

# BURUNDI, COMOROS, MALAWI, MAURITIUS, REUNION, RWANDA, AND SEYCHELLES

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## BURUNDI

In recent years, Burundi, which is a small country in central Africa, has been known to produce columbium (niobium)-tantalum ore, gold, tin, and tungsten ore, most of which has been designated for export (table 1). The country has also produced kaolin, limestone, peat, and sand and gravel for domestic consumption. Additionally, Burundi has resources of cobalt, copper, feldspar, nickel, phosphate rock, platinum-group metals (PGMs), quartzite, rare-earth elements (REEs), uranium, and vanadium.

In 2002, Burundi's gross domestic product (GDP) amounted to about \$4.9 billion at purchasing power parity. The GDP increased by 4.5% in 2002 after rising by 2.2% in 2001 and falling by 1.1% in 2000 and 0.9% in 1999. In 2001, manufacturing accounted for 5% of the GDP; construction, 4%; and mining and energy, about 1% (International Monetary Fund, 2002, p. 7; 2003, p. 180; 2003a<sup>1</sup>, b§).

### Commodity Review

#### *Metals*

**Cobalt, Copper, and Nickel.**—In April, Argosy Minerals Ltd. lifted the force majeure on its operations in Burundi that had been in effect since April 2000. Argosy held exploration licenses for the Musongati, Nyabikere, and Waga nickel laterite deposits. The company had planned a feasibility study for the production of 45,000 metric tons per year (t/yr) of refined nickel, 7,500 t/yr of cobalt, and 2,500 t/yr of copper at Musongati. Argosy reevaluated the PGM potential at Musongati. In August, Argosy reimposed force majeure because of increasing instability in Burundi (African Mining, 2002a-c; Songore, 2002).

**Columbium (Niobium), Tantalum, and Tin.**—In the northern Provinces of Kayanza and Kirundo, Comptoirs Miniers de Burundi S.A. (COMEBU) mined deposits of columbium (niobium), tantalum, and tin. National output of columbium (niobium) and tantalum concentrates fell to 72,441 kilograms (kg) in 2002 from 122,537 kg in 2001; the value of production was about \$1.1 million. Tin production shut down in 2002 (table 1; Mathias Sebahene, Burundi Ministry of Energy and Mines, written commun., 2003).

In 2001, Burundi's exports of columbium (niobium) and tantalum concentrates amounted to 123,278 kg. COMEBU was the largest exporter, accounting for 45,211 kg; followed by Eagle Wings Resources International, 44,816 kg; ALCOMETAL, 19,038 kg; and others, 14,213 kg. At the end of 2000, at least 24 companies had been granted mining and trading licenses for columbium (niobium) and tantalum. In 2001, all but seven of the companies withdrew from the business because of falling tantalum prices (Songore, 2002).

**Gold.**—Artisanal miners have produced gold from alluvial deposits by labor-intensive methods. In 2002, Burundi's reported gold production amounted to 483 kg at a value of \$4.73 million. Interbee held a gold trading license; the company exported 415 kg of gold in 2001. Burundi Mining Corp. (BUMINCO) held an exclusive gold exploration/mining permit for the entire Province of Muyinga. Technical problems with a mineral processing pilot plant have prevented gold production; the company was seeking financing to develop the Muyinga gold project (Songore, 2002; Volkwyn, 2002; Mathias Sebahene, Burundi Ministry of Energy and Mines, written commun., 2003).

**Tungsten.**—BUMINCO's directors have been discussing the possibility of mining wolframite in Muyinga; Burundi has not produced tungsten since 1997 (Songore, 2002).

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

## **Industrial Minerals**

**Cement and Crushed Stone.**—International Cement Review (2003) estimated that Burundi's cement consumption increased to 50,000 metric tons (t) in 2002 from 40,000 t in 2001 and 30,000 t in 2000. All local cement demand was met through imports from Tanzania, Uganda, and Zambia. In recent years, domestic resources of dolomitic limestone have been used in lime production (Songore, 2002).

**Kaolin.**—Deposits of kaolin were found at Vyerwa and Matongo in western Burundi. Kaolin was mined by Extrafar and Fadi for use in pesticide. The Office des Cultures Industrielles du Burundi was the only domestic consumer of pesticide. The agency shifted to imported liquid pesticide from domestic powder pesticide; Extrafar and Fadi were driven out of business and kaolin mining ceased in 2001 (Songore, 2002).

## **Mineral Fuels**

**Peat.**—Domestic resources of peat were estimated to be 36 million metric tons (Mt), most of which were in the Akanyara Valley near Buyongwe (table 3). The state-owned Office National de la Tourbe was responsible for the production and distribution of peat. The largest consumers of peat were army barracks and jails (Songore, 2002).

**Petroleum.**—Burundi has no identified resources of coal, natural gas, or petroleum. The country does not have production facilities for petroleum products; all petroleum demand was met through imports. In 2001, consumption of petroleum products amounted to 48,093 t, compared with 50,647 t in 2000 and 39,888 t in 1997 (International Monetary Fund, 2002, p. 16).

## **Infrastructure**

The state-owned Regie de Production et Distribution d'Eau et d'Electricite was the only local electric utility. In 2002, installed capacity amounted to 33 megawatts (MW). In 2001, Burundi's power production rose to 107.8 gigawatthours (GWh) from 99.2 GWh in 2000; most power was generated from hydroelectric sources. From 1997 to 2001, the consumption of electricity rose to 108.8 GWh from 92.2 GWh. During the same period, industrial consumption fell to 43.5 GWh from 44.5 GWh. Imports were sourced from Congo (Kinshasa); the Governments of Burundi and Tanzania were planning to connect Burundi's grid with Kigoma in western Tanzania (International Monetary Fund, 2002, p. 16; Volkwyn, 2002).

