mining Ltd. (Glencore International AG, 75.2%, and La Générale des Carrières et des Mines (Gécamines), 24.8%]	KOV and KTO Mines[1]	250,000[e] copper; 8,000[e] cobalt.
Do.	Tenke Fungurume Mining SARL [China Molybdenum Co. Ltd., 56%; Lundin Mining Corp., 24%; Générale des Carrières et des Mines (Gécamines), 20%]	Tenke Fungurume Mine in Lualaba Province	225,000 copper in ore; 16,000 cobalt in ore.
Do.	Mutanda Mining SPRL (Glencore plc, 69%, and Fleurette Properties Ltd.,31%)	Mutanda Mine in Lualaba Province	220,000[e] copper; 23,000[e] cobalt.
Do.	Sicomines [China Railway Group Ltd. and Sinohydro Corp., 68%, and La Générale des Carrières et des Mines SA (Gecamines), 32%]	Mashamba West Mine	125,000 copper.
Do.	Eurasian Resources Group (ERG)	Frontier Mine in Haut-Katanga Province	100,000 copper.
Do.	Boss Mining SPRL [Eurasian Resources Group (ERG), 70%, and Générale des Carrières et des Mines SA (Gécamines), 30%]	Mukondo Mountain Mine	40,000[e] copper; 10,000[e] cobalt.
Do.	MMG Ltd.	Kinsevere Mine	80,000 copper.
Do.	La Générale des Carrières et des Mines SA (Gécamines)	Kamfundwa, Kamoya Central, Kamoya South, Kilamusembu, and Shangalowe Mines	50,000[e] copper; 2,500[e] cobalt.
Do.	Congo Dong Fang International Mining SPRL (CDM)	Plants in former Katanga Province	45,000[e] copper; 8,700[e] cobalt.
Do.	Ruashi Mining SPRL (Jinchuan Group, 75%)	Ruashi Mine	38,000 copper; 5,000 cobalt.
Do.	Tiger Resources Ltd., 60%, and La Générale des Carrières et des Mines SA (Gécamines), 40%	Kipoi Mine in Haut-Katanga Province	32,500[e] copper.
Do.	Chemaf SPRL (Shalina Resources Ltd.)	Etoile Mine	31,500[e] copper; 2,400[e] cobalt.
Do.	Shituru Mining Corp. SPRL	Mines in former Katanga Province	35,000[e] copper.
Do.	Société Minière du Katanga SPRL (Somika)	do.	20,000[e] copper; 2,400 cobalt.
Do.	Anvil Mining Congo SARL (Mawson West Ltd., 90%)	Dikulushi Mine[1] near Lake Mweru	20,000 copper.
Do.	do.	Kapulo Mine[1] near Kapulo	19,400 copper.
Do.	La Société pour le Traitement du Terril de Lubumbashi (STL) [Enterprise Générale Malta Forrest SPRL (EGMF), 70%, and La Générale des Carrières et des Mines SA (Gécamines), 30%]	Big Hill tailings treatment plant at Lubumbashi	3,500 copper; 5,500 cobalt.
Do.	Metals Mines	Mines in former Katanga Province	2,000[e] cobalt.
Do.	Feza Mining SPRL	do.	1,000[e] cobalt.

See footnotes at end of table.

