

THE MINERAL INDUSTRIES OF AFRICA AND THE MIDDLE EAST

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Africa

The 55 countries of continental Africa and adjacent islands covered in this book encompass a land area of 30.27 million square kilometers, over three times the size of the United States, and had a 1996 population of approximately 743 million people. World Bank estimates of gross national product (GNP) per capita in Africa based on purchasing power parity data for 1995 ranged from a high of \$9,600 in Libya to a low of \$400 in Ethiopia, Rwanda, and Zaire. The GNP per capita in this mineral- and energy-rich region averaged about \$1,800.

For many African countries, fuel and nonfuel mineral production and development constitute a significant part of the economy and remain a key to future economic growth. The continent is richly endowed in mineral reserves and ranks first or second in terms of concentration (from 23 to 89 percent) of world reserves of antimony, bauxite, chromite, cobalt, diamond, fluor spar, gold, hafnium, manganese, phosphate rock, platinum-group elements, titanium minerals (rutile and ilmenite), vanadium, vermiculite, and zirconium minerals. Except for bauxite (Guinea), cobalt (Zaire and Zambia), diamond (Angola, Botswana, Namibia, Zaire), and phosphate rock (Morocco) the bulk of these reserves are located in South Africa. Africa also possesses from 6 to 8 percent of the world's reserves of coal, copper, natural gas and petroleum and about 20 percent of world uranium reserves minable at a price not less than \$80 per kilogram of uranium.

Natural resource development has proved vital to the economies of African nations because of its role in generating employment and foreign exchange and in providing the stimulus to develop the power and transportation infrastructure of the region. South Africa is one of the world's major mining and mineral-processing nations. Within the continent, the countries of subequatorial Africa comprised the dominant mineral-producing region. Mineral trade plays a significant role in African economies with mineral exports accounting for between 50% and 95% of total export earnings for Algeria, Angola, Botswana, Gabon, Guinea, Libya, Namibia, Niger, Nigeria, Zaire, and Zambia and between one-third and one-half of total export earnings for Egypt, Ghana, Jordan, and South Africa.

Historically, Africa has been a major supplier of strategic minerals to the United States and world markets. Africa accounts for between 11% and 45% of the world supply of eight major mineral commodities, chromite, cobalt, diamond, gold, manganese ore, crude petroleum, phosphate, and uranium (*see table 1*) and is a major producer of valued added processed materials, especially ferroalloys and aluminum. Most of Africa's mineral industries were export oriented and thus

exposed to world market fluctuations. A number of African countries that were dependent on one mineral commodity, typically bauxite, copper, petroleum, phosphate, or diamond, were seeking to diversify their economies by developing downstream mineral-processing industries or additional mineral resources.

Africa is witnessing a major resurgence in mineral exploration and mineral project planning. According to the Metals Economics Group of Halifax, N.S., Canada, \$418 million or nearly 12% of the combined exploration budgets of 223 companies were allocated for expenditure in Africa in 1996 (Metals Economics Group, 1997). This compares to World Bank estimates of exploration spending in Sub-Saharan Africa of about \$280 million in the late 1980's. This increased attention by the world's minerals industry on Africa can be attributed to several factors:

1. The successful effort of the Multilateral Investment Guarantee Agency (MIGA), an arm of the World Bank, over the past 3 to 5 years in working with many African countries to put in place the more progressive mining and foreign investment laws that will attract foreign capital and technology.
2. The unprecedented success of Canadian stock exchanges in generating new capital for global exploration and mineral investment and channeled to Africa through Canadian junior mining companies.
3. Changes in the political climate which have enabled Angola and Mozambique to be reopened to exploration after years of civil war, a post-Apartheid South Africa look outward toward the rest of Africa for mineral investment opportunities, and efforts to privatize previously state-owned mineral holdings such as the Zambian Consolidated Copper Mines.
4. The perceived high probability for the occurrence of mineral resources on the continent, especially Sub-Saharan Africa, which has not been intensely explored in the past because of its high political risk.

Diamond exploration and development continued in Angola, Botswana, Namibia, South Africa, Zaire, and Zimbabwe, while the gold rush continued, especially in Burkina Faso, Côte d'Ivoire, Eritrea, Ethiopia, Ghana, Guinea, Mali, Niger, Tanzania, Uganda, and Zaire. Canadian, South African, and Australian companies were in the forefront of the current exploration activity in Africa. Most gold projects were still in the early drilling stages; however, potentially commercial gold resources were reported for the Bibiani, Damang, Obotan, Tarkwa, and Wassa deposits in Ghana, the Bulyanhulu, Golden Pride, Golden Ridge, and Geita deposits in Tanzania and the

Siguiri deposit in Guinea.

