

THE MINERAL INDUSTRY OF OTHER COUNTRIES OF AFRICA

By Staff

Angola¹

The mineral economy of Angola, decimated by the 19-year civil war, was dominated by petroleum and diamonds. A peace treaty ending the war was signed in November 1994.

All mineral resources remained the property of the state under the Mining Law of 1992. The law eliminated the state-owned mining companies' monopoly on mineral rights.² Environmental issues also were addressed by the Mining Law of 1992. Foreign company mining activity and joint ventures with state-owned companies were officially encouraged. International oil companies operated in joint ventures or under production-sharing agreements with the Government's Sociedade Nacional de Combustíveis de Angola (Sonangol).

Diamonds were traditionally mined by the state-owned Empresa Nacional de Diamantes de Angola (Endiama), its contractors, and small-scale miners (*garimpéiros*). The new diamond law, law 16/94 of October 7, 1994, reinstated Endiama's diamond monopoly. However, the law also permitted *garimpéiro* operations on specified artisanal diamond deposits.

Most of Angola's official diamond production was marketed through De Beers Centenary AG's Central Selling Organization. There were many unofficial *garimpéiro* operations in Lunda North Province and along the Cuango River on the Zairian border, from which a significant volume of rough diamond was smuggled out of the country.

The Government began exporting 12,000 metric tons (mt) of scrap metal to Spain. The *African Economic Digest* reported that Sucasor, a state enterprise for scrap collection, also planned to smelt iron from scrap metal.

Crude oil exports accounted for approximately 99% of the country's official export earnings. Approximately 60% of Angola's output was produced from fields offshore of Cabinda Province.³ The United States imported approximately 70% of Angolan oil exports.

Cabinda Gulf Oil Co. Ltd., a subsidiary of the Chevron Corp. of the United States, and its partners' Kokongo field, 64 kilometers (km) offshore Cabinda, was brought on-stream in early December. Cabinda Gulf also announced the discovery of four new offshore oilfields during 1994. Other exploration activity included Shell's deep-water Bengo-1 well on Block 16, which tested at the rate of 1,760 barrels per day (bbl/d) of oil before being abandoned.

Fields in the Soyo area, both onshore and offshore, were shut in owing to war damage. Pipelines had been rerouted in 1993 from the Quinquena onshore terminal, near Soyo, to the marine loading facilities at the Essungo and Lombo East Fields.⁴ Sonangol reportedly anticipated repairing the Quinquena storage and loading facilities early in 1995.

Much of the Nation's rail system was damaged or destroyed during the war, and most of Angola's 45,000 km of road was in poor condition.⁵ One 200 mt granite shipment from Lubango to Namibe reportedly was derailed during the year.

Petroleum was expected to continue to dominate Angola's economy for the foreseeable future. Unregulated *garimpéiro* operations, mining primarily high-grade diamonds, could damage Angola's ability to restore the alluvial segment of the industry. International interest has been expressed in offshore diamond mining. The minerals industry should revive once security issues are resolved and local and international mining companies become involved in exploration and development of Angola's mineral deposits; however, substantial transportation problems and difficulties associated with abandoned land mines remain.

Benin⁶

The production of mineral commodities represented a small part of the economy of Benin. Cement and crude petroleum formed the foundation of the Nation's mineral production and were the country's most significant mineral exports. (See table 1.) Benin's imports of mineral commodities were dominated by refined petroleum products and clinker for cement. Benin also imported about 95% of its electricity needs from Ghana.

The Office Béninoise des Mines (OBEMINES), under the Ministry of Energy, Mining, and Hydraulics, oversees mineral developments in Benin. The Government increased reported recoverable oil reserves to about 50 million barrels (Mbbbl), of which about 25 Mbbbl was condensate, in addition to increasing natural gas reserves to 6 billion cubic meters (m³).⁷ However, production problems at the offshore Sèmè Field were expected to severely curtail the field's life. The Government proposed to privatize the field and lease two onshore blocks and three offshore blocks.

The Government controlled a majority interest in the Société des Ciments d'Onigbolo (SCO), the country's largest

and only integrated cement plant. Production by SCO continued at a rate well below capacity. Reportedly, much of the plant's production was exported. The domestic market was the primary target for the production of the private cement companies, CIMBENIN and Société des Ciments du Benin.

There is the potential to develop additional mineral resources in Benin.⁸ However, depressed local and international mineral markets apparently have adversely influenced the investment interest that the Government had anticipated in the wake of its liberalization of investment regulations. The general state of the Nation's transportation infrastructure also has hampered inland industrial mineral development.

A number of gold occurrences, both placer and vein, are known in the Precambrian terrane in northwest Benin. None of the known occurrences is large, but potentially could lead to the development of small-scale gold mining in that region. Significant reserves of limestone occur near the cement facility at Onigbolo, sufficient to supply the plant at design capacity for more than a century. Other mineral extraction opportunities identified by OBEMINES include a number of deposits of brick and china clay along the coastal plain, the marble deposits at Idadjo, peat deposits adjacent to the Togo frontier, silica sand along the coast south of Porto Novo, and, in the north, the Mékrou phosphate deposit and the Loumbou-Loumbou iron-bearing deposit.

Burkina Faso⁹

Burkina Faso's mineral production and mineral export revenues remained dominated by gold in 1994. Refined petroleum products accounted for much of the Nation's mineral commodity imports, with cement, clinker, and fertilizers making up most of the difference.

Gold production of the Société de Recherches et d'Exploitations Minères du Burkina's Poura Mine was complemented by the output of the Nation's four semi-industrial operations and the production of tens of thousands of artisanal miners. Gold output was estimated because, despite the legal requirement for all gold to be sold to the Government, a proportion of artisanal production was smuggled out of the country.

A number of international companies, including Anglo American Corp. of South Africa, BHP Minerals of the United States, Channel Resources Ltd. of Canada, Golden Shamrock Mines Ltd. of Australia, Incanore Resources Ltd. of Canada, Loubel Exploration Inc. of Canada, Newmont Gold Co. of the United States, and Randgold and Exploration Co. Ltd. of South Africa, were active in the Burkina Faso gold rush. The narrow, vertical-dipping reefs of the country's extensive Birimian greenstone belts attracted the most attention. Canadian junior mining companies initiating exploration programs in Burkina Faso during 1994 were Geomaque Explorations Ltd., High River Gold Mines Ltd., International Gold Resources Corp., Messeguay Mines Inc., and Mutual

Resources Ltd.

Joint ventures with the Government were required for all international company mineral production operations. InterStar Mining Group Inc. of Canada made several furnace-trial shipments from its Tambao manganese operation. Boliden International Mining of Sweden was involved in the Perkoa zinc joint venture.

Other notable Burkinabe mineral deposits include copper at Gaoua and Wayen, graphite at Kaya, and phosphate at Kodjari.¹⁰ Development was subject to surmounting the Nation's infrastructure problems, including significant transportation costs to coastal ports in adjacent countries and the relatively high cost of power produced by imported diesel fuel.

Burundi¹¹

Minerals commodity production undoubtedly remained a very minor factor in the economy of densely-populated, Maryland-sized, hilly, and landlocked Burundi in 1994. In the absence of official information, the customary small production of gold, tin minerals, and kaolin for export, and limestone, construction stone, sand and gravel, and peat for domestic consumption, presumably continued. Expanding output of gold and initiating production of nickel and associated platinum-group metals from a lateritic deposit and phosphate from a carbonatite-apatite deposit, continued to be of considerable interest to the Government. In earlier years, columbium-tantalum, rare earths, and tungsten were produced, and an oil and gas potential was inconclusively investigated. But the hardening of ethnic divisions and periodic eruptions of violence that persisted intermittently throughout 1994 and into 1995 deterred any possible new developments in the minerals sector, despite the good geological potential for a substantial economic contribution and the Government's demonstrated interest in promoting the industry.

With a gross domestic product (GDP) of \$4.4 billion (purchasing power basis) for 1993, the latest available estimate by the U.S. Central Intelligence Agency (CIA), Burundi had one of the world's lowest per capita GDP. Typically, more than 50% of GDP came from agriculture, which employed more than 80% of the population, and provided more than 80% of export earnings—mostly from coffee beans. A structural adjustment program that included guidance and help from the World Bank and other international groups began in 1986 and continued to show some success. However, all economic development was severely curtailed by the ethnic violence within the country and in neighboring Rwanda. During 1994, an interim Government barely prevented a general civil war. In March 1995, the Minister of Energy and Mines was assassinated.

Geologic mapping, especially active from the 1950's into the 1970's, covered the country at a scale of 1:50,000, revealing mostly Precambrian metamorphic rock formations generally striking north-northeast with the younger

formations at lower elevations along the eastern border with Tanzania. Older formations in the mountainous western quarter of the country along Lake Tanganyika were the locale of rare-earth deposits. The western limb of the Great Rift System was along the western border. Between two patches of the oldest basement rock (Archean)—one in the southwest and the other a small isolated occurrence on the north edge of the easternmost point of the country—a number of rather small basic or ultra-basic areas were the locale for nickel, vanadium, and related metals deposits.

Government policy, laws, and regulations, including those specifically covering mining and petroleum in 1976 and 1979, were designed to attract private investment, particularly by foreign entities. A free-trade (import-export tax free) zone system covering the entire country, launched in 1993, offered many benefits to industrial and commercial ventures. However, minerals processing no longer qualified, according to a Government announcement in May 1995, which resolved a political controversy over the fact that a gold buyer-refiner, Affimet, was the only beneficiary. For a number of years, the Government promoted foreign support for several progressively more detailed studies aimed at exploiting nickel, gold, phosphate, peat and other mineral resources. In May 1995, Burundi's Director General of Geology and Mining presented a paper reviewing the mineral opportunities at a mining investment conference in Toronto, Canada, sponsored by the World Bank's investment promotion unit, the Multilateral Investment Guarantee Agency (MIGA). For U.S. firms, an Overseas Private Investment Corp. investment insurance program was available. Although committed to privatization, the Government apparently still held some ownership of the several known formal mineral-related enterprises.

Environmental problems in mining apparently were not of much concern as yet because of the small-scale operations. However, problems in agriculture caused the Government to draft a National Environmental Action Plan late in 1994.

Production data were not available after 1992, but the political situation probably resulted in slightly smaller output. (*See table 1.*)

Trade figures were not available for several years. Typically, however, the principal mineral commodity export values were in gold and tin, sent mostly to Europe; these were small compared to mineral imports, principally petroleum products, cement, steel, and fertilizer.

The structure of the mineral industry apparently consisted mostly of individuals or small groups of artisans, many of whom worked part-time, who sold the output to export traders, some of which were at least partly Government-owned. Several companies were identified at MIGA's 1995 Toronto conference and/or at a United Nations 1991 round table in Bujumbura as being active in the mineral sector, although the names and other details were not very complete. The companies included Burundi Mining Company, 45% Government- "financed," known for several years to be active in developing gold production, especially in the northeast;

COMEBU, buyer of cassiterite and columbite-tantalite; FADI, producer of kaolin for insecticides; Entreprises Generales du Burundi, producer of brick clay and gabbro (presumably crushed stone); L'Office National de la Tourbe, producer of peat; and VERRUNDI, producer of raw materials for glass bottles.

