

# The Mineral Industry of Egypt

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Increased petroleum production continued to drive Egypt's economy, providing an estimated real growth rate in the gross domestic product (GDP) of between 8% and 9%. The major mineral industries, besides petroleum, were fertilizer production, phosphate, iron and steel, and aluminum. Revenues from the petroleum sector increased from \$1.8 billion<sup>2</sup> in 1979 to an estimated \$2.9 billion in 1980, accounting for over 12% of the total gross national product (GNP) of \$23.4 billion. These increased revenues from petroleum helped to offset Egypt's import bill, which increased 16% over the 1979 level. Increased revenues from tourism, the Suez Canal, and worker remittances also aided in substantially reducing Egypt's current account deficit, and with higher net capital inflows, Egypt registered a considerable balance-of-payments surplus.

Despite strong growth in the economy overall, several internal problems remained. The population was increasing nearly 3% per year, and unemployment remained high. The public sector accounted for around 70% of total industrial production (nonoil) and operated inefficiently. The Government continued the expensive subsidy system for basic commodities to protect lower income groups from Egypt's high rate of price inflation, which ran at over 20% during the year. This subsidy system has caused persistent budgetary deficits over recent years.

As part of the peace treaty concluded in 1979 between Egypt and Israel, a large portion of the Sinai Peninsula was returned to Egyptian sovereignty during 1980. In April, much of this area was opened up for oil exploration and several concession agreements were signed with companies such as Continental Oil Co. (Conoco), British Petroleum (BP), Ente Nazionale Idrocarburi

(ENI), and Compagnie Francaise des Petrole (CFP)-Total. The Sinai was also considered to be a potential source of manganese, coal, kaolin, and gypsum, and studies were initiated by the Egyptian Geological Survey Organization to investigate opening or reopening mining operations in these areas.

The first phase of deepening and widening of the Suez Canal was completed in 1980, enabling ships of up to 150,000 tons, laden, to transit the canal. The second stage was to allow the passage of ships of up to 260,000 tons, laden, and was to be completed by 1985. Revenues from the Suez Canal increased 20% in 1980, to \$710 million. Annual revenues are expected to reach \$1 billion when the expansion programs are completed.

Egypt continued to negotiate for the supply of two nuclear power stations in their long-term plan for the use of nuclear energy for peaceful purposes. A nuclear cooperation protocol was signed between Egypt and France for the supply of two nuclear power stations, worth over \$2 billion. The two reactors were to be 1,000-megawatt pressurized water reactors built by Framatome (France) under license from Westinghouse Corp. (United States). The protocol also included the supply of nuclear fuel. Egypt was scheduled to sign the nuclear nonproliferation treaty in March 1981 to clear the way for the purchase of the reactors.

Egypt also continued investigating the feasibility of constructing a hydroelectric generating plant at the Qattara depression using water from the Mediterranean Sea. The project entailed digging a 76-kilometers channel from the Mediterranean Sea to the Qattara depression, whose base is 135 meters below sea level, and using the flow of water to generate electricity at the rim of

the depression. Lahmeyer International (Federal Republic of Germany) conducted the initial feasibility studies, which were tentatively rejected because of their method of excavation—nuclear explosives. The Swedish Consulting Group began studying the project in late 1980. Pending results of the study, construction was scheduled for as early as the spring of 1981.

Law 43 continued to have a substantial impact on Egypt's economy. Since 1974, when the "Open Door" policy towards foreign private investment first went into effect, the private sector's share in gross fixed investment has risen from 10% to 16%. Oil companies have been the major benefactors, operating production-sharing ventures on favorable terms, but law 43 has also stimulated the private sector in Egypt. Private foreign exchange earnings now finance nearly one-fifth of Egypt's total imports, and their share in the market continues to grow. New emphasis was also placed on decentralizing public sector enterprises

in the 1980's in an attempt to streamline their efficiency.

Egypt's 1980-84 5-Year Development Plan was announced in 1980. Public sector investment priorities over the plan period emphasized infrastructure improvements, housing, and food production. The plan would require high import levels for industrial raw materials, equipment, and machinery.

The Government of Egypt, with the financial assistance of the U.S. Agency for International Development (AID), undertook a \$37 million petroleum and ground water assessment program to improve their data on mineral and petroleum resources, as well as ground water necessary for the development of such resources. The project was to include new areas of potential mineral and petroleum resources and possibly an atlas of Landsat imagery of the entire country. The program was scheduled for completion in 1983.

## PRODUCTION AND TRADE

Production of most of Egypt's mineral commodities increased in 1980, led by new capacity in the petroleum, fertilizer, iron and steel, and phosphate industries. Petroleum production averaged about 590,000 barrels per day in 1980, nearly 20% greater than that of 1979, and export revenues reached \$2.9 billion. Egypt planned to produce 1 million barrels of crude oil per day by 1983. Several new discoveries were made during the year, and 36 new exploration concessions were granted.

