

DJIBOUTI, ERITREA, ETHIOPIA, AND SOMALIA

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DJIBOUTI

In recent years, Djibouti, which is a small east African country, has been known to occasionally produce small quantities of clays, granite, limestone, marble, salt, and sand and gravel. Other mineral occurrences of potential economic interest included diatomite, geothermal fluids and mineral salts, gold, gypsum, perlite, petroleum, and pumice.

In 1999, Djibouti's gross domestic product (GDP) amounted to about \$550 million at purchasing power parity, which was an increase of about 2% compared with that of 1998. The per capita income at purchasing power parity was \$1,200 in 1999. Industry accounted for about 20% of the GDP (U.S. Central Intelligence Agency, 2000a).

Lake Assal is the source for the country's production of mineral salts. Other minerals found in the Lake Assal area include diatomite (near Hanle, at Karkerou, and near Tikible) and gypsum. The Ali Sabieh region is the source of Djibouti's clay, limestone, and pumice deposits (Indian Ocean Newsletter, 1993). Perlite deposits in the volcanic region of Egerleta were estimated to have resources of at least 48 million metric tons (Mt) (U.S. Embassy, Djibouti, Djibouti, 1995).

In 2000, the Government of Djibouti announced its intention to contribute 20% of the cost for a new cement plant; a private foreign investor would cover the remaining 80% (Bouh and Haid, 2000, p. 9). In 2000, Djibouti imported all its cement. The International Cement Review (2001a) estimated that the country's cement consumption was 70,000 metric tons (t) in 2000.

Numerous geothermal areas are found in Djibouti. Exploration work has taken place in the Lake Abbe area on the border between Djibouti and Ethiopia, the Arta area north of the Arta Mountains, the Assal area between Lake Assal and Tadjura Bay, the Gaggade Plain, and the Hanle Plain near Yoboki. Other geothermal areas include the Dorra, the Obock, and the Tadjura areas (Jonsson, 1985).

In 1998, Djibouti consumed about 4.1 million barrels (Mbbl) of petroleum products. The country produced 177 gigawatt-hours (GWh) of electricity, which was generated at diesel-fired plants (U.S. Central Intelligence Agency, 2000a). A joint venture between Geothermal Development Associates of Nevada and Electricité de Djibouti will create a 30-megawatt (MW) geothermal plant to exploit geothermal fluids near Assal (U.S. Department of State, October 25, 2000, Sustainable development projects approved for Africa, Latin America, accessed March 26, 2001, at URL <http://www.usinfo.state.gov/regional/af/trade/10102604.htm>).

Djibouti's transportation network comprised about 2,900 kilometers (km) of roads, of which nearly 400 km was paved. Ethio-Djibouti Railway Co. (jointly owned by Djibouti and

Ethiopia) planned to rehabilitate the railway between Djibouti and Addis Ababa. This project received financial support from the European Union and the World Bank; completion was expected in 2004. In June 2000, the Dubai Ports Authority won the contract to manage Djibouti Port on the Red Sea for 20 years; it planned to more than double the port's handling capacity (MBendi Information Services, 2000, Djibouti—Oil and gas industry—Overview, accessed January 8, 2001, at URL <http://www.mbendi.co.za/indy/oilg/af/dj/p0005.htm>).

The outlook for Djibouti's mineral industry is favorable, although growth will be constrained by small domestic markets and modest natural resources.

ERITREA

In recent years, the east African country of Eritrea produced a variety of minerals, rocks, and semimanufactured goods, which included basalt, cement, common clay, kaolin, coral, gold, granite, gravel, gypsum, lime, limestone, marble, pumice, quartz, salt, sand, and silica sand (table 1). The country also produced refined petroleum products. Eritrea exported and transshipped minerals to landlocked Ethiopia.

The war between Eritrea and Ethiopia continued until June 18, when the two countries signed a cessation of hostilities agreement and agreed to return to peace talks. The war took a heavy toll upon the Eritrean economy; the World Bank (2000a, p. 5) estimated that war damage amounted to 90% of the 1999 GDP. Other damage included the loss of port revenues, which declined by two-thirds owing to the loss of transshipment trade with Ethiopia. The loss of trade with Ethiopia also caused exports to decline by 63%. In October 2000, the World Bank (2000a, p. 5-6) predicted that GDP for 2000 would be down by 9.5%.

In 1999, Eritrea's GDP amounted to about \$2.9 billion at purchasing power parity. The per capita income at purchasing power parity was \$750 in 1999 (U.S. Central Intelligence Agency, 2000b). The International Monetary Fund (2000, p. 24) estimated that manufacturing accounted for 8% of GDP in 1999; construction, 9%; and mining and quarrying, less than 1%.

The war with Ethiopia has discouraged growth in the Eritrean minerals sector. Although artisanal gold production continued in the areas south and southwest of Asmara, plans for commercial levels of gold production had to be put on hold. The war forced Nevsun Resources Ltd. to suspend operations on its gold exploration projects. Tan Range Exploration Corp. of Canada abandoned the Asmat, the Erota, and the Melebesc concessions. The Augaro gold property in western Eritrea [owned by Anglo American Prospecting Services (Proprietary) Ltd. of South Africa and Rift Resources Ltd. of Canada] was

overrun by Ethiopian military forces (Rift Resources Ltd., 2000). The war also forced Rift Resources to suspend work on the Adi Nefas project.