Commodity-specific information was very limited. Gold production was of continued interest to the Government, and in April 1993, the African Development Bank approved funding for a more detailed next-phase feasibility study of an operation in the northeast. In 1992, results of a study by M.E.G.A. International Inc. of Golden, Colorado, indicated economic viability for a 620-metric-ton-per-day ore operation. Award of the new study was not announced as of mid-1995. A Canadian company reportedly had discussions with the Government regarding a gold concession in the northeast.

Nickel exploration in the southeast by RTZ Corp. of the United Kingdom, begun in April 1993, remained suspended after October 1993 owing to the civil unrest. The concession reportedly covered the southern portion of a 50-km-wide mineralized belt extending along the eastern border from near Lake Tanganyika on the south, northeasterly 150 km to the Tanzania border. The belt continued across the border where Sutton Resources Ltd. of Canada and Broken Hill Pty. Co. Ltd. (BHP) of Australia were exploring a nickel occurrence. Also in October 1993, BHP suspended negotiations with the Burundi Government on an exploration agreement reportedly for an area north of RTZ's, in which Anglo American Corp. was also said to be interested.

Phosphate production feasibility studies, presumably an extension of those started by Mackay & Schnellmann of the United Kingdom in 1990, were to be completed in late 1995, according to a Government statement in May 1995.

Reserves of several mineral commodities were included in the Burundi presentation at the 1995 MIGA Toronto conference, although the classification criteria were not defined. Nickel resources appeared to be the most significant.

Infrastructure included an extensive domestic road network, although only a few main ones were paved. Beyond the border, roads to available railheads were rather poor, except northward through Rwanda into Uganda and Kenya. By this route, the ocean port of Mombasa, Kenya was about 2,100 km from Bujumbura. Lake vessels were a major mode of transportation, connecting Bujumbura with several railheads in Tanzania, Zaire, and Zambia. An international airport was at Bujumbura, but only a few other airstrips existed. Hydroelectric power was reasonably available in much of the country, with a potential for additional development. Telecommunications were limited.

The outlook for the minerals industry was for little change, pending resolution of the political situation. Hydropower potential and abundance of water were advantages, but export transportation, as well as infrastructural factors in general, were not favorable.

Cape Verde¹²

Mining's contribution to the economy of Cape Verde was minimal. Salt and volcanic rock were produced for local use. (See table 1.)

Although it directly accounted for less than 1% of Cape Verde's GDP, salt was considered important because one of its main uses was to preserve a portion of Cape Verde's fish harvest. The fishing industry has accounted for about 60% of the Nation's export earnings in recent years.

Output from the four pozzolana mines on Santo Antão had been curtailed owing to the financial difficulties of the operating company. Other mineral resources reported in the country include gypsum, kaolin, ornamental building stone, and pumice. Past attempts to commercialize the deposits were not economically successful.

The construction sector's demand for locally mined stone in Cape Verde was expected to continue. However, most of the Nation's minerals must be imported. Given Cape Verde's poor natural resources base and small market, it is not economically feasible for local companies to compete with larger foreign producers. The salt industry, which has been producing far below historical capacity, should be capable of expanding production to meet domestic demand.

Comoros¹³

The mineral industry of Comoros continued to be limited to producing only common local building materials, such as clay, sand, gravel, and crushed stone during 1994. Quantities were not available but were presumably very low because there were no significant construction projects noted in the press since the early 1980's. Geothermal energy was considered a possibility for development. However, the outlook on minerals output was for no significant change.

Djibouti¹⁴

The mineral industry remained an insignificant part of the economy in Massachusetts-sized Djibouti during 1994. The few reports available in recent years on mineral activity in the arid, mostly hilly country indicated entrepreneurial production, at least intermittently, of small but unspecified quantities of solar-evaporated sea salt, limestone (some of which was at least periodically calcined to lime), and construction materials, including clays, sand, gravel and crushed stone, as well as some marble and granite dimension stone. However, other mineral occurrences of economic interest include diatomite, geothermal fluids and mineral salts, gold, gypsum, perlite, pumice, and possibly petroleum. Most of these are near Lake Asal, although some gold shows were further west near Yoboki and in the south near Ali Sabieh. Oil interest was focused in the south and offshore in the Gulf of Aden.

A GDP of about \$500 million (estimated purchasing power equivalent) in 1993—about \$1,200 per capita—was

reported by the CIA. About 70% was attributed to services related to free trade port activities, banking, government, and support of a French military contingent. In the past, the port and railroad to Addis Ababa were major links in Ethiopia's transportation system. Less than 5% of GDP was attributed to agriculture, mostly stock breeding, in the dry climate and poor soil conditions. A reconciliation agreement between the Government and a dissident group was expected to be signed early in 1995 that would end the violent hostilities that had been an obstacle to development for several years.

The Government was trying to attract foreign investors and demonstrated a keen interest in developing the mineral potential. A \$1.7 million study on the feasibility of specific minerals production and on establishing a mining bureau that originally was to be tendered by the Ministry of Industry, Energy and Mining in 1993 apparently remained on hold pending confirmation early in 1995 of \$1 million, long-expected funding from the African Development Bank. Development of extensive deposits of perlite and geothermal generation of electricity were of particular interest to the Government, which was seeking to attract foreign investors. A U.S. Geological Survey proposal for a \$500,000 feasibility study on gold production from deposits related to hydrothermal fluids associated with the Red Sea crustal rift was also of considerable interest, and United Nations (UN) funding was being sought. A geothermal power project in the early 1990's, backed by the World Bank, was canceled when cofinanciers failed to agree on the program. In earlier work, plugging of the geothermal wells by base metal depositions was a problem.

No major changes in the status of the mineral industry were expected in the immediate future.

Equatorial Guinea¹⁵

The Republic of Equatorial Guinea consisted of two main provinces: the volcanic island of Bioko in the Gulf of Guinea and Rio Muni on the African mainland. Although Equatorial Guinea had no globally significant mineral industry in 1994, the country continued with the development of the Alba gas-condensate field in the Gulf of Guinea 36 km offshore of Bioko, operated by Walter International of the United States. Additionally, Mobil Oil Corp. and United Meridian International Corp., both of the United States, were conducting petroleum exploration offshore of Equatorial Guinea in 1994. Both U.S. companies had begun wildcat drilling operations under a production-sharing agreement involving equity interests of 65% and 35%, respectively.

Petroleum exploitation and production in Equatorial Guinea was controlled by the Decree-Law No. 7/1981, enacted on June 16, 1981, and pursuant to the earlier Hydrocarbons law (Model of Agreement), section II, paragraph 2.8 (E). Hydrocarbon exploration in Equatorial Guinea began both onshore and offshore in the late 1960's and early 1970's. By yearend 1993 and early 1994, the Government appointed new ministers for the mining and

petroleum sectors.

The *Oil and Gas Journal* of December 26, 1994, reported total crude oil production in Equatorial Guinea for 1993 at 1.5 Mbbl and total production for 1994 estimated at 1.9 Mbbl. Additionally, estimated proven reserves of 12 Mbbl of crude oil and 37 billion m³ of natural gas were reported.

According to the Government's Ministry of Mines and Hydrocarbons, several mineral and geological surveys have been conducted in recent years by various foreign organizations, commencing with an air photo survey in 1962. From 1981 to 1985, France's Bureau de Recherches Géologiques et Minières identified several types of minerals in Rio Muni. The mineral occurrences included bauxite, copper, alluvial gold, ilmenite beach sands, lead, phosphates, and zinc. However, the Government indicated that further exploration was needed to better determine the economic viability of these resources. Equatorial Guinea's plant and animal resources are environmentally threatened by deforestation of coastal regions.

Eritrea¹⁶

The minerals industry, including cement and petroleum refinery production, was probably not recognized as a significant factor in 1994's constrained economy of rather mountainous, semiarid, Pennsylvania-sized Eritrea. Minerals information for many years prior to 1994 was included under Ethiopia, from which Eritrea became independent in April 1993. No production data were available for 1994, but facilities reported included an 18,000 bbl/d petroleum refinery at Assab on the Red Sea in which the Ethiopian Government apparently retained ownership and reported producing 4.9 million 42-gallon barrels of products¹⁷ in the year ending July 7, 1994; a 45,000 metric tons per year (mt/a) cement plant at Massawa, the country's main Red Sea port, with associated quarries for limestone, clay or shale, and gypsum; and solar-evaporation sea salt plants near Massawa and Assab, each said to have capacities of more than 100,000 mt/a, although production was variously reported at 15,000 to 30,000 mt/a for each; as well as quarries for dimension stone (granite and other), and sources of silica sand and other raw materials for a 20-metric-ton-per-day glassworks in Asmara. Artisanal gold production was estimated in one report at about 300 kilograms per year (kg/a) per year of unspecified purity from many deposits (probably mostly alluvial) spread over a large area in the southwestern hills; other reports indicated much larger output, most of which was sold outside official channels. Small quantities of lignite and kaolin presumably were also mined southwest of Asmara, and undoubtedly some crude construction materials (clays, gravel, sand, stone, and others) were produced for local use throughout the country.

Additional mineral occurrences having some potential for development included many primary gold deposits in quartz veins and schists of the Precambrian terranes just west of Asmara in the less arid central highlands; a small, high-grade

deposit of sulfide copper with gold and other metallic minerals in similar rocks south of Asmara; chromium minerals in the west; potash extending northerly from Ethiopia in the arid, below-sea-level Danakil depression of sedimentary rocks southeast of Asmara; and petroleum in the sedimentaries along the mostly desert coastal plain and in the Dahlak Islands offshore Massawa.

The GDP was \$1.7 billion (estimated purchasing power equivalent) in 1993—\$500 per capita—according to a CIA report. Most of the population depended on subsistence farming in the former Italian colony (1890-1941), then Ethiopian province, and, after a 30-year civil war that ended in 1991, an autonomous region until an April 1993 referendum resulted in independence.

The Government was making an effort to offer attractive features to foreign investors and was especially interested in the mining and petroleum sectors, which were considered to have good potential for improving the economy. A petroleum code was issued in July 1993, a mining code was issued in March 1995, and a general investment code was issued in 1994. All were considered investor-attractive for the most part by industry observers. Within the Ministry of Energy, Mining and Water Resources, a Mines Control Department and a Geological Survey were functioning. The mining legislation and agencies' organization were developed with Australian assistance. A thorough review of mineral occurrences was being prepared, and a delegation of officials attended the Prospectors and Developers Association of Canada in March 1995 to promote investor interest.

Gold and petroleum possibilities attracted a number of international firms. Among more than 15 companies said to be investigating possible gold ventures, specifically mentioned in the press, were Anglo American Corp. (South Africa); Ashanti Goldfields Corp. Ltd. (Ghana); Billiton International Minerals (Netherlands), a unit of Gencor Ltd. (South Africa); Rift Resources Ltd. (Canada); and Broken Hill Propriety Co. Ltd., CRA Ltd., and Western Mining Corp. (all of Australia).

Oil companies negotiating or preparing to negotiate agreements for mostly offshore areas reportedly included Amoco Oil Corp. (United States), which had a pre-independence 60% interest in one tract with International Petroleum Corp. (Canada), which had a 40% interest; Societe Nationale Elf Aquitaine (France); Saint Phalle International Group (a consortium of unnamed companies); and Anadarko Oil Co., Hunt Oil Co., and Mobil Oil Co. (all of the United States).