Egypt became the largest nitrogenous fertilizer producer in the Arab world when the Talkha II fertilizer plant came on-stream late in 1980. Annual production of nitrogenous fertilizer was expected to reach 1.7 million tons when Talkha II operates near capacity in 1981. Phosphate production also increased steadily, mainly from the Hamrawein and West Sabaya deposits. Production in 1980 was 20% above 1979 levels. Phosphate rock was used in Egypt's three single superphosphate fertilizer plants and new capacity was being studied to supply a triple superphosphate and phosphoric acid plant at Abu Zaabal.

Iron ore production from the Bahariya Oasis deposits continued to increase in 1980. Steel production also increased from the Helwan iron and steel complex, as the plant switched to higher grade Bahariya ore and natural gas-fired furnaces. The Egyptian

Government continued to place high priority on developing the mineral resources of the country. Mineral production in Egypt is shown in table 1.

Egypt's balance-of-trade deficit of \$4 billion in 1979 did not improve in 1980, despite the higher level of exports of oil and cotton. The level of imports increased in line with the higher exports. Egypt's principal mineral exports were petroleum, phosphate rock, aluminum, iron and steel, and salt. Petroleum was exported to Italy (70%), Greece (11%), the United States (7%), France (3%), Yugoslavia (2%), Belgium, the Federal Republic of Germany, Sudan, the People's Democratic Republic of Yemen, and Switzerland (the remaining 7%). Egypt exported most of its mineral and nonmineral commodities to Western European and Middle Eastern countries, but the United States remained its largest single trading partner, supplying \$1.8 billion worth of goods, or nearly one-fifth of the total imports in 1980, and received about one-seventh of its exports. The United States also remained the largest single aid donor to Egypt, averaging around \$1 billion per year over the last 6 years. Official aid for 1980 was in the area of \$1.2 billion.

No detailed statistics on Egyptian foreign trade are available for years following 1977; these data appeared in the 1978-79 edition of Minerals Yearbook, Volume III.

Table 1.—Egypt: Production of mineral commodities<sup>1</sup>

(Metric tons unless otherwise specified)

