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MINERAL INDUSTRIES OF

THE MIDDLE EAST

U.S.
DEPARTMENT
OF THE
INTERIOR

BUREAU
OF
MINES

1989

UNITED STATES DEPARTMENT OF THE INTERIOR • Manuel Lujan, Jr., Secretary

BUREAU OF MINES • T S Ary, Director

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

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Preface

This edition of the Minerals Yearbook records the performance of the worldwide minerals industry during 1989 and provides background information to assist in interpreting that performance. Content of the individual Yearbook volumes follows:

Volume I, Metals and Minerals, contains chapters on virtually all metallic and industrial mineral commodities important to the U.S. economy. In addition, a chapter on survey methods used in data collection with a statistical summary of nonfuel minerals and a chapter on trends in mining and quarrying in the metals and industrial mineral industries are included.

Volume II, Area Reports: Domestic, contains chapters on the minerals industry of each of the 50 States and Puerto Rico, Northern Marianas, Island Possessions, and Trust Territory. This volume also has a chapter on survey methods used in data collection including a statistical summary of domestic nonfuel minerals.

Volume III, Area Reports: International, contains the latest available mineral data on more than 150 foreign countries and discusses the importance of minerals to the economies of these nations. The 1989 review is presented as five area reports and one world overview: Mineral Industries of Africa, Mineral Industries of Asia and the Pacific, Mineral Industries of Latin America and Canada, Mineral Industries of Europe and U.S.S.R., Mineral Industries of the Middle East, and Minerals in the World Economy. This year's reports incorporate location maps, industry structure tables, and an outlook section previously incorporated in our Minerals Perspectives Series quniquennial regional books, which will be discontinued. The Bureau of Mines continually strives to improve the value of its publications to users. Constructive comments and suggestions by readers of the Yearbook are welcomed.

T S Ary, *Director*

Acknowledgments

The Bureau of Mines, in preparing these Volume III Minerals Yearbook Reports, extensively utilized statistics and data on mineral production, consumption, and trade provided by various foreign government minerals and statistical agencies through various official publications. The cooperation and assistance of these organizations is gratefully acknowledged. Statistical and informational material was also obtained from reports of the U.S. Department of State, from United Nations publications, and from the domestic and foreign technical and trade press. Of particular assistance were the routine and special reports submitted by the 10 Regional Resource Officers assigned to minerals and petroleum reporting and by economic and commercial officers and other officials of the Department of State located in American Embassies worldwide. Their contributions are sincerely appreciated.

The text and production, structure of the mineral industry, and reserve tables of this volume were prepared by the respective country authors on the staff of the Division of International Minerals, Information and Analysis Directorate. The mineral export and import trade tables were prepared by the International Data Section of the Division of Statistics and Information Services, Information and Analysis Directorate.

The regimes of some countries reviewed in this volume may not be recognized by the U.S. Government. The information contained herein is technical and statistical in nature and is not to be construed as conflicting with or being contradictory of U.S. foreign policy.

George J. Coakley
Chief, Division of International Minerals

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Vitae

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MINERAL INDUSTRIES OF

THE MIDDLE EAST

By Staff, Branch of Africa and the Middle East

INTRODUCTION[1]

The production and processing of crude petroleum and natural gas are the dominant economic sectors of the Middle East. The 15 countries that constitute the region accounted for 26% of world crude petroleum output, 17% of world natural gas plant liquid production, and almost 5% of world dry natural gas production. About 66% of total world crude petroleum reserves and 31% of total world natural gas reserves are in the Middle East. Transportation and port facilities in the region are geared to expediting efficient and rapid shipment of these materials. U.S.-dollar-denominated export sales of these fuels, estimated at $120 billion in 1989, provide funding for further diversification of the mineral industry. This is usually through development of downstream facilities for producing energy intensive metals such as aluminum and byproducts of the fuels such as petrochemicals and fertilizers. Earnings from the industry are also channeled by several Governments in the region to mineral industry projects in Africa and elsewhere.

A fairly wide range of nonfuel minerals is produced in the region. However, the variety of minerals produced, output levels, and the size of the overall nonfuel mineral economy is dominated by Iran and Turkey. Turkey, with a diverse mineral production and strategically situated between Europe and the Middle East, ranked among the top three world producers of boron, chromite, pumice, and strontium. It was also a significant world producer of magnesium compounds, mercury, and sodium sulfate. Iran had generally lower output owing to 9 years of neglect to the mining sector between 1979 and 1988. It was a significant producer of gypsum and fifth in world production of strontium. Despite a very small domestic mineral industry, Israel was second in world production of bromine and a significant producer of phosphate rock and potash. Jordan ranked fifth in world production of phosphate rock. Iraq ranked about eighth in world production of sulfur, a commodity of major importance in the metallurgical, petrochemical, and fertilizer industries.

U.S. imports of mineral-based materials from the region were primarily energy products. U.S. net oil imports from the Middle East, which include crude petroleum, natural gas liquids, and petroleum refinery products, were about 26% of total U.S. net oil imports or about 680 million barrels in 1989. Nonfuel minerals, for which the Middle East was considered a significant supplier to the United States, were gem stones and potash from Israel and chromite and pumice from Turkey. U.S. exports to the region are primarily food, machinery, equipment, and computers.

Nonfuel mineral output from the Middle East supplied primarily local markets, India, and the European Community. Output of nonfuel minerals generally represented a small percentage of total world production. The most significant were chromite at 13.2%, phosphate rock at 8.9%, gypsum at 8.8%, and potash at 7.2% of world output. New mine and exploration developments were underway for gold in Saudi Arabia and Turkey. Downstream mineral-based industries were expanding in the region, primarily to make use of abundant associated natural gas. Aluminum production, currently underway in Bahrain, Iran, Turkey, and the United Arab Emirates, was to be expanded in Bahrain and the United Arab Emirates. Plans were underway to build aluminum facilities in Qatar and Saudi Arabia, and Iraq discussed the possibility of building a plant in that country. Realization of these plans could bring capacity to more than 1 million tons per year compared with output of about 460,000 tons in 1989. The higher value obtained from the sale of chemicals and plastics produced from hydrocarbon fuels is the motivation behind much of the expansion of petrochemical facilities in the region.

In comparison with the United States, the region covered about 6.2 million square kilometers or about 66% of the U.S. land region of 9.4 million square kilometers. Total population of the region was 189 million compared with 250 million for the United States, and total labor force was about 49 million compared with 124 million. Imported labor was an important factor in the work force of the countries of the Middle East. Perhaps 5 million people from Egypt, India, Pakistan, the Republic of Korea, Taiwan, and other countries of Africa were employed in the Middle East. The estimated gross domestic product (GDP) for the Middle East was $415 billion compared with $5,233 billion for the United States. Per capita GDP ranged from $700 for the Republic of Yemen to more than $17,000 for Qatar. Average per capita GDP for the region was about $2,200 compared with about $21,000 for the United States. All tons are metric in this report unless otherwise specified.

[1]George A. Morgan, Chief, Branch of Africa and Middle East, Division of International Minerals.

SELECTED GENERAL SOURCES OF REGIONAL INFORMATION

American Petroleum Institute, Washington, DC: Basic Petroleum Data Book, annual.

Arab Petroleum Research Center, Paris: Arab Oil and Gas Directory, annual.

British Sulphur Corp. Ltd., London:
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World Mining, monthly.
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Mineral Commodity Summaries.
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U.S. Joint Publications Research Service, Arlington, VA: Foreign Broadcast Information Service Regional Publications, weekly.

World Bank, Washington, DC: Bank news releases.

World Bureau of Metal Statistics, London: World Metal Statistics, monthly.

TABLE 1

MIDDLE EAST: PRODUCTION OF SELECTED MINERALS COMMODITIES, 1989

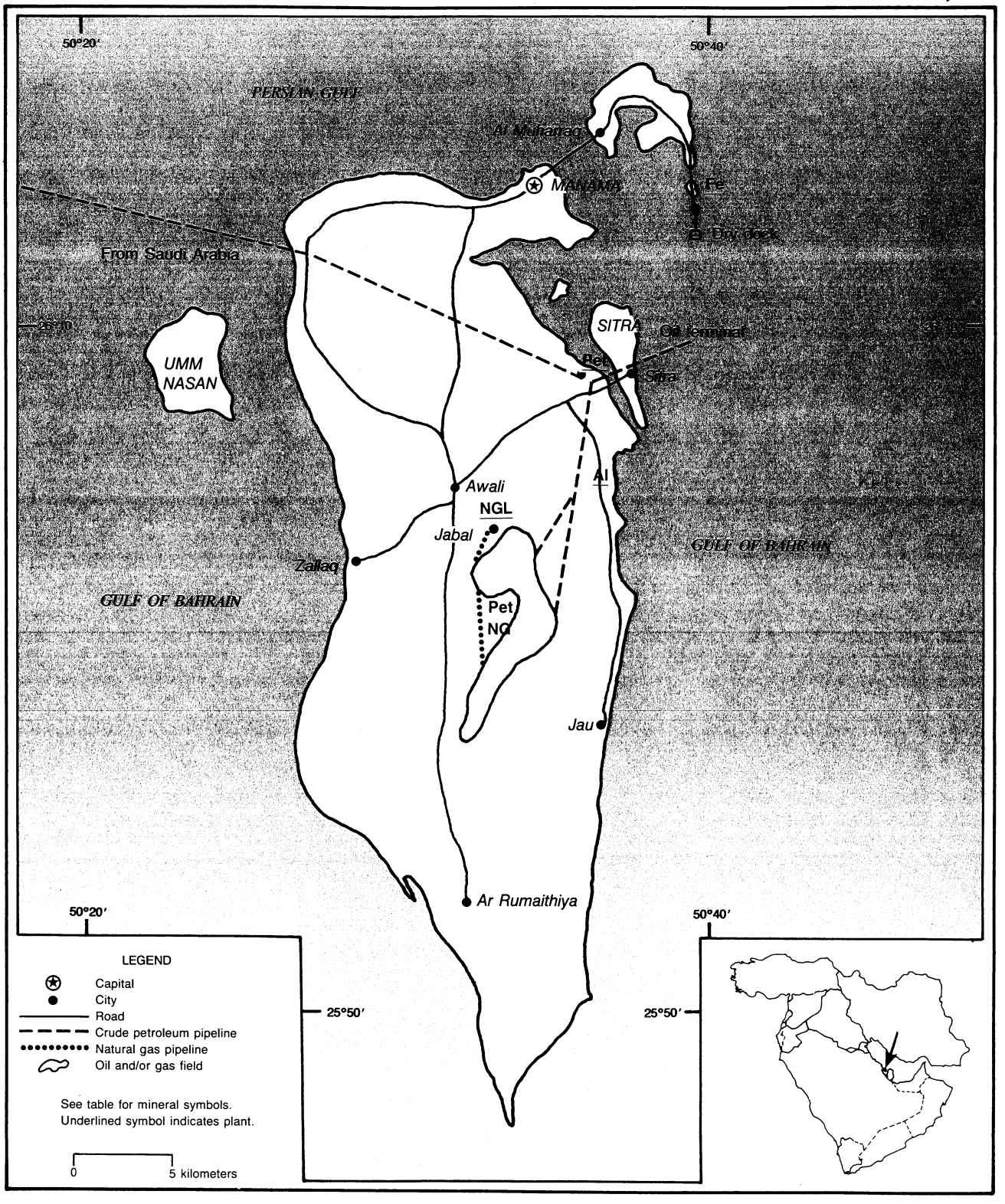
(Thousand metric tons unless otherwise specified)

	Aluminum metal	Cement	Chromite	Gypsum	Natural gas plant liquids (thousand barrels)	Natural gas, dry (million cubic meters)	Nitrogen, N in ammonia	Petroleum crude (thousand barrels)	Phosphate rock (gross weight)	Potash, K_2O equivalent	Salt	Steel, crude	Sulfur
Bahrain	187	—	—	—	2,911	5,946	—	15,595	—	—	—	—	56
Cyprus	—	1,042	—	11	—	—	—	—	—	—	—	—	26
Iran	40	12,500	62	8,000	8,000	15,574	336	850,000	—	—	800	e1,000	510
Iraq	—	e12,500	—	e450	e1,540	3,114	474	978,000	e1,300	—	e300	—	e1,270
Israel	—	2,289	—	31	—	41	48	93	3,922	1,338	475	e95	15
Jordan	—	1,930	—	132	—	—	—	110	6,900	792	18	177	—
Kuwait	—	1,110	—	—	e36,500	7,500	e592	675,700	—	—	32	—	e375
Lebanon	—	e900	—	2	—	—	—	—	—	—	3	—	—
Oman	—	948	13	—	e2,135	3,000	—	275,000	—	—	—	—	32
Qatar	—	e300	—	—	13,231	7,400	714	142,715	—	—	—	550	52
Saudi Arabia	—	e10	—	375	149,650	23,000	1	1,879,000	—	—	—	2	1
Syria	—	3,501	—	e180	e500	991	123	e140,000	2,256	—	138	70	40
Turkey	62	23,796	1,499	223	—	4,922	e308	20,596	85	—	e1,350	7,934	168
United Arab Emirates	e168	3,112	—	80	84,330	20,230	326	682,000	—	—	—	—	e80
Yemen, Republic of	—	700	—	63	—	—	—	71,550	—	—	230	—	—
Total Middle East	457	64,638	1,574	9,545	298,797	91,718	2,922	5,712,359	14,463	2,130	3,346	9,828	2,625
Share of world total, percent	2.5	5.8	13.2	8.8	17.3	4.5	2.9	26.3	8.9	7.2	1.8	1.3	4.5
United States	4,030	70,025	—	15,988	564,290	488,744	12,202	2,778,745	49,817	1,595	35,632	88,813	11,592

eEstimated.

BAHRAIN

AREA 620 km² **POPULATION 520,186**



THE MINERAL INDUSTRY OF

BAHRAIN

By Bernadette Michalski

The nation's economy was largely dependent on the mineral industry, which supplied more than 90% of income and export earnings. The Government's diversification efforts into aluminum smelting and fabrication, iron ore pelletization, petrochemicals, and a major tanker repair shipyard were for the most part successful. However, petroleum and natural gas alone accounted for more than 60% of Government revenues and 80% of export earnings. Aluminum accounted for 7% of export earnings.

GOVERNMENT POLICIES AND PROGRAMS

Although the Bahraini government had encouraged limited privatization of industry, foreign firms were required to have a national partner or sponsor to bid on Government contracts.

The Industry and Development Ministry had offered, on behalf of the Government, the sale of 26% of the wholly Government-owned Bahrain Aluminum Extrusion Co. to end users of its products. As much as 500,000 shares or 10% of the company was purchased by one Kuwaiti firm.

PRODUCTION

Production of the nation's mineral commodities had stabilized. Output of aluminum, natural gas, natural gas liquids, petroleum, petroleum products, and sulfur reflected only modest gains during the past 6 years. Production of pelletized iron from imported iron ore was resumed in 1990, and output was estimated to be about 1.5 million tons for the year.

Planned expansions in aluminum and petrochemical industries would not be reflected in production data until the mid-1990's.

TRADE

The aluminum industry was based on imported alumina, principally from Alcoa of Australia, which supplied 355,151 tons in 1988. Fluoride imports totaled 5,238 tons, all from Italy. Cryolite imports were reported at 2,400 tons, mostly from Japan. Petroleum coke imports were reported at 80,619 tons, most of which were supplied by the United States with minor quantities from the Federal Republic of Germany.

Aluminum sales were reported at 193,530 tons in 1989. The bulk of sales were on the international market. About 57% of exports were delivered to member countries of the Gulf Cooperation Council, about 25% to the Far East and Southeast Asia, and about 4% to Europe.

Refined product exports averaged 243,000 barrels per day (bbl/d) in 1989. About one-half of all exports were destined for Southeast Asia. Bahrain reported the export of 281,845 tons (about 3 million barrels) of natural gas liquids in 1988 with markets principally in Japan and Europe. Prices for propane and butane were $90 and $95 per ton, respectively, by the close of 1988, but improved to $115 and $114, respectively, by the close of 1989.[1]

STRUCTURE OF THE MINERAL INDUSTRY

Bahrain's oil industry was Government-owned and controlled. The mineral policy permitted private investment; however,

TABLE 1

BAHRAIN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[p]
Aluminum metal: Primary, smelter		176,371	178,188	180,344	182,804	186,889
Gas, natural:						
Gross	million cubic feet	224,475	256,230	257,000	260,000	273,100
Marketed	do.	177,755	200,020	200,600	202,000	210,000
Natural gas liquids:						
Propane	thousand 42-gallon barrels	976	889	1,133	880	890
Butane	do.	772	894	775	897	917
Naphtha	do.	1,206	1,169	1,361	1,349	1,104
Petroleum:						
Crude	do.	15,301	15,484	15,377	15,671	15,595
Refinery products:						
Gasoline	do.	6,892	7,520	6,157	5,449	6,931
Jet fuel	do.	11,434	9,613	10,818	10,081	8,419
Kerosene	do.	2,446	7,023	5,200	6,286	7,359
Distillate fuel oil	do.	19,734	26,693	28,071	27,562	28,698
Residual fuel oil	do.	15,378	22,611	22,225	22,268	21,983
Other	do.	11,862	16,100	16,500	17,200	16,526
Total	do.	67,746	89,560	88,971	88,846	89,916
Sulfur, byproduct of petroleum		42,300	r50,070	51,500	56,125	55,900

[p]Preliminary.
[1]Table includes data available through July 1, 1990.
[2]Reported figure.

the Government retained controlling interest in all producing mineral industries.

COMMODITY REVIEW

Metals

Aluminum.—Aluminium Bahrain Bsc (Alba) enjoyed another year of record production levels and planned to raise aluminum production capacity to 460,000 tons per year by mid-1992 at a cost of $1.4 billion. The first of a series of expansion and modernization projects was completed by yearend 1989, involving the addition of 76 pots to the existing 608 pots, increasing annual capacity by 25,000 tons. In February 1989, a further expansion program was approved by the cabinet that would increase capacity by 235,000 tons per year. A third project involving modernizing four of the six pot rooms by installing hoods and computerizing operations should increase capacity by an additional 20,000 tons per year.

The Bahrain Aluminum Co. (Balco) marketed aluminum for the Bahraini and Saudi Arabian Governments, and Balco reported that sale revenues rose to $408 million in 1989 as compared with $395.5 million the previous year.

In October 1989, the Bahraini Cabinet approved the expansion of the Bahrain Aluminum Extrusion Co. to an annual capacity of 14,000 tons. The partial privatization of the company was to be achieved by offering 1.8 million of the company's 5 million authorized shares to its Gulf Cooperation Council customers.

Iron Ore.—The Arab Iron and Steel Co. was purchased by the Gulf Industrial Investment Co., a subsidiary of the Kuwait Petroleum Corp., in March 1988. The former company's facilities had been inaugurated in December 1984, but market conditions did not support operation, and the plant was closed in mid-1986. Production was resumed in early 1989; however, temporary closures were experienced by midyear owing to technical problems related to the long period of inactivity.

Iron ore was to be supplied for pelletizing by the Kudremukh Iron Ore Co., Ltd. of India and Companhia Vale Do Rio Doce and Mineraco Brasileira Reunidas, both of Brazil. In January 1989, an agreement was concluded between the Gulf Industrial Investment Co. and the Iraqi Enterprise for Iron and Steel. It provided for the delivery to Iraq of a total of 4.5 million tons of iron pellets over a 5-year period, commencing with 1 million tons in 1989. Long-term sale contracts were under negotiations with Hadeed of Saudi Arabia and the Qatar Steel Co.

Mineral Fuels

Natural Gas.—Production had been rising steadily for the past decade with most of the increases attributable to the production of natural gas to offset the increased consumption by power generation as well as enhanced recovery by injection into oil wells. In 1989, about 27% of natural gas production was injected, about 25% was consumed in power generation, 21% was consumed by Alba, 14% was consumed by the petroleum refinery, and 13% was consumed by the Gulf Petrochemical Industries Co.

The Jabal al-Dukhan natural gas processing plant was to be expanded to a 7-million-cubic-meter-per-day capacity in 1990.

Petrochemicals.—The Gulf Petroleum Industries Co., a joint venture between Bahrain and Kuwait, operated an ammonia and methanol plant at Sitra. Nonassociated Khuff gas was used as feedstock. Plant capacity was reported at 1,000 tons per day each of ammonia and methanol. Production was running about 10% above capacity with combined output reported at 771,600 tons in 1988 and 764,105 tons in 1989. All production was

TABLE 2

BAHRAIN: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity
Aluminum	Aluminum Bahrain Co., (ALBA) (Government, 74.9%; Saudi Arabia, 20%; Breton Investments, 5.1%)	Sitra	205,000.[1]
Aluminum products	Bahrain Aluminum Extrusion Co. (Government, 100%)	do.	6,000.[1]
Iron oxide pellets	Gulf Industrial Investment Co. (Kuwait Petroleum Corp., 100%)	South Al Muharraq Island	Iron pellets 4,000.[2] Hydrated lime.[2]
Natural gas	Bahrain National Gas Co. (Government, 100%)	Awali Field Nonassociated Khuff gas	1,500.[3] 7,000.[3]
Natural gas liquids	do.	Jabal al-Dukhan	Propane 1,400.[4] Butane 1,100.[4] Naphtha 1,500.[4]
Petroleum, crude	Bahrain National Oil Co. (Government, 100%)	South of Awali	16.[4]
Petroleum products	Bapco BSC (Bahrain National Oil Co., 60%; Caltex, 40%)	Sitra	250,000.[5]
Sulfur	do.	do.	75,000.[1]

[1]Metric tons per year.
[2]Thousand metric tons per year.
[3]Million cubic meters per year.
[4]Thousand barrels per year.
[5]Barrels per day.

exported to China, India, and Southeast Asian countries.

The Bahrain National Gas Co. was planning construction of a $350 million plant to produce polypropylene and the octane boosting, lead-free gasoline additive, methyl tertiary butyl ether (MTBE). Market prices for polypropylene were 10 times higher and for MTBE about 3 times higher than the values on propane and butane. Markets for the polypropylene output were planned in the Far East, and MTBE output would be sold to the United States and Europe.

Petroleum.—Harken Bahrain Oil Co., a subsidiary of Harken Energy Corp. of the United States, concluded an exploration agreement with the Bahraini Government in January 1990. The agreement covered a hydrocarbon exploration program of 3 year's duration in the waters off al Muharraq, and Umm Nasan Islands. Should commercial fields be discovered, a 35-year production license would be granted. Production sharing would range from 70%-30% to 90%-10% in favor of Bahrain depending on volume of output.

Bahrain's crude oil production, stabilized at about 43,000 bbl/d largely by a gas injection program was derived from the Awali Field in central Bahrain. Through a 1972 revenue sharing agreement signed with Saudi Arabia, Bahrain receives a 50% share of revenues from the Abu Saafa offshore field between the two countries. Saudi Arabia had exclusive control over production in this field.

The 250,000-bbl/d capacity refinery at Sitra consistently operated at about 95% capacity. The refinery supplied all of Bahrain's products consumption requirements, estimated at 10,500 bbl/d in 1990. The bulk of the refinery output was exported via a deepwater terminal off Sitra Island.

Reserves

Petroleum reserves were officially reported at 140 million barrels and nonassociated natural gas reserves at 283 billion cubic meters in 1989.

INFRASTRUCTURE

The 620-square-kilometer island nation is about 3.5 times the size of Washington, DC; however, it maintains a 200-kilometer bituminous surfaced highway system and a 25-kilometer bridge causeway to Saudi Arabia.

Domestic crude oil was augmented by a long-term supply agreement with Saudi Arabia that delivers about 195,000 bbl/d of Abu Saafa crude oil to the refinery and storage facilities at Sitra via a 12-inch, 54-kilometer pipeline. Sixteen product pipelines ranging in size from 6 to 20 inches extended for 3 miles from the Sitra storage facilities to a deepwater terminal for export. Natural gas pipelines totaled 32 kilometers.

The Arab Shipbuilding and Repair Yard (ASRY) was established on a constructed island with all installations and support services necessary for a shipyard specializing in the repair of very large crude carriers (VLCC). Owned by Abu Dhabi, Bahrain, Kuwait, Qatar, and Saudi Arabia each with 18.84% equity; Iraq, 4.7%; and Libya, 1.1%, the ASRY facility included four repair berths that can accommodate sizes up to 500,000-deadweight-ton tankers. Occupancy of the dry dock averaged 95% in 1989. In late 1989, ASRY, in competition with European and Singapore repair yards, obtained a contract from Texaco Marine Services for the repair of five VLCC's to be completed by mid-1990. ASRY expansion plans included the construction of facilities to accommodate 40 to 50 ships of up to 180,000 deadweight tons (maximum Suez Canal size).

OUTLOOK

Much of Bahrain's mineral industry operations are closely linked to Iraq, Kuwait, and Saudi Arabia. The tenuous position of the Gulf region after the August 2, 1990, invasion of Kuwait by Iraq placed partnerships and trade agreements in jeopardy.

The major aluminum expansion program and the proposed polypropylene and MTBE plants, when realized, will foster new downstream industries and increase employment. These industries are less dependent on commerce with Iraq.

[1]Where necessary, values have been converted from Bahraini dinars (BD) to U.S. dollars at the rate of BD0.37 = US$1.00.