The infrastructure suffered severe war damage, but was steadily being rehabilitated with financial assistance from a number of countries in the European Community. The work force was generally considered to have a large component that was industrious and self-disciplined with reasonably broad skills as a consequence of Asmara and Massawa having been significant manufacturing and commercial centers for many years.

More mineral activity appeared to be likely as a result of

the political leadership haven taken steps to enact laws and regulations that offer internationally competitive terms for investment.

Ethiopia¹⁸

The minerals industry continued to provide its historically minor contribution to Ethiopia's economy in 1994, although there was more foreign investor activity in the sector. In mineral commodities, gold again probably provided the highest value for total production and was a major export. Construction materials—including brick clay; cement, with its main components of limestone and shale and/or clay; gypsum for cement and plaster; sand and gravel; stone, crushed and dimension; and the like—were also important mineral commodities. Petroleum refinery products were important in the past, but the refinery location was in Assab, which became part of Eritrea in May 1993, as did the principal salt production facilities, which were on the Red Sea. A variety of other minerals were also produced. (*See table 1.*)

Additional valuable minerals, such as natural gas, potash, phosphate, and lignite, are known to occur in deposits of potentially economic size and grade in various parts of the country, which is almost twice the size of Texas. A mountainous high plateau in the northwestern half of the country is capped mostly by thick Tertiary basalt flows rather barren of valuable mineral deposits. But Precambrian basement, hosting many metallic and industrial mineral resources, is exposed below Mesozoic sediments in deep river gorges and outside the edges of the basalt cap, particularly in the far northern highlands and in the western and southern lowlands. In general, the highlands are well-watered as are those lowlands, much of which are covered by rain forest. Drainage, with high potential for hydroelectric power, is mostly westward into the Nile River system. Cutting off the southeastern fourth of the highlands and splitting the country about in one-half, a major rift valley extends southwesterly from Djibouti in the northeast to Lake Turkana in the southwest. That steep-walled valley, underlain by Tertiary and Quaternary volcanics and sediments, at places below sea level, is the locale for a number of evaporite and other industrial mineral deposits, salt lakes, and geothermal sources. The eastern one-third of the country, mainly covered by Mesozoic sediments, is a dry southeasterly sloping plain that offers construction materials sources and oil and gas targets. Oil and gas evidence also was found in the southwestern lowlands near the Sudan.

The GDP was estimated at \$22.7 billion (purchasing power basis)—\$400 per capita—in 1993, according to a CIA report. The economy, one of the poorest per capita in the world, was based on subsistence agriculture, which accounted for about 50% of GDP, 90% of exports (more than 50% coffee), and 80% of employment. Industry, of which mining was a small part, contributed less than 15% to GDP.

The Transitional Government, established in mid-1991

when a socialistic military dictatorship was overthrown, was preparing to hold national elections in 1995. As was the case starting in 1991, at yearend 1994 it continued to vigorously pursue a rather successful economic reform program with World Bank assistance. Under the former central planning, almost all larger industrial enterprises were state-owned, and although privatization was proceeding slowly, the tempo was to increase in 1995. One-stop investment offices were set up in Addis Ababa and in some regions.

The Government was actively promoting further mineral development and, in June 1993, introduced two new mining laws designed to offer competitively attractive terms to international investors. The Ministry of Mines and Energy presented a review of the industry, including policy on mining and mining investment, as well as geology, status of mapping, mineral commodity occurrences, infrastructure, and other pertinent background information in a paper at the African Mining Investment Conference in Denver, Colorado, during June 1994. The organizer was MIGA, a World Bank unit that offers investment insurance against certain political risks. A comprehensive set of investment promotion documents on gold, other minerals, country and economic information, and geology and mining was issued late in 1994 by a U.S. consulting firm under contract with the Government, funded by the UN. Government mining officials held a series of conferences at mining investment centers around the world early in 1995, culminating in an open house conference in Addis Ababa in February at which 20 international companies reportedly were present.

Environmental provisions were included in the new mining laws and implementing regulations. Environmental impact studies were required for submittal with applications both for exploration and for exploitation concessions. Pollution controls and site restoration plans had to be specified in applications. A National Environmental Protection Agency was set up as part of the National Conservation Strategy that was developed during 1994.

Production reports for the most part lacked completeness and accuracy, and much of the data was estimated. Reported gold output dropped 30% for the year ending July 7, 1994, but it was not clear if artisanal or even Government-managed placer production was included. Despite the rather wide fluctuation in data, probably the most significant changes resulted from the transfer of some output to Eritrea, which became independent shortly before the year began. (*See table 1.*)

Trade data for mineral commodities was not available. Nevertheless, gold was obviously an important export and petroleum products an important import. Prior to 1994, Saudi Arabia reportedly supplied substantial oil imports. Although the Assab refinery was in newly independent Eritrea, products may be not be considered imports owing to bilateral agreements on trade and Ethiopia's use of the ports of Assab and Massawa, which together with Djibouti were newly landlocked Ethiopia's main transshipment points.

The structure of the minerals industry for a number of years was dominated by state-owned companies. One that was very active was the Ethiopian Mineral Resources Development Corp. (EMRDC), formed in 1982 to carry out exploration and production of all minerals other than gas, oil, and geothermal resources. It operated the Lega Dembi open pit primary gold mine about 350 km south of Addis Ababa, which had a capacity for producing 3,000 kilograms per year (kg/a) of gold ingot with about one-half coming from a gravity plant and the rest from a tank-leach-electrowinning plant. It also ran the Kenticha open pit primary columbite-tantalite mine and pilot plant, apparently about 50 km southeast of Lega Dembi, with an output capacity of 20 mt/a of concentrate. It also managed a smaller placer gold mining operation in the Adola region east of Lega Dembi, producing about 300 kg/a; operated a soda ash plant at Lake Abiyata about 125 km south of Addis Ababa, capable of producing 20,000 mt/a from the saline lakes in the rift valley; and had projects for developing production of ceramic minerals and gemstones. During 1994, EMRDC was seeking funding and/or partners.

Cement plants at Addis Ababa, Dire Dawa, and Muger (the last two, respectively, about 360 km east-northeast and 60 km northwest of Addis Ababa) were units of the state-owned Ethiopian Cement Corp. Reports were unclear but kiln output capacities were indicated as being, respectively, about 50,000, 20,000, and more than 300,000 mt/a. Grinding capacities were higher.

A petroleum refinery, generally reported as having a crude capacity of 18,000 bbl/d, at the Red Sea port of Assab, Eritrea, was owned by the Government's Ethiopian Petroleum Co. prior to Eritrea's independence. Ownership thereafter was unclear.

Privately owned operations mostly were producing construction materials ranging from local sand and gravel pits to export-oriented dimension stone quarries at various sites. However, significant gold production (1,500 kg/a) was attributed to artisanal operations in the north and west, as well in the south.

A company having both private interests (35%) and Governments companies (65%) as shareholders was proceeding with development of motor and household fuels production from the Calub Gasfield in the Ogaden region in the southeast. In addition, a number of international mining and petroleum companies were pursuing exploration projects.

Mineral commodities attracting most attention during 1994 were headed by gold. A Government tender in 1994 led to exploration permits covering three known deposits being awarded early in 1995 to three companies: Golden Star Resources Ltd. of Canada on the Dul deposit near Asosa on the western border with Sudan; Canyon Resources Corp. of the United States on the Megado Serdo tract and another area, both adjacent to the existing Lega Dembi Mine; and apparently a joint venture of National Mining Corp. of Saudi Arabia and a unit of Boliden AB of Sweden on the Dawa Digati concession, also in the Lega Dembi area. At that

time, 12 other companies had exploration applications pending on 25 other areas, not necessarily all for gold. Two of these also were separately discussing a possible joint venture with the Government on operating and enlarging Lega Dembi: Santa Fe Pacific Gold Corp. and Pegasus Gold Inc., both based in the United States.

Phosphate production viability from the Bikalal apatite-magnetite deposit about 300 km west of Addis Ababa was to be studied using a \$1.8 million grant from African Development Bank (ADB). The Government also announced plans to study an iron ore production project for the same deposit.

Geothermal-generated electricity for the town of Adami Tulu, about 150 km south of Addis Ababa near Lake Langano, studied since the mid-1980's, came closer to realization early in 1994 with a Government invitation for proposals on design and construction. However, no results were announced at yearend.

Natural gas from the Calub Field in the Ogaden region in the southeast was to be used to produce 65,000 mt/a of liquid fuels (liquefied petroleum gas, gasoline, kerosene, and diesel oil) in a \$130 million project. The project received pledges of a \$74 million loan from the World Bank's International Development Association and a \$4 million grant from the Netherlands Government. It was expected the ADB would cover road rehabilitation costs of \$20 million, and other donors would grant \$5 million for community development. The Government was to provide the balance of financing as needed. Shares in the company formed for the project were to be about equally divided among private Ethiopians, foreign investors, and the Government; but early in 1995, reports stated a 35% private interest and 65% interest of state-owned companies including EMRDC, Ethiopian Petroleum Co., the power company, and others.

Petroleum exploration concessions in effect included International Petroleum Corp. in the west on the Sudan border and Hunt Oil Co. in the south. In August 1994, a U.S. firm, Afar Exploration Co., was reported to have secured a production sharing concession for an area in the north near the Eritrean and Djibouti borders. However, in March 1995, it was canceled by the Government because of failure to meet financial commitments. In June 1994, the Government offered production-sharing agreements on 13 blocks in the Ogaden, but results were not announced.

Reserves contained in a number of deposits were available in Government publications.

The physical infrastructure had some limitations that were being addressed by the Government, which was seeking foreign funding. Although road density was low and a fair amount of rehabilitation was needed, regional capitals and many main business centers were connected by all-weather paved or gravel roads. Roads from the Red Sea port of Assab, Eritrea, to Addis Ababa (about 1,000 km) and regional capitals were mostly paved. A bilateral agreement permitted easy access from Ethiopia to Assab and to the port of Massawa further north in Eritrea. Trucking services were

available.

A railroad from the Red Sea port of Djibouti to Addis Ababa (about 750 km) was a major transportation link. It was reportedly owned by Ethiopian and Djibouti interests (probably Government), and apparently others, possibly including French interests. However, the route was reportedly under-utilized owing to equipment shortages, trackage deterioration, and management shortcomings, as well as periodic political dissident attacks. Measures were being taken to revitalize that route, as well as improve the road to Assab.

There were a large number of airports throughout the country and a major international air terminal at Addis Ababa. All regional capitals and main towns were served by scheduled air service.

Electric power was of limited availability outside urban areas, but new generation and distribution facilities were planned, especially to utilize the considerable hydroelectric potential. Water was generally available from river or ground water sources in the minerals-rich areas. Telecommunications were reported reasonably adequate internationally and between regional centers with improvements and expansions planned.

The outlook was for increased activity by domestic and international minerals companies, eventually resulting in increased utilization of Ethiopia's considerable resources.

Lesotho¹⁹

The mineral output of Lesotho consisted almost entirely of clay, gravel, sand, and stone for use in the local economy. Although the domestic mineral sector was relatively insignificant, the wages earned by Basotho miners in the mines of South Africa have traditionally been a significant source of the Nation's foreign exchange.