Eritrea has considerable resources of copper, gold, and zinc at Adi Nefas. The Adi Nefas Doop gold deposit was estimated to have resources of 2.9 Mt at a grade of 3.1 grams per ton (g/t) gold. The Adi Nefas polymetallic massive sulfide deposit was estimated to have a resource of 1.4 Mt at a grade of 9.3% zinc, 0.95% copper, 3.28 g/t gold, and 129 g/t silver (Maiden Gold NL, 2000, Eritrean base metals deal signed with Phelps Dodge, accessed March 30, 2001, at URL <http://www.maiden.com.au/files/qrtsep00.html>).

Other significant deposits of copper, gold, and zinc included Adi Rassi, Debarwa, and Emba Derho. In late 2000, Australia's Maiden Gold NL and Hong Kong's Africa Wide Resources Ltd. signed an agreement with Phelps Dodge Corp. for the acquisition of an 80% stake in the Debarwa and the Medrizien (which included Emba Derho) exploration licenses and other deposits west of Asmara (Africa Mining Intelligence, 2001). As part payment for the Eritrean properties, Phelps Dodge will receive 4 million shares of Maiden's stock. Phelps Dodge has identified resources of 1.65 Mt of ore at a grade of 5.1% copper and 1.4 g/t gold at Debarwa. It also indicated that probable additional resources at Debarwa amount to 1.3 Mt and contain zinc and silver, as well as gold and copper. The Emba Derho deposit has resources of 2.5 Mt at a grade of 2.36% zinc (Africa Mining Intelligence, 2000).

Eritrea also has deposits of chromium, iron, lead, magnesium, and nickel. Garnierite-chromite-magnesite-asbestos deposits that contain nickel are known to occur in northern Eritrea near the Shamege River. Large iron deposits are known to exist in several areas of the country—Agametta-Sabub, the Eritrean highlands, Ghedem (iron-manganese), Mount Tullului, Taereshi, and Woki Defere (Eritrean Ministry of Energy and Mines, 1997, p. 7).

The World Bank (1994, p. 43) indicated that Eritrea has resources of barite, feldspar, and kaolin. Deposits of barite were found in Debarwa, Gharsa Wadis, Heneb, Ketina, and Meter. Barite veins also occur associated with the faults in the sediments of the Dogali and the Desset series. The World Bank estimated Eritrea's resources of barite to be 1.4 Mt. High-quality feldspars occur at Shiliki; the country's total feldspar resources were estimated to be 200,000 t. Large kaolin deposits occur in the lateritic areas of Adi Abeito, Adi Ahderhom, Adi Hausera, Adi Kaieh, Teramni, and Zegrib. Eritrea's total resources of kaolin were estimated to be 2.5 Mt (Eritrean Ministry of Energy and Mines, 1997, p. 7). From 1996 to 2000, Eritrea's production of kaolin averaged about 3,000 metric tons per year (t/yr) (table 1).

Other industrial mineral deposits include gypsum, potash, salt, sand, silica sand, and sylvite. Gypsum-bearing evaporates, potash, and sylvite occur at Colluli. Large deposits of common salt occur in the Dahlak Archipelago and at several places along the Red Sea coast (Eritrean Ministry of Energy and Mines, 1997, p. 7).

Eritrea has exploited its resources of construction materials for domestic and export markets. Europe, the Far East, and the Middle East have imported finished or semifinished Eritrean granite and marble. Large deposits of marble occur at Amberbeb, Debri, Gogne, Kertsekomte, and Mount Kuruku. Granites of various colors and textures outcrop over large areas in Eritrea. Limestone deposits were found in the southern part

of the country near Adi Kaieh and Arberebu (Eritrean Ministry of Energy and Mines, 1997, p. 7).

In 1998, Eritrea consumed about 2.9 Mbbbl of petroleum products (U.S. Energy Information Administration, 2001, Country energy balance—Eritrea, accessed June 20, 2001, at URL http://www.eia.doe.gov/emeu/world/country/cntry_ER.html). In 1997, the Assab refinery (jointly operated with Ethiopian Petroleum Co.) shut down owing to high production costs. Eritrea produced 178 GWh of electricity, which was generated at diesel-fired plants (U.S. Central Intelligence Agency, 2000b). The Alid volcanic center was being explored as a source for geothermal energy.

The World Bank and other international donors approved a \$25 million loan for repairing war damage to Eritrea's energy sector facilities. Funds will be spent on rehabilitating Massawa Hirgigo, which was the country's largest powerplant, and replacing generators and electrical power systems in other parts of the country (World Bank, 2000b, p. 13).

Eritrea's transportation network comprised about 4,000 km of roads, of which nearly 900 km was paved. The railway linking Ak'ordat and Asmara with the port of Massawa was 317 km; only a 5-km stretch in Massawa was operational. Rehabilitation of the remainder was underway. Ports and harbors were Assab and Massawa. In October 2000, the World Bank and others approved a \$36 million loan for repairs of Eritrea's roads and bridges (World Bank, 2000b, p. 13).