OTHER SOURCES OF INFORMATION

Agency

Ministry of Industry and Development
Manama, Bahrain

Publications

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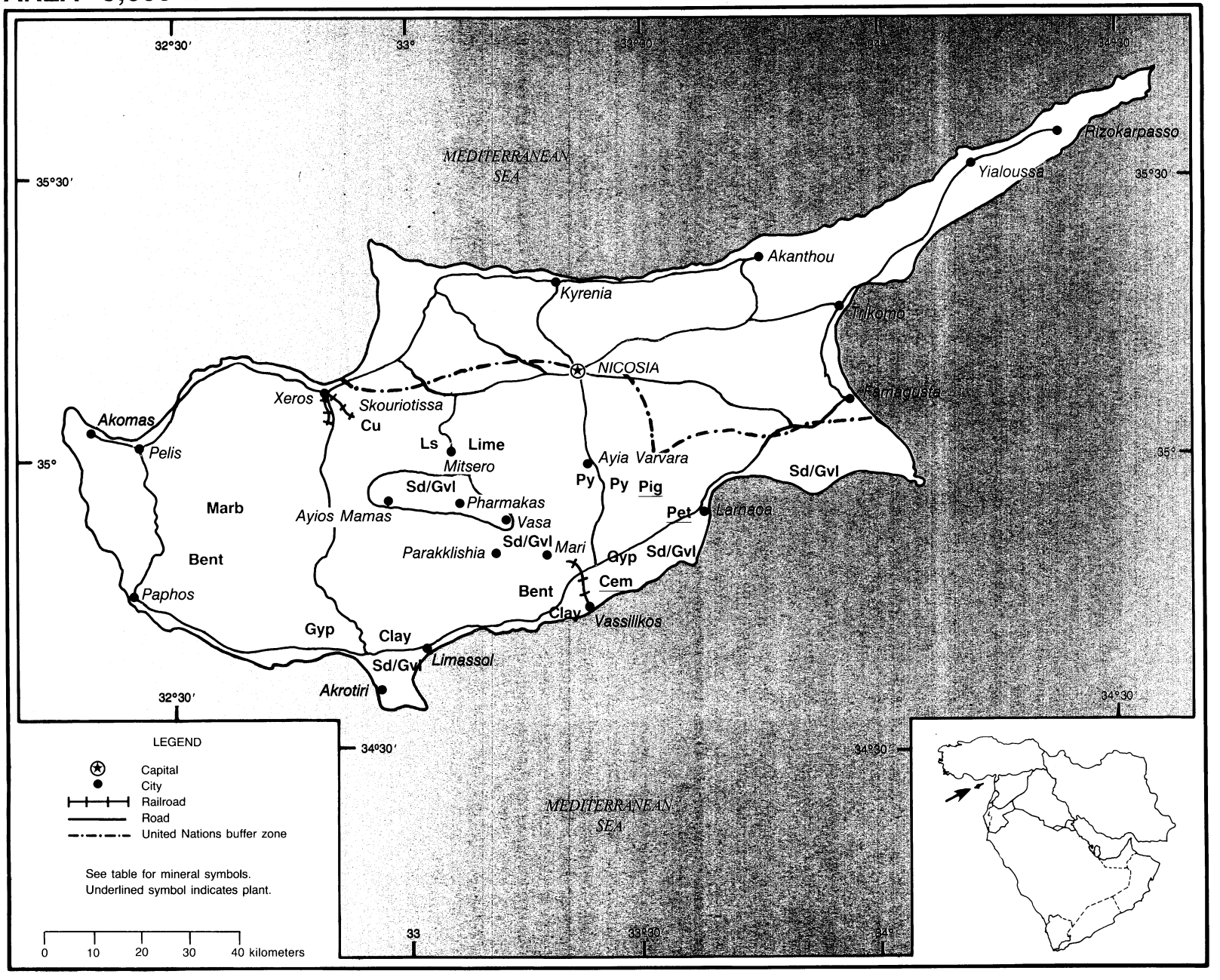
CYPRUS

AREA 9,000 km² **POPULATION 707,000**



THE MINERAL INDUSTRY OF

CYPRUS[1 2]

By Audie L. King

Despite a significant 1989 increase in the production of sand and gravel and other building materials, the mining and quarrying sector continued to decline in terms of its contribution to Cyprus' gross domestic product (GDP). Based on average exchange rates, the total value of the mineral industry's production fell from $31.1 million to $25.9 million. The Government reported a real decline of 15.7% in 1989 compared with a 1.7% drop in 1988. The sector was adversely affected by the closure of the Cyprus Asbestos Mines Ltd. mine near Amiandos. Also, local demand for pyrite fell due to the shutdown of the Cyprus Fertilizer and Chemical Co.'s mixed fertilizer production facilities. Poor world demand for bentonite and iron oxide pigments contributed to a 33.6% and a 15.2% drop in their respective production. Mineral exports dipped by 70.8% to an alltime low of $1.4 million. This accounted for only 0.3% of total domestic exports.

Cyprus has been geopolitically divided since 1974, when Turkish troops took control of 37% of the land area in the northern region of the island. The southern Greek administered area is separated from the northern Turkish administed area by a narrow U.N. buffer zone. Recent U.N. mediated talks aimed at reuniting the county under a new federal system of Government have not been successful. Despite political uncertainty and a steady decline in mineral production, Cyprus continued its progression from a predominately agrarian society with little modern infrastructure to a fully functional free market economy. It had become noted as an important business and tourist center in the eastern Mediterranean. Both the northern and southern areas of the island continued to progress. Although the per capita GDP of the Turkish section was barely one-third of the Greek section, its economy was rapidly expanding. In terms of current market prices, the GDP of the Turkish occupied territory increased by 6.6% in 1987, 7.5% in 1988, and 8.6% to $423 million in 1989.

The overall economy of Cyprus continued to grow rapidly. It expanded by an estimated 6.0% in 1989 compared with 6.9% the previous year. The merchandise trade deficit increased 40%, from $1.02 billion in 1988 to $1.36 billion in 1989. Strong domestic demand, fueled largely by an expanding tourist industry, resulted in a 32% surge in imports. Domestic exports increased by only 4.5%, although overall exports were up by 17.5% because of a 55% rise in reexports. A strong invisibles surplus tied to rapid growth in tourism and related services counterbalanced much of the merchandise trade deficit. However, the country had a negative current account balance of $144 million, the first in 3 years.

GOVERNMENT POLICIES AND PROGRAMS

Cyprus' concerns over escalating inflation rates, which had increased from 2.8% in 1987 to about 4% in 1989, and the Government's budget deficit had prompted the introduction of fiscal reforms. A new tax package and set of liberalized financial measures that were designed to stimulate business and harmonize practices with the European Community (EC) was scheduled to take effect in 1991. A new value added tax would play a central role in a switch from direct to indirect taxation. As a result, the income tax structure will be simplified, leaving a maximum rate of 40%. The corporate tax rate that is now 40% will be cut in half.

Mining operations on the island were privately owned and operate under leases and licenses issued by the Cyprus Mines Service since 1958. Royalties on extracted mineral commodities ranged from 1% to 5% of the value. The Economic Geology Section of the Geological Survey Department was responsible for mineral exploration programs and the evaluation of the country's resources. Prospecting was also carried out by foreign and domestic mining companies and by the research agencies of foreign countries.

PRODUCTION

The production of mineral commodities continued to decline in relative importance to Cyprus' national economy. The overall economy grew by 6%, while the value of the nation's mineral production decreased by a real 15.7%. At the end of 1989, the mineral industry accounted for less than 0.6% of the GDP. In general, those commodities mined for use in the domestic construction industry fared well while those destined for export such as bentonite and umber declined. The 1989 decline in production value was due mainly to the closure of the asbestos mine and the fertilizer-producing plant that used much of the pyrite produced. In contrast to the overall performance of the mineral industry, certain major quarrying materials such as sand and gravel and road aggregate recorded rates of growth that exceeded 10%. Hellenic Mining Co. resumed cupreous pyrite concentrate production after an 8-year hiatus.

Mining accounted for about 0.3% of the Turkish occupied area's GDP. The total value of minerals extracted in the northern area in 1989 increased by 21.8% to about $3.4 million. Information on amounts and specific types of minerals produced was not available. The bulk of the mineral production was likely in support of the construction industry, which expanded by 7.7% in 1989.

TRADE

Exports of mineral commodities decreased by 70.8% in 1989 to a recent year record-low level of $1.4 million and accounted for only 0.3% of total domestic exports. This was due mainly to the closure of the asbestos mine, a fertilizer factory, and poor world demand for

TABLE 1

CYPRUS: PRODUCTION OF MINERAL COMMODITIES[1 2]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[p]
METALS						
Copper:						
Cupreous pyrite concentrate:						
Gross weight		—	—	—	—	1,752
Cu content:		—	—	—	—	251
Cement copper:						
Gross weight		2,130	1,188	193	765	1,080
Cu content		1,065	606	80	315	465
INDUSTRIAL MINERALS						
Asbestos, fiber produced		16,360	13,011	18,070	14,585	—
Cement, hydraulic	thousand tons	659	864	854	868	1,042
Clays, crude:						
Bentonite		52,000	55,000	79,600	90,300	59,744
Other:						
For brick and tile manufacture	thousand tons	212	220	300	357	390
For cement manufacture[e]	do.	25O	250	250	250	330
Total	do.	462	470	580	607	720
Gypsum:						
Crude		16,000	30,000	45,700	32,710	10,98O
Calcined		8,500	5,500	4,960	3,975	[e]4,000
Lime, hydrated		7,730	7,452	6,890	6,810	7,060
Pigments, mineral: Umber		12,200	10,000	12,500	10,060	8,534
Salt, marine		10,013	6,051	—	—	—
Stone, sand, and gravel:						
Limestone, crushed (Havara)	thousand tons	2,800	2,500	2,360	2,450	2,580
Marble	do.	80	75	80	78	96
Marl, for cement production	do.	541	568	567	[e]565	692
Sand and gravel	do.	4,450	4,370	4,200	4,400	4,850
Unspecifed building stone	do.	343	280	Z85	300	166
Strontium: Celestite concentrate		1,400	7,365	6,300	([3])	—
Sulfur:						
Pyrite, gross weight		69,600	56,672	91,380	113,145	57,455
S content		30,972	24,936	41,121	50,916	25,855
MINERAL FUELS AND RELATED MATERIALS						
Petroleum refinery products:						
Liquefied petroleum gas	thousand 42-gallon barrels	172	239	250	342	301
Gasoline	do.	789	993	1,088	1,224	1,191
Kerosene and jet fuel	do.	248	272	281	375	232
Distillate fuel oil	do.	990	1,220	1,299	1,489	1,451
Residual fuel oil	do.	924	1,069	1,288	1,506	1,268
Asphalt	do.	145	165	191	246	266
Refinery fuel and losses	do.	145	152	158	222	198
Total		3,413	4,110	4,555	5,404	4,907

[e]Estimated. [p]Preliminary.

[1]Table includes data available through Nov. 16, 1990.

[2]Mineral production data from the northern Turkish occupied section of the country is not included in this table because available information is inadequate to make reliable estimates of output levels.

[3]Revised to zero.

bentonite and umber. The Turkish occupied area exported about $400,000 worth of mineral commodities that accounted for about 0.7% of its total exports.

Trade was very important to the Cypriot economy. It maintained one of the largest merchant marine fleets in the world. Its trade, which amounted to more than $2.8 billion in 1989, was equal to nearly 63% of its total GDP. Cyprus' merchandise trade deficit in 1989 was a record $1.4 billion. The country imported $2.1 billion and exported $722 million.

Trade with the EC had become increasingly important to Cyprus' economy in recent years while the country's volume of trade with the Middle East had steadily declined. In January 1988, Cyprus began a 15-year program to abolish all trade barriers with the EC as part of a customs union agreement. The existing import duties will be decreased by 9% per year. Exports to both the Middle East and Europe were equal and accounted for about 42% of its total exports in 1986. By 1989, the Middle East took only 31% of total exports while the EC's share had risen to 56%.

Cyprus' trade deficit with the United States widened to $72 million in 1989. Exports to the United States included clothing, footwear, iron oxide pigments, steel tubes and pipes, carob, dairy products, and miscellaneous food items. They accounted for only 2.1% of Cyprus' exports or $90 million. The United States exported cereals, office equipment, paper and paper products, commercial vehicles, and electrical equipment to Cyprus. These products accounted for 3.8% of Cyprus' total imports or $18 million.

STRUCTURE OF THE MINERAL INDUSTRY

Mining sector employment continued its downward trend. Only 700 people were employed in 1989 compared with 1,735 in 1980. The Hellenic Mining Co. was the most significant company, with output from diverse operations. Production generally was by small companies working relatively small deposits.

Many persons were involved in processing primary mineral commodities, including 507 employees in the cement industry and 151 employees in the petroleum refinery in 1988, the last year that such data were available.

COMMODITY REVIEW

Metals

Chromium.—The Hellenic Mining Co. planned to revive operations at the Troodos chromite mine that were suspended in 1982. No timeframe or cost estimate was given for the project.

Copper.—The Hellenic Mining Co. produced 1,752 tons of cupreous pyrite concentrate and 1,128 tons of cement copper in 1990. This is the first concentrate the company had produced since 1980. The company was planning further increases in production at its Skouriotissa Mine.

Gold.—Hellenic Mining Co. entered into a joint venture with Cyprus Mining Investors Ltd. of the United Kingdom for exploration and exploitation of precious metals. The agreement between the two companies started in late 1989 and will last for 3 years. It included all mining leases and prospecting permits currently held by Hellenic Mining Co.

Industrial Minerals

A representative of Ivas Engineers submitted a proposal to the Government of Cyprus to revive the Amiantos Mine that had been inactive since 1988. It contended that because Canada and the U.S.S.R. no longer exported asbestos, a strong market for Cypriot asbestos existed. The proposal stated that a buyer had already agreed to purchase 10 years of production.

Mineral Fuels

A trade protocol was signed in 1989 with the U.S.S.R. to further develop trade between the two countries. It included an agreement for the U.S.S.R. to perform geological and geophysical surveys for offshore oil.

Reserves

Cyprus had been renowned for its copper mines since ancient times. In fact, copper derived its name from **cuprum**, a popular name for Cypriot copper. The domestic copper industry was currently suffering from the depletion of its richer copper ores. Because of the country's past experience in copper processing, it may be able to continue producing minor quantities of cement copper from waste drainage and concentrates from lower grade ore for the foreseeable future. Any significant drop in world copper prices would negatively impact the mining of these low-grade reserves.

Other commodities that had experienced declining production in recent years owing to poor market conditions, such as asbestos, bentonite, celestite, iron oxide pigments, pyrite, and salt, remained in plentiful supply. However, officially reported reserves were not available.

INFRASTRUCTURE

Cyprus had the fifth largest merchant marine fleet in the world in terms of deadweight tonnage. Major ports at Larnaca, Limassol, and Famagusta were supplemented by smaller ports at Paphos, Vassilikos, Akomas, Xeros, Kyrenia, and Trikomo. The deepening of ports at Larnaca and Limassol was being reviewed, and improvements could be essential if Cyprus were to handle new-age shipping vessels. The Famagusta, Trikomo, and Kyrenia ports are presently under Turkish Cypriot control.

Cyprus had 10,780 kilometers of improved roads, 5,170 kilometers of which was paved. A short railroad connected the copper mines at Skouriotissa with the Port of Xeros. Two formerly active copper mines at Mavrovouni and Kalavasos were also connected by rail to the nearby Ports of Xeros and Vassilikos, respectively.

OUTLOOK

The Cypriot mining industry, which has been in a steady decline for more than a decade, appears to have bottomed out. Most of the country's traditional mineral enterprises were either shut down or were operating at a small fraction of past production levels. If international markets can be secured, asbestos and chromite mining will likely resume in the future. The rising trend of copper production will continue if prices remain relatively high. However, production is unlikely to return to past levels. Industrial mineral mining for the construction industry, which in recent years has emerged as the most economically important sector in the mining industry, will continue to grow with the

TABLE 2

CYPRUS: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity[1]
Bentonite	Peletico Plasters Ltd. (private, 100%)	10 kilometers west of Vassilikos	55.[e]
Do.	Bentex Minerals Co. Ltd. (private, 100%)	Vassilikos area	5.5.[e]
Do.	D. Mitides Import-Export (private, 100%)	Paphos area	10.[e]
Cement	Vassiliko Cement Works Ltd. (Hellenic Mining Co., 100%)	Vassilikos	800.
Do.	Cyprus Cement Co. Ltd: (private, 100%)	do.	400.
Clay	Vassiliko Cement Works Ltd. (Hellenic Mining Co., 100%)	do.	600.[e]
Do.	Peletico Plasters Ltd. (private, 100%)	West of Limassol	120.[e]
Copper	Hellenic Mining Co. Ltd. (Archbishop of Cyprus, Trustee to the Greek Community of Cyprus, 100%)	Skouriotissa	2[e] concentrate. 1.1[e] cement copper.
Diabase	do.	Vasa	280.[e]
Gypsum	Gypsum and Plasterboard Co. Ltd.	Vassilikos	22.[e]
Do.	United Gypsum Ltd. (Hellenic Mining Co. Ltd., 100%)	do.	22.[e]
Do.	Peletico Plasters Ltd. (private, 100%)	West of Larnaca	10.
Lime	Hellenic Mining Co. Ltd.	Mitsero	8[e] hydrated lime.
Limestone	do.	do.	280.[e]
Do.	Vassiliko Cement Works Ltd.	Vassilikos	1,500.[e]
Marble	Chrisostomos Peppos Ltd. (private, 100%)	Paphos area	20.[e]
Do.	Elepem Ltd. (private, 100%)	do.	12.[e]
Do.	D. Mitides Import-Export (private, 100%)	do.	8.[e]
Do.	Takis Marble Enterprises Co. Ltd. (private, 100%)	do.	7.5.[e]
Do.	Nearchos Eliades and Sons Ltd. (private, 100%)	do.	1.5.[e]
Do.	Evagoras Andreou (private, 100%)	do.	3.8.[e]
Marl	Cyprus Cement Co. Ltd. (private, 100%)	Vassilikos	700.[e]
Petroleum, refined	Cyprus Petroleum Refinery Ltd. (private, 100%)	Larnaca	5,850.[2]
Pyrite	Hellenic Mining Co. Ltd. (Archbishop of Cyprus, Trustee to the Greek Community of Cyprus, 100%)	Two mines 20 kilometers south of Nicosia	146.
Sand	do.	Mitsero	160.[e]
Do.	do.	Mari	24.[e]
Sand and aggregates	do.	Vasa	200.[e]
Do.	Skyra Lima Ltd. (private, 100%)	Ayia Varvara	600.[e]
Do.	K. M. G. Quarries Ltd. (private, 100%)	Pharmakas	220.[e]

See footnotes at end of table.

TABLE 2—Continued

CYPRUS: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity[1]
Sand and aggregates	Mosphiloti Quarries Ltd. (private, 100%)	Pharmakas	196.[e]
Do.	Costas Kythreotis and Son Ltd. (private, 100%)	do.	250.[e]
Do.	General Construction Co. Ltd. (private, 100%)	Parakklishia	270.[e]
Do.	Eskal Ltd. (private, 100%)	Ayios Mamas	175.[e]
Do.	Skyropiia "Leonik" Ltd. (private, 100%)	Mitsero area	135.[e]
Sand and gravel	Neefa Ltd. (private, 100%)	Akrotiri	150.[e]
Do.	Geomichanikai and Ergoliptikai Epichirisis Merra Ltd. (private, 100%)	do.	65.[e]
Umber	Umber Corporation of Larnaca Ltd. (private, 100%)	20 kilometers northwest of Larnaca	13.[e]

[e]Estimated.
[1]Thousand metric tons per year unless otherwise specified.
[2]Thousand barrels per year.

nation's economy. The output of refined petroleum products and cement is also likely to increase. An economic slowdown in Europe, however, would negatively affect the country's fortunes, which have been increasingly tied to tourism and foreign trade.

[1]Where necessary, values have been converted from Cypriot Pounds (CP) to U.S. dollars at the rate of CP0.49 = US$1.00.

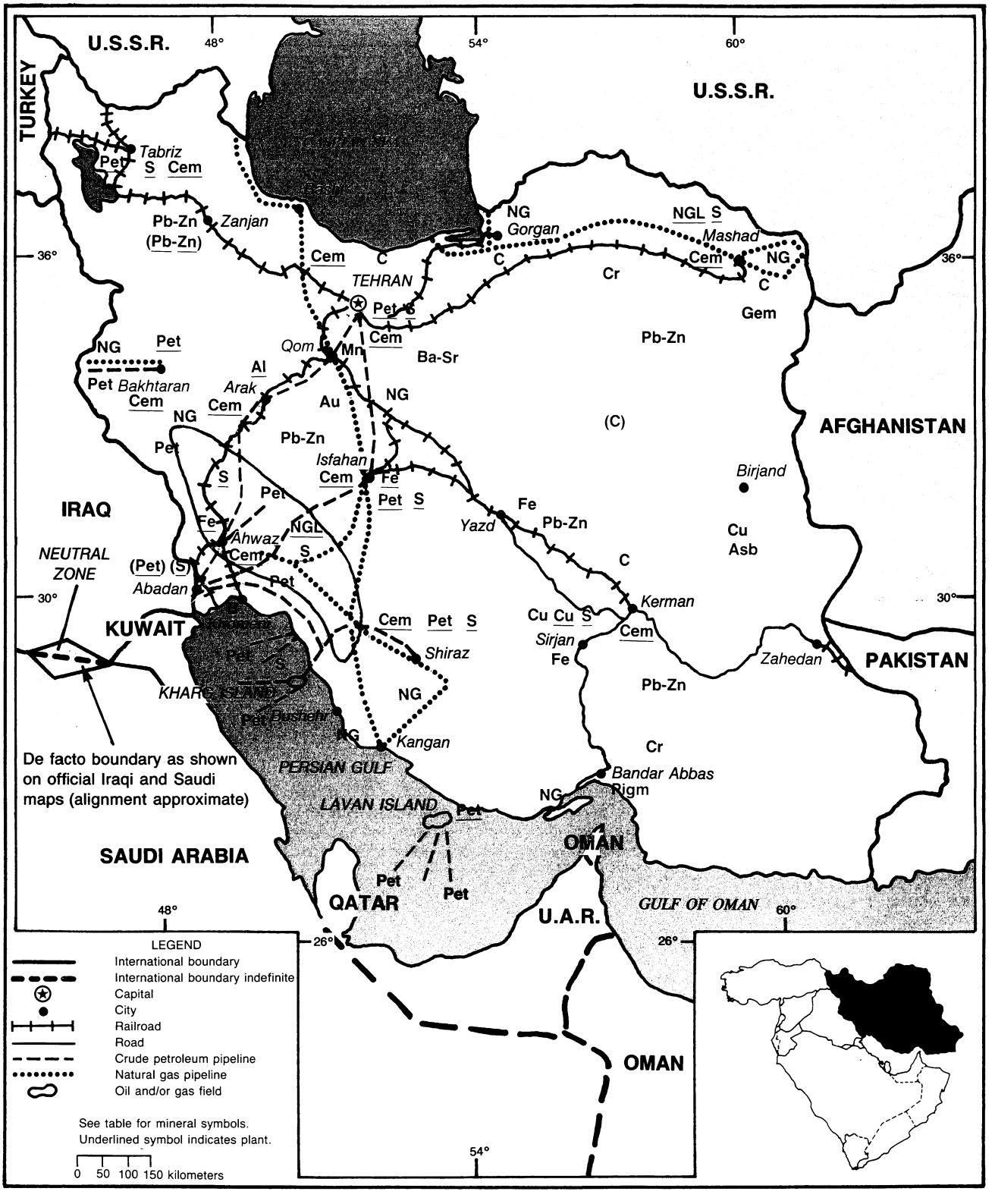
[2]Unless specificly stated, all data in this chapter is concerned with the southern Greek administered area because data related to the Turkish Cypriot area are sparse or unavailable.

OTHER SOURCE OF INFORMATION

Republic of Cyprus, Nicosia: Industrial Statistics, 1989, annual report.

IRAN

AREA 1.6 million km² **POPULATION 54.8 million**



THE MINERAL INDUSTRY OF

IRAN

By Lloyd E. Antonides and George A. Morgan

Crude petroleum was estimated to account for about 90% of total exports. The country remained very import dependent following a 10-year war with Iraq in which many of its main industrial facilities were damaged or destroyed. A number of mines and mineral processing plants were being reactivated as personnel returned from military service. Crude petroleum exports received priority attention because they provided the quickest and most effective way of obtaining foreign exchange.[1] Petroleum refinery capacity was reduced by more than one-half owing to the war, and reportedly was not even able to provide for domestic consumption. However, in 1989, restoration of refining capacity continued, and the first exports of refined products were reported.

The Mines and Metals Ministry indicated that it intended to relinquish control of a significant portion of the country's mining establishments. Excepted would be the Anguran lead and zinc mines, the Golguhar and Chadormalu gypsum mines, and the Sar Cheshmeh copper mine. A total of $4.6 billion was to be invested in mining projects during the next 5 years.

Barter remained an integral part of the Government's policy since it agreed to trade unspecified minerals for Swedish mining equipment. Sweden also agreed to finance mining projects up to a $500 million limit. Reimbursement of the latter would be through barter or buyback arrangements of the mining facilities themselves.

The Government, through its Ministry of Mines and Metals, intended to construct an aluminum plant at Bandar Abbas at a cost of $1.3 billion. It would have a capacity of 220,000 metric tons per year (mt/yr). An unnamed Dubai company was to participate in the project. Output would be divided equally for exports and domestic use and was expected to commence in 1993.

The Zargah Mine near Sarab, northwest of Teheran, was to produce nepheline syenite, which would be processed using equipment and technology supplied by the U.S.S.R. Output would be about 100,000 mt/yr and would be shipped to the Arak aluminum plant.

Output from the Sar Cheshmeh refinery and mining complex near Kerman was 27,286 tons of cathode and 48,269 tons of anode during an 8-month period beginning March 21, 1989. Resources at Sar Cheshmeh were reported to be about 800 million metric tons (MMmt) of ore. The Shadhid Bahonar copper products plant, near the Sar Cheshmeh facility, neared completion.

Two new gold mines commenced output; one was at Astaneh, near Arak, in southwest Hamada Province, and the other at Damghan in Semnan Province. No capacities or operating data were reported.

Construction commenced on a $192 million steel rolling mill near Miyaneh, in East Azerbaijan, with a projected capacity of 250,000 mt/yr of rod and wire products. Planned capacity of the Nasr steel plant was about 525,000 mt/yr, with possible expansion of capacity to 1.5 million metric tons per year (MMmt/yr) by 1992. Construction continued on the Mobarakeh steel plant near Isfahan with the assistance of Italian and Japanese firms. Construction was due to be completed in 1992, and capacity was projected at 2.4 MMmt/yr.

Production expansion occurred at several iron ore mines in 1989. The Choghart Mine increased output to 2.63 MMmt compared with 2.5 MMmt in 1988. The Bafq Mine had an estimated output of 3 MMmt compared with 1.8 MMmt the previous year.

The Gol-e Gohar deposit, 50 kilometers south of Sirjan, was designed to provide feed to both the Mobarakeh steel plant near Isfahan and the Nasr plant near Ahwaz. Six underground mines were to be ultimately opened at Gol-e Gohar, where resources of 1.13 billion tons of iron ore were reported. Mine production would be 5 MMmt/yr, and concentrate output 2.75 MMmt/yr. Mineralogically, the deposit consists of an upper magnetite grading 63.2% iron and 0.09% phosphorous, a middle oxide zone grading 60.3% iron and 0.15% phosphorous, and a lower magnetite grading 56.1% iron and 0.17% phosphorous. A 320-kilometer railroad was proposed to connect the site with the port at Bandar Abbas. A pelletizing plant with a capacity of 2.5 MMmt/yr was inaugurated at the Nasr plant. Discussions were held with unspecified Canadian officials on the possible expansion of the Sangan Mine in Khorasan Province.

Capacity of the Zanjan plant belonging to the National Iranian Lead and Zinc Co. was reported to be 40,000 mt/yr of lead and 60,000 mt/yr of zinc.

Cement production capacity was about 17 MMmt with an estimated 20 MMmt required for domestic consumption. Demand for cement was high, both for reconstruction of industrial and transportation facilities damaged during the war and for new projects.

A coal plant with a capacity of 500,000 mt/yr was put into operation at the Zirab Mine in Masandaran Province. Plans to develop other deposits were underway, including a joint development with unspecified Canadian companies of the Tabas deposit in Khorasan Province.

Iran had yet to resume its prewar production level of about 5 million barrels of crude petroleum per day. Current output was about 2.85 million barrels per day, below its quota of 3.14 million barrels per day. However, by 1992, Iran planned to have a sustainable crude oil production capacity of 4.5 million barrels per day. Reserves were estimated at 93 billion barrels.

The Abadan petroleum refining complex was recommissioned in April with an initial capacity of 130,000 barrels per day, compared with 628,000 barrels per day before 1980. Capacity was expected to reach 380,000 barrels per day by 1992.