Commodity	1976	1977	1978	1979 <sup>P</sup>	1980 <sup>e</sup>
<b>METALS</b>					
Aluminum metal	59,000	89,182	100,698	77,204	120,000
Chromite	243	500	873	22	--
Iron and steel:					
Iron ore and concentrate	1,243	1,409	1,456	1,435	<sup>2</sup> 1,776
Pig iron	250	250	<sup>3</sup> 300	186	119
Ferrous alloys (ferrosilicon)	5	5	<sup>5</sup>	--	--
Crude steel	457	263	<sup>6</sup> 600	<sup>6</sup> 635	<sup>7</sup> 760
Semimanufactures	706	621	1,000	<sup>6</sup> 1,000	<sup>8</sup> 847
Manganese ore and concentrate	4,256	3,833	173	--	--
<b>NONMETALS</b>					
Asbestos	1,096	478	349	<sup>9</sup> 350	<sup>2</sup> 316
Barite	288	746	989	2,272	<sup>2</sup> 4,532
Cement, hydraulic	3,362	3,257	3,000	2,957	<sup>3</sup> 3,028
Clays:					
Bentonite	4,233	3,811	3,448	3,500	3,500
Fire clay	170,052	143,648	383,389	250,000	250,000
Kaolin	28,267	49,000	55,577	46,544	<sup>2</sup> 41,227
Diatomite	327	373	99	3,085	3,000
Feldspar, crude	2,128	2,633	3,337	3,271	<sup>3</sup> 3,309
Fluorspar	1,557	1,404	2,235	682	<sup>2</sup> 1,752
Gypsum and anhydrite, crude	466,604	508,635	798,000	796,000	800,000
Lime	90,000	100,000	100,000	88,000	<sup>2</sup> 87,907
Mica	<sup>1</sup> 10	86	<sup>8</sup> 86	--	--
Nitrogen: N content of ammonia	<sup>2</sup> 210	210	250	263	400
Phosphate:					
Phosphate rock	394	472	639	623	700
Thomas slag	523	NA	NA	9	10
Pigments, mineral, natural: Iron oxide	3,257	32	245	140	135
Pumice <sup>e</sup>	250	250	300	300	350
Salt, marine	480	597	755	616	<sup>2</sup> 636
Sodium compounds:					
Sodium carbonate	NA	NA	4,000	<sup>5</sup> 5,000	<sup>2</sup> 4,675
Sodium sulfate	4,000	5,000	2,902	2,902	<sup>2</sup> 2,942
Stone, sand and gravel:					
Basalt	243	213	281	85	100
Dolomite	120	92	130	504	500
Granite, dimension	NA	NA	NA	2,666	3,000
Gravel	1,500	1,900	2,090	<sup>3</sup> 3,300	3,300
Limestone and other calcareous n.e.s.	5,400	5,500	5,667	5,845	6,000
Marble blocks (including alabaster)					
cubic meters	NA	11,000	25,718	26,000	26,000
Quartz	8,103	9,332	11,348	<sup>1</sup> 10,000	10,000
Sand, including glass sand					
thousand cubic meters	3,535	2,973	2,996	6,147	6,000
Sandstone	120	120	111	787	800
Sulfur:					
Elemental, byproduct	5,000	<sup>5</sup> 5,000	3,106	3,206	3,300
Sulfuric acid	31,000	NA	NA	3,200	32,000
Talc, soapstone, steatite, pyrophyllite	5,636	6,993	5,905	4,406	<sup>2</sup> 4,007
<b>MINERAL FUELS AND RELATED MATERIALS</b>					
Coke:					
Oven and beehive	<sup>6</sup> 650	694	700	853	850
Gashouse and other low temperature	29	<sup>3</sup> 30	<sup>4</sup> 40	<sup>5</sup> 50	50
Total	<sup>7</sup> 679	724	740	903	900
Gas, natural:					
Gross production	<sup>6</sup> 65,000	<sup>9</sup> 93,000	<sup>10</sup> 105,800	<sup>11</sup> 140,000	<sup>2</sup> 84,624
Marketed	13,432	18,670	30,835	120,000	60,000
Petroleum:					
Crude	120,180	150,925	175,925	180,000	<sup>2</sup> 215,028
Refinery products:					
Gasoline and naphtha	12,521	6,936	8,109	8,840	9,000
Kerosine and jet fuel	11,196	11,671	12,849	12,710	13,000
Distillate fuel oil	12,809	14,629	16,412	17,205	18,000
Residual fuel oil	33,673	32,265	36,210	52,281	55,000
Lubricants	--	336	434	461	500
Other:					
Liquefied petroleum gas	--	846	--	1,150	1,200
Asphalt	818	--	6,115	1,127	1,200
Unspecified	--	6,542	--	--	--
Refinery fuel and losses	4,279	3,976	2,631	4,242	4,400
Total	75,296	77,201	82,760	98,016	102,300

<sup>e</sup>Estimated. <sup>P</sup>Preliminary. <sup>r</sup>Revised. NA Not available.<sup>1</sup>Table includes data available through June 23, 1981.<sup>2</sup>Reported figure.

## COMMODITY REVIEW

## METALS

**Aluminum.**—Aluminum production capacity from the State-owned Aluminum Co. of Egypt was scheduled to increase from 133,000 tons per year to 166,000 tons per year when two new potlines come onstream early in 1981. The plant, located at Nag Hammadi, 500 kilometers south of Cairo, produced aluminum ingots, billets, slabs, and rods from eight operating potlines. Alumina was imported from Australia through the Red Sea Port of Safaga, and trucked to Nag Hammadi on the west bank of the Nile River.

Approximately 70% of the output from Nag Hammadi was exported, mainly to Western Europe and Japan. The Port of Safaga was the export terminal for shipments to Japan, and Nag Hammadi and Alexandria were used for exports to Europe.

Aluminum pellets from Nag Hammadi were used in the aluminum extrusion plant at Ismailia, which began production in 1977. Plans also continued for construction of a joint venture aluminum and zinc smelting operation. The State-owned General Co. for Metals and Krupp A.G. (Federal Republic of Germany) planned to produce 24,000 tons per year of zinc plates and strips, and rolled aluminum. The venture was capitalized at \$37 million.

**Copper.**—The Egyptian Geological Survey Organization continued its investigation into copper deposits in the Eastern Desert. Deposits at Um Samiuki contained reserves of 150,000 tons of ore containing 1% to 1.15% copper, 15.2% zinc, 1.1% lead, and 50 grams per ton of silver. Copper-nickel deposits at Gebel Homs and El Ghari-ba also contained an estimated 70,000 tons of 0.95% copper ore. No decision had been made to work any of the deposits.

**Iron and Steel.**—Production of iron ore continued to increase in 1980 to approximately 1.5 million tons, as mining operations expanded at the Bahariya Oasis deposits, 500 kilometers southwest of Helwan. Iron ore at Bahariya Oasis occurs in four localities: Gharabi, El Horra, Nasser, and El Gedida. Mining operations were limited to El Gedida, however, where reserves were estimated at 129 million tons, averaging 54% iron. Total reserves at all the deposits were in excess of 250 million tons, and when brought into production, total output was expected to be 3.5 million tons per year. Smaller amounts of iron ore were also mined at Aswan, but operations were being

phased out because of the low grade and high silica content of the ore.