The outlook for Eritrea's mineral industry is for gradual recovery from the war. Improvements in the general economic situation and the need to rebuild infrastructure are likely to increase demand for building materials. Further development (especially in the metals sector) depends upon favorable conditions on the world minerals markets and the success of the peace process, infrastructure rehabilitation, and landmine clearing in rural areas.

ETHIOPIA

Ethiopia has been a producer of minerals, rocks, and such semimanufactured goods as brick clay, cement, diatomite, feldspar, gold, gypsum and anhydrite, kaolin, lime, pumice, salt, scoria, soda ash, sand, stone, and tantalite (table 1). Refined petroleum products were also produced until 1997. Ethiopia's main mineral export was gold. Prior to the war with Eritrea, most of Ethiopia's exports were shipped through the Eritrean ports of Assab and Massawa. Hostilities between the two countries forced Ethiopia to use the port of Djibouti as a substitute.

The war caused substantial damage to the country's roads, bridges, and power supply (World Bank, 2000c, p. 4). The war also discouraged foreign investment in Ethiopia, diverted scarce financial resources to military expenditures, and had serious effects upon economic growth.

In 1999, Ethiopia's GDP amounted to about \$33.3 billion at purchasing power parity, which was unchanged compared with that of 1998. Per capita income at purchasing power parity was \$560 in 1999 (U.S. Central Intelligence Agency, 2000c). The International Monetary Fund (1999, p. 65) estimated that manufacturing accounted for 5% of GDP in 1998; construction, 3%; and mining and quarrying, less than 1%.

In spite of the loss of economic growth and foreign investment, developments in the minerals sector were numerous in 2000. In January, the Government privatized Ethiopian

Mineral Development Share Co., which prospected, explored, evaluated, and developed mineral deposits other than petroleum, natural gas, and geothermal energy (Addis Tribune, January 28, 2000, Two companies privatized, accessed June 30, 2000, at URL <http://www.addistribune.com/Archives/2000/01/28-01-00/Two.htm>).

In May, Etno Mining plc was formed as a joint venture of the Norwegian company Norex Mining and Energy (75%) and the Ethiopian companies Geodev plc. (12.5%) and Afreds (12.5%). The new company will mine precious minerals, such as diamond, gold, platinum, and silver (Indian Ocean Newsletter, 2000).

Gold was produced at the Lega Dembi Mine (owned by Midroc-Ethiopia plc); the mine is in the southern part of the country. Resources from this mine were estimated to be 62 t of metal from ore that grades 4 g/t gold. Other mines under development included the Adola and the Sakara with estimated gold resources of 13 t and 3 t, respectively. Prospecting and exploration work was continuing at numerous deposits, such as the Akobo, the Chamuk, the Sirkole, and the Degero, where resources were estimated to be 3.6 t, 0.7 t, 0.7 t, and 0.07 t, respectively (Selassie and Reimold, 2000, p. 28-29). In 2000, gold was the mineral commodity that made the largest contribution to the Ethiopian economy; the value of gold produced exceeded \$33.18 million (Getachew Tesfaye, Ethiopia Ministry of Mines and Energy, written comm., 2001).

Ethiopia has notable resources of tantalum. The Kenticha deposit is the source of Ethiopia's tantalum oxide concentrates; in May 2000, Midroc-Ethiopia bought the state-owned Kenticha mining enterprises. The Meleka deposit of columbium (niobium) and tantalum was undergoing follow-up exploration (Selassie and Reimold, 2000, p. 29). In 2000, the value of tantalite produced amounted to \$5.7 million (Getachew Tesfaye, Ethiopia Ministry of Mines and Energy, written comm., 2001).

Other metal deposits include copper, iron, manganese, molybdenum, nickel, platinum, and zinc. The Kata copper deposit in western Ethiopia was estimated to have a resource of 10 Mt of ore; further drilling is necessary to determine the grade. Other copper deposits explored were Abatselo and Azale Akendeyu; the latter deposit also may have a high grade of zinc. Of the four iron deposits in the western part of the country, Bikilal is by far the largest and had an estimated resource of 58 Mt of ore that graded 41% iron. The Chago, the Gordana, and the Koree deposits had higher grades (57% to 71.6%) but were much smaller (at most 489,000 t combined). The Melka Arba iron deposit in the southeast had 10.1 Mt of ore that graded 45.6% iron. In southern Ethiopia, the Adola nickel deposit had an estimated resource of 17 Mt of ore that graded 1.38% nickel. The abandoned manganese mine at Enkafela had an estimated resource of 5,000 t of metal from ore that graded 51.26%. Relatively little is known about the Fakusho molybdenum deposit. The resources of the closed platinum mine at Yubdo were estimated to be 12.5 t of metal from ore that graded 0.336 g/t platinum (Selassie and Reimold, 2000, p. 26-27, 29).