Burundi's transportation network comprised about 14,500 kilometers (km) of highways, of which slightly more than 1,000 km was paved. The major waterway was Lake Tanganyika, which had a port at Bujumbura.

## **Outlook**

Economic growth was expected to be -0.5% in 2003 and 5.4% in 2004 (International Monetary Fund, 2003, p. 180). Strong GDP growth in 2004 may lead to increased demand for such local construction materials as gravel, limestone, and sand. The environmental problems of deforestation may lead to increased demand for peat for use as fuel and in the development of domestic phosphate rock resources to raise agricultural productivity. The outlook for columbium (niobium), gold, tantalum, and tin depends heavily upon the resolution of political instability and the global market; Burundi's domestic market is limited by severe poverty. Exploration and investment in nickel, REEs, and other undeveloped commodities depend upon the same factors.

Columbium (niobium) demand is driven primarily by the steel and aerospace industries. Global consumption of finished steel was predicted to increase by about 1.3% in 2003 and rise by 2.2% per year from 2004 to 2007. In 2003, tin demand was expected to rise and refined production to fall. Global tantalum demand was expected to decline until mid-2003, when the market would start to recover (Metal Bulletin, 2002, 2003; MEPS (International) Ltd., 2003§).

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## COMOROS

The Federal Islamic Republic of the Comoros is located on three main islands in the Mozambique Channel about two-thirds of the way between northern Madagascar and northern Mozambique. In 2002, the GDP of Comoros amounted to about \$970 million at purchasing power parity (International Monetary Fund, 2003a§, b§).

In recent years, political instability had a negative effect on the economy; in 2002, the GDP increased by 2.5% after rising by 1.9% in 2001 and falling by 1.1% in 2000. The unrest has had particularly severe effects upon the manufacturing and construction and public works sectors. In 2000, construction and public works accounted for about 6% of the GDP; manufacturing, 4%; and electricity, gas, and water, 2% (International Monetary Fund, 2001, p. 23; 2003, p. 180).

In 2002, the mineral industry of Comoros continued to be limited to the production of common construction materials, such as clay, sand and gravel, and crushed stone, for local consumption. The demand for cement, steel, and petroleum products was met through imports. International Cement Review (2003) estimated that cement consumption remained unchanged at 45,000 t. Geothermal energy resources are known to occur within the territory.

The outlook on minerals output was not expected to change significantly because Comoros has very limited natural resources. Domestic consumption of cement was expected to rise to 50,000 t in 2003. Import dependence and deforestation may lead to development of the country's geothermal resources. The International Monetary Fund (2003, p. 180) predicted that the GDP would increase by 2.5% in 2003 and 3.0% in 2004. The decision by the Anjouan Island to rejoin the Comoros union and the lifting of an embargo imposed by the Organization of African Unity were expected to have positive effects upon the economy (International Cement Review, 2003b; U.N. Integrated Regional Information Networks, 2002§).

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## MALAWI

In recent years, Malawi, which is a small country in southern Africa, has produced cement, coal, crushed stone for aggregates, dolomite, kaolin, lime, and limestone for domestic consumption (table 1). The country has been known to produce and export dimension stone, gemstones, and vermiculite. Malawi has deposits of bauxite, columbium (niobium), granite, graphite, kyanite, monazite, phosphate rock, pyrite, silica sand, titanium, and uranium.

In 2002, Malawi's GDP amounted to about \$8.8 billion at purchasing power parity. The GDP rose by 1.8% in 2002 after falling by 4.2% in 2001 and rising by 1.1% in 2000 and 4% in 1999. In 2000, manufacturing accounted for 11% of the GDP; construction, 2%; electricity and water, 1%; and mining and quarrying, 1% (International Monetary Fund, 2002, p. 58; 2003, p. 180; 2003a§, b§).

## Commodity Review

### Metals

**Aluminum and Bauxite.**—Millenium Mining Ltd. (a subsidiary of Malawi Minerals Ltd.) held an exclusive prospecting license for the bauxite deposits at Mulanje Mountain. Millenium was considering the development of an alumina refinery at the foot of the mountain. Capital costs of the refinery were expected to be \$157 million; revenues were expected to be about \$40 million per year. Millenium hoped to improve the economics of the project by increasing the size of the resource, using local coal, and negotiating

long-term sales and transportation agreements. The company was seeking funding from Aluminum Corporation of China (Moles, 2002b).

**Columbium (Niobium) and Tantalum.**—Maravi Mineral Development Ltd. (a locally owned company) explored for columbium (niobium) and tantalum in 2002. The company expected to receive financial assistance from the Centre for the Development of Enterprise in Brussels to evaluate three areas with columbium (niobium) and tantalum mineralization. The total resources of the deposits at Chirwa Island, Ilomba, and Tundulu were estimated to be nearly 1.38 Mt of ore containing 9,900 t of columbium (niobium) oxide (table 3; African Mining, 2002b).

**Platinum-Group Metals.**—Albidon Ltd. of Australia explored for PGMs in central and southern Malawi. Lisungwe Mineral Resources Ltd. (LMR), (subsidiary of Agricola Resources Ltd.) explored for PGMs in the Kirk Highlands. In December, Agricola decided to sell its share in LMR (Agricola Resources plc, 2002; Tassell, 2002b).

### *Industrial Minerals*

**Cement.**—In 2002, Malawi's cement production fell to 174,283 t from 180,761 t (table 1); the value of domestic cement output was \$10.27 million. In early 2002, Portland Cement Co. Ltd. and Shayona Cement Corp. were producing cement at the rate of 130,000 t/yr and 10,000 t/yr, respectively. National consumption of cement was estimated to be 190,000 t/yr; Zimbabwe was the primary source of Malawi's cement imports. Cement imports were sourced from Zimbabwe because the collapse in Zimbabwe's currency substantially reduced their cost (Maeresa, 2002§; A. Wona, Malawi Department of Mines, written commun., 2003).