Iron ore from the open pit operations of El Gedida was shipped by rail to the State-owned Egyptian Iron and Steel Co.'s steelworks at Helwan. After opening a fourth blast furnace in 1979 and equipping the older furnaces for sintered feed from Bahariya instead of lumpy ore from Aswan, steel output was expected to reach 1 million tons per year in the mid-1980's. Natural gas from the Abu Gharadig Field was used to fuel the new furnaces, reducing the consumption of coking coal previously imported from Poland and the Soviet Union.

Facilities at Helwan included an 80,000-ton-per-year heavy section mill, an 80,000-ton-per-year merchant bar mill, a 110,000-ton-per-year hot strip mill, and a 300,000-ton-per-year cold reduction mill. Nearly 90% of Helwan's production was sold domestically under the "Hadiesold" brand, but Egypt remained a net importer of steel. Around 70,000 tons of steel was exported to other countries in the Middle East, and no change in sales patterns were envisioned by the company.

Three other steelmaking facilities also operated in Egypt, all of which produced reinforcing rods for the domestic market. The 110,000-ton-per-year Copper Works was located in Alexandria, and the 250,000-ton-per-year Abu Zaabal works was located in Abu Zaabal. National Metal Industries Co., in Cairo, expanded operations late in 1979, from 80,000 tons per year to 125,000 tons per year with the addition of an open-hearth furnace from Poland and a rolling mill from the German Democratic Republic.

A joint venture company was set up in October 1980 to build a \$520 million steelworks at El Dekheila, near Alexandria. The direct reduction plant had a planned capacity of 800,000 tons per year, and was scheduled to begin production in 1984. The company was to be owned 86% by the Egyptian Government; 10% by a Japanese consortium including Nippon Kokan (NKK), Kobe Steel, and Tomen Co. Ltd.; and 4% by the International Finance Corp. (IFC). Financing was to be provided by the Japanese Government (\$80 million loan), the World Bank (\$100 million loan), and the IFC (\$50 million loan).

In June 1980, Egypt and Romania signed a protocol for cooperation on the construction of two plants, one for cement and the other for steel reinforcing bars. The rebar plant was to have an annual production

capacity of 400,000 tons, at a cost of around \$100 million.

**Manganese.**—Manganese production from the Wadi Mesalik deposits located in the Eastern Desert near the Sudanese border ceased in 1979, due to the high cost of transporting relatively small amounts of ore. Feasibility studies were being conducted on reopening the manganese mines at Abu Zeneima on the Sinai Peninsula, which were closed after the 6-day war in 1967. Reserves at Abu Zeneima were estimated at 2 million tons of 21% manganese ore. Kaiser Engineering and Contractors Inc. (United States) was awarded the contract for the study by the Sinai Manganese Co. of Egypt. The study was also to investigate the technical and economic feasibility of reopening the 10,000-ton-per-year ferromanganese smelter at Abu Zeneima, which also operated prior to 1967. Pending the results from Kaiser, the Egyptians planned to invest \$100 million in rebuilding the facility.

**Uranium.**—Egypt's first uranium mine opened in January 1980. The mine was located in the Muskat area of the Eastern Desert. Two other mines, in the same area, were scheduled to open in 1981. Production from the mine was between 30 and 50 tons of  $U_3O_8$  for 1980. The Eastern Desert mines were part of a 5-year research project which is to conclude in 1984, when production is scheduled to reach 100 tons per year.

Analysis of the black sands along the Mediterranean coast continued in 1980. Monzonite from the sands was shown to contain 5.2% thorium and 0.38% uranium. The phosphate deposits at Abu Tartur were also estimated to contain 100,000 tons

of uranium.

## NONMETALS

**Clays.**—Kaolin production from the Kalabsha deposits, 105 kilometers southwest of Aswan, registered a slight increase in 1980. Reserves were estimated at 16 million tons of kaolin with a 38% alumina content. The Geological Survey Organization continued its evaluation of the Kalabsha deposit, and also deposits of nepheline syenite in the Abou Khroug area of the Eastern Desert, for possible use in the production of aluminum. New deposits of unspecified clays were discovered in the Nile Valley, south of Suez, and in the Western Sinai. Kaolin deposits in the Sinai Peninsula had been mined at the rate of 30,000 tons per year in 1966-67 but had ceased after the war. Studies were in progress concerning resuming mining operations there.