Work continued on the Lesotho Highland Water Project in the Maluti Mountains. The estimated \$4- billion project involves the construction of a series of reservoirs, tunnels, and dams to bring water to the Johannesburg area of South Africa and to provide hydroelectric power for Lesotho. Locally produced gravel and crushed stone are being used for the project, but cement is imported. A small, unknown quantity of gem-quality diamond is assumed to have been produced.

The Department of Mines and Geology has identified coal, limestone, peat, and uranium deposits in the country.

Liberia²⁰

There was negligible change in Liberia's mineral economy in 1994, owing to the civil unrest that started in late 1989. Mineral production, which stopped during the later part of 1992, consisted mainly of iron ore by one company, diamonds, and gold by artisanal miners. (See table 1.) The operator at Yekepa was evaluating the resumption of mining. Data on diamonds and gold production are incomplete owing

to the reported smuggling of these commodities to and from Liberia's neighbors. Liberia-registered ships form the world's largest merchant fleet (tonnage), and license fees from these ships are an important source of revenues for the Government. The civil war prevented the Government from realizing most agricultural and mineral-related income because almost all of the mineral and agricultural industries were in the areas controlled by opposition forces. Negotiations between the opposing parties resulted in a cease-fire in 1993 and installation of a power-sharing administration in early 1994. This was to be replaced by a national Government in September 1994. The cease-fire allowed production and import-export activities of rubber and timber to resume, but not of minerals. An embargo of the Port of Buchanan in November 1992 cut off the country's exports of iron ore and remained in effect throughout 1993. Reports from sources in Liberia indicated that most of the infrastructure in the mining area was undamaged. Minerals have the potential to play a significant role in Liberia's future. Mining of iron ore near Yekepa could resume when peace is restored and a stable Government is established. However, the security of mine personnel remains a vital issue that depends on the effective disarming of the rival factions. The Governments of Liberia and Guinea may resume negotiations to develop the MIFERGUI-Nimba iron deposit just over the border in Guinea from Yekepa. An issue of concern to the Government of Guinea is the present state of the Liberian infrastructure to support the MIFERGUI-Nimba project. The project, when completed, would provide shipping revenues to the Liberian Government. Environmental issues related to MIFERGUI include the preservation of the forest and certain animal life; however, the potential mine site has been excluded from the World Heritage Site designated for the area.

Malawi²¹

The mineral sector accounted for an estimated 1% of the GDP in 1994. Locally mined coal and limestone were essential components of the country's cement and lime industries.

Mineral activities were covered by the Mines and Minerals Act, 1981; the Mines and Minerals (Mineral Rights) Regulations, 1981; and the Petroleum (Exploration and Production) Act of 1983. All minerals were vested in the President on behalf of the people of Malawi. Environmental provisions in the Mines and Minerals Act included the requirement that the Department of Research and Environmental Affairs review an Environmental Impact Assessment with each mineral rights application.

The Ministry of Energy and Mining was authorized to negotiate incentives and benefits with investors. The Government encouraged local and foreign investment and anticipated that mining would diversify the Nation's economy from its agricultural base.

Mining operations in Malawi included numerous

small-scale lime producers in the Chenkumbi Hills, southeast of Ncheu, and in the Lirangwe area, near Blantyre. There was extensive small-scale gemstone digging activity. Medium-scale operations consisted of limestone quarries and a 10,000 mt/a coal mine at Mchenga in the Livingstonia coalfield operated by the state-owned Mining Investment and Development Corp. (Midcor). Large-scale operations included the Portland Cement Co.'s 200,000-mt/a Changalumi limestone quarry, near Zomba, and its 120,000-mt/a cement plant in Zomba. (See table 1.)

Renewed interest in the mining sector included Midcor's study of the flake graphite deposit at Katengeza in the Dowa District. Midcor also was looking for joint-venture investors to develop apatite deposits. The apatite would be used as a feed for the country's fertilizer industry. According to the Ministry of Energy and Mining, Malawi's bauxite reserves were estimated to be 28 million metric tons (Mmt) averaging 43.9% aluminum oxide (Al₂O₃). The Ministry also estimated coal reserves of more than 800 Mmt and reported additional mineral deposits including corundum, glass sands, kaolin, kyanite, pyrite, rare-earth elements, rutile and ilmenite sands, uranium, and vermiculite.²²

Mauritius²³

The mineral industry of Mauritius was a negligible factor in the economy. Historically, the output consisted of basalt construction stone, coral sand, lime from coral, and solar-evaporated sea salt. Quantitative information was rarely available and then appeared to be inconsistent. For 1990-94, production of mineral commodities was estimated as follows: lime, 7,000 mt/a; salt, 6,000 mt/a; sand, 300,000 mt/a; and stone, 1,000,000 mt/a. Additionally, some minor amounts of locally used crude construction materials, such as clay, sand, and stone, were probably produced by artisanal operations. Undoubtedly, the bulk of the coral sand was used for construction, but in 1991 (the latest year for which data were available), about 20% was reported used in industry; presumably, some was used to make lime—1.5-to-2.0 mt of coral per metric ton of lime. Coral mining was objected to by environmental groups because of detrimental effects on coastal lagoons. Sand made from crushing basalt rock was a substitute for construction uses.

Polymetallic nodules occurred on the ocean floor at about 4,000 meters (m) depth, extending from 400 km to 800 km north of Port Louis, northeast of Tromelin Island. The nodules averaged more than 15% each of iron and manganese and more than 0.3% cobalt, with an abundance averaging from 2 to 6 kilograms per square meter.

Oil possibilities were of interest east of the polymetallic nodules area at shallower depth. The area was inconclusively explored with geophysics and drilling by Texaco in the 1970's.

An oil refinery and petrochemical plant based on imported crude was included in the Government's economic development plans and financing was being sought.

Steel reinforcing bars were made from imported ingot at three rolling mills.

The near-term outlook for mineral-related matters was for few new developments other than a reduction in coral mining.

Niger²⁴

Niger remained the seventh largest producer and fourth largest exporter of uranium in the world in 1994; its reserves were ranked fifth largest in the world. Niger was endowed with rich deposits of gold. Anticipated gold production was expected to total 100 mt of metal with a capacity of about 1 mt/a. According to the Government of Niger, other commercially exploitable minerals in the country were coal, iron ore, phosphates, salt, and tin. Niger also has significant amounts of copper, chromium, nickel, platinum-group metals, silver, and titanium. Niger Hunt Oil Co., a subsidiary of Hunt Oil Co. of the United States, continued exploration activities for oil in the northeastern part of the country. *Mining Magazine* of July 1994 reported that a Nova Scotia-based company, Etrusan Enterprises signed an agreement with State-owned l'Office National des Ressources Minières (ONAREM) to form a joint venture to conduct a feasibility study on the Koma Bangou gold property 150 km northwest of Niamey. SAMAX, a London-based mining company, also was prospecting for minerals in various parts of the country.

According to the Government, new regulations in place favored foreign and domestic private investment in all aspects of the country's economy. The Government, in its effort to promote commercial production of the country's mineral resources, offered a number of incentives to potential investors. The new investment code included an income tax holiday of 5 years to large companies, 2 years to small companies, and an exemption from customs duties on equipment imported for mining or exploration. Also, foreign investors could get exemptions from value-added taxes in some cases, and had the right to remit dividends freely. Uranium continued to dominate mineral production and export in 1994. Other mineral commodities produced included cement, clays, coal, salt, and tin. Coal production was totally for domestic consumption. (See table 1.)

Imports from the United States primarily included oil industry exploration equipment and technology, other industrial equipment, and manufactured goods. Niger's major trading partners were France, Japan, and Nigeria.

The Government participated in equity-sharing arrangements with several companies through its mining ministry, ONAREM. Uranium concentrates were produced by two companies, the Société des Mines de l'Air (SOMAIR) and Compagnie Minière d'Akouta (COMINAK). Gold was largely produced by artisanal miners. Major operating companies in the country were Societe Nigerienne de Charbon for coal and Societe Minière du Niger for tin.

Production of artisanal gold was mainly from the Liptako Fields, with an estimated output level of 1 mt/a worth about

\$11 million²⁵ at current world prices. Recent exploration work revealed the existence of high-quality gold-bearing ore in the green stone belt of the Liptako hills northwest of Niamey, between the Niger River and the border with Burkina Faso.

Uranium remained the main commodity mined in Niger and represented a large percentage of the country's foreign exchange earnings. SOMAIR and COMINAK operated all mines on two concessions, one near the town of Arlit, 250 km northwest of Agadez, and the other at Akouta. The combined installed capacity of the two companies was 7,700 mt/a. Joint-venture mining operations consisted of the Government and several French, German, Japanese, and Spanish firms.

Small quantities of tin ore were mined by private individual operators at El Mecki, Tarouadji, Timie, Agahak, and Cuissat in the Air Mountains.

Industrial mineral production was limited to a few commodities, such as cement, gypsum, salt, and sand and gravel. Mineral fuels production was also limited to coal with an annual capacity of 150,000 mt/a. No official reserve figures were reported for uranium in 1994.

The transportation system in Niger is inadequate, despite considerable road development. The paved roads included a 902-km all-weather road between Niamey and Zinder through Agadez. The 651-km section of the road between Arlit and Tahoua is called the "uranium road." Niger has no railways.

Uranium should remain the most important mineral commodity produced in Niger for the foreseeable future and the largest foreign exchange earner for the immediate future. Development of other resources, such as gold, iron ore, petroleum, and phosphates, should provide additional jobs and foreign exchange revenue for the country.

Reunion²⁶

Mineral commodities production represented only a small part of the economy of Reunion in 1994 as in prior years, even though little quantitative information was available. However, output of hydraulic cement, made by grinding imported clinker, presumably remained substantial, well above 300,000 mt/a. The plant, owned by Ciments de Bourbon S.A. at Le Port, had a capacity of 350,000 mt/a. Additionally, production of basic volcanic rock and sea coast coral undoubtedly continued to meet the needs of construction. Little change in future mineral activity was anticipated.

Rwanda²⁷

The small, but historic, mineral industry in the densely populated, Maryland-sized, landlocked, scenic highland country of Rwanda undoubtedly ceased functioning in April 1994 when the Hutu-dominated Government and followers began the massacre of hundreds of thousands of ethnic-

minority Tutsi's and politically moderate Hutus. Even after victorious Tutsi-led rebels set up a new Government in July, the displacement of much of the population probably prevented resumption of normal mining operations at least well into 1995.

Although the last specific economic information available was for 1990, the minerals industry, as in most countries, normally directly contributed little to Rwanda's GDP, which was estimated to be \$6.8 billion (purchasing power basis)—a low \$800 per capita—for 1993 by the CIA. However, mineral commodities typically provided more than 10% of export earnings (or about \$10 million in 1990), consisting principally of concentrates of tin, tungsten, and columbium-tantalum ores and gold bullion. Mineral-related commodities, mainly petroleum fuels and structural steel, normally were a significant component of imports, about 25% (or about \$70 million in 1990). Trade was mostly with Europe. By comparison, agriculture, principally coffee and tea production, generally accounted for one-half the GDP and more than 80% of exports, and employed more than 90% of the labor force; all industry, mostly associated with agriculture, but including the minerals sector, contributed only slightly more than 15% to GDP.