The Central African Republic, Côte d'Ivoire, Guinea, and Senegal were also experiencing increased international investor interest in their gold resources. Gold output continued to surpass old production records in Ghana and Zimbabwe. In Ghana, Ashanti Goldfields emerged as a major force in African mining by investing over \$500 million to acquire three companies with significant gold properties in Ghana, Burkina Faso, Guinea, and Zimbabwe. The acquired companies were International Gold Resources (Canada), Cluff Resources (U.K.), and Golden Shamrock (Australia). Ashanti corporate gold production increased to 32,000 kilograms in 1996, following its shift to a calendar year financial reporting. In Mali, the Sadiola Hill gold mine began production in December.

In 1996, about 498 metric tons of gold was produced in South Africa, the lowest in 40 years. The decline was attributed to aging, high-cost mines, declining ore grades, and lost productivity due to continued labor unrest. The depreciating value of the South African rand helped offset higher internal gold production costs and lower dollar export earnings. The South African gold industry continued to expand capacity at a number of existing mines, while major new mine developments, totalling \$1.2 billion, were underway at Anglovaal Ltd.'s Target Mine and JCI Ltd.'s South Deep Mine. Iscor Ltd. of South Africa also planned to develop a new \$360-million heavy minerals project in the Richards Bay area. Production of major South African export commodities—chromium, coal, diamond, iron ore, manganese, and platinum-group metals—remained within 3% of 1995 levels. Three large export-oriented projects entered their first full year of production with mixed success. Alusaf reached full production rate of 490,000 metric tons of aluminum by midyear at its Hillside smelter at Richards Bay. Anglo American's Namakwa Heavy Sands project experienced a setback in October with a furnace explosion at its 96,000-metric-ton-per-year (t/yr) high titanium slag and pig iron facility, which will remain out of commission until the first quarter of 1997. At the new 600,000-t/yr Columbus Stainless Steel plant, a joint venture between Highveld Steel, Samancor, and the Industrial Development Corporation, commissioning problems limited output to about one-half capacity.

The six major South African mining houses continued corporate "unbundling" and diversification of investments outside of South Africa, with a particular eye to new exploration and development opportunities elsewhere in Africa. As part of Black Economic Empowerment initiatives in South Africa, two African-owned commercial firms were established in 1996, stimulated by offers to purchase unbundled Anglo-American assets. The National Empowerment Consortium (NEC) gained control of Johnnic, Anglo's industrial investment company, for an estimated 2.1 billion rand (\$450 million). The National Union of Mineworkers held a 13% interest in NEC. In a similar move in November, Anglo agreed to sell in principle 35% of the nonplatinum mining assets of JCI Ltd. to the African Mining Group Consortium for 2.87 billion rand (\$620 million). In the policy arena, the South Africa Government was expected to release its Minerals Policy Green Paper by yearend. Expectations were that it would promote a positive environment for growth and employment in the mining sector.

Nations in both east and west Africa were actively promoting mineral development to the international investment community. In Nigeria, the new Ministry of Solid Minerals Development continued to develop its organization. The Zambia Privatization Agency, after lengthy internal government debate, issued an international tender to prospective investors to buy the mining and electricity distribution assets of the Zambia Consolidated Copper Mines Ltd. (ZCCM). By November 1996, 38 companies had prequalified to bid on the ZCCM assets which were broken up into nine packages including most of the combined Nchanga and Nkana Divisions, the Luanshya Division, the Mufalira Mine and concentrator, the Chambishi Mine, the Kansanshi Mine, the Nampundwe pyrite Mine, the Chambishi cobalt plant, the Ndola precious metals plant, and the ZCCM Electric Power Division. After 4 months of due diligence, final bids will be submitted, with winners likely to be announced by mid-1997. Proceeds from the sales will go to liquidate \$500 to \$600 million in ZCCM debts. ZCCM estimated that a \$1.5- to \$2-billion investment would be needed to maintain Zambia's role as a major world copper-cobalt producer. A company created by former ZCCM employees, Kabwe Power and Metal Company, acquired 100% ownership of the closed Kabwe lead-zinc mine and announced plans to restart production initially from old tailings. In other tailings reprocessing investments in Zambia, Colossal Resources of Canada continued to move forward with a 60%-40% joint venture with the Zambian-based Qasim Mining Enterprises to reprocess 8.6 million tons of ZCCM's Nkana smelter slags containing an estimated 0.7% to 0.81% recoverable cobalt and 1.15% copper. The operation will produce up to 3,110 tons per year of cobalt using a two-stage process, either a reductive smelting in an open arc electric furnace followed by separation and hydrometallurgical extraction of cobalt or a Foxsmelt flash oxidation smelting process to produce cobalt ferroalloys directly. First Quantum Minerals Ltd. of Vancouver plans to invest \$26 million on their Bwana Mkubwa project, which will reprocess ZCCM's Ndola No. 4 copper tailings using a leach, solvent extraction-electrowinning (SX-EW) process. Annual production is expected to be around 10,000 tons of copper and 60,000 tons of sulfuric acid that can be sold to nearby ZCCM operations. Also in Zambia, a consortium of ZCCM, Anglo-American, and Gencor were conducting feasibility studies on developing the 380 million tons of high-grade copper reserves in the Konkola Deeps Mine extension, Anglovaal Ltd. was exploring the adjacent Konkola North copper deposit, and the Canadian company, Caledonia Mining Corp.'s exploration led to the discovery of 295 million tons of indicated and inferred cobalt resources grading 0.03% cobalt in three zones in the Nama area northwest of the Copperbelt and an additional copper-cobalt discovery at Kadola West, 40 kilometers south of Luanshya.