**Fertilizer Materials.**—Egypt's production capacity for nitrogenous fertilizer was expected to reach 1.7 million tons per year when the Talkha II ammonia-urea complex came online at the end of 1980. Egypt's nitrogen industry became the largest in Africa and the Arab world. Capacity for production of phosphatic fertilizers was also undergoing expansion, through the addition of a triple superphosphate plant at the Abu Zaabal fertilizer complex. Total phosphatic fertilizer capacity was expected to reach 685,000 tons per year by 1981, when Abu Zaabal was scheduled to come onstream. Additional capacity was expected to make Egypt self-sufficient in fertilizer production, and also provide limited export revenues. Egypt's operating and planned fertilizer plants are listed in the following tabulation.

Location	Operating company	Primary product	Start-up date	Capacity (thousand tons per year)
Suez	Société el Nasr d' Engrais et d' Industries Chimiques.	Calcium nitrate.	1951	275
Talkha I.	do	Calcium ammonium nitrate.	1975	365
Talkha II	do	Ammonia-urea	1980	1,000
Abu Qir	do	do	1979	900
Do	do	Ammonium nitrate.	1984	50
Helwan	El Nasr Co. for Manufacturing Coke and Chemicals.	Calcium ammonium nitrate.	1964	140
Kafr-el-Zaiyat	Société Financiere et Industrielle d' Egypte S.A.	Single super-phosphate.	1937	200
Assiut	do	do	1969	200
Kosseir	Kosseir Phosphate Co	do	1958	50
Abu Zaabal	Abu Zaabal Fertilizer and Chemical Co.	do	1948	200
Do	do	Triple super-phosphate.	1981	175
Do	do	Phosphoric acid	1981	200

The new nitrogenous fertilizer facilities at Talkha were built by Foster Wheeler Italiana utilizing synthesis loop technology in the ammonia plant, and Stamicarbon's process in the urea plant. Natural gas feedstock was piped from the Abu Madi Field in the Nile Delta, which produced around 30 million cubic feet per day. Plans were to increase natural gas production to over 100 million cubic feet per day to support further industrial development. Talkha II had a daily production capacity of 1,200 tons of ammonia, 1,700 tons of urea, and 180 tons of ammonium nitrate.

The Abu Qir fertilizer complex, completed in 1979, also embarked on a program to expand its nitrogenous fertilizer production. The company planned to install a 150,000-ton-per-year fertilizer-grade ammonium nitrate plant to absorb excess ammonia, and a 135,000-ton-per-year nitric acid facility by 1983 or 1984. The Abu Qir plant currently operates a 1,000-ton-per-day ammonia unit and a 1,500-ton-per-day urea plant, both built by Uhde-Mannesmann of the Federal Republic of Germany.

Three phosphatic fertilizer plants in Egypt produced single superphosphate from phosphate rock and sulfuric acid. The triple superphosphate plant at Abu Zaabal was scheduled to produce 175,000 tons of triple superphosphate and 200,000 tons of phosphoric acid per year when fully onstream sometime in 1981. The triple superphosphate unit was completed in 1979 by Bradley Pulverizer (United Kingdom). Lurgi (Federal Republic of Germany) and Babcock-Moxley (United Kingdom) were contracted for construction of the phosphoric acid plant and handling facilities. The Abu Zaabal complex consisted of two single superphosphate plants and two sulfuric acid plants. In addition to the triple superphosphate and phosphoric acid units under construction, a third sulfuric acid plant was to be added to the Abu Zaabal complex. Krebs of Paris (France) was awarded the contract for the design, engineering, and equipment supply for the plant. Design capacity was 215,000 tons per year of sulfuric acid, and 100,000 tons per year of 65% oleum.

**Phosphate.**—Plans were underway in 1980 for expansion and development of Egypt's two major phosphate deposits, West Sabaya and Abu Tartur. Phosphate deposits in the Eastern Desert, at Safaga and El Kosseir were nearly depleted, while production at Hamrawein, also in the Eastern Desert, increased substantially.

Overall phosphate production increased almost 20% in 1980 over 1979 levels. Production continued from the Red Sea coast, at Kosseir and Safaga, where reserves were estimated at 150 million tons, and from the Nile Valley area, at West Sabaya and Mahamid, where reserves were estimated at 400 million tons.

The expansion of the West Sabaya Mine, 31 kilometers north of Idfu on the Nile River, was postponed early in 1980 when a \$27 million grant from the United Kingdom's Ministry of Overseas Development Administration was withheld following the United Kingdom Government's cutback on expenditure. The expanded mine and beneficiation plant were intended to supply the new phosphoric acid and triple superphosphate plant at Abu Zaabal. Egypt continued to seek development aid for the project.