Geological maps, available for the entire country at a scale of 1:100,000, in general, showed the surface rock to be essentially all Precambrian basement—mostly granite batholiths but also abundant metamorphic formations. Patches of basic rock were east of Lake Kivu and in the southeast and southwest. Some recent volcanics were found in the northwest and southwest border areas. The western limb of the Great Rift System extended along the western border. Though generally small, many deposits of potentially valuable minerals were known for a number of years, especially owing to United Nations efforts; and the geological environment was considered reasonably promising for finding additional deposits, especially in the extensive pegmatites along the edges of the granite.

The Government, both former and new, favored policies and laws that encouraged foreign investment, especially in mineral ventures. In the past, training and financial assistance to small domestic mine operators were offered and a largely Government-owned company was formed to oversee operation of a number of mines. For some time prior to the start of civil war in 1990, the Government generally followed prudent, conservative economic policies and, as part of an economic reform program being pursued with the World Bank and other donors, was attempting to privatize the many Government-owned or controlled companies.

Environmental problems at the many small mines were known to exist, but economic conditions were not conducive to their resolution.

Production and trade data was not available after 1990. (See table 1.)

The structure of the industry consisted mostly of a number of small cooperatives and individual artisans that produced the concentrates of tin, tungsten, columbium-tantalum, and

gold ores from scattered locations, generally in a zone about 30 km wide extending east-west through Kigali. Apparently, a largely Government-owned company held the mining concession on all deposits and subcontracted at least most of the work, although a similar predecessor company did operate some mines itself. That company apparently started up a 3,000-mt/a capacity tin smelter just north of Kigali in 1981, but went bankrupt in 1985 due to low tin prices and poor management. A small cement plant (ownership not known) in the southwest utilized local limestone, and a brewery in Gisenyi was fueled by natural gas from a Government-owned pilot plant exploiting resources beneath northern Lake Kivu.

Extensive peat deposits in the south were to be developed with the help of an \$8 million interest-free loan from the African Development Fund in 1993. This was aimed at reducing imports of fuel for the cement plant and some other industries, and saving native forests from almost universal use as domestic fuel. Other production possibilities included oil in the west along the rift valley, touted in the mid-1980's; lithium minerals, produced in the 1970's; and beryl, last produced in 1985.

Mineral reserves data were not available, although a large number of deposits were referenced as to general size and recorded by the French Bureau de Recherches Géologiques et Minières (BRGM) on a map published in 1982 for the Government of Rwanda, titled *Carte des Gites Minéraux du Rwanda*.

Transportation was tied to the road system. The internal network of paved roads was considered good, but sea ports on the Indian Ocean were 1,500 km east of Kigali at Mobassa (Kenya) and Dar es Salaam (Tanzania)—typical c.i.f delivered costs of imports were 30% higher than f.o.b. vessel in port. There were no railroads in Rwanda, but several terminals were located about 400 km from Kigali—north in Uganda, and south and southeast in Tanzania. Internationally funded improvements of roads in Tanzania to the latter terminal at Isaka on the railroad to Dar es Salaam were expected to result in much lower costs and transit time. Lake Kivu provided some low-cost transportation to a limited area, and the international airport at Kigali was an important factor in the transportation picture.

Ample hydroelectric power and the availability of methane and peat for fuel were advantageous to further industrial and mine development. However, the electrical distribution system was still rather limited.

Telecommunication links with the rest of the world were said to be among the best in Africa, and the internal telephone system was reliable.

The outlook on mineral production was for a gradual return to pre-1994 conditions as, and if, the political situation stabilized. Significant changes were not likely for some time.

São Tomé e Príncipe²⁸

The Democratic Republic of São Tomé e Príncipe is a dual island Nation south of Nigeria and west of Gabon on the Equator in the Atlantic Ocean. The country had no significant mineral industry in 1994 other than some small clay and stone open pit operations supplying local construction needs. The value of mineral production is insignificant. The legal system of São Tomé was based on the Portuguese legal system and customary law. Decree-Law 30-80 of July 1980 did not relate specifically to mining investment. However, it stipulated the conditions for foreign investment.

Seychelles²⁹

Mineral production in Seychelles during 1994 continued to consist mostly of unspecified quantities of construction materials—clay, coral, stone, and sand. Output of guano, an organic phosphate fertilizer composed of bird droppings, ceased in the mid-1980's, but a 5,000-mt/a-capacity remained; occasional small production was unofficially reported.

Granite in the bedrock of Mahe and nearby islands had some economic potential. It was quarried for dimension stone on a trial basis by an Italian firm in the early 1980's. In 1992, Gondwana Granite, a South African company, was granted a license to extract and export up to 3,000 m³ of granite. Tile and statuary products reportedly were the most likely end uses.

Lime and cement production from the abundant coral also continued to be considered.

However, preservationists and other environmentally concerned groups opposed both the granite and coral use projects.

Polymetallic nodules were known to occur on the ocean bottom near the Admirante Islands. Limited sampling was done in the mid-1980's, but funds for further planned work were not available.

The oil potential of the entire Seychelles region continued to be promoted by the Government. Tar balls from subsurface seeps were known for many years to occur on beaches of Coetivy Island, as well as on Mahe and some nearby islands. Exploration began in 1969, and up to 1994, 23,150 km of seismic profiles and 27,911 km of aeromagnetic lines had been accumulated. In the early 1980's, Amoco drilled three wells about 150 km west of Victoria, each of which showed evidence of hydrocarbons, but gave up its acreage when oil prices dropped. In the late 1980's, several other companies acquired exploration rights in the Seychelles: Enterprise Oil PLC, a British major oil firm, in the southeast, and Texaco of the United States and Lasmo PLC of the United Kingdom in the north and west. Early in 1994, Enterprise was reportedly planning a \$10 million drilling test for 1995 on its 10,000-square-kilometer (km²) offshore concession, 200 km southeast of Victoria. In mid-1994, the Government announced other areas were

available for leasing.

Petroleum could well play a larger role in the future economy of the Seychelles.

Somalia³⁰

Continued political instability in 1994 undoubtedly again caused minerals to have an even smaller than its historically insignificant place in Somalia's economy. As for more than 10 years, officially reported mineral production and trade data were not available, and even general economic information was scanty. The country was one of the world's least developed, and prior to the authoritarian Government's overthrow early in 1991, all of industry—with minerals production being only a small part—was estimated to typically contribute less than 10% to a GDP primarily based on agriculture, especially nomadic livestock husbandry. The CIA estimated GDP in 1993 to be about \$3.4 billion (purchasing power equivalent), or slightly more than \$500 per capita, one of the world's lowest.

In the past, mineral commodity production normally included calcined gypsum (plaster); cement and its component limestone, clay or shale, and gypsum; crude local construction materials; evaporated sea salt; refined petroleum products from imported crude; sepiolite (meerschaum); and occasionally very minor amounts of metallic ores and piezo-electric quartz. A few tons of meerschaum was the only noteworthy mineral export commodity.

However, before the central Government's collapse, oil and gas possibilities in the north and along the eastern coast were attractive to several international companies, and a number of other potentially valuable mineral occurrences were reported by surveys of international agencies. Among these were copper, iron, lead-zinc, manganese, tin, titanium, and uranium. Most of the known occurrences of valuable minerals, other than oil and gas, appeared to be associated with exposures of Precambrian rocks—in the northern highlands near and parallel to the coast along the Gulf of Aden, and in low elevations 100 to 250 km west-northwest of Mogadishu—although another area of nonpetroleum economic mineral interest was in younger rocks 300 to 500 km north-northeast of Mogadishu.

Government policies and programs relating to mineral production were lacking in 1994 because there was no central Government—simply clans and groups of clans that exerted control over various localities. The former Government had made a decision in 1980 to start a program of liberalizing the statist economic order imposed 10 years earlier, and its policy became one of encouraging private investment. Nevertheless, through 1991, more than 75% of the small industrial output value was still from parastatals (Government-controlled, often wholly-owned, semiautonomous businesses). In the mineral sector, for many years the former Government did welcome a number of studies by international agencies and foreign country

Governments.

Environmental concerns were never given much attention in Government, press, or other reports.

Mineral production presumably continued in a limited way during 1994, despite the political chaos, because of the need for cement and crude construction materials and the artisanal nature of salt and meerschaum production. However, the petroleum refinery reportedly was not in operation. (*See table 1.*)

Trade in 1994 apparently was limited—especially in the south—mostly to imports of food, medical supplies, and petroleum products together with some exports of bananas and livestock, according to press reports.

Mineral commodity exports from Somalia in recent years prior to 1991 appeared to be only 10 to 20 mt of meerschaum annually and occasionally some petroleum refinery byproducts. Agricultural products, especially those related to livestock, comprised about 80% of export values. Arabian countries and Italy were principal destinations. Exports to the United States were negligible.

The most important imports in recent years prior to 1991 were of mineral origin—crude petroleum and refinery products—more than double the value of the next largest, foodstuffs. Imports of construction materials were almost as large in value as foodstuffs. Saudi Arabia and Bahrain appeared to be the principal sources of petroleum. Italy and the United States were important sources of other imports.

The structure of the mineral industry prior to 1991 consisted of a 10,000-bbl/d petroleum refinery at Mogadishu and a 200,000-mt/a cement plant near Berbera, both operated by parastatals; and a 1,500 mt/a plaster (calcined gypsum) production facility near Berbera, plus a number of small marine salt, meerschaum, and crude construction material producers at various locations, all believed to be privately owned and operated. Up to 1991, oil and gas operations were limited to exploration by international oil companies.

Commodity information was not available in 1994. Reserve information on a few minerals were available in various reports made between 1960-90. However, few deposits had any significant reserves; and, in fact, work performed was rather minimal and the standards for ore reserve classification were not given.

Limestone for cement was generally reported to be abundant. In the north, near the Berbera cement plant, there was a deposit estimated at 30 Mmt. In the south, large deposits were reported at about 250 km west and at about 250 km north of Mogadishu.

A sepiolite deposit about 350 km north of Mogadishu, near El Bur, was considered to have the most promise for development in an UN countrywide minerals appraisal in 1988. The Government earlier stated that the area probably had the world's largest resource of sepiolite.

The UN appraisal also considered as worthy of further study some base metal occurrences 200 km west of Berbera. Additionally, other occurrences of potentially valuable minerals were reported with rare references to quantity or

grade. Among these were beryl, tin-tantalum, manganese, heavy metal beach sands, uranium, and a number of industrial minerals.

Infrastructure was rather limited. The transport system was poor. The 5,000 km of primary and secondary roads—about one-half paved—were considered an adequate network, but much repair was needed, according to World Bank investigators in 1990. There were no railroads. There were three main sea ports at Berbera, Chisimaio, and Mogadishu, essentially no internal waterways, and little coastal shipping. There were four paved airports, at the port cities and Hargeisa, plus other airfields at most towns. Pack animals were important means of transportation.

Electric power generation capacity of the public system totaled 70 megawatts, 70% near Mogadishu, which demand frequently exceeded. There were many small private generating units with estimated total capacity almost equal to the public system. Essentially all were oil-fueled units, mostly diesel. Hydroelectric plants were planned near Bardera and near Mogadishu.