Deposits of raw materials for construction are known to exist in Ethiopia. Clays used to manufacture bricks, cement, pipes, and tiles occur in numerous places, such as Awzeit, Debre Tabor, Kerker, Mulo, and Zega Wedem. Proven and probable resources of dolomite at Galletti are 1.43 Mt. Resources of granite have been estimated to be 5.3 Mt and 1.32 Mt at Hasegie and Sakul, respectively. Possible resources of gypsum at Sodoble have been estimated to be 56 Mt, and probable

resources at Adigudom are 0.4 Mt. Gypsum was mainly used for cement and stucco production. Proven and provable resources of limestone amount to 69.5 Mt at Mossobo, 50 Mt at Mughher, and 46 Mt at Dire Diwa. All these deposits have been exploited for use in the cement industry. Possible resources of marble were estimated to be 46.5 Mt at Mora, 13.6 Mt at Baruda, and 2.8 Mt at Dalleli. The Mora and Baruda deposits have been exploited for construction projects; raw materials were processed by Ethiopian Marble Industries. Deposits of pumice occur at the Gari Baldi pass and Kimbibi; pumice was used to manufacture cement. Substantial quantities of sand and gravel occur in northern and central Ethiopia; deposits include the Awash Basin (Mengitsu and Fentaw, 2000). In 2000, the value of raw materials for construction produced in Ethiopia amounted to \$8.37 million, including \$3.97 million for gravel and crushed rock, \$2.8 million for limestone, and \$551,000 for marble (Getachew Tesfaye, Ethiopia Ministry of Mines and Energy, written comm., 2001).

In 2000, Ethiopia produced 879,962 t of cement, which was an increase of about 37.9% compared with that of 1999 (table 1). The Mughher Cement Factory has accounted for most of Ethiopia's cement production in recent years. In 2000, however, a new plant was completed at Mekele with a capacity of 600,000 t/yr (International Cement Review, 2001b). The value of cement produced in 2000 amounted to \$19.07 million (Getachew Tesfaye, Ethiopia Ministry of Mines and Energy, written comm., 2001).

The Ministry of Mines and Energy estimated that Ethiopia had resources of 4.3 billion metric tons (Gt) of salt. In late 1999, a salt producers' association was established to exploit salt found at Afdera Wereda for industrial and individual consumption. The association has indicated that it will attempt to sell salt locally and for export (Addis Tribune, October 22, 1999, More than 4 Gt of salt found in Ethiopia, the Ethiopian Salt Producers Association established, accessed June 30, 2000, at URL <http://www.addistribune.com/Archives/1999/10/22-10-99/More.htm>). Before the war, Ethiopia imported most of its salt from Eritrea. Most salt imports since then have been from Djibouti, India, and Yemen. The value of salt produced in Ethiopia amounted to about \$6.84 million in 2000 (Getachew Tesfaye, Ethiopia Ministry of Mines and Energy, written comm., 2001).

The deposits of silica sand at Mughher have proven and probable resources of 3.4 Mt; other deposits occur at Enticho. The Addis Ababa Bottle and Glass Factory has used sands from the Mughher deposit (Mengitsu and Fentaw, 2000). In December 2000, the Ethiopian Investment Authority licensed Summit Glass Works Private Ltd. Co. to build the country's first privately owned plant for the production of glasses, bottles, and related materials. Summit Glass Works was a \$46 million joint venture between U.S.-based Summit Partners Ethiopia and a German company. It will mine the raw materials required to produce glass and export its products to neighboring countries.

Other industrial minerals known to occur in Ethiopia include apatite, bentonite, diatomite, feldspar, kaolin, potash, quartz, soda ash, and talc. The Bikilal apatite deposit had possible resources that were estimated to be 127 Mt at a grade of 3.6% phosphorus pentoxide. The possible resources of the Gewane-Mille bentonite deposit were estimated to be 70 Mt. Proven, probable, and possible diatomite resources at Lake Region were estimated to be 85 Mt. The proven, probable, and possible resources of the Dallol potash deposit were estimated to be

160.4 Mt at a grade of 31% to 33.9% potassium chloride (KCl). Proven and probable KCl content amounted to 21.52 Mt (Mengitsu and Fentaw, 2000).

Deposits of coal and natural gas are known to exist in Ethiopia. Lignite coal resources from three different areas in Ethiopia were estimated to be 61 Mt. Additional deposits have been discovered in the western part of the country (Mbendi Information Services, 2000, Ethiopia—Mining—Overview, accessed January 8, 2001, at URL <http://www.mbendi.co.za/indy/ming/af/et/p0005.htm>). Natural gas resources in the Kalub wet gas field in Ogaden are believed to be 100 billion cubic meters. In December 1999, Secor International, Inc., won the contract to develop these resources; the goal is to produce 500 million cubic meters per year and extract 65,000 t/yr of liquefied petroleum gas and motor fuel (Africa Energy & Mining, 1999).

In 1998, Ethiopia consumed about 6.41 Mbbbl of petroleum products. The closure of the Assab refinery rendered Ethiopia totally dependent upon imports to meet its demand for petroleum. In April, a memorandum of understanding for oil prospecting was signed between Kalub Gas Share Co. and Secor. The purpose of the agreement was to strengthen oil-prospecting activities in the Kalub and the Lalla areas (Addis Tribune, April 7, 2000, A memorandum of understanding for oil prospecting signed between two companies, accessed June 30, 2000, at URL <http://www.addistribune.com/Archives/2000/04/07-04-00/Memo.htm>).