Action was taken in 1980 on developing Egypt's largest phosphate deposit at Abu Tartur in the Western Desert. Reserves at Abu Tartur were estimated at 1 billion tons of phosphate rock with an average  $P_2O_5$  content of 25.6%. The deposit had been examined for several years, without any development plans, due mainly to problems in beneficiation and separation of finely disseminated pyrite, and the high cost of associated infrastructure. In 1980, Occidental Petroleum Co. (United States) drew up a \$1.5 billion plan to develop the deposit. In 1978, the World Bank approved an \$11 million loan to set up a 500,000-ton-per-year pilot plant and mine, and construction was carried out by Sofremines (France) and Alusuisse (Switzerland). The pilot plant operation was encouraging enough to draw Occidental's attention toward developing the deposit. Should Occidental proceed with their plan, total capacity of Abu Tartur would exceed 4 million tons per year of ore, processed to produce 175,000 tons per year of triple superphosphate and 350,000 tons per year of phosphoric acid. Infrastructure development was to include building an entire town, construction of a 480-kilometer railroad from Abu Tartur to the Port of Safaga, and expansion of handling facilities at Safaga.

**Salt.**—Egypt was planning a major project to produce salt, magnesite, and sodium sulfate from a new facility to be located at Lake Quarun. With a \$25 million aid grant from the United States, Egypt planned to produce 200,000 tons per year of high-grade (99% NaCl) salt, 21,000 tons per year of magnesite, and 7,500 tons per year of sodium

sulfate. The salt was to be marketed for consumption domestically and for export, while the sodium sulfate was to be used in the domestic detergent industry. Magnesium oxide was expected to be used in the developing refractories industry in Egypt. Feasibility studies regarding production process and plants for the Lake Quarun facility were carried out by DSS Engineers (United States) and White Consultants (United Kingdom).

**Sulfur.**—Feasibility studies continued on the sulfur deposits in the Siwa Oasis area of northwest Egypt at Taaweeny. Egypt remained under pressure to develop its sulfur deposits after Iraq banned all exports to Egypt in 1979. Egypt had been a major customer of the Iraqi sulfur industry before the Camp David agreements and the Arab boycott. Construction of four sulfur grinding plants was nearing completion in 1980. The plants were to grind 20,000 tons per year of sulfur rock into sulfur powder. The plants were being constructed by Klockner A.G. (Federal Republic of Germany) under contract from the Chama Sulfur Co. of Egypt.

**Trona.**—Egypt's production of natural sodium carbonate remained constant during 1980. The major source was the trona deposits of Wadi Natrun, northwest of Cairo. The entire output of the mine was used in the Misr Chemical Manufacturing Co. plant near Alexandria. The plant used imported and domestic sodium carbonate in the production of 45,000 tons of caustic soda, 5,000 tons of sodium bicarbonate, and 82,000 tons of heavy sodium carbonate per year.

#### MINERAL FUELS

**Coal.**—Egypt regained control in 1980 of a significant coal deposit in the north-central Sinai Peninsula. The Maghara coal deposit was first discovered in 1959, and mined until the June war of 1967. The Maghara deposit contained 27.5 million tons of proved reserves, with an additional 11 million tons of probable reserves. The Egyptian Government allocated \$21 million in 1980 for complete plans to renew mining activity of Maghara. The annual output, once operations begin, is expected to be 800,000 tons. The coal was to be combined with imported Polish coal to produce coke for the Helwan steel plant.

**Natural Gas.**—Egypt marketed around 60 billion cubic feet of natural gas during 1980, most of which was directed toward power generation, fertilizer production, and industrial uses. Nonassociated gas was produced

from three fields: Abu Madi, Abu Qir, and Abu Gharadig, where total reserves were estimated at 5 trillion cubic feet. About 300 million cubic feet per day of associated gas was also produced at the Gulf of Suez oilfields, most of which was flared. In 1979, the World Bank's International Bank for Reconstruction and Development granted the Egyptian General Petroleum Authority (EGPA) a \$75 million loan to partly finance a project to gather, process, and transport the associated gas. The project was to include three gas-gathering stations; a liquefied petroleum gas (LPG) and condensate recovery plant; compression facilities; a pipeline; and engineering, technical, and training services. The initial phase of the project was to collect up to 40 million cubic feet of gas per day from a gas-gathering station at Ras Bakr and transport it by a 16-inch pipeline to a processing and compression station south of Ras Shukair. The total cost of the venture was \$167 million, and was to be completed by 1982.

Production from the gasfields at Abu Madi was scheduled to increase fivefold by the mid-1980's as new wells come onstream. Natural gas from Abu Madi was used to support industrial development in the area, and provide feedstock for the Talkha I and II fertilizer complexes.