Additional activity in Africa's mineral industry included rutile exploration at Akonolinga in Cameroon, the investigation of the Biankouma-Touba nickel deposit in Côte d'Ivoire, and the development of new bauxite deposits and the resumption of diamond exploration in Guinea. In Kenya, Kenya Fluorspar Co. Ltd. was privatized and Tiomin Resources Inc. of Canada was evaluating more than 1 billion metric tons of coastal sands

grading 3% titanium-bearing minerals. An 180,000-t/yr-capacity aluminum smelter was under construction in Nigeria. Processing operations to recover cobalt from stockpiled pyrite concentrates at Kilembe in Uganda were underway. In Zimbabwe, mining began at the Hartley platinum mine during March 1996 and a number of additional platinum projects along the Great Dyke were being evaluated. A proposal was made to ship Zimbabwean iron ore by rail to Mozambique as part of a direct reduced iron project.

Civil war adversely affected mineral exploration and development in Burundi, Liberia, Rwanda, Sierra Leone, Somalia, and Sudan. In the Central African Republic, diamond production continued despite repeated attempted coups. In Sierra Leone, Sierra Rutile Holdings Ltd. remained closed in 1996 but reported little external damage to major equipment resulting from insurgent actions at the site in January 1995. Rutile production is expected to resume in 1997 or 1998. The Rwandan refugee movements and military actions in eastern Zaire affected supply routes through Bukavu for gold and other mining operations in Kivu Province, while incipient civil war and secessionist actions raised concerns for future copper-cobalt and diamond mining activities in Shaba and West Kasai Provinces.

Despite political uncertainties, most of 1996 saw increased foreign investor interest in the minerals sector of Zaire. The Canadian firm, Banro Resource Corp. acquired a 72% interest in the gold mines and properties of Societe Zairoise Miniere et Industrielle du Kivu (Sominki) and began plans for a \$20 million development program. However, the Mobale gold mine near Kamituga in eastern Zaire was heavily damaged and normal supply routes through Bukavu were disrupted during fighting between the Zaire army and local insurgents late in the year. This action delayed further development plans. Sominki produced about 10,000 ounces of gold and 650 tons of tin per year and held reported minable reserves and geological resources in excess of 6.8 million ounces of gold in its Mobale Mine and Twangii, Lugushwa, and Namoya properties.

International Panorama Resource Corp. of Vancouver and its subsidiary, PTM Minerals (Cayman) Ltd., reached an agreement with Gecamines to obtain a 51% equity interest in and to acquire the rights to reprocess an estimated 61 million tons of tailings grading 0.98% copper and 0.19% cobalt from waste from the Kambove and Kakanda mines. Subject to final feasibility studies, a 17,000-ton-per-day vat-leach, SX-EW operation, costing up to \$190 million, is planned for 1999. After a 30-year absence from Zaire, the Belgium company, Union Miniere, entered a 2-year long, joint venture with Gecamines to mine and refine 1,500 tons per year of cobalt from the Kasombo mine during 1996 and 1997. Gecamines continued to look for investors to reprocess similarly rich copper-cobalt tailings from the Kolwezi Mine and selected the Canadian firm, Consolidated Eurocan Venture's over the South African companies Gencor and Iscor Ltd. to reevaluate the feasibility for developing the Tenke-Fungurume deposit, one of the richest undeveloped copper-cobalt deposits in the world. Gecamines, meanwhile, continued to struggle to maintain copper production output at about 10% of capacity, while committing \$100 million to rehabilitate the Kolwezi open pit copper mine. Elsewhere in

Zaire, the U.S.-based, American Mineral Fields Inc. has entered conditional agreements with Gecamines and with Anglo American Corporation of South Africa to examine the feasibility of reopening of Gecamines' Kipushi zinc-copper mine, which closed in 1993. American Mineral Fields' Canadian consultants, Watts, Griffis, and McOuat Ltd. (WGM), estimated remaining minable proven and probable reserves of 22.6 million tons of ore grading 2.06% copper and 13.81% zinc (American Mineral Fields Inc, 1997). Barrick Gold Corporation also reached an agreement with the parastatal Office des Mines d'Or de Kilo Moto to rehabilitate their gold mining operations at Kilo Moto.