**Crushed Stone.**—Malawi's output of aggregates fell to 155,731 t in 2002 from 594,979 t in 2001 (table 1). The value of aggregates produced in Malawi amounted to \$1 million; more than 10,000 were employed in the production of aggregates (Tassell, 2002b; A. Wona, Malawi Department of Mines, written commun., 2003).

Domestic limestone resources have been mined for cement and lime production. Shayona Cement operated a quarry in the Kasungu district. In November, Portland Cement closed its limestone quarry at Changanlume because resources were nearly depleted. Changanlume had been producing at the rate of 192,000 t/yr earlier in 2002 (Tassell, 2002b; Munthali, 2002§).

**Dimension Stone.**—Ilomba Granite of Blantyre opened a sodalite syenite dimension stone quarry at Ilomba Hill in the Chitipa District in the north. The company was working with an Italian joint-venture partner. Granite Ltd. opened a quarry for the production of an amazonite-bearing granite (Malunga, 2002; Tassell, 2002b).

**Gemstones.**—In 2001, mining for precious, semiprecious, and ornamental stones was reported to employ about 1,300 workers. The Government granted or renewed 131 nonexclusive prospecting licenses for semiprecious stones, and 79 reserved minerals licenses for precious and semiprecious stones. In 2002, Agricola planned to expand operations at the Chimwadzulu ruby mine in the Kirk Highlands. By December, however, the unprofitability of the mining operations led Agricola to seek a buyer for Chimwadzulu (African Mining, 2002a; Agricola Resources plc, 2002; Malawi Director of Mines, 2002, p. 2, 8).

**Lime.**—National lime production fell sharply in 2001 and 2002 (table 1) because of a scarcity of fuel wood. Artisanal lime production was a significant source of deforestation in Malawi, with 3 to 4 t of hardwood being burned to produce 1 t of lime. If the Kayelekera uranium mine were to be developed, then it would consume 6,000 t/yr of lime. The Kangankunde Project could serve as a source of byproduct lime (Malawi Director of Mines, 2002, p. 17; Saner, 2002; Tassell, 2002a, b).

**Rare Earths and Strontium.**—In 2002, Rift Valley Resource Developments was raising funds for a feasibility study on mining monazite and strontianite at Kangankunde. Rift Valley planned a three-stage production process; capital costs for the first, second, and third stages were estimated to be \$10 million, \$7.5 million, and \$20 million, respectively (Tassell, 2002c).

In the first stage, 360,000 t/yr of ore would be processed to produce 20,000 t/yr of strontium carbonate concentrate; monazite concentrates would be stockpiled. In the second stage, 6,000 t/yr of mixed rare-earth chloride would be produced from the monazite stockpile. In the third stage, a cerium separation plant would be built to separate cerium from the rare-earth chloride to produce cerium oxide and cerium carbonate. Annual revenues were expected to be \$18 million to \$48 million, depending upon the volume and type of products. Rift Valley also planned to separate and refine lanthanum oxide and other rare earths from the third stage tailings (Saner, 2002; Tassell, 2002c).

**Sulfur.**—The Kayelekera uranium project was expected to consume 16,000 t/yr of sulfuric acid. If Kayelekera were brought into production, then the pyrite deposits at Chisepo in the Dowa District and Malingunde in the Lilongwe District could serve as a source of sulfur for the project (table 3; Tassell, 2002a).

**Titanium and Zirconium.**—Millenium held exclusive prospecting licenses for the Lake Chilwa, Makanjila, and Salima mineral sands, which had a combined resource of more than 2,500 Mt (table 3). In 2002, Millenium concentrated most of its efforts upon the Makanjila sands on the eastern shore of Lake Malawi. Depending on the results of future exploration work, Millenium planned to build a mine at Makanjila and a mineral separation plant (MSP) at Chipoka with a capacity of nearly 550,000 t/yr. The MSP would

produce ilmenite concentrate as well as rutile and zircon products for export. Millennium was also exploring the possibility of building a smelter to convert the separated ilmenite to titania slag (Moles, 2002a).

In southern Malawi, resources at the Tengani deposit were estimated to be 108 Mt at a grade of 11% ilmenite, 2% rutile, and 1% zircon (table 3). In early 2002, the total value of Tengani's resources was estimated to be about \$2 billion. Crown Minerals was reported to have started mining at Tengani (Moles, 2002b; Tassell, 2002b).

In October, Rift Valley was reported to have a small-scale zircon project. The company had separated about 30 t of zircon by hand from sands (Saner, 2002).

**Vermiculite.**—In 2001, Crown Minerals of Lilongwe started vermiculite production at Feremu in the Mwanza District. Vermiculite was exported to South Africa and Zimbabwe. Resources of vermiculite were estimated to be 2.5 Mt at a grade of 10% vermiculite (tables 1, 3; Malawi Director of Mines, 2002, p. 4; Tassell, 2002b).

### **Mineral Fuels**

**Coal.**—In 2002, Coal Products Ltd. produced 41,867 t of bituminous coal from the Mchenga Mine; the value of bituminous coal production amounted to \$1.47 million. In late 2001, Mulanje Minerals Ltd. (a subsidiary of Malawi Minerals Ltd.) started producing lignite coal at the Mwabvi Mine. By November 2002, the mine was producing at the rate of 60,000 t/yr. Starting in 2003, production at Mwabvi was expected to increase to at least 200,000 t/yr. Capital expenditures of \$7.5 million from 2002 to 2008 would be necessary to develop the mine (Tassell, 2002b; Malawi Insider, 2002§; A. Wona, Malawi Department of Mines, written commun., 2003).