In 1998, Ethiopia produced 1,265 GWh of electricity, most of which was provided by hydroelectric power sources (89.34%); the remainder was provided by fossil fuels (7.35%) and other sources, such as geothermal (3.31%) (U.S. Central Intelligence Agency, 2000c). In November, the World Bank and other international donors approved a \$10 million loan to Ethiopia for repairing war damage to its energy sector. Funds will be spent on rehabilitating and reconstructing power lines, powerplants, and substations (World Bank, 2000c, p. 13, 52).

Most of Ethiopia's energy needs are still met by traditional fuels, such as firewood; less than 1% of the country's rural population, which is more than 85% of the total population, has access to electricity (Dr. Fekadu Shewarega, Associate Professor, Addis Ababa University, August 20, 1999, Micro hydropower—A neglected resource in Ethiopia, accessed June 30, 2000, at URL <http://www.addistribune.com/Archives/2000/08/20-08-99/Micro.htm>). Many forests have become severely depleted; the resulting desertification was estimated to cost Ethiopia more than \$2 billion per year (Embassy of Ethiopia, Washington, DC, January 10, 2001, Ethiopia loses over two billion USD annually to desertification, accessed January 10, 2001, at URL <http://www.ethiopianembassy.org/news/dailynews/dailynews.cfm?1441>). In response, the Government has launched a \$160 million program to upgrade the country's energy resources.

The Ethiopian Government's plan involves building 41 new power stations, which include 7 hydropower, and installing 2,067 km of power lines. Ethiopian Electric Power Corp. (EEPC) has begun building three hydroelectric power stations, at Tis Abay, Gilgel Gibe, and Finchaa, with a total generating capacity of 291 MW. In May, EEPC announced that Alstom had won contracts to supply transformers for the Gilgel Gibe power station. Alstom was also participating in a plan to extend the power transmission network between Bhar Dar and Gondar (Africa Energy & Mining, 2000). Ethiopia's known exploitable

potential hydroelectric energy is 162,000 MW (World Resources Institute and others, 1996, p. 288). The country's geothermal potential has been estimated to be 700 MW.

Ethiopia's transportation network comprised about 28,500 km of roads, of which nearly 4,300 km were paved. The Ethiopian segment of the Addis Ababa-Djibouti railroad was 681 km. About 3,900 km of the country's roads were damaged by the war with Eritrea. The World Bank and other donors approved an \$86 million loan for the rehabilitation and improvement of roads and bridges (World Bank, 2000c, p. 13). In May, the Ethiopian Government announced its intention to build more than 57,000 km of trunk and rural roads by 2005 (Addis Tribune, May 5, 2000, More roads to be built in the country over the coming five years, accessed June 30, 2000, at URL <http://www.addistribune.com/Archives/2000/05/05-05-00/More.htm>).

The outlook for Ethiopia's mineral industry is favorable. Improvements in the general economic situation and the need to rebuild infrastructure are likely to increase demand for building materials. Exploitation of natural gas resources is likely to increase owing to the Government's ambitious plans for powerplant construction; the demand for electricity in Ethiopia far exceeds the supply. Ethiopia's plans to expand infrastructure may increase the economic viability of its rich metals and industrial minerals deposits. Favorable conditions in the world minerals markets and the success of the peace process are also important.

SOMALIA

In recent years, Somalia has been known to produce small quantities of gypsum, salt, and sepiolite (meerschaum). The minerals industry makes a small contribution to the country's exports and the economy in general. In 1999, Somalia's GDP amounted to about \$4.3 billion at purchasing power parity. The per capita income at purchasing power parity was \$600 in 1999. Industry accounted for about 10% of the GDP (U.S. Central Intelligence Agency, 2000d).

Officially reported mineral and trade data have been unavailable for a number of years owing to the collapse of the country's central government. The civil war that brought down the government has had considerable adverse consequences for the economy, including the minerals sector. The war has forced the closure of Somalia's cement plant and oil refinery and has halted the exploration of the country's natural gas field, the construction of a hydroelectric and irrigation scheme at Bardera on the Juba River, and the exploration for other resources.

Owing to the closure of the plant managed by the Berbera Cement Agency, Somalia imported all its cement; the International Cement Review (2001c) estimated the country's cement consumption to be 100,000 t in 2000. Most of this cement was believed to be sourced from Kenya, Oman, and Saudi Arabia.

The limestone deposits at Suria Mableh have been mined for use in the cement plant. Resources are estimated to be 11.5 Mt at a grade of 49.18% calcium oxide. Other limestone deposits that may be suitable for cement raw material are found in the central (near Belet Weine) and southern (at Bur Anole and Markabley) parts of the country. Lower grade limestone deposits are found in the north (in the Bihendula District, with an estimated resource of 20 Mt) and along the coast near Mogadishu (Chakrabarti, 1988, p. 97-98).