In Angola, foreign investors began to return in 1996 after that country's lengthy civil war appeared to be resolved. The diamond areas, previously controlled by the opposition forces of Uniao Para A Independencia Total De Angola (UNITA), in Lunda Norte and Lunda Sul Provinces and accounted for about \$400 million out of Angola's annual national diamond output of \$1.1 billion were opened to outside exploration and development companies in 1996. The state-owned diamond mining company, Empresa Nacional de Diamantes de Angola (Endiama), issued exploration licenses or entered joint ventures for a number of projects. De Beers, after a 10-year absence from Angola, acquired a 5-year exploration right to evaluate the alluvial and kimberlite diamond potential in Cuando-Cubango Province. Endiama entered a joint venture with Sociedade Portuguesa de Empreendimentos in Sociedade Mineira de Lucapa's 8,000 square kilometer concession in the Camfue and Camiambo areas of Lunda Norte. Endiama also entered a joint venture with Brazil's Oderbrecht Mining Services and Russia's Almay Rossii-Sakha to begin production by late 1996 of over 900,000 carats annually from the Sociedade Mineira de Catoca's kimberlite holdings in Lunda Sul Province. American Mineral Fields acquired a 50% interest in a 3,700-square-kilometer diamond concession held by a Dutch West Indies security firm, International Defense and Security Forces, on the Luremo River near the border with Zaire. The Canadian company, Carson Gold Corp., and its subsidiary, Branch Energy Ltd., acquired majority interest in reported resources of over 10 million carats of diamond located in the Luo and Luarica concessions in Lunda Norte Province. The end of the civil war in Angola also brought renewed international interest in its offshore petroleum potential.

In north Africa, private investment has made significant contributions to the mining and metallurgical segments of the Egyptian and Moroccan economies. A number of major new industrial projects in cement, fertilizers, metals, and petrochemicals have attracted private investment capital. The Egyptian Aluminium Co. (EGYPTALUM) reduced Government equity in favor of private capital by 20% while continuing its expansion program, raising annual smelter capacity by 60,000 tons in 1997 to a total annual capacity of 240,000 tons. By contrast, two aluminum smelter projects, proposed by Algeria and Libya, have been indefinitely postponed because of security and finance problems—the Algerian Mostaganem 200,000-t/yr-capacity aluminum smelter and the Libyan Zwara 200,000-t/yr-capacity smelter.

Egypt's Alexandria National Iron and Steel Co. has

embarked on an expansion and modernization program costing some \$350 million. A series of contracts were awarded in the expansion program that should increase output capacity from 1.2 million metric tons per year (Mt/yr) to 1.5 Mt/yr. Expansion includes a \$115 million second module of the Midrex direct-reduction plant, a \$46-million expansion of the steelmaking plant, and a \$40-million order to expand the rod mill plant. The expansion is scheduled for completion in 1997. The Canadian company, Inmet Mining Corp. has suspended mining and milling operations at the Bougrine zinc-lead mine in Tunisia. The capital investment required to reduce operating costs was reportedly not justifiable in the current price market. Morocco and Western Sahara host over 50% of the world's phosphate rock reserves and is the world's largest phosphate rock exporter. The Office Cherifien des Phosphates' Sidi Chennane Mine became operational in 1996 and should have a capacity of 5 Mt/yr by 1998.

The production of natural gas and petroleum and the refining of petroleum products were significant factors in the mineral economies of a number of African countries. Nigeria was Africa's largest oil producer, followed by Libya, Egypt, Algeria, Angola, and Gabon. Major oil companies and small independent oil companies were actively exploring offshore southern Africa and offshore from the West African nations of Cameroon, Côte d'Ivoire, Equatorial Guinea, Ghana, Guinea-Bissau, Nigeria, and Senegal. The commercial use of formerly flared natural gas in Nigeria was progressing rapidly. In Mozambique, development of the Pande natural gas fields were being held up over distribution rights into major markets in South Africa. Development continued in the Alba and Zafiro Fields, offshore Equatorial Guinea. Successful drilling of Chad's Doba Basin resulted in the proposal to run an oil export pipeline from Chad through Cameroon to the coast. In Sudan, State Petroleum Corp. was redeveloping the Heglig Field. South Africa, which has been dependent on synthetic fuels produced from coal, was prepared to start up its first commercial oil field in the Bredasdorp Basin offshore from Cape Town in January 1996.

Not all African countries were major mineral producers. In many African nations, the production of mineral commodities represented a minor part of the economy. Mineral output in these countries often was limited to the mining or quarrying of common construction materials such as clay, sand, and stone.

Middle East

The 15 Middle East countries included in this report cover a land area of 6.17 million square kilometers, about two-thirds the size of the United States, and had a 1996 population of approximately 227 million people. World Bank estimates of gross national product (GNP) per capita in the Middle East, based on purchasing power parity data for 1995, ranged from a high of \$24,000 in the United Arab Emirates to a low of \$2,520 in Yemen. The GNP per capita in this energy-rich region averaged about \$10,200. The mineral economy of the Middle East was dominated by the production of petroleum, supplemented by aluminum, cement, natural gas, nitrogen,

phosphate rock, and potash output. The region as a whole accounted for nearly 30% of world crude petroleum production in 1996, and according to the 1997 International Petroleum Encyclopedia, was endowed with 66% of the world reserves of crude oil, including 26% in Saudi Arabia. A number of Middle Eastern countries continued to diversify their oil-dominant economies with growth in the nonfuel minerals sector.