Natural gas exports to the U.S.S.R. reportedly resumed after having ceased for more than 8 years. Annual exports to the U.S.S.R. were to be 2.9 billion cubic meters during a 15-year period, with the potential to increase to 10 billion cubic

TABLE 1

IRAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
METALS						
Aluminum: Metal, primary ingot[e]		43,000	40,000	45,000	40,000	40,000
Chromium: Chromite, mine output, concentrate gross weight[3]		50,000	54,000	55,000	57,000	[4]62,000
Copper:[3]						
Mine output, Cu content[e]		[r]40,000	[r]50,000	40,000	[4]51,000	[4]68,000
Metal:[e 5]						
Smelter output, primary blister		[r]38,000	[r]48,000	38,000	49,000	72,000
Refinery output, primary refined		[r]33,000	[r]25,000	28,000	30,000	38,000
Iron and steel:						
Iron ore, mine output:[e]						
Gross weight	thousand tons	2,800	2,800	2,500	[r]2,000	2,500
Fe content	do.	1,600	1,600	1,400	[r]1,100	1,400
Metal:[e]						
Pig iron	do.	250	250	250	250	250
Steel, crude	do.	900	[r]850	875	[r]980	1,000
Lead: Mine output, concentrates, Pb content[3]		[r]23,000	22,000	20,000	17,000	10,500
Manganese, mine output, ore, gross weight[3]		40,000	34,000	30,000	31,000	35,000
Molybdenum, mine output, Mo content [e]		500	500	500	500	500
Zinc: Mine output, concentrates, Zn content[3]		25,000	29,000	36,000	25,000	25,000
INDUSTRIAL MINERALS						
Asbestos, marketable fiber[e]		2,500	3,000	3,300	[r]3,400	3,500
Barite[e]		[r]40,000	[r]41,000	43,000	44,000	45,000
Boron: Borax[e]		1,200	1,200	1,500	1,700	1,500
Cement, hydraulic	thousand tons	12,464	12,273	12,729	12,202	12,500
Clays:						
Bentonite[e]		27,000	27,000	27,000	[r]37,000	35,000
Kaolin and fire clay[e 6]		429,000	430,000	460,000	[r]493,000	500,000
Feldspar[e]		32,000	32,000	32,000	32,000	32,000
Fluorspar: Fluorite[e]		3,300	3,300	3,300	3,300	3,300
Gem stones: Turquoise[e]	kilograms	[r]35,000	35,000	35,000	[e]24,000	25,000
Gypsum[e]	thousand tons	8,384	8,400	8,400	[r]7,600	8,000
Lime[e]	do.	650	650	650	650	650
Magnesium compounds: Magnesite[e]		2,240	2,240	2,500	[r]2,800	2,800
Mica[e]		820	820	1,000	[r]1,200	1,200
Nitrogen: Ammonia, N content[e]		27,100	65,900	119,200	[r]145,500	336,000
Pigments, mineral, natural iron oxide[e]		4,300	4,300	4,300	4,300	4,300
Salt, rock[e]	thousand tons	[4]703	700	750	[r]815	800
Sodium compound: Caustic soda[e]		12,000	12,000	12,000	12,000	12,000
Stone, sand and gravel:[e]						
Crushed: Limestone	thousand tons	[4]15,430	16,000	16,000	[r]17,400	18,000
Dimension: Marble, granite, and travertine	do.	3,291	3,300	3,300	3,300	3,500
Strontium: Celestite		20,000	22,000	22,000	22,000	22,000
Sulfates, natural:[e]						
Aluminum potassium sulfate (alum)		12,000	12,000	12,000	12,000	12,000
Sodium sulfate		[r]100,000	[r]123,000	[r]170,000	214,000	200,000

See footnotes at end of table.

TABLE 1—Continued

IRAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
INDUSTRIAL MINERALS—Continued						
Sulfur:[e]						
Native		r10,000	r10,000	10,000	10,800	10,000
Byproduct of petroleum and natural gas		150,000	r180,000	240,000	206,000	460,000
Acid from smelter gas, S content		20,000	25,000	20,000	25,000	40,000
Total		r180,000	r215,000	r270,000	241,000	510,000
Sulfuric acid		200,000	200,000	200,000	200,000	200,000
Talc		30,800	31,000	31,000	29,000	30,000
MINERAL FUELS AND RELATED MATERIALS						
Coal	thousand tons	r1,270	1,262	1,239	[4]1,600	1,500
Coke[e]	do.	399	349	400	400	400
Gas, natural:						
Gross	billion cubic feet	1,257	1,165	1,296	[e]1,175	1,250
Dry[7]	do.	600	536	565	520	550
Natural gas plant liquids, unspecified	thousand 42-gallon barrels	3,650	5,475	7,300	8,760	8,000
Petroleum:						
Crude	do.	821,250	742,775	838,770	824,535	850,000
Refinery products:						
Liquefied petroleum gas	do.	[e]6,500	6,250	6,570	6,935	7,000
Motor gasoline	do.	24,820	25,915	33,215	33,580	35,000
Jet fuel	do.	2,920	2,555	2,555	2,555	3,000
Kerosene	do.	21,900	22,630	22,630	22,995	25,000
Distillate fuel oil	do.	75,555	80,300	58,400	62,050	75,000
Residual fuel oil	do.	68,985	74,095	67,525	76,650	80,000
Other[8]	do.	[e]28,175	28,835	18,980	14,235	15,000
Total		229,585	240,535	209,875	219,000	240,000

[e]Estimated. [p]Preliminary. [r]Revised.

[1]Data are for fiscal years beginning Mar. 21 of that stated, except those for natural gas and petroleum, which are for calendar years. Table includes data available through Dec. 30, 1990.

[2]In addition to the commodities listed, other types of crude construction materials, such as common clays, sand and gravel, and other varieties of stone, as well as gold and silver are produced, but output is not reported, and available information is inadequate to make reliable estimates of output levels.

[3]Period not definitively reported, could alternatively be calendar year or year ending Mar. 20 of year stated.

[4]Reported figure.

[5]Excludes output of copper smelted and refined from copper scrap, estimated at about 5% of total output.

[6]Kaolin estimated to be about 17% of figures shown.

[7]Excludes natural gas used for reinjection, flaring, venting, or consumed in the extraction of liquids.

[8]Includes refinery fuel and losses for 1985. Refinery fuel and losses for subsequent years is included in output of individual products, and totals as follows in thousand barrels: 1985—8,760; 1986—9,125; 1987—10,950; 1988—10,585; 1989—[e]11,000.

TABLE 2

IRAN: APPARENT EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	696	2,463	—	All to West Germany.
Metal including alloys, semimanufactures	175	NA		
Arsenic: Oxides and acids	242	NA		
Chromium: Ore and concentrate	NA	24,496	—	Sweden 24,460.

See footnotes at end of table.

TABLE 2—Continued

IRAN: APPARENT EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
METALS—Continued					
Copper:					
Matte and speiss including cement copper		259	NA		
Metal including alloys:					
Scrap		1,232	NA		
Unwrought		r9,038	428	—	Austria 215; Yugoslavia 126; Japan 87.
Iron and steel: Metal:					
Scrap		7,903	1,295	—	All to Japan.
Pig iron, cast iron, related materials		r21,002	54,952	—	Taiwan 29,650; China 14,752; Japan 10,550.
Semimanufactures:					
Bars, rods, angles, shapes, sections		—	26	—	All to Belgium-Luxembourg.
Wire		—	19	—	All to New Zealand.
Tubes, pipes, fittings		20	—		
Lead:					
Ore and concentrate		3,814	NA		
Metal including alloys, semimanufactures		33	—		
Manganese: Oxides		18	—		
Molybdenum: Ore and concentrate		578	609	—	All to Belgium-Luxembourg.
Nickel: Metal including alloys, scrap		17	—		
Platinum-group metals: Waste and sweepings	value, thousands	r$278	NA		
Silver: Waste and sweepings[2]	do.	$275	NA		
Tin: Metal including alloys:					
Unwrought		4	—		
Semimanufactures		5	—		
Zinc:					
Ore and concentrate		14,783	NA		
Metal including alloys, unwrought		1,041	NA		
Zirconium: Ore and concentrate		9,186	19,650	—	All to Japan.
Other:					
Ores and concentrates		NA	72,459	—	China 47,999; Sweden 24,460.
Oxides and hydroxides		2	—		
INDUSTRIAL MINERALS					
Abrasives, n.e.s.: Dust and powder of precious and semiprecious stones including diamond	value, thousands	$5	$30	—	All to Austria.
Clays, crude:					
Bentonite		20	—		
Unspecified		—	108	—	All to Qatar.
Diamond, natural:					
Gem not set or strung	value, thousands	(3)	$132	—	Sweden $98; New Zealand $34.
Industrial stones	do.	—	$1	—	All to New Zealand.
Fertilizer materials: Manufactured:					
Phosphatic		NA	26,250	—	All to Tunisia.
Unspecified and mixed		—	40	—	All to Spain.
Precious and semiprecious stones other than diamond: Natural	value, thousands	$120	NA		

See footnotes at end of table.

TABLE 2—Continued

IRAN: APPARENT EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Salt and brine		175	379	—	All to Qatar.
Stone, sand and gravel: Dimension stone:					
Crude and partly worked		ᵣ1,693	4,662	—	Taiwan 1,976; Qatar 1,423; Japan 1,016.
Worked		ᵣ5,440	290	—	West Germany 270; Austria 16.
Sulfur: Elemental: Crude including native byproduct		ᵣ88,522	79,976	—	All to Tunisia.
Other: Crude		20	11	—	All to Japan.
MINERAL FUELS AND RELATED MATERIALS					
Petroleum:					
Crude	thousand 42-gallon barrels	ᵣ486,387	167,157	406	Japan 71,339; Spain 31,767; Yugoslavia 11,438.
Refinery products:					
Gasoline	do.	82	NA		
Mineral jelly and wax	do.	25	NA		
Lubricants	do.	(4)	—		
Residual fuel oil	do.	598	NA		

ᵣRevised. NA Not available.
[1]Table prepared by Virginia A. Woodson. Owing to a lack of official trade data published by Iran, this table should not be taken as a complete presentation of Iran's mineral exports. Unless otherwise specified, these data have been compiled from trade statistics of individual trading partners.
[2]May include platinum-group metals.
[3]Unreported value of 106,127 carats.
[4]Less than 1/2 unit.

TABLE 3

IRAN: APPARENT IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	ᵣ5,003	251	—	All from Japan.
Oxides and hydroxides	ᵣ18,981	1,817	—	West Germany 1,802; Japan 15.
Metal including alloys:				
Scrap	20	—		
Unwrought	2	31	—	All from West Germany.
Semimanufactures	ᵣ4,703	7,282	—	China 3,474; West Germany 1,738; Switzerland 1,112.
Unspecified	6,000	NA		
Antimony: Metal including alloys, all forms	—	1	—	All from West Germany.
Arsenic: Oxides and acids	1	—		
Cadmium: Metal including alloys, all forms	1	—		
Chromium: Oxides and hydroxides	84	47	—	Japan 34; West Germany 13.
Copper: Metal including alloys:				
Scrap	20	—		
Unwrought	46	—		
Semimanufactures	ᵣ1,919	2,395	—	West Germany 1,052; Netherlands 887.

See footnotes at end of table.

TABLE 3—Continued

IRAN: APPARENT IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS—Continued					
Gold: Metal including alloys, unwrought and partly wrought	kilograms	227,000	NA		
Iron and steel:					
Iron ore and concentrate excluding roasted pyrite		20	—		
Metal:					
Pig iron, cast iron, related materials		ʳ52,994	20	—	All from Yugoslavia.
Ferroalloys:					
Ferromanganese		NA	107	—	All from West Germany.
Ferromolybdenum		1	15	—	Do.
Ferrosilicon		1	3,436	—	Norway 1,750; Yugoslavia 1,272.
Silicon metal	kilograms	NA	91	—	All from Taiwan.
Unspecified		ʳ1,211	3,196	—	Yugoslavia 1,996; Norway 1,000.
Steel, primary forms		ʳ429,886	15,771	—	Philippines 15,750.
Semimanufactures:					
Bars, rods, angles, shapes, sections		ʳ505,149	20,028	—	West Germany 9,216; Spain 5,343; Belgium-Luxembourg 4,674.
Universals, plates, sheets		ʳ107,484	5,957	—	Netherlands 5,956.
Hoop and strip		ʳ3,381	—		
Rails and accessories		3,924	5,198	—	Netherlands 4,760; Belgium-Luxembourg 354.
Wire		ʳ21,902	21,750	—	China 11,434; Japan 8,070; West Germany 1,220.
Tubes, pipes, fittings		ʳ57,466	132,405	9	West Germany 104,903; Japan 20,355; Spain 5,852.
Castings and forgings, rough		ʳ329	12	—	All from Netherlands.
Unspecified		138,239	NA		
Lead: Metal including alloys:					
Unwrought		12,130	6,251	—	All from West Germany.
Semimanufactures		7	137	—	Do.
Lithium: Oxides and hydroxides		—	22	—	Do.
Magnesium: Metal including alloys:					
Semimanufactures		17	—		
Unspecified		2	—		
Manganese:					
Ore and concentrate, metallurgical grade		40	1,000	—	All from Netherlands.
Oxides		NA	210	—	All from Japan.
Mercury		39	—		
Molybdenum: Metal including alloys:					
Semimanufactures		1	—		
Unspecified		2	—		
Nickel: Metal including alloys:					
Scrap		2	—		
Unwrought		363	NA		
Semimanufactures		10	25	—	Japan 23.
Platinum-group metals:					
Waste and sweepings	value, thousands	$5	NA		

See footnotes at end of table.

TABLE 3—Continued

IRAN: APPARENT IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS—Continued					
Platinum-group metals—Continued					
Metals including alloys, unwrought and partly wrought:					
Palladium	kilograms	NA	33	—	West Germany 23; Switzerland 10.
Platinum	value, thousands	$56	NA		
Unspecified	do.	$80	NA		
Silver: Metal including alloys, unwrought and partly unwrought	kilograms	39	7,677	—	Yugoslavia 4,000; West Germany 3,677.
Tin:					
Oxides		71	—		
Metal including alloys:					
Unwrought		r49	—		
Semimanufactures		—	3	—	All from Belgium-Luxembourg.
Titanium:					
Ore and concentrate		1,000	800	—	All from Netherlands.
Oxides		83	268	—	Australia 155; West Germany 89; Japan 24.
Tungsten: Metal including alloys:					
Semimanufactures		3	—		
Unspecified		3	—		
Zinc:					
Oxides		1,269	161	—	Belgium-Luxembourg 144; West Germany 17.
Blue powder		2	7	—	All from Belgium-Luxembourg.
Ash and residue containing zinc		—	67	—	All from Netherlands.
Metal including alloys:					
Unwrought		4,840	3,863	—	Spain 2,462; Belgium-Luxembourg 1,401.
Semimanufactures		593	3	—	All from West Germany.
Zirconium:					
Ore and concentrate		423	NA		
Metal including alloys, semimanufactures	kilograms	—	500	—	All from West Germany.
Other:					
Ores and concentrates		250	NA		
Base metals including alloys, all forms		4	—		
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.		42	—		
Artificial:					
Corundum		16	188	—	Japan 102; West Germany 86.
Silicon carbide		118	NA		
Dust and powder of precious and semiprecious stones including diamond	value, thousands	$339	$623	—	All from Switzerland.
Grinding and polishing wheels and stones		788	714	—	Yugoslavia 312; West Germany 311.
Asbestos, crude		2,300	NA		
Boron materials: Oxides and acids		3,068	11	—	Japan 7; West Germany 4.
Bromine		—	5	—	All from Switzerland.
Cement		r845	NA		

See footnotes at end of table.

TABLE 3—Continued

IRAN: APPARENT IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Chalk	17			
Clays, crude:				
Bentonite	1	—		
Fire clay	NA	625	—	All from West Germany.
Kaolin	2,929	NA		
Unspecified	2,730	NA		
Diamond, natural: Industrial stones value, thousands	$101	NA		
Diatomite and other infusorial earth	25	21	—	All from West Germany.
Fertilizer materials: Manufactured:				
Ammonia	3	7	—	Do.
Nitrogenous	11,931	10	—	Do.
Phosphatic	126,768	NA		
Potassic	22	24	—	All from West Germany.
Unspecified and mixed	214,854	3	—	All from Japan.
Graphite, natural	40	2	—	All from Switzerland.
Gypsum and plaster	NA	251	—	All from West Germany.
Magnesite, crude	r2,131	2	—	All from Switzerland.
Mica: Crude including splittings and waste	—	5	—	All from West Germany.
Nitrates, crude	—	1	—	Do.
Pigments, mineral: Iron oxides and hydroxides, processed	2	173	—	West Germany 171.
Precious and semiprecious stones other than diamond: Synthetic value, thousands	NA	$98	—	All from Belgium-Luxembourg.
Sodium compounds, n.e.s.:				
Soda ash, manufactured	36,942	NA		
Sulfate, manufactured	2,590	7,328	—	All from Spain.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	3	—		
Worked	299	NA		
Gravel and crushed rock	NA	9	—	Switzerland 8; West Germany 1.
Limestone other than dimension	7	—		
Sand other than metal-bearing	81	—		
Sulfur:				
Elemental:				
Crude including native and byproduct	3	16	—	All from Japan.
Colloidal, precipitated, sublimed	—	79	—	Japan 76; West Germany 3.
Sulfuric acid	3	25	—	West Germany 19; Japan 6.
Talc, steatite, soapstone, pyrophyllite	—	45	—	All from West Germany.
Other: Crude	59	—		
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	2	—		
Carbon:				
Carbon black	5	20,006	—	Argentina 19,701; West Germany 305.
Gas carbon	16	—		

See footnotes at end of table.

TABLE 3—Continued

IRAN: APPARENT IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS—Continued					
Coal: Anthracite and bituminous		r209	NA		
Coke and semicoke		500	NA		
Petroleum refinery products:					
Liquefied petroleum gas	thousand 42-gallon barrels	(2)	—		
Gasoline	do.	(2)	(2)	—	Mainly from Netherlands.
Mineral jelly and wax	do.	r4	2	—	Mainly from Yugoslavia.
Kerosene and jet fuel	do.	r2,262	(2)	—	All from West Germany.
Distillate fuel oil	do.	r2,234	1,210	—	Netherlands 658; Belgium-Luxembourg 552.
Lubricants	do.	r681	310	—	Spain 226; Belgium-Luxembourg 41; West Germany 41.
Residual fuel oil	do.	11	—		
Bitumen and other residues	do.	(2)	(2)	—	Mainly from China.
Bituminous mixtures	do.	(2)	49	—	Mainly from Austria.
Petroleum coke	do.	r1	13	—	All from West Germany.

rRevised. NA Not available.
[1]Table prepared by Virginia A. Woodson. Owing to a lack of official trade data published by Iran, this table should not be taken as a complete presentation of Iran's mineral imports. Unless otherwise specified, these data have been compiled from from trade statistics of individual trading partners.
[2]Less than 1/2 unit.

meters per year. Natural gas refining capacity was more than 10 billion cubic meters per year and was to increase more than fourfold by 1994. Reserves of natural gas were estimated at 17 trillion cubic meters.

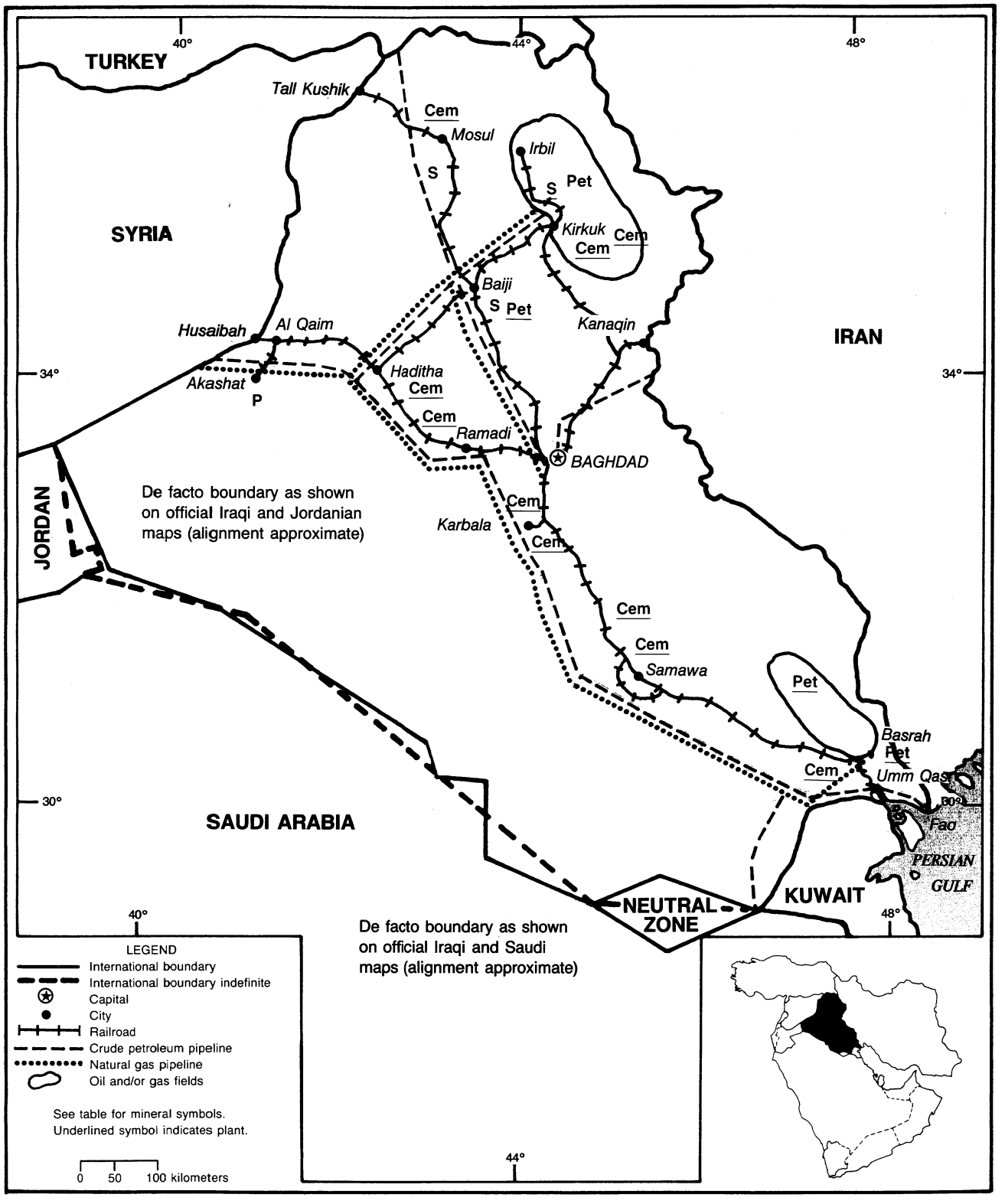
The Atomic Energy Agency of Iran reported that it intended to construct a uranium facility in the northwest Yazd region of Iran. No particulars were given on capacity or capital costs for the operation, which was to exploit deposits in the area. Reserves at the Saghand and Khoshomi deposits in the Yazd region were confirmed to be 5,000 tons.

Prospects for continued improvement in and diversification of the country's mineral industry were good. As occurred before the conflict with Iraq, financing and collateral for most projects will be based on the country's production and export of liquid and gaseous fuels. The Government's intent to allow private ownership of many mining facilities and to accommodate overseas investment in the country bode well for the industry.

[1]Where necessary, values are converted from Iranian rials (Rls) to U.S. dollars at the rate of Rls70.235 = US$1.00.

IRAQ

AREA 434,920 km² **POPULATION 18.1 million**



THE MINERAL INDUSTRY OF

IRAQ

By George A. Morgan

Iraq advanced the importance of petroleum and natural gas resource development to the country in 1989 by improving production facilities and by expanding and rehabilitating transport facilities for these materials. Crude and refined petroleum accounted for over 95% of export revenues, and production and reserves of crude oil were second only to Saudi Arabia in the Middle East. Crude oil output was from 1,000 wells, averaging 3,500 barrels per day (bbl/d) of output. Production capacity was 4.5 million barrels per day (MMbbl/d), although available proved reserves could allow output of 6 to 8 MMbbl/d.

Iraq had plans to expand production of phosphate rock at its single operating mine. The expansion would be in concert with ongoing development of additional nitrogen and fertilizer facilities. These expansions were being undertaken primarily to supply fertilizers for an ambitious domestic agricultural scheme, although export increases were also planned.

GOVERNMENT POLICIES AND PROGRAMS

Government financing was the source of funding for practically all economic activity in Iraq, and was itself based primarily on sales or barter of crude petroleum and petroleum refinery products. In 1989, of an estimated budget of $71 billion,[1] about 50%, or $35 billion, went to industry.

In an attempt to increase the efficiency of the petroleum industry, the Iraq National Oil Co. was dissolved and replaced by several regional companies. The South Oil Co., centered in Basrah, accounted for about 66% of crude petroleum output.

An agreement with Turkey was reached for the exchange of electricity to supply the border area between the two countries. Iraq was to initially receive 400 million kilowatt hours (kW·h), with an increase to 520 million kW·h expected.

PRODUCTION

Iraq continued to regard nearly all statistics on production and trade of basic industries, including the mineral industry, as state secrets. Data reported in this chapter are for the most part estimates based on best available information. Iraq was the second largest producer of crude petroleum in the Middle East after Saudi Arabia, and fourth in the world after the United States and the U.S.S.R. Nearly all its production is exported; however, increasing amounts are being used as feedstock to fertilizer and petrochemical plants. An expanding agricultural sector is the driving force behind expansion of nitrogen, sulfur, and phosphate output. Energy reliance is primarily upon hydroelectric power, with hydrocarbons used mainly in the petrochemical industry.

TRADE

Iraqi exports to the United States were $2.408 billion in 1989, compared with $1.605 billion in 1988. Crude oil exports to the United States were 438,000 bbl/d in 1989, compared with 343,000 bbl/d in 1988. The United States reported imports of 161.017 million barrels of crude petroleum, and 3 million barrels of topped crude from Iraq in 1989. Iraq supplied 6% of Japan's crude oil imports, and currently owed Japanese companies about $3.5 billion in delayed payments for equipment and services rendered. Iraq commenced setting aside 25% of Japanese payments for oil to repay these debts. Exports to France were 5.6 MMmt, compared with 6.2 MMmt in 1988. Total Iraqi nonfuel exports, mainly sulfur, phosphate, chemical fertilizers, and petrochemicals, were forecast to increase sixfold to an estimated $19.2 billion in 1990.

India was also a major recipient of Iraqi minerals, receiving unspecified quantities of fertilizers, petrochemicals, sulfur, and urea. Total trade with the U.S.S.R. was targeted at $2.5 billion for 1989. Exports of oil to the U.S.S.R. in 1988, the latest year for which data were available, were about 96 million barrels.

STRUCTURE OF THE MINERAL INDUSTRY

The Iraq Government retains ownership of the major mineral producing companies, most of which are centered on the crude and refined petroleum, and petrochemical and fertilizer industries. Exploration is also Government controlled; the Oil Exploration Co. is responsible for oil and gas exploration in Iraq. Natural resources are owned by the state.