Somalia also has resources of gypsum. The largest deposit occurs at Suria Malableh, which has an estimated resource of 5 Mt of 80% pure gypsum and more than 2.5 Mt of 90% pure anhydrite. Material from the Suria Malableh deposit has been used to make calcinated gypsum, school chalk, and medical plaster. Plans to gradually increase gypsum production for the domestic market to 200,000 t/yr have been delayed by the war. Other gypsum deposits occur in southern Somalia close to the Belet Weine and the Bulo Burti areas (Chakrabarti, 1988, p. 90-92).

Salt brine deposits (from evaporated seawater) in northwestern Somalia near Zeila have been exploited for many years. Other brine deposits include Horio, Gesira, and Karan. Salt deposits are also found near lakes (Obbia and Agherrar in the southwest), salt springs (Heis Dagah and Darraboh in the northwest), and rock salt (Yet in the southwest).

Somalia produced small quantities of sepiolite, which was its only mineral export. The country has large deposits of sepiolite in the El Bur area. The Indho Qabyo prospect was estimated to have resources of 19 Mt of sepiolite, which included 3.5 Mt of meerschaum-quality and 15.5 Mt of sepiolitic material. Estimated resources in the El Bur area totaled about 100 Mt (Chakrabarti, 1988, p. 95-96).

Other industrial minerals found in Somalia include feldspar, kaolin, kyanite, and quartz. The country's feldspar deposits are found in Laferug, Berdale, Bur Degis, Bur Mado, Laferug, and Waaf Dhai. Kaolin has been found in the Bur Area (Bur Bur, Bur Dubud, Bur Galin, Bur Narible, and Bur Siabo) and between Las Gal and Merodile. Resources at Bur Bur were estimated to be 80,000 t of 20% pure kaolin. Deposits of kyanite are located at Damal and Geed-Deeble; the kyanite found at Damal occurs in micaceous quartzites that contain 33% kyanite and has an estimated resource of 132,000 t. Quartz crystals at the Issutugan and Wai-Wai deposits have been mined by local prospectors; before 1988, 540 kilograms of piezo-quartz raw material was recovered from Issutugan, and 6.5 t, from Wai-Wai (Chakrabarti, 1988, p. 99-100).

Somalia's deposits of tin and tantalum were mined in the mid-1970s by Technoexport Bulgaria. Three deposits are in the Dalan area. The largest has estimated resources of 2.8 Mt at a grade of 0.028% tin; the second largest has estimated resources of 1.4 Mt at a grade of 0.129% tin, 0.015% tantalum, 0.132% rubidium, and 0.011% cesium; and the smallest has an estimated resource of only 13,000 t. The Majayahan deposit was estimated to have resources of 200,000 t at a grade of 0.074% tin, 0.011% tantalum, 0.098% rubidium, and 0.036% cesium (Chakrabarti, 1988, p. 69-72).

Somalia is known to have resources of uranium. The deposit in the Gheliner-El Bur area has an estimated resource of 8,000 t of uranium oxide (U₃O₈) from ore that grades 0.116%. The Wabo-Mirig deposit was estimated to have a resource of 5,500 t of U₃O₈ from ore that graded 0.08%. Dusa Mareb had an estimated resource of 3,000 t of U₃O₈ from ore that graded 0.08% (Chakrabarti, 1988, p. 95-96). The total uranium metal content of these estimated resources is 14,000 t. Nearly 6,700 t of the country's uranium resources were estimated to be recoverable at a world market price between \$80 and \$130 per kilogram. None of these resources would be recoverable at a price of less than \$80 per kilogram (World Resources Institute and others, 1996, p. 288).

In the early 1990s, Somalia consumed about 314,000 t of petroleum products; more recent data are unavailable (MBendi

Information Services, 2000, Somalia—Oil and gas industry—Overview, accessed March 27, 2001, at URL <http://www.mbendi.co.za/indy/oilg/af/so/p0005.htm>). In 1998, Somalia produced 265 GWh of electricity, which was generated by fossil fuels (U.S. Central Intelligence Agency, 2000d). Somalia has estimated resources of 6 billion cubic meters of natural gas. The country's known exploitable potential hydroelectric energy is 50 MW (World Resources Institute and others, 1996, p. 288).

Somalia's transportation network comprised about 22,000 km of roads, of which 2,600 km were paved. The country had no rail network as of 1999. Oil pipelines were 15 km. Ports and harbors were at Bender Cassim (Boosaaso), Berbera, Chisimayo (Kismaayo), Merca, and Mogadishu (U.S. Central Intelligence Agency, 2000d).

The outlook for Somalia's mineral industry is for little change in the short run. The new central government created in August has not been recognized by the breakaway governments in Somaliland and Puntland and faces challenges from regional warlords in southern Somalia (Jane's Information Group, May 9, 2001, North Africa risk pointers—Somalia, accessed June 25, 2001, at URL http://www.janes.com/regional_news/africa_middle_east/sentinel/north_africa/somalia.shtml). Other problems include weak infrastructure and a domestic market that is limited by severe poverty. In the long run, an end to the civil war; investment in education, health, and infrastructure; favorable world market conditions; improvements in mining technology; and other conditions amenable to private foreign investment could lead to greater exploitation of Somalia's mineral resources.