The majority of Mwabvi's output was likely to be exported; domestic coal consumption was estimated to be 100,000 t/yr. Malawi was an importer of coal in 2002, with imports amounting to 25,100 t at a value of \$1.18 million. If the Mulanje bauxite and the Makanjila titanium projects were developed, they would consume 250,000 t/yr of coal (Moles, 2002b; Malawi Insider, 2002§; National Statistical Office of Malawi, 2003b§, c§).

**Petroleum.**—Malawi has no identified resources of natural gas or petroleum. The country did not have production facilities for petroleum products; all petroleum demand was met through imports. In 2002, Malawi's imports of petroleum products amounted to 1.26 million 42-gallon barrels at a value of \$53.4 million (National Statistical Office of Malawi, 2003§b, §c).

**Uranium.**—In 2002, Paladin Resources Ltd. of Australia was seeking funding for a feasibility study on mining the Kayerekera uranium deposit in northern Malawi. Paladin planned to produce 1,000 t/yr of uranium oxide (U<sub>3</sub>O<sub>8</sub>); the mine was expected to have a life of at least 10 years. Revenue during the 10-year period was expected to be \$336.5 million, compared with operating costs of \$213.8 million and capital costs of \$41 million. The company's projections were based on a price of \$15 per pound for U<sub>3</sub>O<sub>8</sub>. Depending upon the results of the study and Paladin's ability to obtain funding, production could start as early as July 2005 (Tassell, 2002a).

### **Infrastructure**

In 2002, the production of electricity increased to 1,156.4 GWh from 1,107.2 GWh in 2001 and 940 GWh in 1997. From 1997 to 2002, sales of electricity increased to 930.2 GWh from 789.1 GWh. Domestic sales accounted for more than 99% of total sales; the remainder was exported to Mozambique (National Statistical Office of Malawi, 2003§a).

Malawi had about 28,400 km of roads, of which approximately 5,300 km was paved; the rail network covered nearly 800 km. Railways were managed by the Mozambican railway company CFM/SDCN. Waterways included Lake Malawi and the Shire River.

### **Outlook**

Because most output of Malawi's minerals industry was for local consumption in 2002, the short-term outlook for most currently produced minerals depends on the state of the domestic economy. The International Monetary Fund (2003, p. 180) predicted that Malawi's economy would grow by 6.5% in 2003 and by 5.2% in 2004. High rates of economic growth could increase demand for cement, limestone, sand and gravel, and other construction materials.

The outlook for many of Malawi's undeveloped mineral commodities is tied to strong global demand, because severe poverty limits domestic markets for bauxite, columbium (niobium), REEs, tantalum, titanium, and uranium. Demand for titanium oxide pigment is expected to increase by 3% per year from 2002 to 2006. However, increases in supply from new projects are likely to offset the rise in demand. Global nuclear generating capacity was expected to increase from 352.6 gigawatts (GW) in 2001 to 368.4 GW in 2005 and 381.8 GW in 2010 (Gambogi, 2002, p. 79.6; U.S. Energy Information Administration, 2003, p. 102). More information on the global market outlook on columbium (niobium) and tantalum can be found in the section on Burundi.

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## MAURITIUS

The Republic of Mauritius is about 1,000 km east of Madagascar. In recent years, Mauritius has produced basalt construction stone, coral sand, lime from coral, semimanufactured steel, and solar-evaporated sea salt. Local companies also cut imported diamond.

In 2002, the GDP of Mauritius amounted to about \$15.5 billion at purchasing power parity. The GDP increased by 4% in 2002 after rising by 7.2% in 2001, 2.6% in 2000, and 5.3% in 1999. Manufacturing accounted for about 21% of the GDP; construction, 5%; and electricity, gas, and water, 2%. The mining and quarrying industry was a negligible factor in the economy (International Monetary Fund, 2002, p. 38; 2003, p. 180; 2003a§, b§).

Steel reinforcing bars (rebar) and welded mesh were made from imported ingot at three rolling mills. In 2002, production rose to 48,700 t from 48,000 t in 2001 and 46,000 t in 2000 (table 1). Consolidated Steel Ltd. was the largest producer, accounting for more than 75% of national output in 1999 and 2000. The plant has been operating at about 40% of its rated capacity of 85,000 t/yr (Metal Bulletin, 2000).

United Basalt Products (UBP) was the largest supplier of building products in Mauritius. UBP produced about 660,000 t/yr of aggregate from crushed basalt at La Mecque. The company operated a total of 13 crushing plants in Mauritius, Madagascar, and Sri Lanka.

International Cement Review (2003) estimated that domestic consumption of cement increased to 680,000 t in 2002 from 670,000 t in 2001 and 650,000 t in 2000. All the country's cement was imported, mainly from Asian or Middle Eastern countries.

Mauritius Chemical and Fertilizer Industry Ltd. was the country's only producer of fertilizers. In 2002, fertilizer production rose to 90,600 t from 83,000 t in 2001 and 83,700 t in 2000 (table 1). Small amounts of potassic fertilizers were also imported.

Mauritius has no identified resources of fossil fuels. Imports of coal increased to 347,400 t in 2001 from 259,500 t in 2000 and 80,100 t in 1990. Gamma Civic Ltd. operated an asphalt plant; the demand for all other petroleum products was met through imports. In fiscal year 2000-01, the value of imported petroleum products amounted to nearly \$220 million (International Monetary Fund, 2002, p. 74).

The country's effective plant capacity increased to 513.9 MW in 2001 from 370 MW in 1997. During the same period, production by the Central Electricity Board (CEB) fell to 946.9 GWh from 1,103.5 GWh. Fossil fuels and hydroelectric power sources provided 95.7% and 4.3%, respectively, of national production in 2001. From 1997 to 2001, energy purchased from sugar and other factories increased to 710.2 GWh from 148.3 GWh. The Government planned to privatize the CEB in March 2003 (Africa Energy Intelligence, 2002a; International Monetary Fund, 2002, p. 50).