Saudi Arabia was the world's leading producer of crude oil. Iran, Kuwait, and the United Arab Emirates also were significant suppliers of petroleum to the world market. (*See table 2.*) Utilizing the region's low-cost energy supply for energy intensive aluminum smelting, Bahrain and Dubai, United Arab Emirates accounted for over 3% of the world supply of primary aluminum. Israel and Jordan ranked as the world's sixth or seventh largest producer of phosphate rock and potash in 1996. Israel was also the world's second largest bromine producer. Turkey was the world's largest producer of boron minerals and magnesite, the second largest chromite producer and a major producer of barite, cement, feldspar, ferrochromium, glass, marble, perlite, pumice, steel and strontium. Litigation continued to delay development of the Ovacik gold mine. Zinc production was expected to increase as the new owners of Cinkur Kurşan Metal Sanyii A.Ş. refurbished the plant's zinc refinery. Also in Turkey, Etibank increased run-of-mine boron production by 34% during 1996.

Elsewhere in the Middle East, aluminum smelter expansion activities progressed on schedule in Bahrain and in Dubai, United Arab Emirates. Aluminum Bahrain (ALBA) anticipates the 76-cell extension of potline 3 to be operational by May 1997 enhancing smelting capacity by 36,500 t/yr for a total annual capacity approaching 0.5 million tons. Construction of 130,000 t/yr additional capacity at the Dubai Aluminum (DUBAL) smelter is scheduled for completion by September 1997 raising total capacity to nearly 375,000 t/yr.

The zinc industry in the Middle East is relatively undeveloped compared to the region's aluminum industry. A project involving indigenous zinc production could ease the region's traditional reliance on imports. The Arabian Shield Development Co. (ASDC) of the United States is about to begin commercial exploitation of the Al Masane polymetallic deposit in Saudi Arabia. The deposit is estimated by ASDC to total 7.2 million metric tons containing 5.3% zinc, 1.42% copper, 40 grams per metric ton (g/t) silver, and 1.19% g/t gold.

Oman and Qatar were evaluating new liquefied natural gas facilities. Iraq was floating the possibility of issuing petroleum production-sharing agreements with European petroleum companies, but remained unable to market petroleum or petroleum products because of the sustained embargo by the United Nations.

References Cited

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- Metals Economics Group, 1997, Overview of worldwide exploration expenditures: Metals Economics Group Strategic Report, September/October, v. 10, no. 5, p. 1-5.

TABLE 1
AFRICA: PRODUCTION OF SELECTED MINERAL COMMODITIES 1/ 2/ IN 1996

(Thousand metric tons unless otherwise specified)