COMMODITY REVIEW

Metals

Aluminum.—Spie Batignolles of France had a letter of intent for an $80 million engineering contract for an aluminum smelter at Nasiriya, northwest of Basrah. Ultimate cost of the 215,000 mt/y aluminum plant was estimated at $800 million, with output commencing in 1993. The project was under the control of the Aluminum Smelter Commission, part of the Ministry of Industry and Military Industrialization. Domestic aluminum consumption was less than 100,000 mt/y.

Iron and Steel.—The Military Industries Commission reported the completion of a 1,500 mt/y stainless steel plant. No location or operating specifics were given for this small-capacity plant. Work commenced by Danieli of Italy for the State Enterprise for Iron and Steel (SEIS) on a $300 million hot strip mill near Khor al-Zubair south of Basrah. Capacity was to be 2 million mt/y of flat products, and feed to the plant would be 70% sponge iron and 30% pellets. Sponge iron would come from the existing steel plant at Khor al-Zubair; iron pellets would be imported.

TABLE 1

IRAQ: PRODUCTION OF MINERAL COMMODITIES[1]

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
INDUSTRIAL MINERALS						
Cement, hydraulic[e]	thousand metric tons	8,000	8,000	10,000	[3]10,500	12,500
Gypsum[e]	do.	300	300	350	350	450
Nitrogen:[e]						
N content of ammonia	do.	60	60	60	[3]312.9	[3]473.6
N content of urea	do.	60	60	60	70	80
Phosphate rock[e]	do.	1,000	1,000	[r]1,500	[3]1,273	1,300
Salt[e]	do.	70	70	70	[3]300	300
Sulfur, elemental:[e]						
Native, Frasch	do.	500	600	[r]707	[3]958	960
Byproduct	do.	70	200	[r]250	[3]227	370
Total	do.	570	800	[3]957	1,050	1,270
MINERAL FUELS AND RELATED MATERIALS						
Gas, natural:[e]						
Gross	million cubic feet	450,000	450,000	500,000	500,000	510,000
Marketed[4]	do.	80,000	80,000	100,000	100,000	110,000
Natural gas liquids:[e]						
Natural gasoline	thousand 42-gallon barrels	400	400	400	400	440
Propane and butane	do.	1,000	1,000	1,000	1,000	1,100
Petroleum:						
Crude	do.	520,900	617,000	792,050	981,000	[3]978,000
Refinery products[e]	do.	110,000	110,000	110,000	120,000	150,000

[e]Estimated. [r]Revised. [p]Preliminary.
[1]Includes data available through June 21, 1990.
[2]In addition to the commodities listed, lime and a variety of crude construction materials (clays, sand and gravel, and stone) were also produced, but output was not reported, and available information is inadequate to make reliable estimates of output levels.
[3]Reported figure.
[4]Includes reinjected, if any.

A $136 million pipe plant was also planned at Khor al-Zubair for SEIS. Output would be 220,000 mt/y of 2-to-9-inch-diameter pipe, and plant completion was expected in 1992.

Industrial Minerals

Bentonite.—The State Establishment for Geological Surveys and Metallurgical Research signed a contract with INA-Petrokemija of Yugoslavia for a test lot of 450 tons of bentonite for use in oil drilling. If successful, a process for production of 50,000 mt/y may be considered.

Cement.—The Iraqi State Cement Enterprise reported planned exports of 330,000 tons of cement to Brazil at $60 per ton, and about 211,000 tons to North Yemen. Shipments would be via Umm Qasr. Spain contracted to purchase 5 million tons from the Karbala and another cement plant. Shipments were to begin in 1990 following completion of bulk loading facilities at Umm Qasr.

Fertilizer.—According to the State Enterprise for Phosphates, total urea production capacity was 1.5 million tons. Three contracts were awarded for new nitrogen fertilizer plants. Snamprogetti of Italy was to build a $328 million plant at Khor al-Zubair for the Fertilizer Projects Commission of the Industry and Military Industrialization Ministry. Construction was to include two 1,000 mt/d and two 1,730 mt/d ammonia lines. The new plant would be near the existing Complex 3 at Khor al-Zubair.

Technip of France won a $550 million contract to construct a nitrogen plant at Al-Qaim for integration with the phosphate operations. The plant would supply 3,000 mt/d of ammonia and 5,000 mt/d of urea.

M. W. Kellogg Co. of the United States won a contract to double capacity at fertilizer Complex 4 in Baiji to 2,000 mt/d of ammonia and 3,500 mt/d of urea.

Phosphate and mixed fertilizer facilities at Al-Qaim were to be upgraded owing to problems encountered with conveyor spillage, dust and fume emissions, and unspecified blockages. Additionally, expansion was underway to meet domestic demand for fertilizers. The current plant consists of two 930 mt/d triple superphosphate lines, one 850 mt/d monoammonium phosphate line, and one 1,100 mt/d compound fertilizer line. Additionally, capacity exists for 1.7 million mt/y of sulfuric acid and 400,000 mt/y of phosphoric acid. Additions to Al-Qaim underway include three 2,200 mt/d production lines for sulfuric acid, including throughput of both solid and liquid sulfur; two lines totaling 643,000 mt/y phosphoric acid production; a 570,000 mt/d phosphate beneficiation plant; a 540,000 mt/y triple superphosphate line; a 520,000 mt/y

TABLE 2

IRAQ: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity[1]
Cement	Iraq State Cement Enterprise (100% Government)	Hamman al'Alil, near Mosul	1.5
Do.	do.	Sarchinar, about 100 kilometers east of Kirkuk	[2]250,000
Do.	do.	Hit, 90 kilometers west of Baghdad	1
Do.	do.	Al Tamin, near Kirkuk	1
Do.	do.	Al Falluja, south of Karbala	[2]200,000
Do.	do.	Kufa, about 180 kilometers south of Baghdad	2
Do.	do.	Samawa	2
Do.	do.	Umm Qsar	1
Do.	do.	Sinjar, about 100 kilometers west of Mosul	2
Do.	do.	Karbala	2
Do.	do.	Kubaysah, 40 kilometers south of Haditha	2
Petroleum, crude	North Oil Co. (100% Government)	Oil and gasfields in the vicinity of Kirkuk	[3]911
Do.	South Oil Co. (100% Government)	Oil and gasfields in the vicinity of Basrah	[3]1,768
Petroleum, refined	Iraq Oil Refineries Administration (100% Government)	Baiji	[4]220,000
		Basrah	[4]140,000
Phosphate rock	Akashat State Organization for Minerals (100% Government)	Akashat	7
Sulfur	Mishraq Sulfur State Enterprise (100% Government)	About 50 kilometers south of Mosul	1
Do.	Iraq Oil Refineries Administration (100% Government)	Baiji	[2]200,000
		Kirkuk	[2]200,000

[1]Million metric tons per year unless otherwise specified.
[2]Metric tons pert year.
[3]Million barrels per day.
[4]Thousand barrels per day.

diammonium phosphate line; and a 370,000 mt/y compound fertilizer line. In 1988, Davy McKee of the United Kingdom won a contract to build a 1,160 mt/d compound fertilizer line at Al-Qaim.

Sulfur.—As part of a barter agreement with Egypt, 250,000 tons of sulfur was to be exported to a number of Egyptian companies.

Mineral Fuels

Petroleum, Crude.—The Iraqi Oil Minister stated that crude petroleum production capacity was 5 MMbbl/d, and expansion of capacity to 6.5 MMbbl/d was underway.

Pipelines.—The second stage of the Iraqi Pipeline Trans Saudi Arabia (IPSA-2) was officially opened January 9, 1990. Initial capacity was 1 MMbbl/d, with full capacity of 1.65 MMbbl/d expected shortly following testing of pumping facilities.

Refinery Products.—The State Oil Marketing Organization (SOMO) expected to have the Khor al-Zubair liquefied petroleum gas plant and export terminal in operation in June 1990. Plant capacity was to be 4 MMmt/y, of which 2 MMmt/y would be for export.

The refinery at Basrah was nearly at its full prewar capacity of 140,000 bbl/d following extensive repairs due to war damage. A new 100,000 mt/y lubricant plant at Basrah commenced output; about one-half of production would be for export.

A 140,000 bbl/d refinery in Musayyib, about 60 kilometers (km) south of Baghdad, neared completion. Output would include gasoline, kerosene, diesel fuel oil, residual fuel oil, and liquefied petroleum gas (LPG).

Reserves

The Iraqi Oil Minister reported that proven reserves of crude petroleum were 100 billion barrels, and estimated total reserves were between 400 and 600 billion barrels. It was reported that in the past 20 years only 104 exploratory wells were drilled in Iraq, and 95% of these were drilled east of the Tigris River. A total of 75 oil fields are known, 6 of which have reserves exceeding 5 billion barrels each. Potential oil structures are known in the western desert, but have yet to be drilled. The Geological Survey and Mineral Investigations Department reported in 1987 that resources of phosphate rock were 7.5 billion tons.

INFRASTRUCTURE

Truck, pipeline, and railroad transport constitute critical modes of conveyance for the country's mineral industry. About one-half of the country's annual railroad freight revenue is derived from the Baghdad-Akashat-Al-Qaim section. The section, which connects the capital with the phosphate and fertilizer production

centers, represents about 16% of the country's total trackage of 2,962 km. Increases in output from these plants as well as other industries are expected to lead to transport increases to 6 million tons on the line, compared with 4.3 million tons in the year to June 1989. Tanker truck transport paralleling this route was important to Iraq's export effort to Turkey during the war with Iran. Expenditure of $5 billion for railroad projects was announced by the Ministry of Transport and Communications. The largest project was a 670 km double track connecting Baghdad with Basrah, requiring construction of 5 sections over a 5 to 6 year period. A 12 km line was underway connecting the Baiji fertilizer plant with the main line at Al-Hilaiwat near Baiji.

Major super highways are under construction as an alternate mode of transport. The 1,200 km expressway No. 1 linking Baghdad with Jordan, Syria, and Kuwait is to be one of the most modern and largest expressways in the world. Begun in 1979, contracts issued to date for its construction have totaled almost $3 billion, with about 1,000 kilometers completed by yearend 1989.

Navigation channels for the ports of Umm Qasr and Khor al-Zubair have been cleared of hazards for accommodating ships of 15,000 to 20,000 deadweight tons. Of the 12 berths at Khor al- Zubair, 2 are for imports of iron ore and iron and steel scrap, and 2 are for phosphate, and 1 is for urea exports. Channel deepening to 13.2 meters, and widening to 300 meters, should allow the passage of LPG carriers. Shipment of LPG from Khor al-Zubair is to begin in 1990. At Umm Qasr 13 new berths are being built for $590 million, and they will add 4 million tons to that port's capacity.

The $242 million Hindiya Dam, on the Euphrates River south of Karbala, opened in May, 1989. Part of an expanding agricultural scheme, and built by China's State Construction Engineering Corp., the dam will control water to 500,000 hectares of farm land. Water supply, primarily from the Tigris and Euphrates rivers whose headwaters are in Turkey, is becoming an increasing concern for Iraq and neighboring countries.

The country's civil servant force was 800,000, supported by a budget allocation of $12.5 billion. Employment in the petroleum sector, the largest industry sector, was about 40,000. Foreign workers made a substantial contribution to the economy; about 6,500 Pakistani laborers were to be hired for shipyard, railroad, and communications projects, in addition to Chinese and Egyptians already in the country. The State Co. for Oil Projects was expected to use workers from Vietnam and Bangladesh for several projects it had planned.

OUTLOOK

The existence of large reserves of crude petroleum and natural gas in Iraq, and their accessibility for development purposes, represent strong collateral both for current debt payment and for the future. The Government expects to continue to maintain direct control of this primary resource, and all budget allocations, trade and purchase agreements, and debt funding is based on this premise. Large Government mining or mineral processing corporations may be divided into smaller entities, but this is for competitive reasons, and does not mean lessened Government control. The country's ambitious agricultural schemes, and its resources of raw materials other than crude petroleum and natural gas, such as phosphate and sulfur, are the reasons for a continuation of the massive expansion of the fertilizer industry. Its reliance on water from the Euphrates and Tigris rivers will remain an important factor in the country's development.

[1]Where necessary, values have been converted from Iraqi dinars (ID) to U.S. dollars at the rate of ID0.32 = US$1.00.

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Agencies

Ministry of Industry and Minerals,
Planning, Studies, and Follow-Up Department
Nidhal Street, Sabani Square, Baghdad, Iraq
Telephone: 8862006
Telex: 212205 MIINDIK

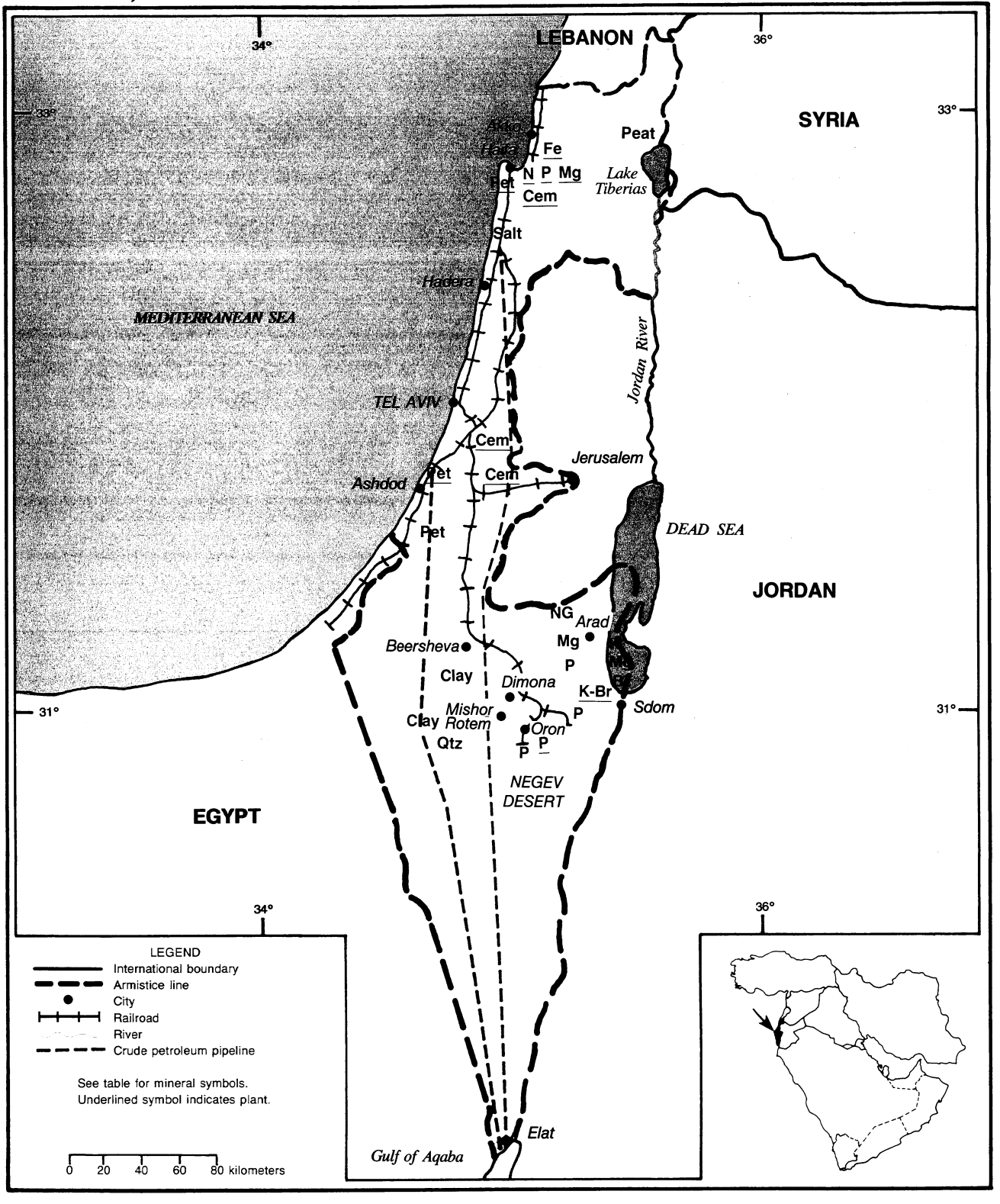
Ministry of Oil
Baghdad, Iraq
Telex: 212216 MIPETROL

Publications

Jonathan Crusoe, Middle East Economic Digest, 1989, 94 pp.

ISRAEL

AREA 21,000 km² **POPULATION 4.4 million**



THE MINERAL INDUSTRY OF

ISRAEL

By Audie L. King

Israel's principal mining activities continued to be phosphate production in the Negev Desert and the extraction of bromine, magnesium, and potassium from the Dead Sea. The country was the world's eighth largest producer of phosphate rock and accounted for 2% of world production. It continued to be the world's second largest producer of bromine and bromine compounds, accounting for nearly 28% of total world production in 1989. Potash production was Israel's most lucrative mineral industry, earning more than $50 million in 1989. Israel supplied 6% of the potash sold on the world market and accounted for 4% of the world's potash production, making it the seventh largest producing nation. Slightly more than 1% of the world's refractory-grade magnesia was also recovered from Dead Sea brine.[1]

The extractive mining industry continued to play a minor role in Israel's overall economy. It generated less than 0.8% of the gross domestic product (GDP) in 1989 and employed about 1.0% of the labor force. About 90% of the country's crude mineral production was exported in 1989, however, making the mining industry disproportionately important to Israel's balance of trade. Exports of crude mineral products from mining and quarrying and manufactured nonmetallic mineral products was $311 million in 1989 or nearly 3% of all exports.

For its size, Israel is a significant consumer of mineral products. It has a relatively high per capita consumption rate and a well-developed industrial capacity to process imported raw materials for reexport. If reexports of processed mineral imports, such as diamond, primary metal products, fertilizer, refined petroleum products, and inorganic chemicals, were considered, mineral commodity exports would account for more than 40% of the value of total exports. The diamond cutting and polishing trade alone accounted for about 22% of total imports and about 29% of the value of total exports.

GOVERNMENT POLICIES AND PROGRAMS

To lower its very high inflation rates of the early 1980's, Israel began an economic program that included austere fiscal policies and moved to a more market-oriented system. About 12% of the country's economy was controlled by 170 state-run companies. Although these firms were targeted for privatization owing to their marginal profitability, disagreements on how their transfer should take place have stalled extensive action on the Government's part. The only significant transfer relevant to the mineral industry was the sale of the Government's 75% share in Paz Oil to an Australian investor for $100 million.

The Knesset Finance Committee, which has a veto over all privatization issues, vetoed a plan to sell a 50% stake in Israel Chemicals (ICL), one of Israel's most profitable industries, worth an estimated $400 million.

The Ports and Railways Authority was established in August 1988. Under the new arrangement, the responsibility for the country's rail system was vested in the same agency that formerly oversaw only port operations. One of the new Ports and Railway Authority's first acts was to commission a logistical study from the French railway authority (SNCF) to develop a master plan for the improvement of Israel's rail system.

The Israeli Ministry of Energy established a National Energy Policy in 1988 that was to last until 1992. The policy aimed at securing a stable energy supply and minimizing social and economic costs. One of its goals was to lower the importance of oil imports by emphasizing coal imports.

PRODUCTION

The slowdown in Israel's economy that began in 1988 and continued throughout most of 1989 adversely affected the production of steel, cement, and other mineral commodities that are dependent on markets within the domestic construction industry. The production of minerals for the construction sector showed little change from 1988 levels despite a growing demand for new housing caused by the continuing influx of Russian immigrants. It is estimated that 30,000 to 90,000 new apartments will have to be built in the future to house the growing immigrant population.

Minerals that were extracted primarily for export proved to be immune to Israel's economic downturn. The production of bromine reached record levels of 135,000 tons of elemental bromine and 120,000 tons of bromine compounds during 1989. High external demand and prices stimulated the country's phosphate rock quarries to operate near their rated capacities and to produce 3.922 million tons of ore. Potash production was up by about 8% to more than 2.1 million tons. Table salt production rose by 31.6% to 475,000 tons.

TRADE

Israel's economy is very dependent on trade. Its foreign trade, valued at nearly $24 billion in 1989, was equal to more than 60% of the country's GDP. This is a very unusual situation, making Israel one of the most trade dependent countries in the world. Israel exported an estimated $11 billion worth of merchandise in 1989 and imported about $13 billion.

The United States remained Israel's single most important trading partner even though Israel's total volume of trade with the European Community was somewhat larger. Israel's trade with Eastern Europe expanded by 70% in 1989. The U.S. trade deficit with Israel was $408 million in 1989 or $135 million larger than in 1988. U.S. exports to Israel were $2.8 billion, a 12.7% decrease, and U.S. imports from Israel were $3.2 billion, a 9.0% increase. The United States exported mainly machinery and

TABLE 1

ISRAEL: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
METALS						
Iron and steel: Steel, crude		100,000	110,000	116,000	95,000	95,000
INDUSTRIAL MINERALS						
Bromine:[e]						
Elemental		100,000	105,000	110,000	[3]118,000	[3]135,000
Compounds		70,000	73,000	78,000	[3]99,000	[3]120,000
Cement, hydraulic (from domestic clinker)	thousand tons	2,020	2,059	2,226	2,326	[3]2,289
Clays:						
Bentonite[e]		6,000	5,000	4,500	3,000	3,500
Flint clays[e]		6,000	6,000	6,000	[3]6,020	[3]6,130
Kaolin[e]		27,000	28,000	29,000	[3]30,600	[3]33,280
Other[e]		16,000	14,000	12,000	[3]11,739	14,000
Gypsum[e]		45,000	[3]45,999	35,000	[3]31,181	31,000
Lime[e]		50,000	75,000	100,000	[3]130,000	130,000
Magnesia, Mg content[e]		20,000	20,000	20,000	30,000	39,000
Nitrogen: N content of ammonia[e]		57,500	60,000	60,000	[3]47,758	[3]47,648
Phosphate rock:						
Beneficiated	thousand tons	4,076	3,673	3,798	[3]3,479	[3]3,922
P_2O_5 content	do.	1,204	1,107	1,214	1,092	1,223
Phosphoric acid[e]		210,000	210,000	210,000	204,000	210,000
Potash, K_2O equivalent	thousand tons	1,200	1,253	1,244	1,240	1,338
Salt, marketed (mainly marine)[e]		[r]350,000	[r]350,000	[r]350,000	[3]361,000	[3]475,000
Sand:						
Glass sand[e]		61,000	60,000	60,000	[3]59,520	[3]65,300
Other[e]	thousand tons	4,300	4,300	4,500	4,500	4,500
Sodium and potassium compounds: Caustic soda		31,248	27,000	29,717	29,727	30,900
Stone:						
Crushed[e]	thousand cubic meters	6,000	6,000	6,000	6,000	6,000
Dimension, marble[e]		13,000	13,000	10,000	10,000	10,000
Sulfur:						
Byproduct from petroleum[e]	thousand tons	10	15	15	15	15
Sulfuric acid	do.	178	182	142	163	161
MINERAL FUELS AND RELATED MATERIALS						
Gas, natural, marketed	thousand cubic meters	52,800	39,400	45,100	[3]41,400	41,100
Peat[e]	thousand tons	20	20	20	20	20
Petroleum:						
Crude	thousand 42-gallon barrels	52	74	85	[3]107	93
Refinery products:						
Gasoline	do.	9,855	10,700	11,400	10,950	11,600
Kerosene and jet fuel	do.	5,290	5,100	5,450	5,500	5,800
Distillate fuel oil	do.	11,800	11,315	14,650	14,700	15,600
Residual fuel oil	do.	13,300	14,920	13,440	13,500	13,700
Other	do.	6,000	7,900	5,200	5,200	4,400
Refinery fuel and losses[e]	do.	1,800	1,800	1,800	1,800	1,800
Total	do.	48,045	51,735	51,940	51,650	52,900

[e]Estimated. [p]Preliminary. [r]Revised.

[1]Table includes data available through Nov. 8, 1990.

[2]In addition to the commodities listed, a variety of other crude construction materials are produced, but available information is inadequate to make reliable estimates of output levels.

[3]Reported figure.

military equipment, agricultural products, vehicles and transport equipment, optical and measuring instruments, chemicals, rough diamonds and precious stones, cardboard, and paper to Israel. The United States' main imports from Israel included polished diamonds and gem stones, machinery and mechanical instruments; medical, optical, and measuring instruments; vehicles and transport equipment; chemicals; textiles and clothing; and metals.

STRUCTURE OF THE MINERAL INDUSTRY

The Government was still the principal owner of most of the country's mineral-related industries. The diamond cutting and polishing industry was privately owned and so were the cement and potassium nitrate manufactures. Most Government officials agreed that it would be best for the nation's economy to sell more than a 50% interest in all Government-controlled corporations. It was widely felt that Israel Chemical Ltd. should be one of the first Government companies to be privatized, but so far disagreements regarding the details of the sale had not been resolved.

COMMODITY REVIEW

Industrial Minerals

Cement.—Nesher Israel Cement Enterprises Ltd., Israel's only cement producer, was accessing plans to expand its production capacity by another 800,000 metric tons per year (mt/yr). The plans called for the construction of another dry kiln that would probably be at the Tel Aviv plant. The new scheme, if approved, would not likely be operational until the mid-1990's.

Diamond.—The polishing and reexporting of imported diamond continued to be important to Israel's minerals industry. Imports of rough-cut diamond was 7.88 million carats in 1989, down from 8.51 million carats in 1988. This decline reflected price increases initiated by De Beers' Central Selling Organization. This was the first decline in the volume of the diamond industry's activity after 5 years of growth. The value of imports increased slightly from $2.876 billion to $2.994 billion. Exports of polished diamonds were about 3.96 million carats in 1989, down from 4.24 million carats in 1988. The value of these exports increased in 1989 to about $3.114 billion from $2.837 billion in 1988.

Phosphate.—Negev Phosphates' plans to exploit the new Zohar phosphate field near Arad were still pending approval. In 1989, there were three active quarries, which together shipped 2.4 million tons of phosphate rock to the Port of Ashdod for export. Zin, the largest producer, about 20 kilometers (km) east by northeast of Oron, had a rail capacity of 2.2 million mt/yr. The two smaller producers, Oron and Arad, about 30 km northeast of Oron, had rail capacities of 550,000 mt/yr and 250,000 mt/yr, respectively.

Rotem Fertilizers processed about 1.3 million tons of phosphate rock to produce about 180,000 tons of phosphoric acid and 600,000 tons of various fertilizers. The plant is in the Negev Desert at Mishor Rotem, close to its source of raw materials. Phosphoric acid production capacity at Rotem's plant was projected to increase to 200,000 mt/yr in the near term owing to improvements in the processing facilitites that were underway in 1989. Plans were to ultimately double capacity in an expansion project known as Rotem II. The sister plant that was to be built next to the older one will need additional raw materials, which would possibly come from the proposed Zohar deposit. The expansion project was not yet approved and likely would not be completed until the mid-1990's.