The economy of Mauritius is likely to continue to grow steadily in the near future. The International Monetary Fund (2003, p. 180) predicted that the GDP would increase by 3.3% in 2003 and by 5.5% in 2004. In the short run, the growth in the minerals sector is likely to be restricted to construction materials. Cement consumption was expected to rise by 4% to 6% per year from 2003 to 2007

(International Cement Review, 2003). Offshore oil exploration has been inconclusive, and polymetallic nodules on the ocean floor are unlikely to be developed in the foreseeable future.

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## REUNION

Reunion, which is an overseas department of France, is about 650 km east of Madagascar. Production of mineral commodities represented only a small part of the economy of Reunion, although little quantitative information was available.

Reunion imported small amounts of salt and potassic fertilizers. Hydraulic cement was made by grinding imported clinker. The Ciments de Bourbon S.A. cement grinding plant at Le Port (owned by Holcim Ltd.) had a capacity of 400,000 t/yr. International Cement Review (2001) estimated that Reunion's cement production was 400,000 t/yr in 2000 and 2001, which was an increase compared with 380,000 t/yr in 1998 and 1999. Imports, which were mainly clinker, were estimated to be 540,000 t in 2001 and 520,000 t in 2000. Additionally, production of volcanic rock and seacoast coral continued to meet local construction needs. Little change in future mineral activity is anticipated.

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## RWANDA

In recent years, Rwanda's mineral industry has produced gold ores and concentrates of columbium (niobium)-tantalum, tin, and tungsten, most of which has been designated for export. This small country in central Africa has also produced cement, sapphire, and small quantities of natural gas (table 1). Rwanda was also known to have deposits of beryllium, kaolin, and peat.

In 2002, Rwanda's GDP amounted to about \$8.3 billion at purchasing power parity. The GDP grew by 9.4% in 2002 after rising by 6.7% in 2001, 6% in 2000, and 7.6% in 1999. The per capita income at purchasing power parity was \$900. In 2001, manufacturing accounted for 10% of the GDP; construction, 9%; mining and quarrying, 2%; and electricity, gas, and water, less than 1% (International Monetary Fund, 2002, p. 4; 2003, p. 180; 2003a§, b§).

In July, the Governments of Rwanda and Congo (Kinshasa) signed a peace agreement that called for the withdrawal of all Rwandan military forces from Congolese territory in return for a pledge from the Government of Congo (Kinshasa) to disarm and return the Interahamwe militia to Rwanda. In October, the United Nations Security Council issued a report that accused Rwandan Government officials, military officers, and businessmen of illegally exploiting columbium, diamond, gold, and tantalum from Congo (Kinshasa) to enrich themselves and finance their country's military presence in Congo (Kinshasa). The Rwandan Government denied the accusations. Others accused of taking advantage of the war in Congo (Kinshasa) to exploit Congolese mineral resources included Ugandan military officers and businessmen, rebel forces that operated in Congo (Kinshasa), a network of Congolese and Zimbabwean commercial, military, and political interests, and Lebanese diamond traders that were alleged to have ties with Hezbollah (Mining Journal, 2002; United Nations Security Council, 2002, p. 5-12,14-23).

## Commodity Review

### Metals

**Columbium (Niobium) and Tantalum.**—COPIMAR (a group of many small miners' cooperatives) and Régie d'Exploitation et de Développement des Mines (REDEMI) produced ores of columbium (niobium), tantalum, tin, and tungsten. Columbite-tantalite was produced from numerous mines near Gikongoro, Kamonyi (in the Province of Gitarama), Kayenzi, Kibongo, Shyorongi, and Taba. Concentrating facilities were located at Gatumba. In July, the Metal Processing Association (MPA) of Rwanda announced plans to produce nearly 150 t/yr of tantalum oxide from tin slags and upgraded ores from its tin mine in Gisenyi (Ryan's Notes, 2002).

In 2002, falling prices for columbite-tantalite caused output to decline; output was one-sixth of the level reached in 2000. Exports of columbite-tantalite concentrates amounted to 1,082 t at a value of nearly \$14 million. Columbite-tantalite accounted for 21% of total exports in 2002, compared with 45% in 2001 and 3% in 1997 (Banque Nationale du Rwanda, 2003).

**Tin.**—The MPA operated a tin mine at Gisenyi; cassiterite was also mined at Gatumba and Shyorongi. REDEMI operated a cassiterite processing facility at Rutongo. In 2002, tin output rose to 197 t from 169 t in 2001. Rwanda's exports of cassiterite were 669 t at a value of about \$1.4 million, or 2% of total exports (Banque Nationale du Rwanda, 2003b; Bikoro Munyanganizi, Rwanda Ministry of Infrastructure, written commun., 2003).

In July, the MPA was in the process of commissioning its tin smelter at Gisenyi. The smelter had a capacity of 200 t/yr; full production was expected in August (Ryan's Notes, 2002).

**Tungsten.**—Wolframite was mined at Shyorongi. In 2002, tungsten production rose to 153 t from 142 t in 2001 and 108 t in 1998 (table 1). National exports of wolframite amounted to 324 t at a value of about \$500,000, or nearly 1% of total exports (Banque Nationale du Rwanda, 2003b).

### **Industrial Minerals**

**Cement.**—Cimenterie du Rwanda (Cimerwa) was Rwanda's only producer of cement; production increased to 83,024 t in 2001 from 70,716 t in 2000 and 42,452 t in 1996. In late 2002, local demand for cement was unusually high during Cimerwa's annual shutdown for plant maintenance. Rwanda imported cement from other countries in the Common Market for Eastern and Southern Africa (International Monetary Fund, 2002d, p. 10; Rwanda National Assembly, 2003§).