Production from the Abu Gharadig Field averaged around 60 million cubic feet per day. Gas from Abu Gharadig was supplied to cement plants at Helwan and Turah, as well as the iron and steel plant at Helwan.

Production from the offshore Mediterranean Abu Qir Field began in 1979 at around 100 million cubic feet per day and was scheduled to reach 200 million cubic feet per day by the mid-1980's. The gas was used in the Abu Qir fertilizer plant, nearby power-generating facilities, and industrial plants in Kafr al-Dawar and Demanhur. EGPA also drew up a plan in 1980 to utilize natural gas instead of bottle gas in residences around Cairo. Tenders were issued for the construction of a natural gas distribution system in the Cairo area. The project was scheduled for completion in 1982.

The Elf-Aquitane group (France) made a substantial gas discovery 20 kilometers northeast of Alexandria in their offshore Mediterranean concession. Initial reports indicated that the field was at least as large as the nearby Abu Qir Field, and possibly much larger. Elf planned to continue drilling in the area to evaluate the actual size of the discovery. The group also submitted proposals to the Egyptian Oil Minister for

the construction of a \$950 million gas liquefaction plant onshore at Abu Qir. No decision was made by the ministry during the year.

**Petroleum.—Production.**—Egypt's oil production increased nearly 20% in 1980 over 1979 levels, due mostly to the new producing wells in the Gulf of Suez and the recovery of oilfields lost as a result of the June war of 1967. Egypt planned to attain a production target of 1 million barrels per day by 1985. Production for 1980 averaged 590,000 barrels per day. With new discoveries in 1980, Egyptian petroleum reserves stood at 2.3 billion barrels. The EGPA supervised all exploration, production, refining, and marketing of crude and refined petroleum. The spot price of Egypt's Gulf of Suez blend reached \$40 per barrel at the end of 1980, while the official price was raised to \$36 per barrel in December of 1980.

The Gulf of Suez continued to be the major oil-producing area in Egypt during 1980. The increase in production during the year was largely brought about by increased drilling in existing oilfields, and not by new discoveries, which were still under evaluation. The major fields in the Suez were operated by the Gulf of Suez Petroleum Co. (GUPCO), a joint venture of Amoco Egypt Oil Co. and EGPA. The July, El Morgan, and Ramadan Fields all averaged near 100,000 barrels per day in 1980. Production from the Gulf of Suez fields was slightly reduced midway through 1980 in an attempt to conserve reserves. Egypt's total oil production for the second half of 1980 averaged around 545,000 barrels per day as a result of reduced output from these fields. Production from the Shi'ab Ali (formerly Alma) Field, returned to Egypt in 1979, was reduced from 40,000 to 15,000 barrels per day to prevent damage to the field.

Production from oilfields in the Sinai also increased during 1980. The major field in the Sinai, Abu Rudeis, increased production

from 50,000 barrels per day in 1979 to an average 90,000 barrels per day in 1980. The Abu Rudeis Field was operated by Cie. Orientale des Petroles d'Egypte (COPE), a joint venture of EGPA and ENI (Italy). Nearly two-thirds of the Sinai was returned to Egypt in January 1980, as part of the Egypt-Israel Peace Treaty, much of which was opened up for exploration during the year.

The General Petroleum Co. (GPC), owned totally by the Egyptian Government, produced oil from seven fields in the Eastern Desert. The Egyptian Petroleum Development Co. (Epedeco) group of Japan started production from the West Bakr onshore field in the Eastern Desert. The field came onstream in June 1980 at 3,400 barrels per day. Other oil companies operating in Egypt were the Western Desert Petroleum Co. (WEPCO), a joint Phillips Petroleum Co.-EGPA venture; Fayum Petroleum Co. (FAPCO), a joint venture of Amoco and the EGPA; and the Nile Valley Petroleum Co. (NIPCO), another Amoco-EGPA company.

**Exploration.**—In recent years, Egypt has attempted to attract the major oil companies into oil exploration and joint venture concessions. During the 1970's, 75% of the cost of developing the country's oil reserves came from EGPA's foreign partners, and EGPA's management emphasized that new agreements would be liberal and negotiable. Favorable terms and large unexplored areas prompted 36 concession agreements to be signed during 1980, 15 of which were with U.S. companies. Exploration capital committed by these agreements alone was in excess of \$500 million.

Exploration in the Gulf of Suez continued to be the most profitable, with several new discoveries. Amoco, Deminex, Petrolbel, CFP-Total and Mobil Oil Corp. all had commercially viable discoveries during 1980. Details of these discoveries are listed in the following tabulation.