TABLE 2—Continued
CONGO (KINSHASA): STRUCTURE OF THE MINERAL INDUSTRY IN 2016

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Copper and cobalt:—Continued				
Black copper[2]		Congo Dong Fang International Mining SPRL (CDM)	Plant in Lubumbashi	30,000[e] copper.
Do.		Rubamin SPRL	Plant in Likasi	20,000 copper.
Do.		Huachin Metal Leach	Plant in former Katanga Province	7,000[e] copper.
Refined[2]		Katanga Mining Ltd. (Glencore International AG, 75.2%, and La Générale des Carrières et des Mines (Gécamines), 24.8%]	Luilu plant[1]	300,000 copper; 8,000 cobalt.
Do.		Tenke Fungurume Mining SARL	Plant near Tenke Fungurume Mine	225,000 copper.
Do.		Mutanda Mining SPRL (Glencore plc, 69%, and Fleurette Properties Ltd., 31%)	Plant at Mutanda Mine in Lualaba Province	200,000 copper.
Do.		Sicomines [China Railway Group Ltd. and Sinohydro Corp., 68%, and La Générale des Carrières et des Mines SA (Gecamines), 32%]	Plant near Mashamba West Mine	80,000[e] copper.
Do.		MMG Ltd.	Kinsevere plant	80,000[e] copper.
Do.		Boss Mining SPRL [Eurasian Resources Group (ERG), 70%, and Générale des Carrières et des Mines SA (Gécamines), 30%]	Luita plant near Lubumbashi	40,000 copper.
Do.		Ruashi Mining SPRL (Jinchuan Group, 75%)	Ruashi plant	38,000 copper.
Do.		Shituru Mining Corp. SPRL	Plant in former Katanga Province	37,000[e] copper.
Do.		Tiger Resources Ltd., 60%, and La Générale des Carrières et des Mines (Gécamines), 40%	Plant near Kipoi Mine	32,500 copper.
Do.		Chemaf SPRL (Shalina Resources Ltd.)	Usoke Avenue plant in Lubumbashi	31,500 copper.
Do.		Congo International Mining Corp. (CIMCO)	Plant in former Katanga Province	30,000 copper.
Do.		CNMC Huachin Mining Mabende	do.	26,000[e] copper.
Do.		La Minière de Kalumbwe Myunga (MKM)	do.	26,000[e] copper.
Do.		Compagnie Minière de Luisha	do.	24,000[e] copper.
Do.		La Générale des Carrières et des Mines SA (Gécamines)	Shituru plant	21,600 copper.
Do.		do.	Fonderie Electrique de Panda cobalt plant[1]	1,200 cobalt.
Do.		CNMC-Mabende Metal Leach SPRL	Plant at Lwisha	20,000 copper.
Do.		Société Minière du Katanga SPRL (Somika)	Plant near Lubumbashi	18,000[e] copper.
Do.		Kai Peng Mining Ltd.	Plant at Likasi	13,000[e] copper.
Diamond	carats	Artisanal miners	Mines in Kasai-Oriental Province	13,000,000.[e]
Do.	do.	do.	Mines in Kasai Province	1,400,000.[e]
Do.	do.	do.	Mines in Kasai-Central Province	630,000.[e]
Do.	do.	do.	Mines in Kwango Province	140,000.[e]
Do.	do.	do.	Mines in Tshopo Province	130,000.[e]
Do.	do.	Société Anhui-Congo d'Investissment Minier SPRL (SACIM) [Anhui Foreign Economic Construction Group, 50%, and Société Congolaise d'Investissment Minier, 50%]	Tshibwe Mine in Kasai-Oriental Province	6,000,000.
Do.	do.	Société Minière de Bakwanga (MIBA) [Government, 80%, and Sibeka Group, 20% (which was owned by Mwana Africa plc)]	Mines at Mbuji Mayi in Kasai-Oriental Province	900,000.
Do.	do.	Société Minière de Lupatapata (SMDL)	Mines in Kasai-Oriental Province	220,000.[e]
Gemstones		Artisanal and small-scale miners	Mines at Rwangara and Shakubangwa in Nord-Kivu Province	48[e] tourmaline.
Germanium	kilograms	La Société pour le Traitement du Terril de Lubumbashi (STL) [Enterprise Générale Malta Forrest SPRL (EGMF), 70%, and La Générale des Carrières et des Mines SA (Gécamines), 30%]	Big Hill tailings treatment plant at Lubumbashi	20,000.

See footnotes at end of table.