**Gemstones.**—Alluvial deposits of sapphire were found in the Cyangugu District in southwestern Rwanda. Small amounts of sapphire were mined by labor-intensive methods.

### **Mineral Fuels**

**Natural Gas.**—Rwanda had resources of natural gas under Lake Kivu. Natural gas production fell by nearly 40% in 2001 after increasing by 1.5% in 2000 (table 1); inadequate infrastructure has inhibited plans to increase industrial consumption of natural gas. In 2002, Israel Electric Company was conducting a preliminary study on using natural gas to fuel a power station with a capacity of 25 MW. Gisenyi Electric and Gas Company planned to build a gas-fired power station with an initial capacity of 2.5 MW that would increase to 10 MW (Africa Energy Intelligence, 2002).

**Petroleum.**—Rwanda has no identified resources of coal or petroleum. The country did not have production facilities for petroleum products; all petroleum demand was met through imports. In 2002, imports of energy products amounted to about 93,000 t at a value of \$38 million; energy imports accounted for 15% of Rwanda's total imports (Banque Nationale du Rwanda, 2003a).

### **Infrastructure**

In 2001, Rwanda's production of electricity was 89.27 GWh compared with 110.84 GWh in 2000 and 72.16 GWh in 1996. From 1996 to 2001, imports increased to 121.5 GWh from 82.58 GWh. Hydroelectric sources provided most of Rwanda's electricity. Natural gas resources under Lake Kivu were estimated to be able to support powerplants with a capacity of 200 MW to 700 MW (Africa Energy Intelligence, 2002b; International Monetary Fund, 2002d, p. 11).

Rwanda's transportation network comprised about 12,000 km of roads, of which 1,000 km was paved. Lake Kivu was navigable by shallow-draft barges and native craft. Transportation costs are among the highest in Africa.

The International Monetary Fund (2003, p. 180) predicted that Rwanda's GDP would grow by 3.2% in 2003 and 6% in 2004; the improving economic situation may lead to increased consumption of construction materials. The severe environmental problems caused by deforestation may lead to the development of domestic peat and natural gas resources. The outlook for Rwanda's mineral industry depends on the resolution of political instability and favorable world market conditions for columbium (niobium), gold, tantalum, tin, and tungsten. More information on the global market outlook on columbium (niobium), tantalum and tin can be found in the section on Burundi.

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## SEYCHELLES

The Republic of Seychelles is a group of 40 granitic and 50 or more coralline islands that are northeast of Madagascar in the Indian Ocean. In 2002, the GDP of Seychelles amounted to about \$820 million at purchasing power parity. The GDP rose by 0.3% in 2002 after falling by 2.2% in 2001, and rising by 4.8% in 2000. In 2001, mining, manufacturing, and handicrafts accounted for about 14% of the GDP; building and construction, 9%; and electricity and water, about 2% (Central Bank of Seychelles, 2003, p. 88; International Monetary Fund, 2003, p. 180; 2003a§, b§).

Mineral production in Seychelles consisted mostly of production of such construction materials as clay, coral, sand, and stone. Gondwana Granite mined local granite resources; the production of granite dimension stone in Seychelles amounted to 54,788 t in 2000 and 6,044 t in 2001. Civil Construction Company Ltd. and United Concrete Products of Seychelles produced crushed rock, gravel, and sand. In 2001, the reported production of gravel and crushed rock increased by 19%, and sand output fell by nearly 33%. Cement requirements were met from imports, which were estimated to be 45,000 t in 2002 (International Cement Review, 2003; Mamy Razanajatovo, Seychelles Ministry of Industries and International Business, written commun., 2002).

In 2001, imports of mineral fuels amounted to \$60 million, which was 16% of total imports. The production of electricity for the first three quarters of 2002 was 170 GWh compared with 157 GWh for the same period in 2001 (Central Bank of Seychelles, 2003, p. 83).

The International Monetary Fund (2003, p. 180) predicted that the GDP of Seychelles would decline by 5.1% in 2003 and by 2% in 2004. The short-term outlook for mineral production is for little change. Seychelles has modest natural resources, and any newly discovered resources of petroleum and natural gas could not be exploited immediately.

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TABLE 1

BURUNDI, MALAWI, MAURITIUS, REUNION, RWANDA, AND SEYCHELLES: PRODUCTION OF MINERAL COMMODITIES<sup>1</sup>

(Metric tons unless otherwise specified)