Location	Company	Initial flow (barrels per day)	API gravity
Gulf of Suez	Amoco	8,720	28.2
Northwest Gulf of Suez	do	9,300	13.6
Gulf of Suez	do	6,700	40
Do	do	2,900	30
Do	Deminex	2,045	29.7
Do	do	1,900	15
Do	do	1,753	30
Do	do	1,860	
Feiron-onshore	Petrolbel	1,080	23
South Rudeis-onshore	do	770	17.5
Gulf of Shugair	CFP-Total	3,280	35
Gulf of Suez-Red Sea	Mobil	2,948	23



Most interesting was Mobil's strike in the Red Sea. The area had not been considered to have great potential for oil, but the new discovery was likely to prompt more thorough exploration efforts. New exploration agreements in the Gulf of Suez were also signed by CFP-Total, Petrofina, and Conoco.

As a result of the 1979 Peace Treaty between Egypt and Israel, nearly two-thirds of the Sinai Peninsula was returned to Egypt in 1980. The Sinai coast, or the "oil corridor," and offshore areas in the Mediterranean Sea were considered as having good potential for oil reserves. The EGPA signed production-sharing agreements for concessions in both areas—with Conoco for a 1,600-square-kilometer tract in Ras Muhammad, South Sinai, committing \$113 million over 3 years; with BP for a 1,200-square-kilometer tract in the Mediterranean-North Sinai Area; with the International Egyptian Oil Co., an affiliate of Italy's ENI, for a 1,200-square-kilometer tract in the same area; and with CFP-Total for a 1,200-square-kilometer offshore Mediterranean concession. Terms offered by the EGPA allowed the companies to recover their costs out of 30% of production for onshore areas, and 40% for offshore areas.

Contracts and agreements were also signed in other areas in Egypt. Agypetco (Switzerland-Federal Republic of Germany) signed an agreement with EGPA for an 1,800-square-kilometer concession in the Razzak West Area of the Western Desert, and a 5,800-square-kilometer concession in the Qattara depression in the Northwest Desert was awarded to Shell Winning N.V. (Netherlands). Other companies who signed production-sharing agreements during the year with EGPA include Gulfstream Resources Ltd. (Canada), Medoil-Mediterranean Oil and Gas Co., L.K. Exploration, Brinco Group (Canada), and Polar Bear Co. (Canada).

*Refining.*—Around 45% to 48% of Egypt's crude petroleum production was refined within the country in six refineries operated by three public companies. A small amount of petroleum products was imported in 1980, mainly from Western Europe. Egypt planned to increase refinery output from 85 million barrels per year to 110 million barrels per year to keep pace with the increase in domestic consumption. Egypt's refinery capacities were as follows in thousand barrels per year:

Company	Location	Capacity
Suez Petroleum Co	Suez	10,000
	Musturud	25,000
	Tanta	10,000
El Nasr Petroleum Co	Suez	7,000
	Ameriyah	15,000
Alexandria Petroleum Co	Alexandria	15,000

Construction continued on the \$100 million lube oil complex at the Alexandria Petroleum Co.'s refinery. The unit was scheduled to produce 54,000 tons per year of lube oil, 16,000 tons per year of cylinder oil, 100,000 tons per year of asphalt, and 11,000 tons per year of micro wax.

Work began in 1980 on Egypt's first petrochemical complex, to be located at Ameriyah, near Alexandria. The complex is scheduled to come onstream in 1982 with an annual production capacity of 80,000 tons of polyvinyl chloride, 90,000 tons of low-density polyethylene, and 50,000 tons of high-density polyethylene. Ethylene feedstock was to be imported from Montedison of Italy, and in return, Egypt was to supply Montedison with sufficient naphtha to produce the ethylene needed. The complex was owned 75% by EGPA and 25% by Montedison. Total cost of the complex was estimated at \$550 million.

*Pipelines.*—The second line of the Sumed pipeline began operating in September 1979. Total capacity of the line was 590 million barrels per year. The pipeline, which runs between Suez on the Red Sea, and Alexandria on the Mediterranean, operated at the rate of 1.6 million barrels per day in 1979-80. Around 50% of the pipeline's capacity was reserved by seven major oil companies. Saudi Arabia continued to investigate the possibility of using the Sumed pipeline in conjunction with its Abqaiq-Yanbu transpeninsular line to facilitate shipping Saudi crude to Western Europe. Saudi Arabia would put through up to 1 million barrels per day starting in 1982, but these plans appeared less likely since the Arab boycott was imposed on Egypt after signing the peace treaty in 1979.

<sup>1</sup>Physical scientist, Branch of Foreign Data.

<sup>2</sup>Where necessary, values have been converted from Egyptian pounds (£) to U.S. dollars (\$) at the rate £10.70 = US\$1.00.