Potash.—Despite a strike at the Dead Sea Works (DSW) in April 1989, which stopped production for 13 days, potash production increased by 8% over 1988 levels to 2.11 million tons in 1989. About 90% of its output was exported as raw ore or as potassium fertilizer. Plans were to increase the number of evaporation ponds to increase the capacity by 200,000 to 300,000 mt/yr by 1991. Production may be 2.3 to 2.4 million metric tons per year (MMmt/yr) by 1991.

DSW was experimenting with the production of a fertilizer for crops requiring lower chlorine levels. It had announced plans to build a potassium sulfate plant adjacent to its existing facilities. When completed, the $5 million plant will have a capacity of 300,000 mt/yr of potassium sulfate. Potash will come from the Dead Sea, and gypsum will be processed from waste generated in phosphoric acid production. DSW also planned to increase its loading capacity at the Port of Ashdod by installing a new shiploader.

Mineral Fuels

Coal.—Israel imported 3.5 million tons of coal in 1989. Its suppliers continued to be, in descending order of importance, the Republic of South Africa, the United States with 20% of the total, Australia, Colombia, Venezuela, the U.S.S.R., and Poland.

The demand for electricity, which was rising faster than the gross national product, will require that Israel import more than 7 MMmt/yr of coal by 1995. The Rutenberg power station that was scheduled to open in 1991 will add 2.5 MMmt/yr to imports. In April 1990, the existing powerplant at Hadera received authorization to expand capacity from 1,400 megawatts to 2,500 megawatts, which will require an additional 1.5 MMmt/yr of imported coal.

A new coal reception and handling facility became operational at the new Rutenberg coal powerplant in June 1989, and another one is due to open in 1991. In April, two new reception and handling units were authorized to be built at the Hadera plant.

Coal imports to industrial users, which have been minimal, were expected to increase to an estimated 1 million MMmt/yr by 1995. The cement industry already had the capacity to use 250,000 tons of coal; however, it had been less expensive to use oil in recent years.

Oil Shale.—Israel had about 12 billion tons of lean oil shale resources. Work continued on exploitation of these resources, primarily through the Government corporation Energy Resources Development Ltd. (PAMA). A cogeneration demonstration plant to be fueled by oil shale was under construction at Mishor Rotem in the Negev Desert at a cost of $30 million. The plant will produce 50 tons of steam per hour and 4.4 megawatts of electricity. It was scheduled to be completed by the end of 1989.

Petroleum.—Israeli American Oil Co. (Isramco) announced that it was encouraged by initial petroleum production testing at the Yam-2 well site, 16 km from Ashdod. Energy Ministry officials said that this was the most significant offshore

TABLE 2

ISRAEL: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity[1]
Bromine	Dead Sea Bromine Co. Ltd. (Israel Chemicals Ltd. (ICL),[2] 90%; private, 10%)	Sdom	200 bromine and bromine compounds.
Do.	Bromine Compounds Ltd. (ICL, 90%; private, 10%)	Romat industrial park, plant south of Beersheva	36.
Do.	do.	Romat industrial park, plant near Beersheva	24 bromine compounds.
Cement	Nesher Israel Cement Enterprises Ltd. (private, 100%)	Near Haifa	850.[e]
Do.	do.	Near Jerusalem	700.
Do.	do.	Near Tel Aviv	750.[e]
Chlorine	Dead Sea Bromine Co. Ltd. (ICL, 90%; private, 10%)	Sdom	75.
Fertilizer	Rotem Fertilizer Ltd. (ICL, 74%; private, 26%)	Mishor Rotem	600[e] mixed fertilizers.
Magnesia	Dead Sea Periclase Ltd. (ICL, 50%; Austrian-American Magnesite Co., 50%)	Haifa	45.
Magnesium chloride	Dead Sea Works Ltd. (ICL, 90%; private, 10%)	Sdom	75.
Nitrogen, ammonium sulfate	Fertilizers and Chemicals Ltd. (ICL, 76%; private, 24%)	Mishor Rotem	180 ammonium sulfate.
Petroleum, crude	Israel National Oil Co. (Government, 100%)	40 kilometers south of Tel Aviv	136.[3]
Petroleum, refined	Oil Refineries Ltd. (Government, 100%)	Haifa	43.8.[4]
Do.	do.	Ashdod	25.5.[4]
Phosphate rock, calcined	Negev Phosphates Ltd. (ICL, 100%)	Arad, Zin, Oron southwest of Sdom	4,000.
Phosphoric acid	Rotem Fertilizer Ltd. (ICL, 74%; private, 26%)	Mishor Rotem	180.
Do.	Negev Phosphates Ltd. (ICL, 100%)	Near Oron	30.
Potash, K_2O equivalent	Dead Sea Works Ltd. (ICL, 90%; private, 10%)	Sdom	1,000.
Potassium nitrate	Haifa Chemicals Ltd. (private, 100%)	Haifa	220.
Iron	United Steel Mills Ltd. (Koor Industries Ltd., 100%)	Near Haifa	130.
Sulfuric acid	Rotem Fertilizer Ltd. (ICL,74%; private, 26%)	Mishor Rotem	500.
Do.	Fertilizers and Chemicals Ltd. (ICL,76%; private, 24%)	Haifa	220.

[e]Estimated.
[1]Thousand metric tons per year unless otherwise specified.
[2]ICL is 100% Government owned.
[3]Thousand barrels per year.
[4]Million barrels per year.

discovery Israel had made to date. However, its commercial viability had yet to be shown.

Reserves

The supply of bromine, chlorine, potash, and magnesium salts from Dead Sea brine is virtually unlimited. Reliable information on Israel's phosphate reserve base was not available.

INFRASTRUCTURE

One of the new Ports and Railway Authority's first acts was to commission a logistical study from the SNCF to develop a master plan for the improvement of Israel's rail system. In the past 10 years, there had been little upgrading of the existing 594-km rail system. About 85% of the current rail traffic was involved in the transport of potash and phosphate materials from the Dead Sea and the Negev Desert to the Ports of Ashdod and Haifa. Other than for a small amount of sulfur and food, the rail cars had been returning from the ports empty. However, starting in 1990, coal bound for the new Rutenberg powerplant will also be transported by rail. A total of 708 km of pipelines carried crude oil from the Port of Elat, on the gulf of Aqaba, to the Haifa and Ashdod oil refineries. There were also 89 km of natural gas pipelines and 290 km of pipeline carrying refined petroleum products.

There was 4,500 km of roads, the majority of which was paved. Three ports were at Haifa, Ashdod, and Elat.

OUTLOOK

If Israel moves ahead with its plans to privatize a majority of the country's corporations, the economy may experience improved efficiencies in certain sectors. Such economic growth would increase the domestic consumption of Israel's mineral commodities, but its mining industry will continue to be primarily export oriented. Because of its export dependence, the health of Israel's mining industry will continue to fluctuate with world commodity prices. Trends to export less raw materials and more value added mineral products such as manufactured fertilizer will continue. More high-tech products using Israel's mineral wealth, such as fused high-purity magnesium oxide for the nuclear industry and single crystals that are cut and polished for use as substrates in high-temperature superconductors, will be exported in the future.

[1]Where necessary, values have been converted from new Israeli shekels (NIS) to U.S. dollars at the rate of NIS1.945 = US$1.00.

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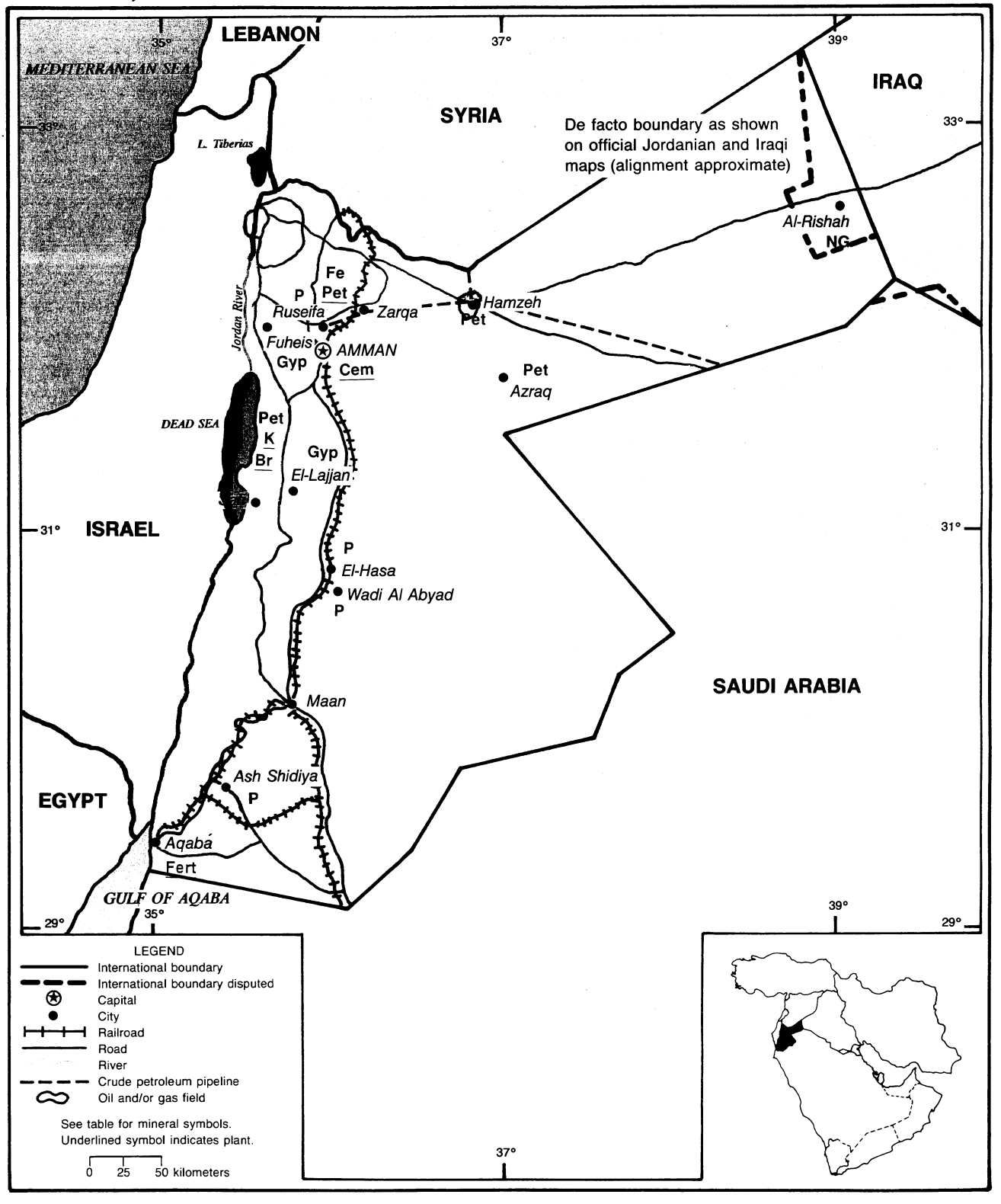
JORDAN

AREA 91,880 km² **POPULATION 3,064,508**



THE MINERAL INDUSTRY OF

JORDAN

By Thomas P. Dolley

In 1989, Jordan benefited from increased international prices for its two most important mineral commodities—phosphate and potash. As of late 1989 and early 1990, the Jordan Phosphate Mines Co. (JPMC) retained third place in phosphate exports worldwide after Morocco and the United States. JPMC was the world's fifth largest producer of phosphate rock, following the United States, the U.S.S.R., Morocco, and China.

Jordan's Arab Potash Co. (APC) again registered a profit in 1989. The firm recorded a profit for the first time in its history in 1988, although operations commenced in 1983. Owing to the surging global market price for potash, APC's 1989 gross profits increased to approximately $57 million[1] from $21 million in 1988.

The performance of these two mineral commodities helped to bolster an otherwise sagging economy. External debt had risen to $8.3 billion by yearend 1989. Exacerbating the economic problem, the Persian Gulf crisis of 1990 had also caused more Jordanian workers to return home from other gulf states, thus cutting remittances and foreign exhange. Trade embargoes and naval blockades have had a deleterious effect on traffic through the Port of Aqaba, including a higher cost for oil importation for Jordan. There were indications that the crisis was affecting mineral producers outside of Iraq and Kuwait. For current output to meet current contractual obligations, JPMC has held on to existing phosphate customers, only to have newer customers lost owing to canceled shipments. These shipments were canceled because the host countries of customers prohibited the phosphate sales. JPMC was still maintaining normal production and stockpiling. However, it was absorbing concomitant increases in insurance costs of an estimated 0.25%. This increase was on behalf of the war risk undertaken by JPMC's customers during the crisis, with the effect of reducing revenue. Phosphate shipping costs had also risen dramatically. APC reported no loss of production, shipments, or revenue as of October 1990. APC also utilized the Port of Aqaba.

The Government had wrestled with severe economic problems since 1988. However, the country's imports dropped by 25% in real dollar terms in the first 6 months of 1989 with exports increasing by 12%. Reforms had included floating of the dinar and reduction of the Government's budget deficit. Once again, the extraordinary increase in production and profitability of the phosphate and potash industries had helped to prevent other economic shortfalls.

GOVERNMENT POLICIES AND PROGRAMS

The Provisional Law of Natural Resources 37 of 1966, amended, is the basic mining law of Jordan. The law allows for private Jordanian or foreign national ownership of a mine or quarry with the provision that mine management be conducted by a Jordanian operator.

The Government agreed to a rescheduling of debts in March 1989 with the International Monetary Fund (IMF). The Government will pay $100 million plus interest each year on the principal. The IMF estimates Jordan's foreign debt for 1989–90 at $8.1 billion. The IMF hoped to rely on gradual economic growth to decrease the debt as a proportion of the gross domestic product. Major savings by the Government include cutting expenditures and revising the tax system. Further measures included the complete deregulation of bank interest rates and the lifting of the abolition on imports of luxury goods. These moves were made to satisfy the IMF's desire for a free-trade market. The action caused an improvement in Jordan's balance of trade in 1989.

The Government signed an agreement with the European Community (EC) in 1990. The EC was to provide approximately $700,000 in funding for economic geology projects. The projects include the mining of ornamental stone, assessment of the mineral potential of granites, and a feasibility study of the Wadi Araba copper prospect.

PRODUCTION

Despite economic upheaval in 1989, all mineral commodities showed increases in production within Jordan with the possible exception of sand and hydrocarbons. Cement production, controlled by the Jordan Cement Factories Co. (JCFC), increased in 1989 along with clinker production.

TRADE

Phosphate rock exports recorded a 2% increase in 1989 with a decrease of 2% in export tonnage for potash. Phosphate exports totaled 5.1 million tons at a sales value of $203.6 million. Potash exports totaled approximately 1.3 million tons at a sales value of $125 million. Global prices buoyed the industry despite the lower export figures however.

Jordanian phosphate was exported to an estimated 30 countries, with India receiving the largest shipments. JPMC's share of the world export market had increased greatly since 1975. In 1975, the share was 2.5%, with a gradual increase

TABLE 1

JORDAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[p]
Cement, hydraulic	thousand tons	2,023	1,795	2,373	1,828	1,930
Clays		[e]26,000	14,144	14,000	23,452	38,600
Gypsum		91,965	70,083	114,560	84,866	132,400
Iron and steel: Steel, crude		136,266	[e]136,000	217,000	[r e]200,000	176,500
Lime		[e 2]224,000	4,338	3,906	2,461	3,100
Petroleum:						
Crude[e]	thousand 42-gallon barrels	—	110	153	200	110
Refinery products:						
Gasoline	do.	4,900	4,517	2,975	2,368	2,514
Jet fuel	do.	1,474	1,456	1,496	100	85
Kerosene	do.	1,529	1,793	1,581	1,398	1,179
Distillate fuel oil	do.	10,806	4,602	5,431	5,104	4,845
Residual fuel oil	do.	4,720	4,543	4,735	4,462	4,887
Liquefied petroleum gas	do.	930	1,012	1,032	640	670
Other	do.	890	791	1,158	[e]800	2,500
Total	do.	25,249	18,714	18,408	14,872	16,680
Phosphate:						
Mine output:						
Gross weight	thousand tons	6,067	6,250	6,800	6,611	6,900
P_2O_5 content[e]	do.	2,011	2,063	2,260	2,182	2,277
Phosphatic fertilizers		500,650	550,880	565,066	615,000	602,000
Potash:						
Crude salts		908,560	1,103,716	1,200,000	1,309,000	1,320,000
K_2O equivalent		550,000	660,000	720,000	785,000	792,000
Salt[e]		[3]32,000	32,000	18,000	18,000	18,000
Stone:						
Limestone[e]		7,000	7,000	[3]13,484	[3]3,642	3,600
Marble		4,600	[e]4,600	[e]4,600	322,800	333,560

[e] Estimated. [p] Preliminary. [r] Revised.
[1] Table includes data available through Oct. 31, 1990.
[2] Includes aggregates of unspecified type.
[3] Reported figure.

to 7.6% in 1981 to 13.8% in 1988. Diammonium phosphate (DAP) was exported by Jordan to 14 countries. The principal importers in 1988 were India, Saudi Arabia, Italy, and Ethiopia.

Potash accounted for one-fifth of Jordan's exports. Of the 1.29 million tons of potash exported by Jordan in 1989, an estimated 500,000 tons was sold to India. APC signed a contract with India in August 1989 to raise potash exports to that country to 1.5 million tons per year.

Cement exports more than doubled in 1989 compared with weak 1988 exports, and revenues more than tripled to $16.7 million.

Jordan did not have significant oil production. Thus, the country relied heavily on petroleum imports from Iraq and Saudi Arabia. These oil imports totaled approximately 17.8 million barrels for 1988, the latest year for which such information was available. Approximately 12.5 million barrels came from Iraq with 5 million barrels from Saudi Arabia. Between 1984 and early 1989, Iraq exported an average of 80,000 to 100,000 barrels per day (bbl/d) of crude oil and petroleum products through Jordan's Port of Aqaba. Transportation of the petroleum from the Iraqi border to Aqaba was provided at a rate of 900 tanker trucks per day.

STRUCTURE OF THE MINERAL INDUSTRY

The Jordanian Natural Resources Authority (NRA) is the governmental agency responsible for all activities relating to exploration and development of minerals and mineral fuels. The exploitation of the major mineral commodities of Jordan—phosphates, potash, cement, and kaolin—are all controlled by parastatals that are public shareholding mining companies. Aggregates, basalt, calcium carbonate, dimensional stone, glass sand, and natural sand are produced by private-sector firms.

TABLE 2

JORDAN: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Principal destinations, 1988
METALS			
Aluminum:			
Oxides and hydroxides	5,000	12,266	All to Iraq.
Metal including alloys:			
Scrap	3,133	7,162	Japan 3,310; Pakistan 1,705; West Germany 989.
Unwrought	—	6	All to Belgium-Luxembourg.
Semimanufactures	121	114	Iraq 97; United Arab Emirates 14.
Copper: Metal including alloys:			
Scrap	238	1,529	Netherlands 501; West Germany 227; Pakistan 200.
Unwrought	—	62	Saudi Arabia 35; Iraq 26.
Semimanufactures	—	28	Kuwait 16; Saudi Arabia 6.
Iron and steel: Metal:			
Scrap	2,059	502	North Korea 194; Syria 176; Saudi Arabia 86.
Semimanufactures:			
Bars, rods, angles, shapes, sections	95	26	Mainly to Saudi Arabia.
Universals, plates, sheets	158	2,065	Iraq 1,257; Saudi Arabia 316; Bahrain 135.
Hoop and strip	3	—	
Rails and accessories	—	4	All to Iraq.
Wire	65	65	Iraq 62; Syria 2.
Tubes, pipes, fittings value, thousands	$3,772	$3,708	Iraq $3,229; Romania $288.
Castings and forgings, rough	—	9	United Kingdom 4; Saudi Arabia 2.
Lead: Metal including alloys, semimanufactures	—	84	Kuwait 49; Saudi Arabia 35.
Nickel: Metal including alloys, semimanufactures	—	168	All to Iraq.
Silver: Metal including alloys, unwrought and partly wrought value, thousands	$2	—	
Titanium: Oxides	—	53	Morocco 40; Iraq 13.
Zinc: Metal including alloys:			
Scrap	271	—	
Unwrought	—	15	
INDUSTRIAL MINERALS			
Abrasives, n.e.s.:			
Natural: Corundum, emery, pumice, etc.	22	197	Saudi Arabia 158; Qatar 39.
Grinding and polishing wheels and stones	2	53	Saudi Arabia 46; Iraq 5.
Boron materials: Oxides and acids	—	1	All to Iraq.
Cement	739,560	217,620	Egypt 99,538; Saudi Arabia 54,402; Iraq 30,321.
Fertilizer materials:			
Crude, n.e.s. thousand tons	1,244	1,987	India 677; China 515; Italy 154.
Manufactured:			
Nitrogenous	422,783	682,943	India 201,768; West Germany 90,050; Italy 85,527.
Phosphatic	4,346	6,060	Saudi Arabia 5,000; United Arab Emirates 1,040.
Unspecified and mixed	—	325	United Arab Emirates 240; Iraq 75.
Gypsum and plaster	11	—	
Lime	25	160	All to Saudi Arabia.
Phosphates, crude thousand tons	5,544	5,727	India 1,135; Yugoslavia 707; Turkey 654.

See footnotes at end of table.

TABLE 2—Continued

JORDAN: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Principal destinations, 1988
INDUSTRIAL MINERALS—Continued				
Salt and brine		305	94	West Germany 48; Iraq 35.
Sodium compounds, n.e.s.:				
Soda ash, manufactured		—	20	West Germany 10; Iraq 10.
Sulfate, manufactured		1,265	3,076	Iraq 2,976; Syria 86.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked		3,247	2,225	Iraq 1,904.
Worked		109,745	119,807	Kuwait 104,521; United Arab Emirates 7,742.
Gravel and crushed rock		10,699	14,544	Saudi Arabia 8,789; Lebanon 2,262; Kuwait 1,998.
Sand other than metal-bearing		12,941	2,161	Saudi Arabia 1,890.
Sulfur: Elemental, crude including native and byproduct		125	—	
Talc, steatite, soapstone, pyrophyllite		6,357	70	All to West Germany.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural		30	—	
Carbon black		60	—	
Coal: Anthracite and bituminous		40	108	Syria 90; United Arab Emirates 18.
Coke and semicoke		140	—	
Petroleum refinery products:				
Liquefied petroleum gas	42-gallon barrels	(2)	2,993	Iraq 2,958; United Arab Emirates 35.
Kerosene and jet fuel	do.	—	3,927	All to Syria.
Lubricants	do.	4,690	546	Belgium-Luxembourg 182; Saudi Arabia 126; Netherlands 119.
Bituminous mixtures	do.	212	—	

[1] Table prepared by Virginia A. Woodson. No exports of mineral commodities to the United States were reported for 1988.
[2] Unreported quantity valued at $21,000.

COMMODITY REVIEW

Industrial Minerals

Phosphate Rock.—JPMC mined phosphate rock from three principal mines; the Wadi Al Abyad Mine, the El Hasa Mine, and the southernmost Ash Shadiya deposit. Another phosphate operation existed at the Ruseifa Mine, north of Amman. However, work was suspended in 1985 owing to undesirable mining and transportation conditions. Wadi Al Abyad and El Hasa are the primary phosphate producers. At both of these open pit mines, overburden is blasted and then stripped by electric walking draglines. The capacity of one dragline is approximately 25,000 cubic meters per day of overburden material. Stripping is completed down to a chert layer, which provides good support for heavy equipment. The chert is then stripped by a combination of front-end loaders and bulldozers. The waste rock is then cast into gangue piles, followed by mining of the phosphate benches. The ore is ripped using similar equipment, loaded into dump trucks, and hauled to crushing and screening plants. Similar mining techniques are used at the Ash Shadiya Mine. In 1989, the first production of phosphate rock was realized at Ash Shadiya.

In mid-1990, Jordan began development of the Ash Shadiya deposit. Ash Shadiya was estimated by the NRA to have reserves of 958 million tons of ore grading 49.7% bone phosphate of lime (BPL). The ore required little beneficiation to be upgraded to 70% BPL. The United Nations Development Fund will assist the project with an estimated total cost of $53.4 million. The foreign exchange component of the cost will amount to $44.7 million with the United Nations fund covering 19% of the total cost. Other contributors to the funding of the project included the Arab Fund for Economic and Social Development at approximately $17 million, the World Bank, and $11 million from the Islamic Development Bank (IDB).

The project at Ash Shadiya will consist of providing mining equipment for an open pit operation covering 15.7 square kilometers. Additionally, the project will provide for equipment and plants to be utilized in the transportation, crushing, screening, and process-

TABLE 3

JORDAN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals	56	—		
Aluminum:				
Oxides and hydroxides	11,548	22,174	—	France 22,115.
Metal including alloys:				
Scrap	745	68	—	All from Iraq.
Unwrought	5,319	3,883	—	Bahrain 2,137; Egypt 1,026; Canada 494.
Semimanufactures	2,328	2,309	9	Italy 380; Hungary 370; Turkey 359.
Chromium: Oxides and hydroxides	6	—		
Cobalt: Oxides and hydroxides value, thousands	$5	$5	—	United Kingdom $4; Switzerland $1.
Copper:				
Matte and speiss including cement copper do.	$1	—		
Metal including alloys:				
Scrap	(2)	165	—	Saudi Arabia 141; Iraq 24.
Unwrought	42	131	—	Saudi Arabia 64; Italy 43; United Kingdom 19.
Semimanufactures	1,211	1,002	89	Saudi Arabia 440; Turkey 64.
Iron and steel: Metal:				
Scrap	3,797	1,256	—	Iraq 266; France 225; Italy 214.
Pig iron, cast iron, related materials	16,755	3,402	—	U.S.S.R. 3,014; China 329.
Ferroalloys:				
Ferromanganese	600	—		
Unspecified	222	—		
Steel, primary forms	136,796	170,005	—	Turkey 113,360; Zambia 52,708.
Semimanufactures:				
Bars, rods, angles, shapes, sections	47,902	11,278	—	Romania 2,627; Lebanon 1,788; Hungary 1,592.
Universals, plates, sheets	54,435	94,693	320	Brazil 19,174; Czechoslovakia 10,519; Hungary 10,324.
Hoop and strip	585	—		
Rails and accessories	4,523	562	—	United Kingdom 330; Czechoslovakia 104; East Germany 74.
Wire	11,735	1,744	—	Romania 670; China 294; Japan 134.
Tubes, pipes, fittings value, thousands	$42,912	$26,721	$832	Turkey $5,926; Italy $4,153; France $3,066.
Castings and forgings, rough	—	3,307	15	China 634; Romania 627; Bulgaria 587.
Lead:				
Oxides	142	82	—	West Germany 42; Spain 40.
Metal including alloys:				
Scrap	—	59	—	Mainly from Saudi Arabia.
Unwrought	22	22	—	United Kingdom 12; Sweden 10.
Semimanufactures	14	21	—	Italy 19.
Manganese:				
Ore and concentrate, metallurgical-grade	254	—		
Oxides	1	2	—	West Germany 1; Portugal 1.
Mercury	3	—		
Molybdenum: Metal including alloys, all forms value, thousands	$2	—		

See footnotes at end of table.