| Country | Alumi- num e/ | Cement e/ | Chromite | Coal, anthracite and bitu- minous 3/ | Cobalt, mine Co con- tent e/ (metric tons) | Copper, mine Cu con- tent | Diamond (thousand carats) e/ 4/ | Gold e/ (kilograms) |
|--------------------------|------------------|--------------|----------|---|---|------------------------------------|---------------------------------------|------------------------|
| Algeria | -- | 7,000 | -- | 22 | -- | -- | -- | -- |
| Angola | -- | 300 | -- | -- | -- | -- | 2,500 5/ | -- |
| Benin | -- | 380 | -- | -- | -- | -- | -- | -- |
| Botswana | -- | -- | -- | 852 | 406 5/ | 28 | 17,707 5/ | 5 |
| Burkina Faso | -- | -- | -- | -- | -- | -- | -- | 4,000 |
| Burundi | -- | -- | -- | -- | -- | -- | -- | 10 |
| Cameroon | 82 | 600 | -- | 1 | -- | -- | -- | 1,000 |
| Central African Republic | -- | -- | -- | -- | -- | -- | 470 | 90 |
| Congo | -- | 121 | -- | -- | -- | -- | -- | 10 |
| Cote d'Ivoire | -- | 500 | -- | -- | -- | -- | 75 | 1,000 |
| Egypt | 177 5/ | 18,000 | 1 | -- | -- | -- | -- | -- |
| Equatorial Guinea | -- | -- | -- | -- | -- | -- | -- | -- |
| Eritrea | -- | 47 5/ | -- | -- | -- | -- | -- | 98 |
| Ethiopia | -- | 700 | -- | -- | -- | -- | -- | 2,500 |
| Gabon | -- | 142 | -- | -- | -- | -- | 500 | 70 |
| Ghana | 137 5/ | 1,300 | -- | -- | -- | -- | 715 5/ | 49,211 5/ |
| Guinea | -- | -- | -- | -- | -- | -- | 205 | 6,838 5/ |
| Kenya | -- | 1,102 5/ | -- | -- | -- | -- | -- | 300 |
| Liberia | -- | -- | -- | -- | -- | -- | 150 | 700 |
| Libya | -- | 3,550 5/ | -- | -- | -- | -- | -- | -- |
| Madagascar | -- | 60 | 137 p/ | -- | -- | -- | -- | 500 |
| Malawi | -- | 140 | -- | 56 | -- | -- | -- | -- |
| Mali | -- | 15 | -- | -- | -- | -- | -- | 8,400 |
| Mauritania | -- | 375 | -- | -- | -- | -- | -- | 200 |
| Morocco | -- | 8,000 | -- | 651 | 565 5/ | 15 | -- | -- |
| Mozambique | -- | 30 | -- | 37 | -- | -- | -- | 6,800 |
| Namibia | -- | -- | -- | -- | -- | 15 | 1,420 5/ | 2,145 5/ |
| Niger | -- | 30 | -- | 170 | -- | -- | -- | 1 |
| Nigeria | -- | 3,000 | -- | 30 e/ | -- | -- | -- | 6 |
| Rwanda | -- | 10 | -- | -- | -- | -- | -- | 26 |
| Senegal | -- | 590 | -- | -- | -- | -- | -- | 600 |
| Sierra Leone | -- | -- | -- | -- | -- | -- | 270 | 16 5/ |
| Somalia | -- | 30 | -- | -- | -- | -- | -- | -- |
| South Africa | 617 5/ | 7,668 5/ | 5,137 5/ | 206,981 5/ | 350 5/ | 153 5/ | 9,946 5/ | 497,583 5/ |
| Sudan | -- | 380 | 15 e/ | -- | -- | -- | -- | 4,500 |
| Swaziland | -- | -- | -- | 144 | -- | -- | 70 | -- |
| Tanzania | -- | 800 | -- | 52 | -- | -- | 127 | 318 5/ |
| Togo | -- | 350 | -- | -- | -- | -- | -- | -- |
| Tunisia | -- | 4,567 5/ | -- | -- | -- | -- | -- | -- |
| Uganda | -- | 150 | -- | -- | -- | -- | -- | 2,954 5/ |
| Zaire | -- | 10 | -- | 10 | 2,000 | 29 e/ | 21,000 | 8,200 |
| Zambia | -- | 350 | -- | 373 | 7,900 | 334 e/ | -- | 130 |
| Zimbabwe | -- | 1,150 5/ | 697 | 5,175 | 110 | 10 e/ | 437 5/ | 24,699 5/ |
| Total, Africa 6/ | 1,013 | 61,447 | 5,987 | 214,554 | 11,331 | 583 | 55,592 | 622,910 |
| Total, world | 20,700 | 1,484,564 | 12,246 | 3,809,962 | 26,986 | 10,992 | 117,020 | 2,247,353 |
| Share of world total | 5% | 4% | 49% | 6% | 42% | 5% | 48% | 28% |
| United States | 3,577 5/ | 80,818 5/ 7/ | -- | 885,231 | -- | 1,918 | -- | 318,078 5/ |

See footnotes at end of table.

TABLE 1--Continued
AFRICA: PRODUCTION OF SELECTED MINERAL COMMODITIES 1/ 2/ IN 1996

(Thousand metric tons unless otherwise specified)