Country and commodity	1998	1999	2000	2001	2002	
<b>BURUNDI</b>						
Clays, kaolin	3,500	1,597	1,500	--	-- <sup>e</sup>	
Columbite-tantalum, mine output, ore (32% Ta <sub>2</sub> O <sub>5</sub> ):						
Gross weight	kilograms	30,840	42,149	31,175	122,537	72,441
Ta <sub>2</sub> O <sub>5</sub> content	do.	9,200	12,600	10,013	39,359	17,676
Gold, mine output, Au content	do.	--	--	--	415	483
Lime <sup>e</sup>		50	50	-- <sup>2</sup>	--	--
Peat <sup>3</sup>		11,000	20,000	4,088	6,816 <sup>r</sup>	6,977
Tin, mine output, Sn content		9	18	7	4	--
<b>MALAWI<sup>4</sup></b>						
Cement, hydraulic		134,000	186,500	155,920	180,761 <sup>r</sup>	174,283
Coal:						
Bituminous		54,200	43,800	34,250	34,410	41,867
Lignite		--	--	--	--	40,000 <sup>e</sup>
Dolomite		1,100 <sup>e</sup>	1,200 <sup>e</sup>	--	49 <sup>r</sup>	4,394
Gemstones	kilograms	934	649	16,390	16,500 <sup>e</sup>	16,500 <sup>e</sup>
Kaolin		NA	NA	719	825	636
Lime		2,600	2,900	21,886	3,580 <sup>r</sup>	1,241
Sodium silicate		750	803	1,538	--	--
Stone:						
Crushed for aggregate		283,055	111,095	80,780	594,979	155,731
Dimension, crude and partly worked		NA	NA	78	483 <sup>r</sup>	130
Limestone, for cement <sup>e</sup>		171,900 <sup>2</sup>	171,900 <sup>2</sup>	144,000	167,000	175,000
Vermiculite		NA	NA	--	1	100 <sup>e</sup>
<b>MAURITIUS<sup>5</sup></b>						
Fertilizers		83,200	85,300	83,700 <sup>r</sup>	83,000 <sup>r</sup>	90,600
Iron and steel, semimanufactures		44,300	45,000	46,000 <sup>r</sup>	48,000	48,700
Salt, sea		6,200	7,435	6,000	6,000 <sup>e</sup>	6,000 <sup>e</sup>
Sand, coral <sup>e</sup>		437,000	450,000 <sup>2</sup>	400,000 <sup>2</sup>	410,000 <sup>r</sup>	300,000 <sup>e</sup>
<b>REUNION<sup>6</sup></b>						
Cement <sup>e</sup>		380,000 <sup>2</sup>	380,000 <sup>2</sup>	400,000	400,000	400,000
<b>RWANDA<sup>7</sup></b>						
Cement		58,929	66,291	70,716	83,024	83,000 <sup>e</sup>
Columbite-tantalite, ore and concentrate:						
Gross weight	kilograms	224,000	147,000	561,000	241,000	96,000
Nb content	do.	70,500	46,200	176,000	75,800	43,200
Ta content	do.	47,300	31,000	118,000	50,900	24,000
Gold, mine output, Au content	do.	17	10	10	10 <sup>e</sup>	10 <sup>e</sup>
Natural gas, gross	million cubic meters	855	1,353	1,373	828	830 <sup>e</sup>
Tin, mine output, Sn content		187	248	276	169 <sup>r</sup>	197
Tungsten, mine output, W content		109	41	108	142 <sup>r</sup>	153
<b>SEYCHELLES</b>						
Dimension stone, granite		NA	NA	54,788	6,044	6,000 <sup>e</sup>
Gravel and crushed rock		NA	NA	81,400	96,819	97,000 <sup>e</sup>
Sand		NA	NA	12,053	8,128	8,100 <sup>e</sup>

<sup>e</sup>Estimated. <sup>r</sup>Revised. NA Not available. -- Zero.<sup>1</sup>Includes data available through September 22, 2003.<sup>2</sup>Reported figure.<sup>3</sup>Reported on the basis of fiscal year starting on May 1.<sup>4</sup>In addition to commodities listed, modest quantities of salt and unlisted varieties of crude construction materials (clays, sand and gravel, and other stone) may also be produced, but information is inadequate to make reliable estimates of output levels.<sup>5</sup>In addition to the commodities listed, asphalt, basalt, and lime are also known to be produced, but information is inadequate to make reliable estimates of output levels.<sup>6</sup>In addition to the commodity listed, coral and volcanic rock are also known to be produced, but information is inadequate to make reliable estimates of output levels.<sup>7</sup>In addition to the commodities listed, sapphire and pozzolanic materials are also known to be produced, but information is inadequate to make reliable estimates of output levels.

TABLE 2  
BURUNDI, MALAWI, MAURITIUS, REUNION, AND RWANDA: STRUCTURE OF THE MINERAL INDUSTRIES IN 2002

(Metric tons unless otherwise specified)

Country and commodity	Major operating companies	Location of main facilities	Annual capacity
<b>BURUNDI</b>			
Cement	Burundi Cement Plant <sup>1</sup>	Bujumbura	20,000 mill.
Columbium (niobium) and tantalum	Comptoirs Miniers de Burundi S.A. (COMEBU)	Kayanza and Kirundo Provinces	NA.
Gold	Burundi Mining Co. <sup>2</sup>	Masaka	18,300 ore processing.
Do. kilograms	do.	do.	33 gold.
Peat	Office National de la Tourbe	Highland Bogs	20,000.
Tungsten	COMEBU <sup>3</sup>	do.	25.
<b>MALAWI</b>			
Cement	Portland Cement Co.	Blantyre	288,000 mill.
Do.	do.	Changalume	180,000 kiln.
Do.	Shayona Cement Corp.	Livwezi	37,000.
<b>Coal:</b>			
Bituminous	Coal Products Ltd.	Mchenga	35,000. <sup>e</sup>
Lignite	Mulanje Minerals Ltd.	Mwabvi	60,000.
Dimension Stone	Ilomba Granite of Blantyre	Ilomba Hill	NA.
Fertilizers	Optichem Ltd.	Blantyre	40,000.
Limestone	Portland Cement Co. <sup>4</sup>	Changalume	192,000. <sup>e</sup>
Do.	Shayona Cement Corp.	Kasungu Province	NA.
Vermiculite	Crown Minerals	Feremu	NA.
<b>MAURITIUS</b>			
Aggregates	United Basalt Products	La Mecque	660,000. <sup>e</sup>
Fertilizers	Mauritius Chemical and Fertilizer Industry Ltd.	Port Louis	100,000.
Steel	Consolidated Steel Ltd.	do.	85,000 rebar.
<b>REUNION</b>			
Cement	Ciments de Bourbon SA	Bourbon	400,000 mill.
<b>RWANDA</b>			
Cement	Cimenterie du Rwanda	Cyangugu	80,000 mill; 65,000 kiln.
Columbium (niobium) and tantalum	Regie d'Exploitation et de Developpment des Mines (REDEMI)	Gikongoro, Kamonyi, Kayenzi, Kibongo, Shyorongi, and Taba	NA.
<b>Tin:</b>			
Mine	Metal Processing Association	Gisenyi	NA.
Refined	do.	do.	200.
Tungsten	REDEMI	Shyorongi	NA.