TABLE 3—Continued

JORDAN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS—Continued					
Nickel:					
Matte and speiss		4	—		
Metal including alloys, semimanufactures		137	17	—	West Germany 7; Canada 6.
Platinum-group metals: Metals including alloys, unwrought and partly wrought	value, thousands	$79	$79	—	Switzerland $78; Syria $1.
Silver: Metal including alloys, unwrought and partly wrought	do.	$81	$100	—	Mexico $51; Italy $14; West Germany $11.
Tin: Metal including alloys:					
Scrap		—	5	—	United Kingdom 4.
Unwrought		22	3	—	NA.
Semimanufactures		24	31	(3)	United Kingdom 16; Belgium-Luxembourg 10.
Titanium: Oxides		1,922	2,203	18	United Kingdom 759; France 440; West Germany 320.
Tungsten: Metal including alloys, all forms	value, thousands	$2	—		
Zinc:					
Oxides		73	7,458	—	France 7,437.
Metal including alloys:					
Scrap		406	—		
Unwrought		981	692	1	Poland 400; Bulgaria 157; Belgium-Luxembourg 134.
Semimanufactures		7	—		
Other:					
Oxides and hydroxides		378	58	—	Iraq 40; Yugoslavia 17.
Base metals including alloys, all forms		29	12	—	All from Norway.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.		152	128	—	Italy 51; Switzerland 40.
Artificial: Corundum		6	—		
Grinding and polishing wheels and stones		315	188	—	Italy 99; West Germany 37.
Asbestos, crude		1	—		
Barite and witherite		2	23	—	All from West Germany.
Boron materials:					
Crude natural borates		—	8	—	All from Republic of Korea.
Oxides and acids		—	1	—	All from United Kingdom.
Cement		2,453	2,961	—	Saudi Arabia 2,391; West Germany 404.
Chalk		910	721	—	France 675; United Kingdom 42.
Clays, crude		2,879	3,674	5	United Arab Emirates 998; United Kingdom 905; Bulgaria 850.
Cryolite and chiolite		—	5	—	All from Italy.
Diamond, natural:					
Gem, not set or strung	value, thousands	$308	$9	—	All from Belgium-Luxembourg.
Industrial stones	do.	$224	—		
Diatomite and other infusorial earth		27	5	—	All from West Germany.
Feldspar, fluorspar, related materials		805	1,382	—	Turkey 630; Finland 440; Belgium-Luxembourg 194.

See footnotes at end of table.

TABLE 3—Continued

JORDAN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Fertilizer materials:				
Crude, n.e.s.	1,045	647	—	Lebanon 499; Finland 80.
Manufactured:				
Ammonia	19,322	121,455	—	Kuwait 60,019; Qatar 24,243; Bahrain 15,005.
Nitrogenous	86,528	46,268	158	Egypt 13,000; Kuwait 6,346; Lebanon 6,113.
Phosphatic	8,383	7,621	67	Iraq 6,871; Lebanon 120.
Potassic	(3)	635	—	United Kingdom 272; Finland 210; West Germany 130.
Unspecified and mixed	6,680	3,698	71	Italy 727; West Germany 706; France 681.
Gypsum and plaster	2,701	—		
Lime	683	2,209	—	Iraq 2,029; Lebanon 180.
Magnesite, crude	878	106	—	Greece 100; United Kingdom 6.
Mica: Crude including splittings and waste	—	66	—	India 50; United Kingdom 16.
Pigments, mineral: Iron oxides and hydroxides, processed	132	184	—	West Germany 109; Spain 40.
Potassium salts, crude	—	2,879	—	West Germany 2,619; Canada 70.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$31	—		
Synthetic do.	$3	$54	—	Thailand $30; Pakistan $10.
Salt and brine	741	651	—	Netherlands 333; West Germany 114; Austria 80.
Sodium compounds, n.e.s.:				
Soda ash, manufactured	10,539	7,818	—	France 5,098; West Germany 1,610.
Sulfate, manufactured	9,744	5,148	—	Kuwait 2,633; France 1,216; West Germany 723.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	11,787	11,938	—	Italy 7,731; Greece 1,431.
Worked	390	88	—	Italy 68; West Germany 20.
Dolomite, chiefly refractory-grade	83	162	—	Saudi Arabia 140; Norway 22.
Gravel and crushed rock	4,218	1,980	—	Italy 1,468; Lebanon 406.
Limestone other than dimension	228	173	—	All from Iraq.
Quartz and quartzite	—	20	—	All from Belgium-Luxembourg.
Sand other than metal-bearing	363	121	—	Mainly from France.
Sulfur:				
Elemental:				
Crude including native and byproduct	168,387	267,996	—	Iraq 202,536; Kuwait 46,698; Poland 18,018.
Colloidal, precipitated, sublimed	20,719	—		
Sulfuric acid	22,323	792	—	Iraq 568; Turkey 92; Saudi Arabia 70.
Talc, steatite, soapstone, pyrophyllite	471	395	—	Norway 193; China 102; Netherlands 41.
Other:				
Crude	102	146	—	Turkey 103; Belgium-Luxembourg 20.
Slag and dross, not metal-bearing	16	—		

See footnotes at end of table.

TABLE 3—Continued

JORDAN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		—	16	—	All from Cyprus.
Carbon black		26	2	([3])	Mainly from West Germany.
Coal:					
Anthracite and bituminous		24	39	—	All from West Germany.
Briquets of anthracite and bituminous coal		107	24	—	Do.
Coke and semicoke		476	884	—	West Germany 322; Egypt 200; China 150.
Peat including briquets and litter		2,065	—		
Petroleum:					
Crude	thousand 42-gallon barrels	18,855	17,873	—	Iraq 12,542; Saudi Arabia 5,331.
Refinery products:					
Liquefied petroleum gas	do.	197	237	—	All from Iraq.
Gasoline, motor	value, thousands	$90	—		
Mineral jelly and wax	thousand 42-gallon barrels	3	2	—	Mainly from Iraq.
Kerosene and jet fuel	do.	([4])	2	—	All from Saudi Arabia.
Distillate fuel oil	do.	483	—		
Lubricants	do.	187	129	11	Belgium-Luxembourg 27; West Germany 20; Sweden 18.
Residual fuel oil	do.	4,778	5,817	—	Kuwait 3,187; Iraq 2,055.
Bitumen and other residues	do.	5	—		
Bituminous mixtures	do.	3	1	—	Mainly from Saudi Arabia.
Petroleum coke	do.	—	1	—	Mainly from Egypt.

NA Not available.
[1]Table prepared by Virginia A. Woodson.
[2]Unreported quantity valued at $60,000.
[3]Less than 1/2 unit.
[4]Unreported quantity valued at $435,000.

ing of the ore. The project is to be completed by mid-1992.

Potash.—In 1989 and 1990, APC intended on implementing expansion plans for its potassium chloride (KCl) plant at Safi. This Dead Sea facility is 178 km from Amman at an elevation of 400 meters (m) below sea level. Work to increase the plant's capacity from 1.4 million metric tons per year to 1.8 million metric tons per year was scheduled to begin in 1992 with completion targeted for 1994. Investment in the expansion had been estimated at $66 million, part of the sum to be financed by the World Bank. In April 1990, Jacobs International of the Republic of Ireland received a letter of intent from APC to carry out economic and technical feasibility studies on the company's Dead Sea complex. Additionally, included in the contract were supervision and design work worth $5.5 million. Jacobs was to complete the feasibility study by November 1990.

Mineral Fuels

Natural Gas.—The Government announced in early 1990 that the Al-Rishah natural gas reserve estimates would be increased to a total of 11.3 billion cubic meters. Natural gas from this field was already accounting for 15% of the nation's total energy needs. The Al-Rishah Field is near the Iraqi border. Al-Rishah is known to be geologically comprised of complex stratigraphic traps, which create difficulty in assessing reserves and rate of sustainable production. By yearend 1989, two wells at Al-Rishah were producing 600,000 cubic meters of natural gas per day. The natural gas powers two on-site 30-megawatt gas turbine generators, which were installed by Japan's Sumitomo Corp. This power station was commissioned in May 1989 with further expansion planned. Sources for the Petro-Canada International Assistance Corp. (PCIAC) and the NRA stated that the new discoveries at the field could provide a minimum of 30 years of fuel for Jordan's gas-fired powerplant needs. The natural gas from Al-Rishah is currently supplying 15% of the nation's total energy requirements. PCIAC assisted the NRA and improved data quality on the Al-Rishah Field by conducting extensive seismic surveys and utilizing vibroseis techniques. Additionally, the existing seismic data on Al-Rishah was reprocessed and reinterpreted.

On February 21, 1990, the Govern-

ments of Jordan and Canada signed an agreement for energy development, which added $12 million to the earlier $25.5 million in aid for energy exploration in Jordan.

Petroleum.—For its petroleum requirements, Jordan remained dependent on imports of crude oil. A national strategy had been developed, aimed at (1) exploration and utilization of domestic sources of hydrocarbons, (2) plans for natural gas development, (3) natural gas price regulation, and (4) investigation into the utilization of oil shale deposits.

By yearend 1989, approximately 50 exploratory oil wells had been drilled in Jordan. No significant accumulations of crude oil had been discovered. Early in 1989, the NRA announced oil discoveries at a depth of 200 m in the Dead Sea area and Wadi Sirhan. In August 1989, the NRA announced a light crude discovery at a depth of 1,400 m in southeastern Jordan along the Saudi Arabian border. Amoco Oil Co. of the United States relinquished its exploration concessions in June 1989. Hunt Oil of the United States, in consortium with British Petroleum Ltd., relinquished their concessions in January 1990.

The NRA and the Austrian National Oil Co. (OMV) signed a cooperation agreement on March 22, 1989, in which OMV will carry out an 18-month exploration program in a 14,245-square-kilometer area southeast of Sarhan in the eastern part of Jordan. OMV will carry out explorations at its own expense with NRA participation. OMV may enter a production agreement or withdraw once exploration is completed. Similar agreements had been signed between NRA, PCIAC, and the Japanese National Oil Corp.

The only significant producing field for petroleum in Jordan was the Hamza Field in the Azraq area. Currently, production has leveled off at 300 bbl/d, with the petroleum being transported by trucks to the Zarqa refinery for processing. At Azraq, prior investigation had revealed crude petroleum of 30° API with a low-sulfur content. The crude oil was contained stratigraphically in a pay zone with a 160-m average thickness and at a depth of 650 to 1,800 m, immediately below a thick asphalt layer. The discoveries within the Azraq basin continued to generate interest from international operators in the late 1980's. However, the petroleum traps found within the basin were small and required a more focused examination to locate them.

Though possessing substantial oil shale deposits, Jordan had been unable to develop this energy resource owing to high investment costs. The consortium of Kloeckner-Lurgi of the Federal Republic of Germany was conducting a feasibility study for a 50,000-bbl/d retorting complex at El-Lajjun.

Reserves

The NRA estimated Jordanian phosphate reserves at 1 billion tons. Potash was obtained primarily from Dead Sea brines. Geological surveys had shown that Jordan had additional untapped mineral resources of bromine, dolomite, gypsum, glass sands, iron, lead, oil shale, pyrite, tin, travertine, and tripoli. However, no reports were available on the size or grade of these resources.

TABLE 4

JORDAN: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity[1]
Cement	Jordan Cement Factories Co. (Government, 49%; private shareholdings, 51%)	Fuheis	1.3
Fertilizer	Jordan Fertilizer Industry Co. (Government, 26%; JPMC, 25%; private Jordanian interests, 19.875%; Arab Mining Co., 10%; Arab Petroleum Investments Corp., 10%; International Finance Corp., 5%; Islamic Development Bank, 4.125%)	Aqaba	1.5
Petroleum:			
Crude	Natural Resources Authority (Government, 100%)	Northeast of Azraq, Azraq	NA
Products	Jordan Petroleum Refinery Inc. (Government, 100%)	Zarqa	[2]60
Phosphate rock	Jordan Phosphate Mines Co., (Government, 82%; private shareholdings, 12%)	El Hasa, Wadi El Abyad, and Ash Shadiya	3 [e]3 [e]1.5
Potash	Arab Potash Co. (Government, 56.659%; Arab Mining Co., 22.826%; Government of Kuwait, 4.348%; Islamic Development Bank, 5.521%; Government of Libya, 4.348%; Government of Iraq, 5.187%; Government of Saudi Arabia, 0.345%; private shareholders, 0.766%)	Safi, Dead Sea	[e]1.3
Steel	Jordan Iron and Steel Co. (private shareholders, 100%)	Zarqa	[e]50

[e] Estimated. NA Not available.
[1] Million metric tons per year unless otherwise specified.
[2] Thousand barrels per day.
[3] Thousand metric tons per year.

INFRASTRUCTURE

Railroads within Jordan consisted of 619 km of 1.05-m-gauge single track. Highways totaled 7,500 km, of which 5,500 km was asphalt paved with the remaining 2,000 km composed of crushed stone and gravel. Crude oil pipelines within the country totaled 209 km.

Electrical generation capacity within the country was estimated at 981,000 kilowatts.

The Port of Aqaba contained two petroleum tanker berths. One berth was for the management of imported oil products through a pipeline to a tank farm. The remaining tanker berth was the 120-m Moshterek berth utilized for crude petroleum exports. However, in 1990, the international sanctions against Iraq negatively impacted the port operations. Cargo ships entered the port to be loaded with phosphate, and shipping costs had risen from $18 per ton to an estimated $27 to $30 per ton.

OUTLOOK

Jordan's lack of domestic energy sources, mainly hydrocarbons, will continue to place stress on the nation's balance of trade owing to fuel importation costs. The continuation of trade embargoes, naval blockades, and sanctions against Iraq will impact negatively on Jordan's Port of Aqaba, through which much Iraqi trade moves. The shipment of JPMC's phosphate exports through the port may continue to suffer owing to the lack of suitable ships. Additionally, JPMC's insurance costs may continue to rise. A protracted Persian Gulf crisis scenario could have deleterious effects on the Jordanian economy.

The outlook for major mineral commodity development in Jordan is good. JPMC, benefiting from greater international phosphate prices for the past 2 years, should continue this profit-making trend. JPMC planning reflects optimism, with five proposed joint-venture projects for the production of phosphoric acid, compound fertilizer, and triple superphosphate. Discussions continue on these projects, with the proposed major partners being India, Pakistan, and the U.S.S.R. Major expansion is planned by JPMC for 1993 and 1994. JPMC's production target for the year 2005 is approximately 8 million tons for export, representing a 20% to 25% increase in current production. An additional 5 to 6 million tons of phosphate will be transported to the Aqaba Industrial Complex for the production of phosphate fertilizers.

[1] Where necessary, values have been converted from Jordanian dinars (JD) to U.S. dollars at the rate of JD0.57 = US$1.00.

OTHER SOURCES OF INFORMATION

Agency

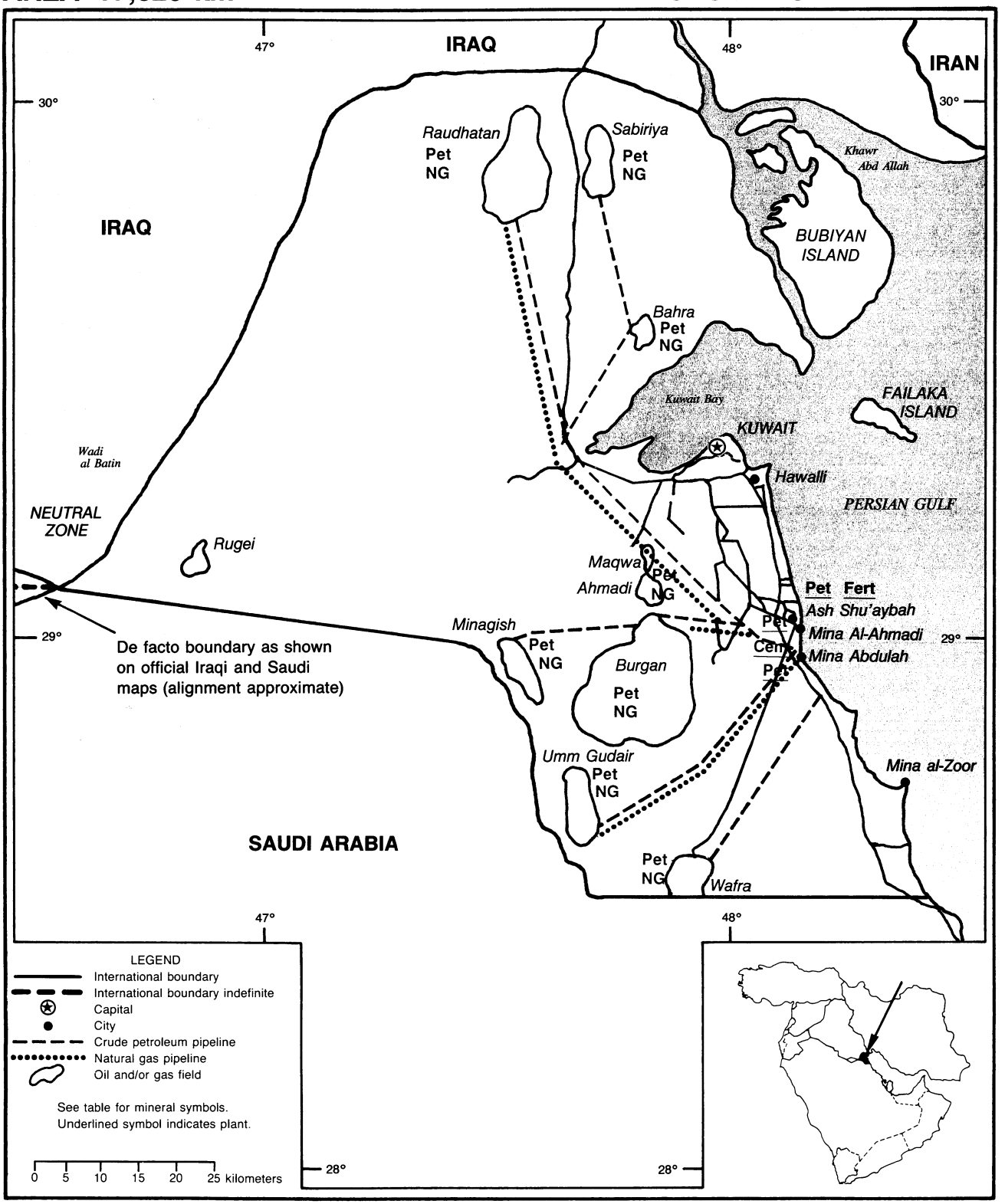
Jordan Natural Resources Authority
P.O. Box 220
7 Amman, Jordan

Publication

Natural Resources In Jordan, published by the Jordan Natural Resources Authority, Dec. 1988.

KUWAIT

AREA 17,820 km² **POPULATION 2.12 million**



THE MINERAL INDUSTRY OF

KUWAIT

By Bernadette Michalski

The production and refining of crude oil and natural gas, together with the output from the downstream industries processing fertilizers and petrochemicals, contributed more than 90% of both the export and Government revenues. This sector also made up about 40% of the gross domestic product (GDP). Kuwait's massive hydrocarbon resources provided the most favorable reserve-production ratio in the world. The participation in foreign petroleum exploration, the acquisition of foreign downstream petroleum refining and marketing interests, as well as fertilizer and petrochemical facilities have aided Kuwait in developing its economy. Kuwait accumulated more assets than debts and was the most economically and financially secure of all Arab nations. With the military invasion of Kuwait by Iraq on August 2, 1990, the United Nations Security Council Resolution 661 of August 6, 1990, imposed worldwide economic sanctions, including a trade embargo on both nations. The objective of the sanctions was to pressure Iraq to abandon the Kuwait takeover while preserving Kuwaiti assets, then under Iraqi control.

GOVERNMENT POLICIES AND PROGRAMS

Until the Iraqi invasion and occupation, the responsibility for petroleum policy was vested in the Supreme Petroleum Council established in 1974. In 1980, the Government passed a law providing for the establishment of the Kuwait Petroleum Co. (KPC). The KPC oversaw all the state hydrocarbon companies and also managed Government shareholding in various oil ventures. Included were operations in the divided producing zone and in the acquired interest in overseas exploration and development companies, refining and distribution operations, and the numerous other downstream foreign ventures into which KPC subsidiaries had entered.

Until August 1990, the Kuwaiti Government continued to follow a fiscal policy of limiting expenditure levels, and actual outlays usually fell short of the proposed budget. The Government collected about 88% of its income from hydrocarbon sales by the state-owned KPC. Total revenues were reported at $8.11 billion in the 1987-88 fiscal year. The Finance Ministry continued to set aside 10% of ordinary revenues as the Government's annual allocation to the Reserve Fund for Future Generations. The funding was a commitment outside the ordinary budget process, and Fund revenues had no effect on fiscal policy.

The Government's hydrocarbon conservation policy emphasized use of secondary recovery techniques at fields that are technically difficult to exploit while reducing production from fields where secondary recovery programs were not required. Enhanced recovery techniques were in widespread use throughout Kuwait.

The Government introduced a new labor law early in 1989 with the objective of promoting more stability in the labor market as well as introducing further controls on expatriate labor. It banned the movement between jobs of expatriate private-sector staff before they had worked a 3-year contract.

Kuwait imposed few restrictions on trade or financial flows and placed considerable emphasis on the private sector to develop the economy.

PRODUCTION

Output of construction materials, Kuwait's principal nonhydrocarbon minerals, has remained relatively stable in recent years because Government construction programs continued at a constant pace. The production of fertilizer materials for domestic use and export, however, virtually doubled since expansion and development programs at Shuaiba have come on-stream. In the past decade, Kuwait's oil production levels varied between 2 million barrels per day (bbl/d) and less than 800,000 bbl/d, reflecting market opportunities and, to some extent, the Organization of Petroleum Exporting Countries' (OPEC) policy.

TRADE

The volume of higher priced petroleum product exports approached that of crude oil exports in 1989. The surge in product exports was attributable to the $4.7 billion refinery modernization and expansion program implemented between 1982 and 1988, resulting in a combined capacity of 720,000 bbl/d for the nation's three refineries. The modernization program also increased the proportion of light products capacity from 50% to 70% to support the consumer shift to unleaded gasoline.

Crude oil shipments from Kuwait averaged approximately 775,000 bbl/d in 1989. The Far East imported more than 325,000 bbl/d of Kuwaiti crude oil in 1989, remaining the largest regional market with Japan absorbing about two-thirds of the shipment to that area. Western Europe imported about 270,000 bbl/d of Kuwaiti crude oil in the same period. The United States imported 155,000 bbl/d in 1989. The 1989 spot market price for Kuwaiti crude ranged from a low point of $13.55 per barrel in January to $16.71 in December, with modest peaks in excess of $16 in April and October. Kuwaiti export crude oil is of the quality that can only be processed by a limited number of refineries, forcing the KPC to keep its selling price competitive to keep the sales volume up. In January of 1990, Kuwaiti 31 ° API gravity blend crude sold at $17.35 per barrel; in July, the price dropped to $15.00, and just before the invasion the price was $16.10 on the spot market. Kuwait crude oil spot market price jumped to $22.75 in mid-August on crude oil available before the embargo.

Petroleum product exports totaled 635,000 bbl/d in 1988 and 700,000 bbl/d in 1989. Western Europe was the major

TABLE 1

KUWAIT: PRODUCTION OF MINERAL COMMODITIES[1]

Commodity		1985	1986	1987	1988[p]	1989[e]
Chlorine	metric tons	—	9,000	22,000	24,700	23,610
Cement	thousand metric tons	1,193	1,014	1,000	888	[2]1,110
Clay products, nonrefractory: Sand lime bricks	cubic meters	336,200	336,000	336,000	300,100	[2]354,800
Gas, natural:[3]						
Gross	million cubic meters	5,830	7,440	6,960	8,980	9,500
Dry	do.	4,200	5,730	4,780	6,490	7,500
Lime: Hydrated and quicklime	metric tons	52,400	57,198	62,700	[e]65,000	65,000
Natural gas liquids	thousand 42-gallon barrels	19,710	27,375	29,200	[e]30,000	36,500
Nitrogen: N content of ammonia	metric tons	322,700	450,600	577,500	497,500	592,000
Petroleum						
Crude[3]	thousand 42-gallon barrels	374,000	518,600	496,770	546,000	657,700
Refinery products:[e]						
Gasoline, motor	do.	10,000	11,300	11,500	16,425	20,000
Jet fuel	do.	6,000	9,800	9,500	12,775	12,800
Kerosene	do.	10,000	13,100	13,000	14,600	15,000
Distillate fuel oil	do.	45,000	45,600	45,000	60,225	60,000
Residual fuel oil	do.	79,000	95,000	90,000	93,075	95,000
Refinery fuel and loss	do.	7,000	8,400	8,000	9,000	9,000
Other	do.	50,000	46,000	45,000	41,610	42,000
Total	do.	207,000	[r]229,200	222,000	247,710	253,800
Salt	metric tons	21,000	21,000	21,000	39,500	[2]31,950
Sodium and potassium compounds: Caustic soda	do.	9,800	10,000	12,000	16,100	[2]15,700
Sulfur:						
Elemental, petroleum byproduct	do.	[e]250,000	260,000	310,000	360,000	375,000
Sulfuric acid	do.	4,600	4,600	4,600	4,500	5,000

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through June 30, 1990.
[2]Reported figure.
[3]Includes Kuwait's share of production in the Kuwait-Saudi Arabia Divided Zone.

market, importing about 270,000 bbl/d from Kuwait in 1989. Italy accounted for almost one-half of the shipment destined for Western Europe. Exports to the Far East were estimated at 250,000 bbl/d, with Japan absorbing about 175,000 bbl/d. Product exports to the United States were minimal, averaging 8,200 bbl/d, most of which was liquefied petroleum gas. The KPC included petroleum coke in its export product line for the first time in 1989 as a result of the completion of the upgrading of the Mina Abdulah refinery. Production capacity for petroleum coke is 600,000 metric tons per (mt/yr), of which more than one-half is scheduled for delivery to Japan.

Urea exports were reported at almost 800,000 tons and ammonia exports at 220,000 tons in 1989. Increased demand for Kuwaiti exports of urea was a result of larger orders from China and diminishing market competition. Exports from Bangladesh and Indonesia have been reduced because domestic demand in those countries increased. Libya and Venezuela suspended exports after plant explosions affected output in both countries.

Before the Iraqi invasion, the Kuwait Oil Tanker Co. (KOTC) operated a fleet of 30 vessels with a total capacity of 2.6 million deadweight tons (dwt), sufficient to transport 60% of product output and 30% of crude oil output. In the spring of 1990, KOTC placed an order for two 280,000-dwt crude oil tankers and two 78,000-cubic-meter liquefied petroleum gas carriers for delivery in 1992. KOTC's plans called for the eventual fleet expansion to 38 vessels with a combined capacity of 3.86 million dwt.

Kuwait supplemented its associated gas supply with imports from Iraq, averaging 10 million cubic meters per day. Natural gas was delivered by pipeline from Iraq's southern oilfields to northern Kuwait.

COMMODITY REVIEW

Industrial Minerals

Cement.—The Saudi-Kuwaiti Cement Co. declared a net profit of $4.4 million in 1989 compared with a net loss of $7.7 million in 1988. Efforts are being coordinated with other local cement companies to improve marketing operations and increase exports.