Water resources were scanty and unevenly distributed. Wells were the main source of supply. Reasonably reliable surface supplies were only near the two main rivers in the south. Telecommunications were reportedly very poor.

The outlook for mineral production to become important to Somalia's economy was very doubtful. However, resolution of the political strife could bring some prompt oil and gas exploration.

Sudan³¹

Mineral commodities produced in Africa's largest country (more than one-fourth the size of the United States) included cement, chromite, crude construction material, crude oil, gold, gypsum, limestone, petroleum refinery products, and salt. Although the quantities were small in the world view and the industry contributed very little to Sudan's economy, the country had some potential for increasing output of oil and gas, gold, and chromite, as well as for reviving production of manganese ores and several industrial minerals. Although minerals—mainly chromite, gold, and salt, and frequently manganese ore—typically provided less than 1% of export revenues, mineral commodity imports, principally petroleum refinery products and crude oil, constituted nearly 50% of total imports.

In general, geological mapping showed the surface rocks in the eastern one-third of the country comprised the western one-half of the granitic Precambrian Nubian-Arabian Craton, separated from the Saudi Arabian one-half by the Red Sea Rift. Those igneous and metamorphic rocks of the basement complex, which formed the Red Sea Hills along Sudan's coast and the Ingeessana Hills further south along the Ethiopian border, were the locale of most of the solid mineral activity in the Sudan, as well as in Saudi Arabia. In the Rift, active vents were producing new mineral deposits in the depths of the Red Sea and, near shore, there was at least one

gasfield. In the west, the southern two-thirds, including the Marra Mountains west of Al Fashir, had rock exposures showing even older granitic Precambrian (Archean) formations, which also occurred in the central part of the country, including the Nuba Mountains south of El Obeid. In these rocks, base metal, gold, and uranium occurred at various locations. In the northwestern desert plateau, rocks were mostly Cretaceous age. The south central, well-watered lower lands, had Tertiary exposures and were the locale of petroleum activity. Geologic maps covering the Sudan at a scale of 1:1M, published in 1988, were produced by Robertson Research for the Government.

The economy, with a GDP estimated by the CIA at \$21.5 billion (purchasing power equivalent) for 1993 (latest year available), shrank in 1994, according to some observers. GDP on a per capita basis remained one of the world's lowest. It was based on agriculture, which typically contributed nearly 40%, employed about 80% of the work force, and provided almost all of the exports, more than 50% of which was cotton. The industry sector was also mainly involved in agricultural processing. Deficits in the Government budget and the balance of trade persisted, contributing to annual inflation rates well in excess of 100%. Slow progress on economic reforms and arrears in payments on a large foreign debt continued to cause difficulties with the international financial community.

Politically, the costly 10-year-old civil war in the south continued to be a major problem for the military Government (established by coup in 1989) and involved the largest army in the sub-Sahara other than South Africa. In addition to direct fiscal effects, it was a major cause of a large displaced population requiring humanitarian aid, although some other ethnic problems and a widespread religious controversy also contributed. A dispute continued with Egypt over mineral rights in the triangular zone along Sudan's border with Egypt and the Red Sea known as the Halaib area.

Government policy continued to encourage foreign investments, especially in minerals, as it had even before the Investment Encouragement Act of 1980. That Act and the Mines and Quarries Act of 1972 and Regulations of 1973, together with the Petroleum Act and Regulations of 1972 and 1973, respectively, appeared to be the principal laws affecting the minerals industry, except for radioactive minerals and precious stones, which were treated separately. Early in 1995, it became apparent that to encourage foreign prospective gold mining investors, the Government was permitting a 2-month reconnaissance prior to awarding exploration-exploitation concessions. Representatives of the Government-owned General Petroleum Company gave a presentation reviewing the oil and gas opportunities and soliciting investments at the "AfricaOil '94" conference in Cape Town, South Africa, in October. However, the commercial climate continued to be considered less than favorable by some observers because of certain Government regulations and procedures, as well as ramifications of Islamic law imposed during 1991 in all but some southern

regions. The Government nationalized private industries, including mining, in 1971, but in 1979 let Sudanese nationals regain control of at least certain companies, in which the Government thereafter had no further involvement. However, despite stating privatization was a goal in 1990, the Government apparently continued to require an equity share in any foreign company venture and, in business generally, Government entities continued to make most new investments. Funding of the Geology and Mineral Resource Department of the Ministry of Energy and Mining continued to provide for developing geologic maps and investigating potentially economic mineral occurrences.

Environmental degradation was reported to be substantial in the south as a result of the civil war. However, effects of the small-scale mineral activity apparently were not of concern.

Production information on minerals was very meager and generally considered of doubtful reliability. Nevertheless, various reports indicated that, in 1994, there were some substantial increases: a continuing rise in gold production as the single formal operation expanded, an apparent resumption of a small production of crude oil that initially occurred for a short period in 1993, and a jump in chromite output in response to demand.

Trade in minerals undoubtedly saw a significant increase in exports in line with the rise in production of gold and chromite. However, mineral exports still had little significance in value or volume to overall trade figures, whereas mineral imports were significant, with petroleum refinery products and crude oil being the major components and fertilizer and structural steel also important. In terms of value of all exports (almost all agricultural) the destinations were typically Western Europe for almost 50%, Arab countries for more than 15%, and the United States for less than 5%. Sources of imports typically included roughly one-third from Western Europe, one-third from Arab countries, and one-sixth from the United States.

The structure of the mineral industry consisted of mostly rather small companies, often producing intermittently, although gold and oil possibilities were attracting larger foreign companies into at least some exploration. State-owned companies became significant starting in the early 1970's and remained the sole producers of cement and oil refinery products. They apparently also produced some crude oil, held equity in the gold producer, and probably continued to participate in chromite and manganese ventures. Private firms also began operating again in 1979, but the Government apparently held some equity ownership in production ventures that had foreign participation, with the possible exception of crude oil.

Commodities receiving most attention in the press during the year were gold and petroleum.

Gold would become Sudan's principal export within 10 years, coming from deposits in a belt stretching from near Kenya northernly to near Egypt, according to predictions of the Energy and Mines Minister reported in a Sudanese

newspaper. The only known producer, Ariab Mining Co., owned 45% by the BRGM and 55% by the Government's Sudanese Mining Co., again planned to raise its output of gold doré bullion—to 3,800 kilograms (kg) or more in 1995 compared with 3,000 kg in 1994 and 1,600 kg in 1993—according to press reports in early 1995. A senior officer in a company affiliated with BRGM was quoted as saying production costs were only \$110 per troy ounce. BRGM, operator of the venture, which had explored for a number of years in other areas, started work in the so-called Ariab Basin area, centered about 200 km west of Port Sudan, in about 1987. A 150-metric-ton-per-day ore open pit was opened at the Hassai Mine site in 1989. In late 1991, existing heap-leaching facilities, presumably used for feasibility tests, were rehabilitated, and doré bullion was poured in December 1991. At yearend 1994, BRGM was reportedly near finalizing negotiation for another mining concession in the north, probably east of the Nile south of Wadi Halfa, about 700 km west-northwest of Port Sudan. Beginning in 1994, BRGM became involved in a complex merger with an Australian firm (Normandy Poseidon) and possibly Kuwaiti and/or Saudi Arabian interests that would result in a new holding company called La Source Compagnie Minière and a subsidiary, Mine Or SA, that would hold all gold interests of the group.

Gold prospecting license negotiations between the Government and several international companies were reported to be nearing conclusion at mid-1995. Areas in the Red Sea Hills in the quadrant northwest of Port Sudan, roughly centered about 600 km northeast of Khartoum, as well as areas in the southeast at several places near the borders with Ethiopia, Kenya, and Uganda, were mentioned. Anglo American Corp. of South Africa and Hong Kong International Co. (identified as a Chinese company) were specifically cited separately in press reports as being interested in the southeast. Mention of the northern area may have been in reference to BRGM's new partners and new concession. The northern area was the locale of two short-lived ventures that closed in 1990—one operated by Greenwich Resources Plc. of the United Kingdom, the other by Kenmare Resources Plc. of Ireland.

Crude oil production by Government entities and/or Romania's Rompetrol group in the Abu Gabra area, about 750 km southwest of Khartoum, started late in 1992 and apparently continued despite reports of water inflows causing a shutdown in 1993. Several petroleum industry publications reported output at 2,000 bbl/d being processed in a nearby topping plant.

Oilfield development by Arakis Energy Corp., an independent oil investment company headquartered in Vancouver, Canada, made little progress during 1994, and at mid-1995, final financing arrangements were still unresolved. In late 1993, the company concluded a production-sharing agreement with the Government on 48,000 km² centered about 700 km south-southwest of Khartoum, with options on additional areas. Arakis'

production share was 60% until payback and then 40%. The concession area was part of the former Chevron holdings and contained many more-than-a-decade-old Chevron discovery and delineation wells that led Arakis to estimate recoverable reserves of more than 260 million barrels at 1,500 to 2,500 m depth in the Heglig, Unity, and Kaikang fields. In April and May 1994, reentry and testing of five drillholes required by the agreement gave combined flows of 15,000 bbl/d of light crude having low sulfur, low metals, and 29° to 43° API gravity. However, the rainy season prevented further work until late November on a preliminary \$30 million phase of an \$88 million project to achieve initial production of 65,000 bbl/d by yearend 1995. Early in 1995, tests continued to give promising results, and initial production plans were raised to 85,000 bbl/d. Plans for 1995 also included some drilling and importantly starting a 12-month project for the \$300-million, 1,500-km, 50-centimeter, 85,000 bbl/d pipeline to Port Sudan needed to handle the initial production. Future plans called for producing 100,000 bbl/d in 1997 and 300,000 bbl/d by 2000. However, funds for the pipeline and expansions, totaling \$750 million according to press reports, were not definitely secured at mid-1995. The Government reportedly held independent talks with Iraqi and Russian representatives regarding construction of the pipeline.

Natural gas production possibilities from the Suakin field discovered by Chevron in 1976 along the Red Sea coast southeast of Port Sudan in the Delta Tokar block were not drill-tested by June 1994 as reportedly required for the 6-year concession of International Petroleum Corp., a Canadian company. Presumably as a result, the company retained only about 2,900 km² or 10% of the original permit.

Oil refinery rehabilitation at Port Sudan was expected to be funded by a loan from the French bank Paribas. The loan reportedly was to be guaranteed by the Government's share of profits from the Ariab gold venture. Apparently owned by a Government entity for some time, the refinery was said to be an old topping plant started-up by British Petroleum and Shell in 1964 and had a rated capacity of about 24,000 bbl/d at yearend 1994, although it always had operated at less than 50% of capacity.

Cement plant expansions at Sudan's two cement plants, which were owned by the Government, were expected to raise total output about 15% in 1994, according to the Arab Union for Cement and Building Materials. It was unclear if this occurred since local observers indicated output in 1994 was at best about 150,000 mt/a at the Atbara Cement Co. Ltd. operation, about 275 km northeast of Khartoum, and about 75,000 mt/a at the Nile Cement Co. facility, about 250 km south of Khartoum at Rabak. Annual capacities for finished cement in 1990 before expansions started were estimated respectively at 150,000 mt and 100,000 mt. In the Cembureau's 1991 Directory, expansions scheduled for the early 1990's were to raise capacity at Atbara to 375,000 mt/a burning (clinker) and 500,000 mt/a grinding, and at Rabak to 300,000 mt/a, presumably of finished cement.