References Cited

- Africa Energy & Mining, 1999, Ethiopia—Contracts for Calub: Africa Energy & Mining, no. 266, December 22, p. 4.
- 2000, Ethiopia—Contracts despite warfare: Africa Energy & Mining, no. 275, May 17, p. 4.
- Africa Mining Intelligence, 2000, East Africa—New hunting ground for Angloraal: Africa Mining Intelligence, no. 1, November 1, p. 1.
- 2001, Tanzania/Eritrea—Maiden pulls out the stops: Africa Mining Intelligence, no. 6, January 17, p. 3.
- Bouh, Y.E., and Haid, D.M., 2000, Djibouti letter of intent and memorandum on economic and financial policies: Washington, DC, International Monetary Fund, July 11, 16 p.
- Chakrabarti, A.K., 1988, An appraisal of the mineral resource potential of the Somali Democratic Republic: Mogadishu, Somalia, United Nations Revolving Fund for Natural Resource Exploration, 230 p.
- Eritrean Ministry of Energy and Mines, 1997, Mineral prospects of the state of Eritrea: Asmara, Eritrea, Eritrean Ministry of Energy and Mines, 16 p.
- Indian Ocean Newsletter, 1993, Djibouti—Making the most out of mining: Indian Ocean Newsletter, no. 561, February 6, p. 5.
- 2000, Etno Mining plc—New mining company in Ethiopia: Indian Ocean Newsletter, no. 903, May 13, p. 3.
- International Cement Review, 2001a, Djibouti, in *The global cement report: Dorking, United Kingdom, Tradeship Publications, Ltd.*, p. 124.
- 2001b, Ethiopia, in *The global cement report: Dorking, United Kingdom, Tradeship Publications, Ltd.*, p. 134.
- 2001c, Somalia, in *The global cement report: Dorking, United Kingdom, Tradeship Publications, Ltd.*, p. 266.
- International Monetary Fund, 1999, Ethiopia—Recent economic developments: Washington, DC, International Monetary Fund, September 20, 98 p.
- 2000, Eritrea—Statistical annex: Washington, DC, International Monetary Fund, May 11, 58 p.
- Jonsson, Isleifur, 1985, Republic of Djibouti—Country report, in 1985 International Symposium on Geothermal Energy, Kailua-Kona, Hawaii, August 26-30, 1985, Proceedings: Sacramento, CA, Cal Central Press, p. 175-178.
- Mengistu, Tibeitu, and Fentaw, H.M., 2000, The industrial mineral and rock resource potential of Ethiopia: Chronicle of Mineral Research & Exploration, no. 540, September, p. 33-40.

- Rift Resources Ltd., 2000, Management discussion and analysis—July 21: Calgary, Alberta, Canada, Rift Resources Ltd., 2 p.
- Selassie, M.G., and Reimold, W.U., 2000, A review of the metallic mineral resource potential of Ethiopia: *Chronicle of Mineral Research & Exploration*, no. 540, September, p. 11-32.
- U.S. Central Intelligence Agency, 2000a, Djibouti, *in* *World factbook 2000*: U.S. Central Intelligence Agency, p. 139, 140.
- 2000b, Eritrea, *in* *World factbook 2000*: U.S. Central Intelligence Agency, p. 154-156.
- 2000c, Ethiopia, *in* *World factbook 2000*: U.S. Central Intelligence Agency, p. 159-161.
- 2000d, Somalia, *in* *World factbook 2000*: U.S. Central Intelligence Agency, p. 454-456.
- U.S. Embassy, Djibouti, Djibouti, 1995, Djibouti's energy and mineral resources—Djibouti: U.S. Department of State Telegram 002185, October 1, 2 p.
- World Bank, 1994, Eritrea—Options and strategies for growth: Washington, DC, World Bank, November 10, 216 p.
- 2000a, Interim support strategy for the state of Eritrea: Washington, DC, World Bank, October 23, 25 p.
- 2000b, Memorandum and recommendation of the president of the International Development Association to the executive directors on a proposed credit in the amount of SDR 69.3 million (US\$90.0 million equivalent) to Eritrea for an emergency recovery project: Washington, DC, World Bank, October 23, 29 p.
- 2000c, Technical annex for a credit of SDR 180.2 million (USD 230.0 million equivalent) to the Federal Democratic Republic of Ethiopia for an emergency recovery project: Washington, DC, World Bank, November 9, 68 p.
- World Resources Institute, United Nations Environment Program, United Nations Development Program, and World Bank, 1996, *World resources 1996-97*: Oxford, United Kingdom, Oxford University Press, 365 p.