| Country | Iron ore (gross weight) | Lead, mine Pb content (metric tons) | Manganese ore (gross weight) | Petroleum, crude 3/ 8/ (thousand barrels) | Phosphate rock e/ (gross weight) | Steel, crude e/ | Uranium, concentrate U ₃ O ₈ 9/ (metric tons) | Zinc, mine Zn content (metric tons) |
|--------------------------|-------------------------------|---|---------------------------------------|--|---|--------------------|--|---|
| Algeria | 2,245 | 1,016 | -- | 453,330 | 1,051 | 620 | -- | 5,912 |
| Angola | -- | -- | -- | 259,150 | -- | 9 | -- | -- |
| Benin | -- | -- | -- | 1,000 e/ | -- | -- | -- | -- |
| Botswana | -- | -- | -- | -- | -- | -- | -- | -- |
| Burkina Faso | -- | -- | 10 e/ | -- | -- | -- | -- | -- |
| Burundi | -- | -- | -- | -- | -- | -- | -- | -- |
| Cameroon | -- | -- | -- | 33,945 | -- | -- | -- | -- |
| Central African Republic | -- | -- | -- | -- | -- | -- | -- | -- |
| Congo | -- | -- | -- | 64,000 e/ | -- | -- | -- | -- |
| Cote d'Ivoire | -- | -- | -- | 6,000 e/ | -- | -- | -- | -- |
| Egypt | 3,000 e/ | -- | 15 e/ | 336,530 | 1,596 5/ | 2,618 5/ | -- | -- |
| Equatorial Guinea | -- | -- | -- | 7,300 | -- | -- | -- | -- |
| Eritrea | -- | -- | -- | -- | -- | -- | -- | -- |
| Ethiopia | -- | -- | -- | -- | -- | -- | -- | -- |
| Gabon | -- | -- | 1,980 | 134,000 | -- | -- | 620 | -- |
| Ghana | -- | -- | 789 | 2,190 | -- | -- | -- | -- |
| Guinea | -- | -- | -- | -- | -- | -- | -- | -- |
| Kenya | -- | 5 | -- | -- | -- | 20 | -- | -- |
| Liberia | -- | -- | -- | -- | -- | -- | -- | -- |
| Libya | -- | -- | -- | 511,365 | -- | -- | -- | -- |
| Madagascar | -- | -- | -- | -- | -- | -- | -- | -- |
| Malawi | -- | -- | -- | -- | -- | -- | -- | -- |
| Mali | -- | -- | -- | -- | 3 | -- | -- | -- |
| Mauritania | 11,360 | -- | -- | -- | -- | 5 | -- | -- |
| Morocco | 12 | 71,668 | 29 | 35 | 20,855 5/ | 5 | -- | 79,662 |
| Mozambique | -- | -- | -- | -- | -- | -- | -- | -- |
| Namibia | -- | 15,349 | 89 | -- | -- | -- | 2,890 | 33,955 |
| Niger | -- | -- | -- | -- | -- | -- | 3,160 e/ | -- |
| Nigeria | 100 e/ | 3,500 e/ | -- | 798,620 | -- | 20 | -- | -- |
| Rwanda | -- | -- | -- | -- | -- | -- | -- | -- |
| Senegal | -- | -- | -- | 2 e/ | 1,800 | -- | -- | -- |
| Sierra Leone | -- | -- | -- | -- | -- | -- | -- | -- |
| Somalia | -- | -- | -- | -- | -- | -- | -- | -- |
| South Africa | 30,830 | 88,613 | 3,240 | -- | 3,077 5/ | 7,968 5/ | 1,706 | 76,853 |
| Sudan | -- | -- | -- | 4,380 | -- | -- | -- | -- |
| Swaziland | -- | -- | -- | -- | -- | -- | -- | -- |
| Tanzania | -- | -- | -- | -- | 3 | -- | -- | -- |
| Togo | -- | -- | -- | -- | 2,731 5/ | -- | -- | -- |
| Tunisia | 238 | 4,764 | -- | 32,229 | 7,167 5/ | 187 5/ | -- | 31,920 |
| Uganda | 200 5/ | -- | -- | -- | -- | 55 | -- | -- |
| Zaire | -- | -- | -- | 10,000 | -- | -- | -- | -- |
| Zambia | -- | -- | -- | -- | -- | -- | -- | -- |
| Zimbabwe | 324 | -- | -- | -- | 123 5/ | 212 5/ | -- | -- |
| Total, Africa 6/ | 48,309 | 184,915 | 6,152 | 2,654,076 | 38,406 | 11,719 | 8,376 | 228,302 |
| Total, world | 1,020,266 | 2,919,775 | 22,264 | 23,379,710 | 132,750 | 758,070 | 41,510 | 7,444,303 |
| Share of world total | 5% | 6% | 28% | 11% | 29% | 2% | 20% | 3% |
| United States | 62,073 | 435,945 | -- | 2,359,725 | 45,400 | 94,651 5/ | 2,854 | 628,063 |

e/ Estimated. p/ Preliminary.

1/ Table prepared by Glenn J. Wallace.

2/ Data may be different from that appearing in individual country production tables owing to availability of more current data. Table includes data available through Mar. 31, 1998.

3/ Source: International Energy Annual 1996, Feb. 1998.

4/ Excluding synthetic diamond.

5/ Reported figure.

6/ May not add to totals shown because of independent rounding.

7/ Includes Puerto Rico data.

8/ Includes lease condensate.

9/ Source: The Uranium Institute 1998, London, Jan. 22, 1998, via the Internet.

Source: U.S. Geological Survey.

TABLE 2
MIDDLE EAST: PRODUCTION OF SELECTED MINERAL COMMODITIES 1/ 2/ 3/ IN 1996

(Thousand metric tons unless otherwise specified)