TABLE 2—Continued
CONGO (KINSHASA): STRUCTURE OF THE MINERAL INDUSTRY IN 2016

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Gold	kilograms	Artisanal and small-scale miners	Mines in various locations, including:	13,000.[e]
Do.	do.	do.	Ituri Province	NA.
Do.	do.	do.	Maniema Province	NA.
Do.	do.	do.	Nord-Kivu Province	NA.
Do.	do.	do.	Sud-Kivu Province	NA.
Do.	do.	do.	Tanganyika Province	NA.
Do.	do.	Coomid, Fametal, and Gold Dragon Resources	Mines in Ituri Province[1]	2,000.[e]
Do.	do.	AngloGold Ashanti, 45%, and Randgold Resources Ltd., 45%	Kibali Mine in Ituri Province	29,000.
Do.	do.	Banro Corp.	Namoya Mine in Maniema Province	4,100.
Do.	do.	do.	Twangiza Mine in Sud-Kivu Province	3,500.
Niobium (columbium) and tantalum		Government, 100%	Lueshe Mine[1] in Nord-Kivu Province	1,440 pyrochlore.
Do.		Artisanal and small-scale miners	At least 31 mines in Nord-Kivu Province	1,400[e] columbite-tantalite.
Do.		do.	At least 28 mines in Tanganyika Province	1,000[e] columbite-tantalite.
Do.		do.	Mines in Haut-Katanga Province	260[e] columbite-tantalite.
Do.		do.	Mines in Maniema Province	80[e] columbite-tantalite.
Do.		do.	Mines in Sud-Kivu Province	35[e] columbite-tantalite.
Petroleum, crude	thousand 42-gallon barrels	Perenco REP (subsidiary of Perenco plc) and Congolaise des Hydrocarbures SARL	Kifuku, Kinkasi, Liawenda, Makelekese, Muanda, Nsiamfuma, and Tschiende onshore wells	5,480.
Do.	do.	Muanda International Oil Co. (subsidiary of Perenco plc), 50%; Teikoku Oil Co. Ltd., 32.3%; ODS Ltd., 17.7%	Mibale, Motoba, and Tshiala offshore wells	3,650.
Silver, mine	kilograms	Anvil Mining Congo SARL (Mawson West Ltd., 90%)	Dikulushi Mine[1] near Lake Mweru	60,000.
Do.	do.	do.	Kapulo Mine[1] near Kapulo	3,000.[e]
Stone, crushed		Chemaf SPRL (Shalina Resources Ltd.)	Kilimasimba quarry near Lubumbashi	440,000.
Sulfuric acid		Tenke Fungurume Mining SPRL	Plants at Tenke Fungurume Mine	760,000.
Do.		Ruashi Mining SPRL (Jinchuan Group, 75%)	Plant at Ruashi Mine	190,000.
Do.		Chemaf SPRL (Shalina Resources Ltd.)	Plant in Lubumbashi	170,000.
Do.		Mutanda Mining SPRL (Glencore plc, 69%, and Fleurette Properties Ltd., 31%)	Plant at Mutanda Mine in Lualaba Province	130,000.
Do.		La Générale des Carrières et des Mines SA (Gécamines)	Plant at Likasi	68,000.
Tin, mine		Artisanal and small-scale miners	Mines in Haut-Katanga Province	3,300[e] cassiterite.
Do.		do.	Mines in Tanganyika Province	2,900[e] cassiterite.
Do.		do.	Mines in Maniema Province	2,400[e] cassiterite.
Do.		do.	Mines in Nord-Kivu Province	2,300[e] cassiterite.
Do.		do.	Mines in Sud-Kivu Province	2,200[e] cassiterite.
Tungsten		Artisanal and small-scale miners	Mines in Maniema Province	80[e] wolframite.
Do.		do.	Mines in Sud-Kivu Province	75[e] wolframite.
Zinc		La Société pour le Traitement du Terril de Lubumbashi (STL) [Enterprise Générale Malta Forrest SPRL (EGMF), 70%, and La Générale des Carrières et des Mines SA (Gécamines), 30%]	Big Hill tailings treatment plant at Lubumbashi	15,000 zinc in zinc oxide.

[e]Estimated. Do., do. Ditto. NA Not available.
[1]Not operating at the end of 2016.
[2]Largest facilities listed; also several more small producers.