Fertilizers.—The Petrochemical Industries Co. (PIC) operated the Shuaiba Fertilizer Complex, which had the capacity to produce almost 1 million tons of

TABLE 2

KUWAIT: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity[1]
Caustic soda	Petrochemical Industries Co. (Government, 100%)	Shuaiba	70.
Cement	Kuwait Cement Co. (Government, 100%)	Do.	1.500.[2]
Chlorine	Petrochemical Industries Co. (Government, 100%)	Do.	58.
Natural gas	Kuwait Oil Co. (Government, 100%)	All oilfields	10,000.[3]
Natural gas liquids	Kuwait National Petroleum Co. (Government, 100%)	Shuaiba	155.[4]
Nitrogen	Petrochemical Industries Co. (Government, 100%)	Do. Do.	990 ammonia. 792 urea. 5 sulfuric acid.
Petroleum, crude	Kuwait Oil Co. (Government, 100%)	Burgan Raudhatain Sabiriya Minagish Others	3.[5]
Petroleum products	Kuwait National Petroleum Co. (Government, 100%)	Mina al-Ahmadi, Shuaiba Mina Abdullah	270.[4] 200.[4] 250.[4]
Salt	Petrochemical Industries Co. (Government, 100%)	Shuaiba	125.

[1]Thousand metric tons per year unless otherwise specified.
[2]Million metric tons per year.
[3]Million cubic meters per year.
[4]Thousand barrels per day.
[5]Million barrels per day.

ammonia and 800,000 tons of urea annually. Urea production attained a record 852,000 tons, almost 8% above design capacity. The ammonium sulfate unit of the Shuaiba Fertilizer Complex was shut down in 1988 and 1989 owing to a weak demand and ample stocks.

In addition to developing the fertilizer industry at the Shuaiba Complex in Kuwait, PIC acquired interests in fertilizer manufacturing operations in other Gulf countries, North Africa, Europe, and China.

During the past decade, PIC acquired interest in five Tunisian fertilizer companies: Industries Chimiques Maghrébines (49%), Société Industrielle d'Acide Phosphorique et d'Engrais (49%), Engrais de Gabès (49%), Compagnie des Industries Chimiques de Gafsa (49%), and Compagnie d'Etudes des Mines de Phosphate Sira Wartan (50%). In June of 1989, Société Industrielle d'Acide Phosphorique et d'Engrais absorbed Industries Chimiques Maghrébines, Compagnie des Industries Chemiques de Gafsa, and Engrais de Gabès. An integrated phosphate processing group with expanded marketing capabilities as well as fully coordinated research and development operations was created.

PIC held a 47.25% interest in a fertilizer complex at Mersin, Turkey, which had the capacity to produce 500 metric tons per day (mt/d) of diammonium phosphate, 215 mt/d of phosphoric acid, 600 mt/d of sulfuric acid, 1,100 mt/d of nitric acid, and 1,800 mt/d of calcium ammonium nitrate. The plant was reported to be operating consistently at 95% capacity through 1989. A contract was awarded in 1988 by the Turkish-Arab Fertilizer Co. (Tagas) for the construction of a second fertilizer plant at Mersin. PIC held a 25% interest in the plant, which will have the capacity to produce 2,000 mt/d of calcium ammonium nitrate and 1,400 mt/d of diammonium phosphate. Scheduled plant completion was early 1992.

Kuwait acquired a substantial interest in the Spanish fertilizer industry amounting to 75% equity in the Ercros group, which ranked fourth among European fertilizer manufacturers.

The Sino-Arab Chemical Fertilizer Co. was a joint venture of the China National Chemical Construction Corp., PIC, and Société Industrielle d'Acide Phosphorique et d'Engrais. The group had a fertilizer plant under construction in China scheduled for completion in 1992 with the capacity to produce 1,600 mt/d of diammonium phosphate or 2,200 mt/d of nitrogen-phosphate-potash.

PIC, in partnership with the Bahrain National Oil Co. and the Saudi Arabian Basic Industries Corp., formed the Gulf Petrochemical Industries Co., which owns and operates an ammonia and methanol complex in Bahrain. The complex had the capacity to produce both ammonia and methanol, each at the rate of 1,200 mt/d. Plans for the complex included the construction of a 1,700-mt/d capacity urea unit.

Mineral Fuels

Natural Gas.—The venting and flaring of associated natural gas in Kuwait has been sharply reduced with the installation of gas recovery facilities. Natural gas is gathered for processing at three locations. Associated natural gas from the fields of Raudhatain and Sabiriya is processed in northern Kuwait, and a mixed liquids stream is delivered by pipeline to the fractionator at Shuaiba. Associated natural gas from the Minagish, Umm Gudair, and South Umm Gudair Fields flows as wet gas to the processing plant at Shuaiba. Associated gas from the Burgan and Magwa-Ahmadi Fields is processed at two field recovery plants. The recovered liquids are then delivered by pipeline to Shuaiba for fractionation. The natural gas liquids plant at Shuaiba has an annual capacity of 4.6 million tons. It would be necessary for Kuwait to sustain crude oil production levels of 3.5 million barrels per day (MMbbl/d) to supply sufficient quantities of associated natural gas to attain this capacity level.

Petroleum.—Increased profits resulting from higher oil prices and an expansion of the company's worldwide exploration and production operations afforded the state-owned KPC record profits of $1,165 million in the year ending June 30, 1989. Throughout the 9 years of its existence, the company averaged a capital gain of 20% according to the KPC annual report.

Exploration.—The Kuwait Foreign Petroleum Exploration Co. (Kufpec) continued to embark on new exploration projects as well as to buy into production acreage with partners from Europe, the United States, and the U.S.S.R. In the second half of 1989, Kufpec engaged in exploration in Yemen and had discovered oil in Egypt and Tunisia and gas in Pakistan. Kufpec has a presence in Australia, China, Indonesia, and the Congo. Joint ventures have been discussed with Algeria, Syria, Thailand, and Vietnam and exploration and production possibilities examined in Italy and Spain.

A joint exploration protocol was signed in February 1989 with the U.S.S.R. The protocol also provided for the adoption of water-injection systems in Kuwaiti fields utilizing U.S.S.R. technology. A more specific agreement was concluded in July 1989 under which the U.S.S.R. was to engage in technical studies of the Bahrah Field for possible development by U.S.S.R. technology.

Production.—During the first half of 1989, Kuwait's production quota as assigned by OPEC was approximately 1.04 MMbbl/d. In the third quarter, the quota was elevated to 1.09 MMbbl/d and finally to 1.15 MMbbl/d in the fourth quarter for an annual average of 1.08 MMbbl/d. Kuwait production for the year, including output from its share in the Divided Zone, however, averaged 1.80 MMbbl/d. In response to Kuwait's request for a higher quota, the first half of 1990 quota was elevated to 1.5 MMbbl/d. Kuwait's production, also including output from its share in the Divided Zone, averaged 2 MMbbl/d during the first half of 1990.

The Kuwait Oil Co., the operating company for the KPC, increased production of light crude oil to maintain the export crude blend at 31.5° API gravity. Additional reservoirs of light crude were to be brought into production by mid-1990 with the oil flow from the Marat formation yielding crude oil of 36° to 38° API gravity.

Refining.—After extensive upgrading of domestic facilities, Kuwait's combined refining capacity was reported at 720,000 bbl/d. All refineries were operated by the Kuwait National Petroleum Co. The largest refinery was the Mina al-Ahmadi at 270,000-bbl/d capacity. Naphtha constituted 23.6% of the output from Kuwait's second largest refining facility, the 250,000-bbl/d-capacity Mina Abdullah refinery. Virtually all of the naphtha production was destined for petrochemical feedstock. The refinery at Shuaiba had a 200,000-bbl/d capacity.

In September 1989, KPC launched a major new oil company, Kuwait Petroleum (Great Britain), to further support its presence in downstream world markets. The basis of the new company was the acquisition of Hays Petroleum Services; Ultramar Marketing Co., United Kingdom; Nafta, Great Britain; and Carless Lubricants. These acquisitions gave the newly formed Kuwaiti company a 5% share of the United Kingdom lubricants market and a 2% share of the retail gasoline market with the Q8 brand visible at more than 1,000 service stations.

An affiliate of KPC purchased the Italian refining and fuels marketing operations of Mobil Oil Italiana SpA. The purchase included a 100,000-bbl/d refinery and associated aromatics plant in Naples and a network of 2,000 service stations.

Kuwait has established an ensured market for a significant portion of its crude oil by the acquisition of foreign refinery operations.

Petrochemicals.—The nation's principal petrochemical complex in Shuaiba was operated by PIC, a wholly owned subsidiary of KPC. Initially commissioned in 1966, the complex steadily expanded, including a fertilizer complex and salt and chlorine plants.

In February 1989, Union Carbide (United States) licensed its technical process to PIC and will provide basic engineering for a 100,000-mt/y-capacity polypropolene plant. The plant will be in the Shuaiba Industrial Zone and will receive its feedstock from the Mina al-Ahmadi refinery. Completion was scheduled for 1992.

In March 1990, KPC announced approval for the construction of a $3 billion ethylene-based petrochemicals complex at Shuaiba. The complex will be based on a 750,000-mt/yr-capacity ethylene cracker that will supply 500,000 mt/yr of ethylene to feed downstream units and supply 250,000 mt/yr of ethylene for export. The complex will include at least eight main units with the following capacities: high- and low-density products at 250,000 mt/yr, monoethylene glycol at 263,000 mt/y, triethylene glycol at 27,000 mt/yr, benzene at 300,000 mt/yr, styrene monomer at 385,000 mt/yr, polystyrene at 150,000 mt/yr, paraxylene at 400,000 mt/yr, and orthozylene at 150,000 mt/yr.

RESERVES

Kuwait's proven reserves of crude oil were officially estimated at 94.5 billion barrels as of January 1, 1990. This figure includes proven reserves of 2.6 billion barrels from the Kuwait portion of the reserves in the Divided Zone shared with Saudi Arabia. More than one-half of the petroleum reserve is in the Burgan Field.

Natural gas reserves were officially estimated at 1,400 billion cubic meters as of January 1, 1990.

INFRASTRUCTURE

Kuwait's highway system totals 3,000 kilometers, most of which is bituminous surfaced and traverse the country from

north to south with a greater concentration of highways between Kuwait City and the port cities of Shuaiba and Mina al-Ahmadi to the South.

The petroleum and natural gas industry was serviced by a network of pipelines operated by KOC. These pipelines connect major fields to the export terminals and/or the refineries. The network is described in the 1988 OPEC Annual Statistical Bulletin as follows:

Crude oil pipelines:	
Raudhatain-Ahmadi	92 km
Minagish-Ahmadi	48 km
Umm Gudair-Shuaiba	42 km
Wafra-Mina Abdullah	57 km
Burgan-Ahmadi	22 km
Natural gas pipelines:	
Raudhatain-Ahmadi	92 km
Maqwa-Ahmadi	16 km
Umm Gudair-Shuaiba	65 km
Burgan-Ahmadi	22 km

In addition to the domestic pipeline network, two 170-km-long parallel pipelines transported natural gas and condensates from Iraq's southern fields to collection stations in northern Kuwait for distribution to power stations and industrial plants in the country.

OUTLOOK

Before the Iraqi invasion and occupation of Kuwait on August 2, 1990, spending by the Kuwaiti Government was the impetus for domestic business activity. Spending programs included housing, road construction, education, public utilities, telecommunications, and medical care. Among the major development projects was the electrical grid interconnecting Gulf Cooperation Council States.

The Kuwaiti Government in exile was supported by the United Nations, and the economic boycott imposed on Iraq continued at the time of this writing.

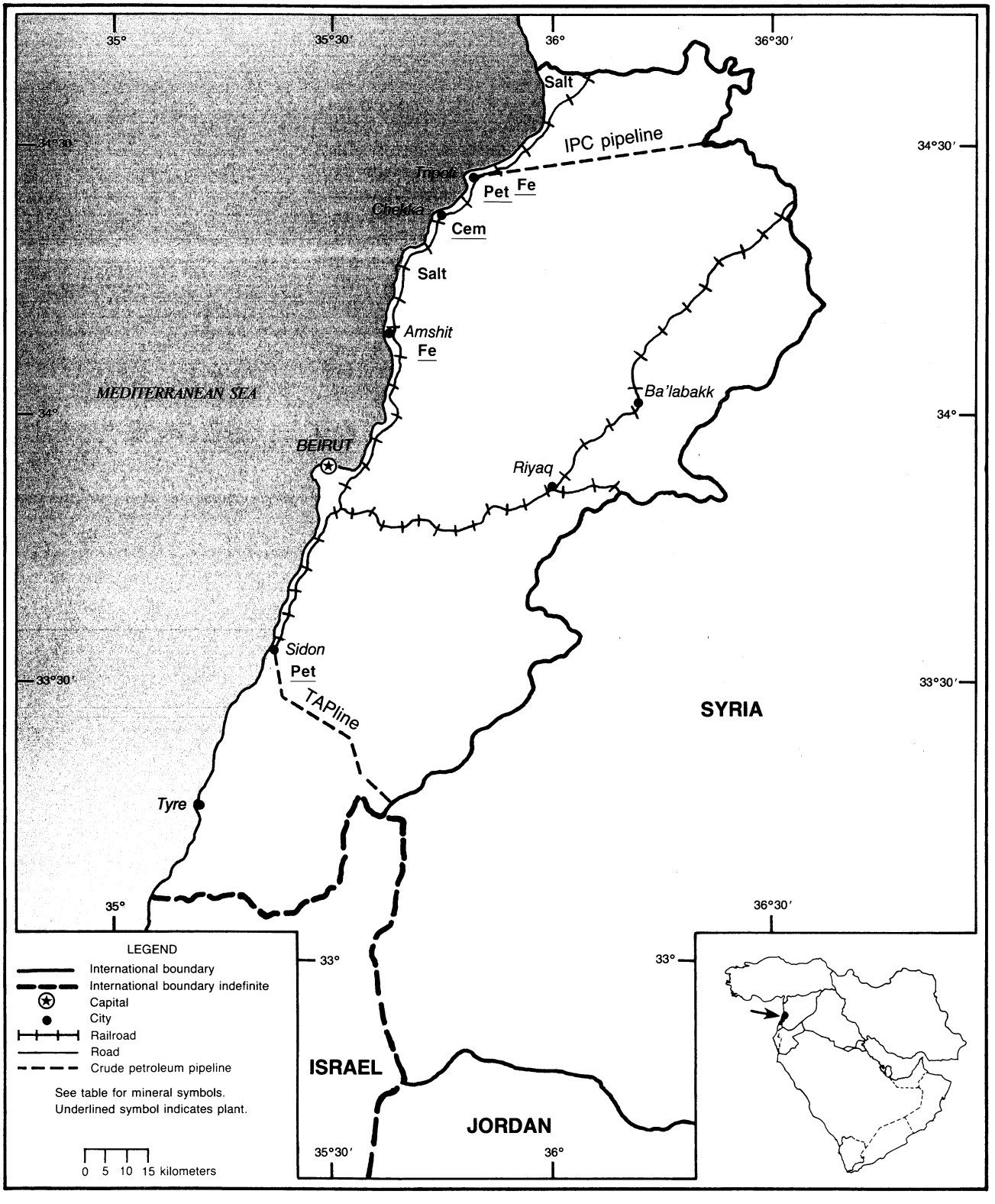
OTHER SOURCES OF INFORMATION

Publications

Kuwait Petroleum Corp. (KPC)
Ninth Annual Report, 1988–89.
OPEC Annual Statistical Bulletin 1989, Vienna, Austria.

LEBANON

AREA 10,400 km² **POPULATION 3.3 million**



THE MINERAL INDUSTRY OF

LEBANON

By Bernadette Michalski

Many of Lebanon's industrial enterprises, including its minerals sector, have been seriously damaged or disrupted during the course of the 15-year-old civil war. Most seriously affected has been the fuel supply network. Dependent upon imports of crude oil and petroleum products for most of its energy requirements, the nation suffered serious shortages because tankers were damaged while calling on besieged ports. Confidence in the Lebanese pound collapsed, depreciating by 80% in 1987, and, by 1990, virtually no international trading was conducted in this currency.

The external debt was reported by the International Monetary Fund at $935 million at the close of 1988, the latest year for which data were available.

GOVERNMENT POLICIES AND PROGRAMS

Lebanese law permits private ownership of subsoil resources, but Government licenses are required for the exploitation of minerals. Domestic fuels sales are controlled, subsidized, and priced by the Government.

In May 1989, an Arab League summit meeting established a three-member (Saudi Arabia, Algeria, and Morocco) Arab committee with a 6-month mandate to achieve a peaceful settlement to the Lebanese civil war. Efforts at reconciliation of political differences among contending parties appeared close to fruition, and a tenuous cease-fire was in effect.

PRODUCTION

Mineral production entirely from indigenous deposits was limited to the production of salt and the quarrying of raw materials for the construction industry. The petroleum refineries were totally dependent upon imported crude oil delivered by tanker. The steel industry utilized domestic and imported scrap as raw material. Actual production data have not been reported in recent years.

TRADE

Mineral trade remained limited in 1989. Although trade in gold in any

TABLE 1

LEBANON: PRODUCTION OF MINERAL COMMODITIES[1]

Commodity		1985	1986	1987	1988[p]	1989[e]
Cement, hydraulic[e]	thousand tons	1,000	[r]900	[r]900	[r]900	900
Gypsum[e]	tons	3,000	3,000	2,000	2,000	2,000
Iron and steel: Metal, semimanufactures[e]	do.	90,000	80,000	80,000	80,000	75,000
Lime[e]	do.	10,000	[r]10,000	10,000	10,000	10,000
Petroleum refinery products:						
Liquefied petroleum gas	thousand 42-gallon barrels	230	194	141	140	125
Gasoline	do.	1,275	2,566	2,015	2,000	1,800
Jet fuel	do.	160	218	92	100	90
Kerosene	do.	120	129	151	150	130
Distillate fuel oil	do.	1,566	2,234	1,723	1,725	1,600
Residual fuel oil	do.	1,232	2,264	3,388	3,400	3,200
Other	do.	150	153	35	40	35
Refinery fuel and losses	do.	590	735	510	500	450
Total	do.	5,323	8,493	8,055	8,055	7,430
Salt[e]	thousand tons	5	3	3	3	3

[e] Estimated. [p] Preliminary. [r] Revised.
[1] Table includes data available through June 1, 1990.

form was permitted and did not require a license, the Government maintained a monopoly on crude oil and petroleum product imports. These imports were estimated at 7.4 million barrels of crude oil, 4.5 million barrels of residual fuel oil, 3 million barrels of gasoline, 1.5 million barrels of distillate fuel oil, and 0.8 million barrels of liquefied petroleum gas. The Arab states were Lebanon's principal trading partners; however, the United States exported to Lebanon 3,000 barrels of petrochemical naphthas, 1,000 barrels of pentane plus, 9,000 barrels of lubricants, and 140,000 barrels of petroleum coke in 1989.

STRUCTURE OF THE MINERAL INDUSTRY

Lebanon was basically a free-enterprise-oriented economy. Most mineral operations in Lebanon remained privately owned, including all cement plants, steel mills, and building material quarries. Fuel imports, however, were controlled by the Lebanon Ministry of Petroleum. The nation had two refineries. The Tripoli operations came under Government control with the nationalization of Iraq National Oil Co.'s properties in March 1973. The second refinery, operated by the Mediterranean Refining Co. at Zahrani, came under full Government control by 1987. Operations at both refineries remained severely restricted by war damage and the inability of tankers to deliver crude oil. The cease-fire agreement resulted in a modest increase in deliveries in spite of periodic breaches of the cease-fire accord.

COMMODITY REVIEW

Industrial Minerals

The bulk of cement manufacturing was centered in the north coastal region of Chekka; however, a single cement plant was near the port of Sidon in the south. These plants were designed to service the domestic market during the construction boom of the mid-1960's as well as to provide a substantial volume for export. Production in recent years has been curtailed for lack of supplies, equipment, and electric power and because of damaged plant facilities and export terminals as well as a myriad of other problems associated with the civil war and world market conditions.

Mineral Fuels

Lebanon did not produce any indigenous hydrocarbons and was totally dependent upon imported crude oil to supply its two refineries. Product output from these refineries has supplied from 30% to 45% of the nation's requirements, with the remainder satisfied by petroleum product imports. About 85% of all electricity produced in Lebanon was derived from powerplants operating on fuel oil; the remainder was supplied by hydroelectric power.

Reserves

The nation's only known commercial minerals were salt and quarried building materials. No information about reserves has been reported.

INFRASTRUCTURE

Lebanon's principal port, Beirut, had undergone repeated shelling, resulting in chronic disrepair and intermittent serviceability during the 15-year civil war. The Ports of Sidon and Tripoli essentially served as tanker terminals for the Zahrani and Tripoli refineries, respectively. These ports also suffered heavy war damage, and this condition, combined with the threat to offloading tankers in a war zone, has resulted in limited utilization. The tenuous cease-fire agreement in May 1989 only briefly resulted in increased port activity because the cease-fire agreement was frequently breached.

TABLE 2

LEBANON: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity[1]
Cement	Cimenterie Nationale S.A.L. (100% private ownership)	Chekka	1,300
Do.	Societe Libanaise des Ciments Blancs (100% private ownership)	65 km north of Beirut	1,900
Do.	Societe des Ciments Libanais (100% private ownership)	70 km north of Beirut	150
Do.	Ciment de Sibline (100% private ownership)	Sidon	150
Petroleum products	Tripoli Refining Co. (100% Government ownership)	Refinery at Tripoli	[2]20
Do.	Mediterranean Refining Co. (100% Government ownership)	Refinery at Zahrani	[2]17
Steel	Lebanon Steel Mill Co. (100% private ownership)	Mill at Tripoli	100
Do.	Consolidated Steel Lebanon S.A.L. (100% private ownership)	Mill at Amshit	240

[1] Thousand metric tons per year unless otherwise specified.
[2] Thousand barrels per day.

The nation's 378 kilometer railroad, most of which is 1.435-meter gauge, was virtually inoperable because it primarily paralleled the coastal area where most of the hostilities took place.

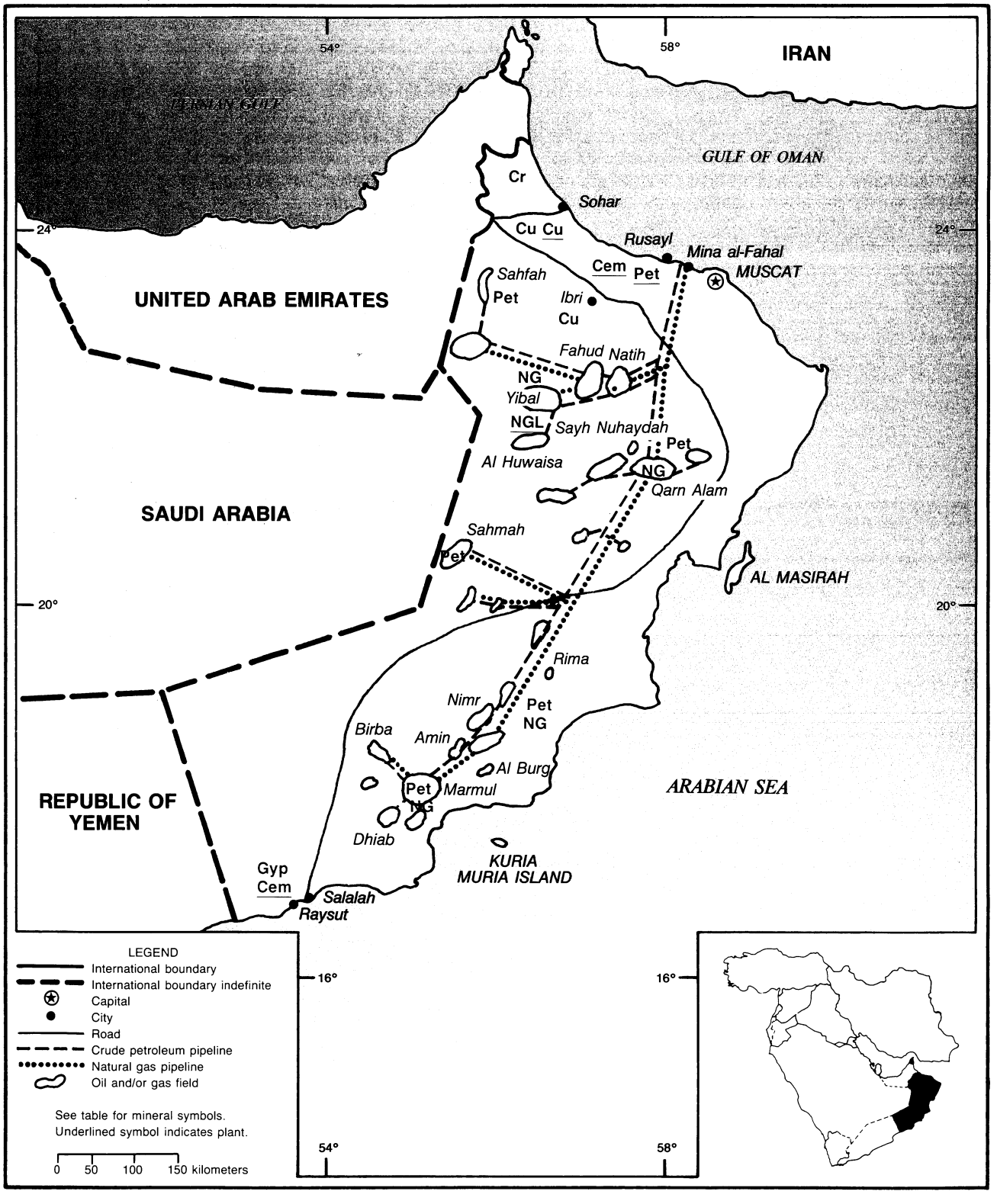
OUTLOOK

Lebanon entered its 15th year of civil war in 1989. In March, heavy fighting erupted, devastating Beirut and nearby coastal areas. Sporadic shelling and air attacks continued despite the cease-fire agreement established in May. Before the eruption of hostilities in the early spring, the Lebanese economy experienced a limited resiliency. In early 1989, foreign exchange reserves rose to $1.1 billion, the highest since 1985. In the 12 months preceding the 1989 hostilities eruption, the Lebanese pound lost 26% of its value, a considerable improvement over the previous 2 years when depreciation was 80% per year. In January 1988, the exchange rate was £L409 = US$1.00 and £L530.5 = US$1.00 the succeeding year.

The charter of reconciliation ratified by the Lebanese Parliament meeting in Saudi Arabia in November 1989 called for modest measures to accommodate the demands of both the Muslim and Christian parties. Although this effort represented significant progress in achieving a settlement, hostilities erupted again in February 1990.

OMAN

AREA 212,460 km² **POPULATION 1.4 million**



THE MINERAL INDUSTRY OF

OMAN

By Bernadette Michalski

Although much progress has been made in recent years toward diversification, Oman remains dependent on hydrocarbons to underwrite its developing economy. Petroleum and natural gas supply about 90% of Government revenues. Other commercial mineral industries include copper mining and refining with gold and silver as byproducts, cement manufacturing, and dimension as well as crushed stone operations. Further evaluation of precious metals and chromite deposits may lead to commercial mining in the northern regions of the country.