Reserve data on minerals in the Sudan was not considered sufficiently reliable for publication.

Infrastructure problems in the country were severe. Sudan's transport system was considered inadequate for the country's size and terrain, which includes large desert and swamp areas. Roads were the primary transportation mode and were badly in need of repair. Of the total 20,000 km, 60% was unimproved dirt and only 10% was paved. A 4,800-km railway network linked major cities, but was in very poor condition and carried only a fraction of the tonnage it had in the early 1970's. A refined petroleum products pipeline 800 km from Port Sudan to Khartoum was opened in 1977. It mainly handled gasoline and diesel fuel, but operated much below capacity and more fuel was carried by tanker trucks. There also was about 3,000 km of waterways, mostly connected to the Nile, but that least expensive mode of transportation was little used. Airports were scattered throughout the country, about 10 of which had permanent surface runways. Port Sudan and nearby Suakin were deepwater ports on the Red Sea that had scheduled shipping services. Major foreign aid programs were aimed at improving transportation.

Electric power shortages were not uncommon, and studies on generation and distribution improvements were also a focus of foreign aid. Hydropower was an important component, but liquid-fueled steam-turbine units were widely used. An additional thermal plant north of Khartoum was planned. New hydro dams and facilities were also being planned, but faced opposition because of summertime limits on waterflow as well as additional displacement of people and loss of croplands. The nuclear plant option was being debated and solar power for rural areas in the west was under study.

Telecommunications were reported as barely adequate.

The outlook for development of some oil production still appeared promising, though difficult financial hurdles remained. Increased gold output also was probable. However, continued political and economic instability was likely to deter major efforts at further exploiting the remaining mineral potential of Sudan for some time. The generally poor infrastructure was an additional obstacle to any significant mineral production increases.

Uganda³²

Uganda's mineral production in the world mineral economy was negligible in 1994. However, minerals could play a significant role in Uganda's economy if Government efforts to revive the industry succeeds. Minerals account for less than 1% of the country's GDP of \$24 billion.³³ Commercial-level mineral deposits include copper, iron ore, gold, phosphate, salt, tin, and tungsten, particularly in southwestern Uganda. The other mineral commodity of importance was cobalt, produced as a byproduct of copper and gold.

The combined biological oxidation, solvent extraction

and electrowining plant being built at Kasese was designed to recover 1,000 mt/a of cobalt from the copper pyrite tailings at the old Kilembe copper mine, near Kilembe in southwestern Uganda, according to the Ugandan Government, which has a 45% stake in this cobalt recovery project. The production of cobalt from copper tailings at the Kilembe Mine on a pilot basis was scheduled to begin in 1995.

In a related development, according to a Uganda news paper, *The East African* of November 1994, an agreement was signed between Banff Resources Ltd. of Canada and the state-owned Kilembe Mines Ltd. to resuscitate copper mining at Kilembe. Exploration and feasibility studies for this project would cost about \$1 million. Rehabilitation of the mine's workshop and foundry was underway by North Korean technicians. Kilembe's proven reserves of copper, according to *The East African*, was 4 Mmt. The copper mines would be expected to provide about 6,000 jobs. Construction of a hydroelectric power station on the Mobutu River in Kasese for this project was completed in 1994.

The country's continued effort to revive its mining industry and improve its infrastructure should lead to growth of the mineral industry and economic expansion. (*See table I.*) Additional financing and technical assistance for reconstruction and rehabilitation of old mining equipment and facilities is being sought from Western donors.

The current Kilembe cobalt and copper projects, if implemented and managed successfully, could stimulate foreign investors' confidence in the economy. Also, the Government continued work on phosphate extraction research at the Tororo apatite deposits. The completion of the Tororo phosphate mine and fertilizer plant could enhance production of food crops and provide additional export commodities. Mineral production is expected to attain its full potential after the turn of the century. Additional gold and iron ore exports should increase the country's foreign exchange revenues.

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¹Text prepared Mar. 1995 by P. M. Mobbs.

²Law No. 1/92 of Jan. 17, 1992.

³Africa Energy & Mining. No. 122, Nov. 17, 1993, p. 1.

⁴Petroleum Economist. New Fields, New Licences, and Hopes of Peace. V. 61, No. 11, Nov. 94, pp. 4-6.

⁵Ministry of Geology and Mines. Opportunity for Mining Investment in Angola. Paper presented at the African Conference on Mining Investment, Denver, Colorado, June 6-8, 1994. 42 pp.

⁶Text prepared Feb. 1995 by P. M. Mobbs.

⁷Oil & Gas Journal, Seme Reserves Hiked, Benin Gas Project Eyed, v. 92, No. 23, June 6, 1994, p. 105.

⁸Ministry of Energy, Mining, and Hydraulics. Benin Mining Resources, 1992. 23 pp.

⁹Text prepared Apr. 1995 by P. M. Mobbs.

¹⁰Mining Journal. Burkina Faso Country Supplement. V. 321, No. 8237, Aug. 13, 1993, 8 pp.

¹¹Text prepared July 1995 by Lloyd E. Antonides.

¹²Text prepared Feb. 1995 by P. M. Mobbs.

¹³Text prepared Mar. 1995 by Lloyd E. Antonides.

¹⁴Text prepared Oct. 1995 by Lloyd E. Antonides.

¹⁵Text prepared Mar. 1995 by Thomas P. Dolley.

¹⁶Text prepared Oct. 1995 by Lloyd E. Antonides.

¹⁷Reported in metric tons, converted using U.S. Department of Energy factors.

¹⁸Text prepared Oct. 1995 by Lloyd E. Antonides.

¹⁹Text prepared Feb. 1995 by P. M. Mobbs.

²⁰Text prepared Feb. 1995 by David Izon.

²¹Text prepared Mar. 1995 by P.M. Mobbs.

²²Mineral Investment Opportunities in Malawi. Ministry of Energy and Mining. Lilongwe, Malawi, 1993, 34 pp.

²³Text prepared Mar. 1995 by Lloyd E. Antonides.

²⁴Text prepared Mar. 1995 by David Izon.

²⁵Where necessary, values for Niger have been converted from Communaute Financiere Africaine francs (CFA) to U.S. dollars at the rate of CFA296.00=US\$1.00 in 1994.

²⁶Text prepared Mar. 1995 by Lloyd E. Antonides.

²⁷Text prepared July 1995 by Lloyd E. Antonides.

²⁸Text prepared Mar. 1995 by Thomas P. Dolley.

²⁹Text prepared Apr. 1995 by Lloyd E. Antonides.

³⁰Text prepared Apr. 1995 by Lloyd E. Antonides.

³¹Text prepared Sept. 1995 by Lloyd E. Antonides.

³²Text prepared Mar. 1995 by David Izon.

³³Where necessary, values have been converted from Ugandan shillings to U.S. dollars at USH1,131.00=US\$1.00 in 1994.

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TABLE 1
OTHER COUNTRIES OF AFRICA: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity	1990	1991	1992	1993	1994 e/
ANGOLA 4/					
Cement, hydraulic e/	260	260	300	250	300
Diamond 5/ 6/	1,130	961	1,180	145 r/	300
Gas, natural:					
Gross e/ 7/	2,600	2,870	2,800	2,700 r/	2,800
Dry	538	577	564	560 r/	560
Granite	402	978	184	1,130	1,490
Iron and steel: Steel, crude e/	10,000	10,000	10,000	9,000	9,000
Marble	267,000	244	455	104	91,000
Natural gas plant liquids e/	2,500	2,500	2,500	1,730	2,000
Petroleum:					
Crude	174,000	184,000	190,000 r/	187,000 r/	199,000
Refinery products e/ 8/	9,560	9,600	10,200 r/	9,000	9,000
Salt e/	30,000	40,000	20,000	30,000	30,000
BENIN 9/ 10/					
Cement, hydraulic e/	300,000	320,000	370,000	380,000	380,000
Iron and steel: Steel, crude e/ 11/	8,000	8,000	8,000	2,000	--
Petroleum, crude	1,416	1,353	931	950 r/ e/	900
BURUNDI 12/ 13/					
Clays: Kaolin	5,280	6,680	9,690	5,000 e/	5,000
Gold 14/	9	25 e/	32 e/	20 e/	20
Lime	188	86	182	150 e/	150
Peat	12,000	10,000	12,000	10,000 e/	10,000
Tin, mine output, ore (e/ 60% SnO ₂):					
Gross weight	115 e/	124	183	100 e/	100
Sn content e/	54	74	110	50	50
BURKINA FASO 15/ 16/					
Gold	7,800	5,600	5,400	5,000	6,000
Manganese, Mn content of ore	--	--	--	17	30
Pumice and related volcanic materials	10	10	10	10	11
Salt	6,500	6,500	6,500	6,500	6,500
Stone: Marble	8,280	100	100	100	110
CAPE VERDE 17/ 18/					
Salt e/	3,500	4,000	4,000	4,000	4,000
Pozzolana e/	53,000	53,000	53,000	25,000	5,000
ETHIOPIA e/ 19/ 20/					
Cement, hydraulic	340,000 3/	290,000	320,000	350,000	300,000
Clays: 21/					
Brick	17,000	14,000	15,000	15,000	10,000
Kaolin (China clay)	670	370	420	500	--
Diatomite	3 3/	1 3/	5	10	1
Gold: Mine output, Au content 3/ 22/	848	3,040	2,220	3,390	2,370
Gypsum and anhydrite, crude 21/ 23/	2,250	1,750	2,650	2,500	30,700
Lime	70 3/	45 3/	100	100	100
Petroleum refinery products 24/	5,560 3/	3,600	2,530 3/	4,000	-- 25/
Platinum: Mine output, Pt content 26/	1,500	1,000	500	-- r/	--
Pumice 4/	23,000	37,000	49,000	40,000	113,000
Salt:					
Marine	100,000	85,000	100,000	120,000	--
Rock	10,000	8,000	10,000	10,000	5,000
Scoria	10,000	8,500	8,000	8,000	7,000
Soda ash, natural	1,410 3/	18,500 3/	500	248 3/	2,150 3/
Stone, sand and gravel: 21/					
Construction stone, crushed	1,560	2,640	860	1,000	3,720
Dimension stone	3,300	2,800	2,000	3,000	3,000
Limestone 23/	100	90	100	100	261
Sand 27/	1,250	1,000	700	1,000	3,770

See footnotes at end of table.