TABLE 1
ERITREA, ETHIOPIA, AND SOMALIA: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Country and commodity	1996	1997	1998	1999 e/	2000 e/
ERITREA					
Basalt	509,300	489,686	403,219	400,000 r/	300,000
Cement	47,031	60,000 e/	50,000 e/	50,000 r/	45,000
Clays:					
Common	81,600	80,000 e/	80,000 e/	80,000 r/	50,000
Kaolin	2,620	4,670	3,809	3,800 r/	2,000
Coral	69,269	96,535	245,112	245,000 r/	250,000
Gold kilograms	98	612	573	570 r/	500
Granite	130,000	111,062	249,829	250,000 r/	200,000
Gravel	1,715,000	798,055	941,129	941,000 r/	500,000
Gypsum	23	27	56	56 r/	50
Laterite	1,449	585	5,881	5,880	5,880
Lime e/	7,000	7,000	6,000	6,000 r/	3,000
Limestone 4/	4,552	5,585	4,077	4,100 r/	4,000
Marble	218,300	220,000 e/	200,000 e/	200,000 r/	100,000
Petroleum products thousand 42-gallon barrels	4,500	3,000	--	-- r/ 3/	-- 3/
Pumice	300 e/	754	391	390 r/	200
Quartz	870	604	731	730 r/	600
Salt	200,412	252,073	114,137	114,000 r/	100,000
Sand e/ thousand tons	1,500 r/	2,097 r/ 3/	2,170 r/ 3/	2,170 r/	2,000
Silica sand	1,481,100	27 r/	-- r/	-- r/	--
ETHIOPIA 5/ 6/					
Cement, hydraulic	690,000 r/	752,000 r/	750,000 r/	638,266 r/ 3/	879,962 3/
Clays: 7/					
Brick e/	7,000	6,000	6,000	80,865 r/ 3/	224,093 3/
Kaolin (China clay)	1,428 r/	3,512 r/	378 r/	681 r/ 3/	1,654 3/
Other clay cubic meters	NA	NA	NA	23,750 3/	23,000
Columbite-tantalite, ore and concentrate:					
Gross weight kilograms	20,000	20,000	20,000	49,630 r/ 3/	64,940 3/
Nb content do.	NA	NA	NA	4,960 3/	6,490 3/
Ta content do.	6,500	6,500	6,500	29,300 r/ 3/	38,800 3/
Diatomite	150	150	125	140 r/ 3/	140
Feldspar e/	4,000	5,000	5,000	391 r/ 3/	285 3/
Gold, mine output, Au content kilograms	2,500	3,000	2,500	4,905 r/ 3/	5,177 3/
Gypsum and anhydrite, crude	124,000	120,000	120,000	35,983 r/ 3/	46,798 3/
Lime	3,100	2,500	3,000	2,991 r/ 3/	3,769 3/
Platinum, mine output, Pt content 8/	-- r/	-- r/	-- r/	-- r/ 3/	-- 3/
Pumice e/ 7/	360,000	325,000	325,000	135,400 r/ 3/	156,466 3/
Salt, rock e/	5,000	1,000	1,000	56,400 r/ 3/	56,400 3/
Scoria e/	250,000	250,000	250,000	281,164 r/ 3/	286,800
Soda ash, natural	20,000	15,000	15,000	4,745 r/ 3/	4,745 3/
Stone, sand, and gravel: e/ 7/					
Construction stone, crushed thousand tons	750	750	1,000	3,407 r/ 3/	3,459 3/
Dimension stone 9/	38,000	40,000	130,000	130,000 r/	100,000
Granite	NA	NA	NA	126 3/	140
Limestone thousand tons	3,300	3,300	3,400	846 r/ 3/	1,197 3/
Sand 10/ do.	1,600	1,600	2,500	1,600 r/ 3/	1,853 3/
Silica sand	6,000	7,000	7,000	6,061 r/ 3/	5,601 3/
Other stone	NA	NA	NA	10,162 3/	15,768 3/
SOMALIA 11/ e/					
Gypsum	1,000	1,000	1,500	1,500	1,500
Salt, marine	1,000	800	600	1,000	1,000
Sepiolite (meerschau)	6	6	6	6	6

See footnotes at end of table.

TABLE 1--Continued
ERITREA, ETHIOPIA, AND SOMALIA: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

e/ Estimated. r/ Revised. NA Not available. -- Zero.

1/ Estimated data are rounded to no more than three significant digits.

2/ Includes data available through June 25, 2001.

3/ Reported figure.

4/ For other than cement.

5/ Data are for year ending July 7 of the year listed.

6/ In addition to the commodities listed, some lignite, semiprecious gemstones, steel semimanufactures, and talc reportedly were produced, and silver was reportedly contained in gold ingots from the Lege Dembi Mine, but information is inadequate to estimate output.

7/ When reported as volume or pieces, conversions to metric tons are estimated.

8/ No platinum production was officially reported after 1988. Some artisanal platinum probably continued to be produced, and platinum was also reported by others as being contained in gold ingots from the Lege Dembi Mine, Ethiopia, which started up in 1990.

9/ Includes marble. Production of marble was estimated to be 13,900 t in 1996 and reported to be 6,014 t in 1999 and 6,662 t in 2000.

10/ May include gravel.

11/ In addition to the commodities listed, various crude construction materials (e.g., clays, sand and gravel, crushed and dimension stone) and limestone for lime manufacture and/or agriculture are presumably produced; available information, however, is inadequate to make estimates of output.