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

<sup>1</sup>Has not operated since 1996.

<sup>2</sup>Not operational in 2002.

<sup>3</sup>Has not operated since 1997.

<sup>4</sup>Closed in late 2002.

TABLE 3  
BURUNDI, MALAWI, AND RWANDA: MINERAL RESOURCES IN 2002<sup>1</sup>

Commodity	Deposit	Tonnage	Grade	Mineral content
<b>BURUNDI</b>				
Cobalt, copper, and nickel	Musongati	184.7 Mt	1.31% Ni; 0.08% Co; 0.17% Cu	2.42 Mt Ni; 150,000 t Co; 310,000 t Cu.
Do.	Nyabikere	46 Mt	1.45% Ni; 0.031% Co; 0.012% Cu	670,000 t Ni; 14,000 t Co; 5,500 t Cu.
Do.	Waga	35 Mt	1.38% Ni; 0.048% Co; 0.028% Cu	480,000 t Ni; 17,000 t Co; 9,800 t Cu.
Feldspar	Kayanza	0.73 Mt	NA	NA.
Gold	Various deposits in Muyinga Province <sup>2</sup>	NA	NA	60 t.
Kaolin	Vyerwa	16 Mt	NA	NA.
Do.	Matongo	2.7 Mt	NA	NA.
Limestone	do.	1 Mt	NA	NA.
Peat	Akanyuru Valley	NA	NA	36 Mt.
Phosphate rock	Matongo Region	17.3 Mt	11.1% P <sub>2</sub> O <sub>5</sub>	1.92 Mt.
Rare earths	Gakara	NA	NA	5,000 t.
Silica sand	Ngozi	5.7 Mt	98.3% SiO <sub>2</sub>	NA.
Vanadium	Mukanda	9.7 Mt	0.63% V	61,000 t.
<b>MALAWI</b>				
Bauxite	Mulanje Mountain	25.6 Mt	43.3% Al <sub>2</sub> O <sub>3</sub>	11.1 Mt Al <sub>2</sub> O <sub>3</sub> .
Coal	Ngaga	15 Mt	NA.	NA.
Do.	Mwabvi	4.7 Mt	NA.	NA.
Do.	Livingstonia (Mchenga Mine)	2 Mt	NA.	NA.
Columbium (niobium)	Tundulu	0.9 Mt	0.37% Nb <sub>2</sub> O <sub>5</sub>	3,300 t Nb <sub>2</sub> O <sub>5</sub> .
Do.	Chilwa Island	0.38 Mt	0.95% Nb <sub>2</sub> O <sub>5</sub>	3,600 t Nb <sub>2</sub> O <sub>5</sub> .
Do.	Ilonga Hill	0.1 Mt	3% Nb <sub>2</sub> O <sub>5</sub>	3,000 t Nb <sub>2</sub> O <sub>5</sub> .
Graphite	Katengeza	2.7 Mt	5.83% C	140,000 t C.
Kaolin	Linthipe	14.1 Mt	33.8% Al <sub>2</sub> O <sub>3</sub>	NA.
Limestone	Malowa Hill	4.08 Mt	52% CaO	NA.
Marble	do.	3.7 Mt	36.21% CaO	NA.
Strontium and rare earths	Kangankunde	11 Mt	8% Sr; 2% REE	880,000 t Sr; 220,000 t REE.
Phosphate rock	Tundulu	2 Mt	17% P <sub>2</sub> O <sub>5</sub>	340,000 t.
Pyrite	Chisepo	34 Mt	8% S	2.7 Mt.
Silica sand	Lake Chilwa	25 Mt	92.7% SiO <sub>2</sub>	NA.
Do.	Mchinji	1.6 Mt	97.2% SiO <sub>2</sub>	NA.
Titanium	Makanjila	1000 Mt	NA	NA.
Do.	Lake Chilwa	1000 Mt	7% ilmenite; 0.52% zircon	70 Mt ilmenite; 5.2 Mt zircon.
Do.	Salima	500 Mt	8.4% ilmenite; 0.35% rutile; 0.28% zircon	42 Mt ilmenite; 1.75 Mt rutile; 1.4 Mt zircon.
Do.	Tengani	108 Mt	11% ilmenite; 2% rutile; 1% zircon	11.9 Mt ilmenite; 2.2 Mt rutile; 1.1 Mt zircon.
Uranium	Kayelakera	7.7 Mt	0.15% U <sub>3</sub> O <sub>8</sub>	11,600 t U <sub>3</sub> O <sub>8</sub> .
Vermiculite	Mwanza District	2.5 Mt	10% vermiculite	250,000 t.
<b>RWANDA</b>				
Natural gas		57 billion cubic meters	NA	NA.

NA Not available.

<sup>1</sup>Abbreviations used in this table for commodities include the following: Al<sub>2</sub>O<sub>3</sub>--aluminum oxide; C--carbon; CaO--calcium oxide; Co--cobalt; Cu--copper; Nb<sub>2</sub>O<sub>5</sub>--columbium (niobium) oxide; Ni--nickel; P<sub>2</sub>O<sub>5</sub>--phosphorous pentoxide; REE--rare-earth element; S--sulfur; SiO<sub>2</sub>--silicon dioxide; Sr--strontium; U<sub>3</sub>O<sub>8</sub>--uranium oxide; and V--vanadium. Abbreviations used in this table for units of measurement include the following: Mt--million metric tons; and t--metric tons.

<sup>2</sup>Includes Masaka, which has resources of 8 Mt at a grade of 1.8 grams per metric ton (g/t) gold.

Sources: Burundi Ministry of Energy and Mines, 1991; Malawi Ministry of Energy and Mining, 1997; Songore, 1998, 1999; Radler, 2001; Malunga, 2002; Moles 2002a, b; Tassell, 2002a.