TABLE 1--Continued
OTHER COUNTRIES OF AFRICA: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity	1990	1991	1992	1993	1994 e/
ETHIOPIA--Continued:					
Tantalite, concentrate (40% -60% Ta ₂ O ₅)	6 3/	10 3/	14	17 /3	26 3/
LIBERIA 28/					
Cement, hydraulic	48,800 3/	2,310 r/	8,280 3/	8,300	--
Diamond: 29/					
Gem					
thousand carats	40,000	40,000	60,000	60,000	40,000
Industrial	60,000	60,000	90,000	90,000	60,000
do.					
Total	100,000	100,000	150,000	150,000	100,000
do.					
Gold 29/	600	600	700	700	700
kilograms					
Iron ore	4,050 3/	1,100 3/	1,740 3/	--	--
thousand metric tons					
Silica sand e/	5,000	--	--	--	--
MALAWI 30/ 31/					
Cement, hydraulic	99,300	120,000	112,000	127,000 r/	130,000
Coal	41,400	49,100 r/	39,200	52,800	55,000
Dolomite e/	2,480	2,500	2,500	2,000	2,000
Gemstones: Ruby and sapphire e/	730 r/	200 r/	122 r/	124 r/	125
kilograms					
Lime e/	4,100	4,000	4,000	2,560	2,600
Stone:					
Crushed for aggregate	139,000	200,000 e/	420,000	308,000	380,000
Limestone for cement	145,000	175,000	175,000 r/	126,000	140,000
NIGER 32/					
Cement, hydraulic	19,478	20,109	29,288	29,200	29,200
Coal, bituminous	153,913	156,542	133,525	133,500	133,500
Gypsum e/		1,000 3/	1,750 e/	1,700	1,700
Molybdenum concentrate, Mo content e/	10	10	10	10	10
Salt	2,740	2,960	2,970 r/	3,000	3,000
Tin, mine output, Sn content	38	20	20 e/	20	20
Uranium, U ₃ O ₈ content of concentrate	3,161	3,330	2,970	2,900	2,900
RWANDA e/ 33/ 34/					
Cement	60,300 3/	60,000	60,000	60,000	10,000
Columbite-tantalite, ore and concentrate:					
Gross weight	110,000	35/100,000	100,000	100,000	10,000
kilograms					
Cb content e/	37,000 r/	34,000 r/	34,000 r/	34,000 r/	3,400
do.					
Ta content e/	24,000	22,000	22,000	22,000	2,200
do.					
Gold, mine output, Au content	2,160 36/	1,000	1,000	1,000	100
do.					
Natural gas, gross	973 3/	970	970	970	100
thousand cubic meters					
Tin: Mine output, Sn content	734 37/	730	500 r/	400 r/	50
Tungsten, mine output, W content	156 38/	175	175	175	30
SOMALIA e/ 39/ 40/					
Cement, hydraulic	40,000	10,000	25,000	25,000	25,000
thousand metric tons					
Gypsum	2,500	1,000	2,000	2,000	2,000
do.					
Limestone 41/	65,000	17,000	40,000	40,000	40,000
do.					
Petroleum refinery products:					
Gasoline 42/	740	150	--	--	--
thousand 42 gallon barrels					
Jet fuel	120	30	--	--	--
do.					
Kerosene	60	20	--	--	--
do.					
Distillate fuel oil	660	120	--	--	--
do.					
Residual fuel oil	110	20	--	--	--
do.					
Other 43/	100	20	--	--	--
do.					
Total	1,750	360	--	--	--
do.					
Salt, marine	1,500	500	1,000	1,000	1,000
thousand metric tons					
Sepiolite (meerschau)	10	4	2	5	5
do.					
SUDAN e/ 44/ 45/					
Cement, hydraulic	167,000 3/	170,000	250,000	250,000	250,000
thousand metric tons					
Chromium: Chromite, mine output, gross weight 46/	12,500 3/	10,000	10,000	11,500 r/	25,000
kilograms					
Gold, mine output, Au content	100	50	1,000	1,600	3,000
kilograms					

See footnotes at end of table.

TABLE 1--Continued
OTHER COUNTRIES OF AFRICA: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity	1990	1991	1992	1993	1994 e/
SUDAN--Continued:					
Petroleum:					
Crude (including lease condensate) thousand 42-gallon barrels	--	--	110	360	730
Refinery products do.	1,050	7,800	7,500 r/	7,500 r/	7,500
Salt	68,300 3/	75,000	75,000	75,000	75,000
UGANDA 47/					
Cement, hydraulic	26,920	50,000 e/	50,000 e/	50,000 e/	50,000
Gold kilograms	--	--	1,800	1,800	1,800
Iron ore	--	--	132	130	130
Lime, hydrated and quick e/	1,500	2,000	1,500 3/	1,500	1,500
Phosphate minerals: Apatite e/	100	100	100	100	100
Salt, evaporated e/	5,000	5,000	5,000	5,000	5,000
Tin, mine output, Sn content e/	25	25	30 3/	30	30
Tungsten, mine output, W content e/	4	4	66 3/	60	60

e/ Estimated. r/ Revised.

1/ Previously published and 1994 data are rounded by the U.S. Bureau of Mines.

2/ In addition to the commodities listed, a variety of industrial minerals and construction materials (clays, gypsum, sand and gravel, and stone) are produced, but information is inadequate to make reliable estimates of output.

3/ Reported figure.

4/ Includes data available through Aug. 1, 1995.

5/ Does not include smuggled production.

6/ Production is approximately 90% gem and 10% industrial grade.

7/ Angola has no natural gas distribution system. Most gas is vented, except for a small fraction, from which natural gas liquids are produced. Propane and butane canisters are filled at the well site. See "Natural gas plant liquids."

8/ Includes asphalt and bitumen, natural, previously listed separately.

9/ Includes data available through Feb. 10, 1995.

10/ In addition to the commodities listed, unreported quantities of clay, sand and gravel, and stone are believed to be produced, but information is inadequate to make reliable estimates of output levels.

11/ Plant closed in 1993.

12/ Includes data available through Aug. 1, 1995. Previously published and 1994 data are rounded to three significant digits; and data may not add to totals shown because of independent rounding.

13/ In addition to commodities listed, the following were produced but information is inadequate to reliably estimate output: columbium-tantalum ore and concentrate officially reported as 8,527 kilograms gross weight in 1992 (last prior report was 2,100 kilograms in 1979); and mostly locally produced and used crushed stone (47,282 cubic meters known and reported in 1992), and presumably other crude construction materials (clays, sand and gravel, et al.).

14/ Prior to 1991 some additional gold production, mostly in the northwest, was illegally exported and not officially recorded, but information is inadequate to reliably estimate such output. This unrecorded production was reported to be substantial in 1990 especially. Starting in 1991 production data reported are considered realistic although only estimates because statistics are no longer obtained by Burundi Government agencies.

15/ Includes data available through Apr. 18, 1995.

16/ In addition to the commodities listed, Burkina Faso produced clays, and sand and gravel for local construction use; however, information is inadequate to make reliable estimates of output levels.

17/ Includes data available through Feb. 24, 1995.

18/ In addition to commodities listed, small quantities of limestone, clays, gypsum, pumice, and ornamental building stone may have been produced, but available information is inadequate to make reliable estimates of output levels.

19/ Data are for year ending July 7 of the year listed. Includes data available through Oct. 1, 1995. Previously published and 1994 data are rounded by the U.S. Bureau of Mines to three significant digits; data may not add to totals shown because of independent rounding. For 1993, some production (particularly cement and component limestone, shale or clay, and gypsum; gold; petroleum refinery products; salt; and stone) may be in Eritrea which became independent in May 1993.

20/ In addition to the commodities listed, some lignite and semiprecious gemstones reportedly were produced, some crude construction materials (clays, sand, gravel, stone, et al.) presumably were produced locally on a small scale, and silver was reportedly contained in gold ingots from the Lege Dembi Mine, but information is inadequate to reliably estimate output.

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

22/ Additional artisanal gold reportedly was normally produced (estimated at 1,500 kilograms per year according to a Government official in 1994), and there may have been other production, but information is inadequate to reliably estimate output.

23/ Apparently does not include production for cement manufacture, except possibly for 1994. Normally the manufacture of 1 ton of cement requires 30 to 50 kilograms of gypsum as well as 1.3 to 1.8 tons of limestone and up to 0.5 ton of shale and/or clay.

24/ When reported in metric tons, conversion to barrels is calculated using U.S. Department of Energy factors.

TABLE 1--Continued
OTHER COUNTRIES OF AFRICA: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

- 25/ Reported as 674,865 metric tons total (converted to 4,930,000 barrels); but refinery is located in Eritrea, which became independent in May 1993, although the Government of Ethiopia may have some retained ownership.
- 26/ No platinum production was officially reported after 1988. However, 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 gold mine which started up in 1990, but information is inadequate to reliably estimate output.
- 27/ May include gravel.
- 28/ Includes data available through Feb. 17, 1995.
- 29/ Data through 1990 do not include smuggled production. Data for 1990-94 are estimates of artisanal production, likely smuggled out of Liberia, but which are comparable to that hitherto reported to the Government.
- 30/ Includes data available through Mar. 30, 1995.
- 31/ In addition to the commodities listed, modest quantities of unlisted varieties of crude construction materials (clays, sand and gravel, and other stone) presumably are produced, but output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels.
- 32/ Includes data available through Mar. 24, 1995.
- 33/ Includes data available through Aug. 1, 1995.
- 34/ In addition to commodities listed, the following are produced but information is inadequate to reliably estimate output: some gemstones (sapphire and tourmaline); limestone for cement and possibly agriculture; shale and/or clay for cement; and probably crude construction materials (e.g., clays for brick and tile, sand and gravel, stone) from small local operations. Beryllium (concentrate, estimated 10% beryllium oxide) production was last reported in 1985 at 27 tons. Tin smelter output was last reported in 1985 at 800 tons metal when the smelter was reported shut down.
- 35/ Reported figure. Estimated to contain 22% tantalum plus 34% columbium (content last reported in 1985 at 27% tantalum oxide; weight ratio of tantalum oxide to columbium oxide historically was about 56%).
- 36/ Gross weight reported, estimated to contain 92% gold.
- 37/ Gross weight ("cassiterite") reported, estimated to contain 70% tin (90% cassiterite).
- 38/ Gross weight ("wolfram") reported, estimated to contain 54% tungsten (68% tungsten trioxide).
- 39/ Includes data available through Apr. 1, 1995. Previous published and 1994 data are rounded by the U.S. Bureau of Mines to three significant digits; data may not add to totals shown because of independent rounding.
- 40/ In addition to 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; also clay and/or shale are normally produced for cement manufacture. But available information is inadequate to make reliable estimates of output.
- 41/ Estimated for cement manufacture only.
- 42/ Includes aviation and motor gasoline.
- 43/ Includes nonenergy products (lubricants, bitumen, and miscellaneous other) and refinery fuel and losses. Liquid petroleum gas apparently was not produced. Refinery fuel and losses were estimated as follows, in thousand barrels: 1990--60 and 1991--10.
- 44/ Includes data available through Sept. 1, 1995. Previously published and 1994 data are rounded by the U.S. Bureau of Mines to three significant digits; data may not add to totals shown because of independent rounding.
- 45/ In addition to the commodities listed, the following are presumably produced but available information is inadequate to reliably estimate output: clay and/shale for cement manufacture (normally about 0.4 ton clay and/or shale per ton of finished cement); gypsum for cement manufacture (about 0.04 ton per ton of finished cement) and plaster; limestone for cement manufacture (normally at least 1.25 ton per tons of finished cement), agriculture, lime manufacture, and construction aggregate and fill; and other locally used construction materials (clays, sand and gravel, stone, et al.). Also production of manganese ore (48% to 50% manganese) was reported for 1990 at 60,000 metric tons.
- 46/ Presumed to be ores and concentrates with an estimated average grade of about 48% chromic oxide.
- 47/ Includes data available through Mar. 3, 1995.