| Country | Alumi- num e/ | Boron | Cement, hydraulic e/ | Chromite | Copper, mine Cu content | Gypsum e/ | Natural gas p/ 4/ | |
|-----------------------|------------------|--|---|--|---|---------------|---|-------------------------------------|
| | | | | | | | Plant liquids (thousand 42-gallon barrels) | Dry (million cubic meters) |
| Bahrain | 461 5/ | -- | 193 5/ | -- | -- | -- | 3,650 | 6,950 |
| Cyprus | -- | -- | 1,000 | -- | 2 | 150 | -- | -- |
| Iran | 118 | 1 e/ | 16,500 | 129 e/ 6/ | 108 | 8,300 | 21,900 | 39,077 |
| Iraq | -- | -- | 18,000 | -- | -- | 450 7/ | 7,300 | 3,115 |
| Israel | -- | -- | 5,000 | -- | -- | 50 | -- | 18 |
| Jordan | -- | -- | 3,610 | -- | -- | 190 | -- | (8/) |
| Kuwait | -- | -- | 2,000 | -- | -- | -- | 31,025 | 9,400 |
| Lebanon | -- | -- | 4,000 | -- | -- | 3 | -- | -- |
| Oman | -- | -- | 1,260 | 15 | -- | -- | 3,650 | 3,176 |
| Qatar | -- | -- | 690 5/ | -- | -- | -- | 18,250 | 13,592 |
| Saudi Arabia | -- | -- | 16,437 5/ | -- | 1 e/ | 363 5/ | 254,405 | 41,343 |
| Syria | -- | -- | 5,000 | -- | -- | 325 5/ | 2,920 | 3,000 e/ |
| Turkey | 60 | 2,379 | 35,214 5/ | 1,668 | 58 e/ | 600 | -- | 204 |
| United Arab Emirates | 251 | -- | 6,000 | 56 | -- | 90 | 58,400 | 40,000 e/ |
| Yemen | -- | -- | 1,100 5/ | -- | -- | 80 | -- | -- |
| Total, Middle East 9/ | 890 | 2,380 | 116,004 | 1,868 | 168 | 10,601 | 401,500 | 159,876 |
| Total, world | 20,700 | 2,980 | 1,484,564 | 12,246 | 10,992 | 99,716 | 2,037,430 | 2,320,847 |
| Share of world total | 4% | 80% | 8% | 15% | 2% | 11% | 20% | 7% |
| United States | 3,577 5/ | 1,150 | 80,818 5/ 10/ | -- | 1,918 | 17,500 5/ 11/ | 667,950 | 538,586 |
| Country | | Nitro- gen N in ammo- nia e/ | Petroleum, crude (thou- sand 42-gal- lon barrels) p/ 4/ 12/ | Phos- phate rock e/ (gross weight) | Potash e/ K ₂ O equivalent | Salt e/ | Steel, crude e/ | Sulfur e/ |
| Bahrain | | 358 | 14,124 | -- | -- | -- | -- | 6 |
| Cyprus | | -- | -- | -- | -- | -- | -- | -- |
| Iran | | 700 | 1,345,390 | -- | -- | 450 | 5,415 | 890 |
| Iraq | | 500 | 211,335 | 1,000 13/ | -- | 250 | 300 | 475 |
| Israel | | 41 14/ | 36 | 3,800 13/ | 1,325 | 800 | 200 | 60 |
| Jordan | | -- | -- | 5,350 | 1,080 | 25 | 30 | -- |
| Kuwait | | 325 | 752,630 | -- | -- | 100 5/ | -- | 576 |
| Lebanon | | -- | -- | -- | -- | 4 | -- | -- |
| Oman | | -- | 322,295 | -- | -- | -- | -- | 35 |
| Qatar | | 635 | 186,150 | -- | -- | -- | 626 5/ | 62 |
| Saudi Arabia | | 1,300 | 2,999,570 | -- | -- | -- | 2,683 5/ | 2,200 |
| Syria | | 68 | 220,460 | 2,000 | -- | 112 5/ | 70 | 10 |
| Turkey | | 519 | 25 | -- | -- | 1,400 | 13,382 5/ | 160 |
| United Arab Emirates | | 350 | 831,470 | -- | -- | -- | -- | 259 |
| Yemen | | -- | 129,200 | -- | -- | 110 | -- | -- |
| Total, Middle East 9/ | | 4,796 | 7,012,685 | 12,150 | 2,405 | 3,251 | 22,706 | 4,733 |
| Total, world | | 97,466 | 23,379,710 | 132,750 | 23,895 | 192,272 | 758,070 | 52,201 |
| Share of world total | | 5% | 30% | 9% | 10% | 2% | 3% | 9% |
| United States | | 14,600 5/ 15/ | 2,359,725 | 45,400 | 1,390 5/ | 42,277 5/ 10/ | 18,220 5/ | 11,796 |

e/ Estimated. p/ Preliminary.

1/ Table prepared by Glenn J. Wallace.

2/ Table includes data available through Mar. 31, 1998.

3/ Data may be different from that appearing in individual country production tables owing to availability of more current data.

4/ Source: International Energy Annual 1996, Feb. 1998.

5/ Reported figure.

6/ Concentrate.

7/ For cement production only. Information is insufficient to formulate reliable estimates for output for other uses (plaster, mortar, etc.).

8/ Less than 1/2 unit.

9/ May not add to totals shown because of independent rounding.

10/ Includes Puerto Rico data.

11/ Excludes byproduct gypsum.

12/ Includes lease condensate.

13/ Beneficiated.

14/ May include nitrogen content of urea.

15/ Synthetic anhydrous ammonia; excludes coke oven byproduct ammonia.

Source: U.S. Geological Survey.