The main industrial facilities include a petroleum refinery, gas processing plants, a copper smelter and refinery, and two cement works. All but the copper operations produce primarily for the domestic market.

The gross domestic product rose by 10.8% in 1989. The critical element in this growth rate was the 22% increase in crude oil and natural gas production. Growth in nonpetroleum sectors was only slightly more than 3%.

GOVERNMENT PROGRAMS AND POLICIES

The director of the Department of Geological Survey of the Ministry of Petroleum and Minerals announced the commencement of a five-phase geological mapping program of the entire Sultanate in December. The contract for the project was awarded to the Bureau de Recherches Geologiques et Minieres (France). The initial phase of the project covers the study of data from previous reports and mapping. The second phase addresses the study of local stratigraphy, topography, and the coastal region. Phase three calls for actual mapping and prospecting for mineral resources. Phase four includes geochemical exploration, and the final phase will be the printing of a geological map at the scale of 1:250,000.

The tax laws were adjusted at the close of 1989, introducing a 5% tax on Omani wholly owned companies posting net profits of more than $78,000 and below $520,000 and a 7.5% tax on net profits exceeding $520,000. Formerly, only firms with joint-venture arrangements with foreign companies were taxed.

PRODUCTION

Crude oil production continued to steadily increase as the number of producing fields reached 57 by early 1989. Natural gas and crude petroleum production rose by 22% over that of 1988. Chromite production was entirely dependent on export contracts. Although production was reported for 1989, by yearend, it was discontinued pending a decision to construct a ferrochrome plant.

TRADE

Government-released figures indicate that 1989 was a highly successful year for the economy. The trade surplus rose by two-thirds to $1,675 million. The trade account was enriched by a 19% rise in oil exports to $3,490 million. Total imports were reduced to $2,252 million in 1989 from $2,337 for the previous year. Nearly 90% of all export earnings were derived from petroleum. More than 206 million barrels were exported in 1989. Japan purchased nearly 83 million barrels, and the Republic of Korea imported about 50 million barrels. U.S. imports of Omani crude was nearly 7 million barrels. Copper exports were reported at 15,080 tons in 1989, with markets principally in the United Kingdom and Saudi Arabia.

STRUCTURE OF THE MINERAL INDUSTRY

The Government maintains a majority interest in most companies; however, foreign partnerships are encouraged.

COMMODITY REVIEW

Metals

Copper.—Three copper mines, one open pit and two underground, were operating in the Sohar area. Almost one-half of Oman's copper production is extracted from the Lasail Mine, with much of the remaining output derived from the Aarja surface mine that commenced operation in 1989. A minor amount was produced from the Bayda Mine, where reserves are near exhaustion. The blended ore from the three mines is beneficiated to yield about 75,000 tons of concentrates annually. The concentrate is processed at the adjacent smelter and refinery yielding approximately 15,000 to 16,000 tons of copper cathodes, which are exported under a contract with Amalgamated Metals Corp. of the United Kingdom. Copper output for 1990 was projected at 15% less owing to lower ore grade and the complex mineralization of the Aarja deposit. Additionally, about 20 kilograms of combined silver and gold is recovered annually as byproducts in the anode slime.

The Sohar copper deposits are nearing exhaustion; however, commercial deposits of copper with a relatively high gold content were discovered at Hajl al-Safi and Raka in Ibri about 150 kilometers (km) south of the Oman Mining Co.'s smelter at Suhar. Early studies conducted on behalf of the Sultanate indicate the deposits may contain 8 to 12 million tons of ore.

Although the copper smelter was designed to produce 20,000 tons of metal annually, actual production was about 15,000 to 16,000 tons. The smelter design performance was based on a 2.0% copper content of ore. Ore production, however, averaged 1.5% copper. Revenue from the Sohar smelter product was reported to be $41.6 million in 1989.

TABLE 1

OMAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Country and commodity		1985	1986	1987	1988[p]	1989[e]
Cement, hydraulic		648,501	[e]700,000	839,796	864,915	[2]947,672
Chromite, gross weight		—	4,820	—	—	[2]12,810
Copper:						
Mine output, Cu content		17,700	18,200	18,121	17,065	[2]22,600
Metal:						
Smelter		18,800	19,601	[e]19,500	16,500	15,200
Refinery		14,300	14,561	15,490	16,473	[2]15,080
Gas, natural:						
Gross	million cubic meters	3,965	4,589	4,650	6,088	7,000
Dry	do.	2,208	2,152	2,265	2,449	3,000
Natural gas liquids: Butane and propane	thousand 42-gallon barrels	1,200	1,460	2,120	2,130	2,135
Petroleum:						
Crude	do.	181,800	204,100	212,430	226,600	275,000
Refinery products:						
Gasoline	do.	3,243	3,585	2,864	3,431	3,450
Jet fuel	do.	1,462	1,476	928	948	950
Kerosene	do.	85	70	77	80	80
Distillate fuel oil	do.	3,930	3,880	3,565	4,459	4,500
Residual fuel oil	do.	8,570	9,363	7,373	7,800	8,000
Other	do.	809	938	900	1,000	1,000
Total	do.	18,099	19,312	15,707	17,718	17,980
Sand and gravel	thousand tons	[e]6,642	7,514	7,590	4,719	[2]5,539
Stone:						
Marble	do.	[e]37	44	39	41	[2]33
Other	do.	[e]4,000	2,875	248	1,335	[2]1,396
Sulfur		31,000	31,000	30,000	30,000	32,000

[e]Estimated. [p]Preliminary.
[1]Table includes data available through July 30, 1990.
[2]Reported figure.

Chromite.—The Rajmi chromite mine near Sohar yielded about 2,000 tons of ore annually between 1985 and 1988. The mines in the Sohar region yield refractory-grade and metallurgical-grade chromite. All output was destined for the export market. Japan purchased 800 tons of Omani refractory-grade chromite in 1989, and Fond Metall International AB of Sweden purchased 12,000 tons of metallurgical-grade chromite in mid-1989. Exports and, consequently, mining operations, were suspended pending a decision on the construction of a ferrochrome plant that was under consideration by a joint committee of the Ministries of Commerce and Industry and Petroleum and Minerals. The proposed annual capacity of the plant was 25,000 to 50,000 tons of refined product.

INDUSTRIAL MINERALS

Cement.—The manufacture of cement is conducted at Rusayl and at Salalah. The Oman Cement Co.'s Rusayl plant accounts for about 85% of the nation's output. Fuel for cement production is provided by natural gas via the Government Gas System network.

Marble.—In mid-1989, an industrial license was issued for the extraction and processing of 28,800 square meters of marble annually at Suhar.

MINERAL FUELS

Natural Gas.—More than two-thirds of Oman's natural gas reserves are represented by associated gas. Total reserves were increased to 280 billion cubic meters with the 1989 discovery of an unassociated gas deposit beneath the Saih Nihayda Field at a depth of 4,000 to 4,500 meters. Almost 80% of all natural gas production is utilized, and that figure should be further improved when gas handling facilities are in place for the sour associated gas produced from the Yibal Khuff formation.

About 7 million cubic meters of natural gas was produced daily from the Yibal Field, while the Fahud and Saih Nihayda Fields each account for almost 1 million cubic meters daily.

Field operations, including reinjection, absorbed almost one-half of the natural gas produced. About one-third of

TABLE 2

OMAN: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity[1]
Cement	Oman Cement Co. (Government, 100%)	Rusayl	600.
Do.	Salalah Cement Works (Raysut Cement Co., 80%; Government, 20%)	Salalah	210.
Chromite	Oman Mining Co. (Government, 100%)	30 kilometers northwest of Sohar	20.
Copper	do.	Mine at Sohar Smelter at Sohar	1,500 ore. 20 blister copper.
Natural gas	Petroleum Development Oman Co. (Government, 60%; Royal Dutch/Shell, 34%; Compagnie Francais des Petroles 4%; Partex-Portgual, 2%)	Yibal Field and others	7.[2]
Natural gas liquids	do.	Yibal	7.[3]
Petroleum:			
Crude	do.	Yibal-Shuaiba, Fahud, and Rima	700.[3]
Do.	Occidental Group.	Sahfah Field	22.[3]
Do.	Elf-Aquitaine Oman Ltd. (Elf-Aquitaine, 48%; Sumitomo Petroleum Development Co., 32%; Wintershall AG, 20%)	Sahmah Field	6.[3]
Products	Oman Refinery Co. (Government, 100%)	Mina al-Fahal	80.[3]

[3]Thousand metric tons per year.
[2]Thousand cubic meters per year.
[3]Thousand barrels per day.

production is distributed by the Government Gas System network.

The collection and processing of both associated and nonassociated gas in Oman is centered at three plants: the Fahud gas processing plant, the 2.2-million-cubic-meter-per-day capacity Saih Nihayda gas treatment plant, and the Yibal gas processing plant now under expansion with capacity projected at 16.6 million cubic meters per day by 1992.

Petroleum.—An intense decade of exploration has yielded a steady growth in crude oil reserves reported in excess of 4.3 million barrels in 1990. More than one-half of the reserves are in the northern region. Petroleum Development Oman Co., the Government-owned principal operating company in the Sultanate, announced two discoveries in December 1989. The Hawqa Field in the central Bahja region yielded a light crude oil at a depth of 2,200 meters. An appraisal well at the Al Burj Field in the southern region tapped a new reservoir representing a major extension of the field.

Unencumbered by quotas imposed on members of the Organization of Petroleum Exporting Countries (OPEC), production during the past decade maintained a constant growth spiral. The Petroleum Development Oman Co. remains responsible for 97% of production. Other producers were Occidental Oman of the United States and Elf Aquitaine of France. The Japex Oman Co. was to initiate production from the Daleel Field in mid-1990 at the rate of 8,000 barrels per day (bbl/d).

Less than 10% of crude oil production is refined domestically; almost 90% is exported. Japan, recognizing the strategic importance of a supply source independent of the Strait of Hormus, has been a traditional market for Omani crude oil, purchasing 40% to 50% of all exports for the past decade.

Oman's sole refinery, the Mina al-Fahal, came on-stream at a capacity of 50,000 bbl/d in 1982. By 1988, an expansion was completed, raising capacity to 80,000 bbl/d. Refinery throughput in 1989 was 55,000 bbl/d. Refinery output is designed to meet domestic demand, and the bulk of its output is consumed in the Sultanate. A feasibility study for the possible expansion of the refinery to allow a greater share of production for the export market is under consideration by the Government.

RESERVES

The Ministry of Petroleum and Minerals has announced proven copper ore reserves at 8 million tons and proven chromite reserves at 1.6 million tons. Petroleum reserves are reported at 4.3 billion barrels. Natural gas is reported at 280 billion cubic meters. Coal resources in the Misaw Valley are reported at 36 million tons.

INFRASTRUCTURE

The Omani highway system totals 22,800 km, of which only 18% is bituminous surfaced with the remainder described as motorable track.

Petroleum and natural gas pipelines total 1,300 km and 1,030 km, respectively. The bulk of crude oil production is serviced by the central pipeline running from the Dhiab Field in the south to Mina al-Fahal near Muscat on the northern coast. The petroleum tanker terminal at Mina al-Fahal can accommodate tankers up to 550,000 deadweight tons. The port has 8 storage tanks with

a combined capacity of 3.6 million barrels.

OUTLOOK

The Sultanate of Oman has enjoyed a stable economy sustained by hydrocarbon revenues for more than a decade, and the economy should continue in this vein. Although petroleum and natural gas output is modest, reserves continue to outpace reservoir withdrawals, affording a substantial economic base for at least the next 20 years at the current rate of production.

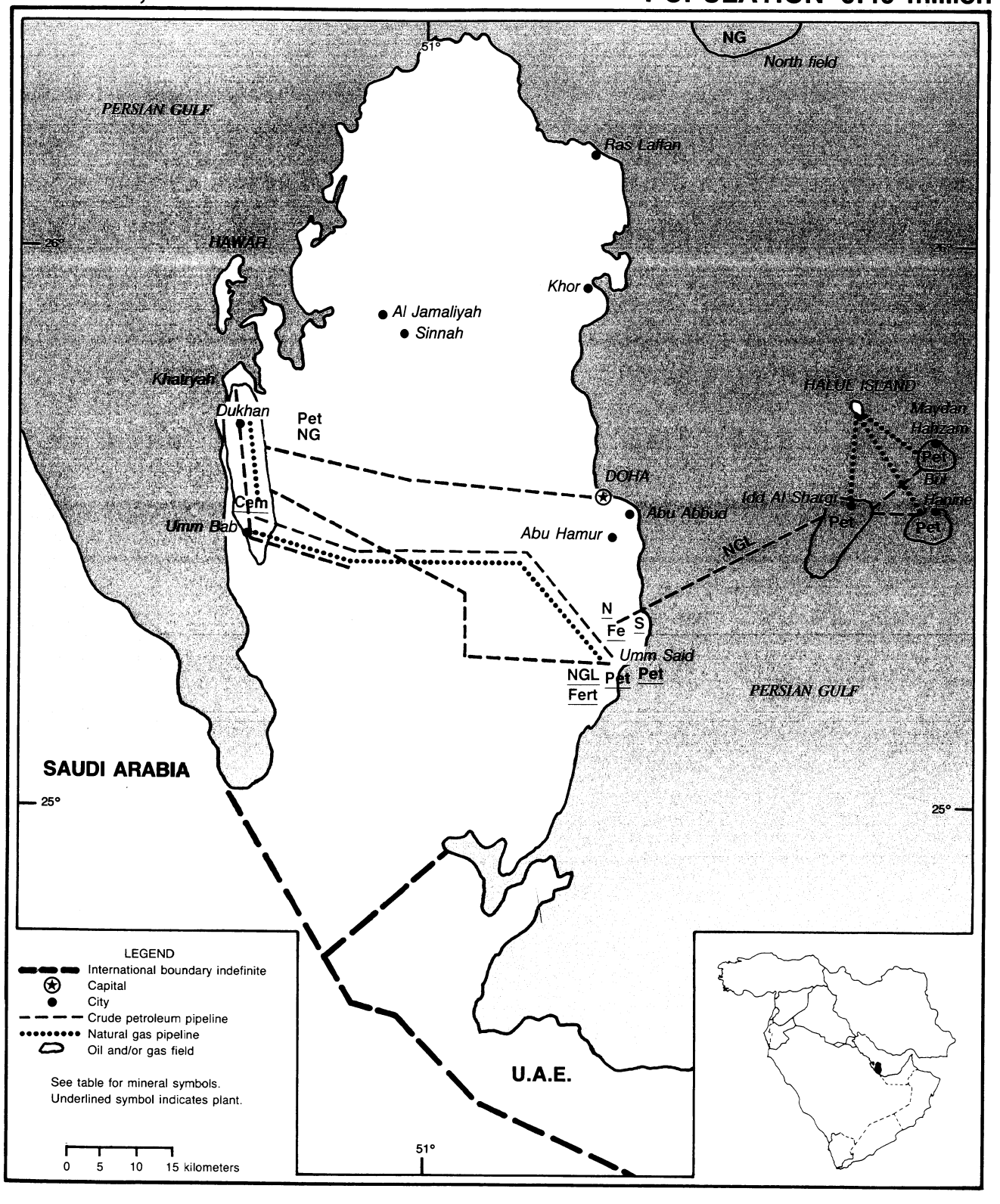
The mining of copper and chromite offers a basis for some diversification and the potential for increased export earnings. The development of a mining code to facilitate foreign investment in mineral projects and the completion of major infrastructure projects are Government priorities.

OTHER SOURCES OF INFORMATION

Ministry of Petroleum and Minerals
P.O. Box 551
Muscat, Oman
Directorate General of Petroleum
and Minerals
P.O. Box 18205
Salalah, Oman
Petroleum Development Oman
P.O. Box 81
Muscat, Oman

QATAR

AREA 11,000 km² **POPULATION 0.49 million**



THE MINERAL INDUSTRY OF

QATAR

By David Izon

Qatar, one of the smaller members of the Organization of Petroleum Exporting Countries (OPEC), relied mainly on oil and natural gas as its primary mineral resources. Qatar did not play a significant role in world production of crude oil, producing less than 1% of world output. However, Qatar's North Field is reported to be the largest nonassociated gas reserve in the world. Decreasing petroleum reserve figures prompted the country to reevaluate its resources and direct attention toward the development of the vast North Field.

Owing to existing abundant supply of natural gas in the North Field, the Government planned to expand its industries to include an aluminum smelter with a production capacity of 193,000 metric tons per year (mt/yr). Also, plans were underway for the construction of a $300 million ferroalloy smelter in Umm Said. Efforts to diversify the mineral industry included construction of a petrochemical plant, a fertilizer plant, and a steel plant. Although Qatar has continued to diversify its industrial base, the economy still depended mostly on oil exports, which accounted for about 90% of the country's revenues. In 1989, Qatari revenues exceeded their budget projections by $400 million owing to higher oil prices and increased production.

Qatar traded mostly with the United Kingdom and Japan. In addition to oil, Qatar also exported natural gas liquids (butane, propane, and natural gasoline), mostly to Japan and east Asia. Fertilizer was marketed by Norsk Hydro AS, the foreign partner in the fertilizer plant. Also, steel was exported to neighboring Arab states. The United States received approximately 1% of Qatar crude oil exports in 1989. Imports from the United States included chemical compounds and semimanufactured metals. The Government actively sought foreign and local investors for its natural gas projects. Investment patterns remained unchanged with the Government adopting a cautious approach to large-scale investments during 1989.

GOVERNMENT POLICIES AND PROGRAMS

Major Government policy emphasized the importance of developing a new industrial site dependent on gas as the main energy source and feedstock. Comprehensive plans have been approved by Qatar to build a new industrial town at Ras Laffan. This site was designed to house phase two of the gas-based industries, led by a 2,500-mt/yr methanol plant and a 450,000-mt/yr petrochemical complex. Plans were also underway to expand the fertilizer and petrochemicals complexes at Umm Said because Umm Said may soon not be able to meet demand. On December 11, 1989, the Qatar General Petroleum Corp. (QGPC) signed an agreement for a $400 million loan syndicated by nine banks to finance the North Field's $1.3 billion first phase of development. Income from the expected 50,000 barrels per day (bbl/d) of liquids and condensates, which are to be exported, will be used to repay the loan over 3 years.

In an effort to attract foreign investor participation in Qatar industries, the visa system was liberalized to smooth the way for business visitors. In July 1989, an agreement was signed between the Government and Pennant Holdings of Australia to build a $300 million ferroalloy smelter. The complex was expected to produce ferrochrome, ferromanganese, and silicomanganese. In 1989, the Government announced a 43% cut in the budget for building, public works, social, and health projects. The cutback in capital spending was designed to encourage funding of only essential infrastructure projects.

PRODUCTION

The Government planned to expand its fertilizer and petrochemical complexes to cope with domestic and external demand. The petrochemical plant reported record levels of production while the fertilizer and steel plants reported increased productions above rated capacities. Petroleum and natural gas production also increased.

TRADE

Qatar's main trading partners in 1988,the latest year for which data were available, were Japan, the United Kingdom, the United States, and neighboring Arab states. Qatar's total imports for 1988 amounted to $1,267.3 million, of which imports from the United States were $118 million. Total exports amounted to $2,200 million in 1988, and oil accounted for the major part of the country's export trade volume.

Government sources estimated the 1989 revenue from oil exports to be $2 billion. Major commodities imported were iron ore and raw materials for the steel and construction industries.

STRUCTURE OF THE MINERAL INDUSTRY

The Qatari mineral industry was dominated by oil and gas. The Government has a controlling interest in al-

TABLE 1

QATAR: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
Cement, hydraulic		318,000	308,000	303,000	[e]300,000	300,000
Gas, natural:						
Gross	million cubic meters	6,073	6,487	6,439	7,405	8,500
Marketed[e]	do.	[3]5,304	5,600	5,600	6,400	7,400
Iron and steel: Metal:						
Steel, crude	thousand tons	533	507	492	527	[3]550
Semimanufactures	do.	510	493	503	505	530
Natural gas liquids:	thousand 42-gallon barrels[e]	[3]12,789	13,600	13,500	15,000	[3]13,231
Nitrogen: N content of ammonia		524,800	544,100	560,800	605,665	[3]714,000
Petroleum:						
Crude	thousand 42-gallon barrels	111,800	102,000	106,945	124,445	[3]142,715
Refinery products:						
Gasoline	do.	2,169	2,130	2,125	[e]2,150	[3]3,794
Jet fuel	do.	723	710	608	[e]625	[3]2,827
Kerosene	do.	27	32	35	[e]35	[3]23
Distillate fuel oil	do.	1,678	3,148	2,685	[e]2,700	[3]4,906
Residual fuel oil	do.	3,668	4,162	3,929	[e]4,000	[3]5,579
Other[4]	do.	558	696	[e]800	[e]900	[3]1,771
Total	do.	8,823	10,878	[e]10,182	[e]10,410	18,900
Stone: Limestone[e]	thousand tons	1,100	900	900	900	900
Sulfur		36,500	48,500	53,300	[e]55,000	52,000

[e] Estimated. [p] Preliminary.

[1] Table includes data available through Nov. 15, 1990.

[2] In addition to the listed commodities, Qatar produced clays, sand, gypsum, and gravel for construction purposes.

[3] Reported figure.

[4] Includes refinery fuel and losses.

most all of Qatar's mineral industry. Of Qatar's labor force of about 104,000 people, 90% were noncitizens, and an estimated 25,000 worked in oil-related fields. Only 189 of the approximately 1,000 people employed in the steel industry were Qataris.

COMMODITY REVIEW

Metals

Aluminum.—In October 1989, the Government signed a memorandum of understanding with Davy McKee, a subsidiary of Davy Corp. of the United Kingdom, to build a 193,000-mt/yr aluminum smelter and associated water desalination and powerplants. The project, which was to be sited at Umm Said, was planned to generate power using natural gas from the North Field. The Government envisaged 100% financing of the project by Davy McKee, with Qatar taking royalties and being given the option of acquiring 30% equity in the plant in the first 10 years. Negotiations were not finalized by yearend 1989.

Ferroalloys.—In mid-1989, the Government announced an agreement signed with an Australian company, Pennant Holding Co., to build a 230,000-mt/yr ferroalloy complex at Umm Said. The planned products were 110,000 mt/yr of ferromanganese, 70,000 mt/yr of silicomanganese, and 60,000 mt/yr of ferrochrome. Raw materials for the plant, other than gas, were to be imported from the Pennant mines in Australia. Pennant owns coal, iron ore, and manganese mines in Australia. The complex will be run by Qatar Ferro Alloy Smelter, which held a 30% interest in the joint venture. A 120-megawatt power station was to be built at the site by Vitkovice of Czechoslovakia.

Iron and Steel.—Qatar Steel Co. (QASCO) maximized its production to a record level of 550,000 mt/yr in 1989, which was above its rated capacity of 400,000 mt/yr. The increase in production at the plant was attributed to operational improvements. The plant used two 70-ton electric furnaces and two continuous casters to produce carbon steel for rolling into reinforcement bars. It sold 90% of the output to neighboring Gulf Co-operation Council states. Iron oxide pellets were imported from Brazil and India, and steel scraps that were formerly imported from the United States were obtained locally. Owing to lower demand and surplus supply of products, the Government has started searching for other markets. Qatar was particularly focusing on the Iranian market, but

TABLE 2

QATAR: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	Sources	
		United States	Other (principal)
METALS			
Aluminum:			
Oxides and hydroxides	22	7	Japan 15.
Metal including alloys:			
Unwrought	172	—	Bahrain 126; Egypt 40.
Semimanufactures	3,019	134	Bahrain 991; Oman 273; Belgium-Luxembourg 284.
Copper: Metal including alloys, unwrought	1,645	1	Greece 759; Brazil 372; United Kingdom 312.
Iron and steel:			
Iron ore and concentrate including roasted pyrite	699,370	—	Brazil 401,529; Sweden 134,634; Chile 69,110.
Metal:			
Scrap	13,812	—	Bahrain 9,146; United Arab Emirates 3,672.
Pig iron, cast iron, related materials	10,285	—	Australia 2,961; China 2,375; Japan 2,300.
Steel, primary forms	3	—	All from Lebanon.
Semimanufactures:			
Bars, rods, angles, shapes, sections	14,946	—	Saudi Arabia 3,880; United Kingdom 2,175; East Germany 1,340.
Universals, plates, sheets	7,083	—	Japan 2,864; United Kingdom 881; West Germany 665.
Hoop and strip	46	—	Japan 35; United Kingdom 11.
Wire	1,197	—	China 490; Saudi Arabia 416; United Arab Emirates 151.
Tubes, pipes, fittings	33,752	211	Brazil 20,297; Japan 7,973; France 3,698.
Castings and forgings, rough	4	—	Mainly from Belgium-Luxembourg.
Mercury kilograms	109	—	All from United Kingdom.
Platinum-group metals: Metals including alloys, unwrought and partly wrought do.	675	—	United Kingdom 650; France 25.
Silver: Metal including alloys, unwrought and partly wrought do.	720	—	All from West Germany.
Tin: Metal including alloys, unwrought[2]	7	—	All from Japan.
Uranium and thorium: Metal including alloys, all forms	4	—	Mainly from Canada.
Zinc: Metal including alloys, unwrought[2]	26	—	Belgium-Luxembourg 19; United Kingdom 4.
Other: Oxides and hydroxides	572	41	Taiwan 160; West Germany 106; Saudi Arabia 96.
INDUSTRIAL MINERALS			
Abrasives, n.e.s.:			
Natural: Corundum, emery, pumice, etc.	1,628	—	Netherlands 1,610.
Grinding and polishing wheels and stones	187	—	Italy 71; Brazil 43; Netherlands 34.
Cement	81,141	—	United Arab Emirates 73,684; Saudi Arabia 3,771.
Chalk, crude	3,555	—	Greece 1,500; United Arab Emirates 1,231; Japan 251.
Clays, crude	3,851	—	United Arab Emirates 1,823; Belgium-Luxembourg 500; Netherlands 389.
Fertilizer materials: Manufactured:			
Ammonia	6	—	United Kingdom 4; West Germany 2.
Phosphatic	170	99	Belgium-Luxembourg 55.
Potassic	150	—	All from Saudi Arabia.
Gypsum and plaster	5,540	—	Saudi Arabia 4,772; United Arab Emirates 513.
Lime	122	42	Saudi Arabia 50; Bahrain 30.

See footnotes at end of table.

TABLE 2—Continued

QATAR: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	Sources	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Salt and brine		3,747	—	Netherlands 1,402; United Arab Emirates 800; Saudi Arabia 428.
Sodium compounds, n.e.s.: Sulfate, manufactured		772	5	United Arab Emirates 296; Saudi Arabia 89; Kuwait 81.
Stone, sand and gravel:				
Dimension stone, crude and partly worked		4,120	—	Jordan 1,559; Iran 1,423; Italy 543.
Limestone other than dimension		22	—	All from Saudi Arabia.
Sand other than metal-bearing		10,533	—	United Arab Emirates 4,395; Netherlands 3,194.
Sulfur: Elemental:				
Crude including native and byproduct		318	—	United Arab Emirates 283; Saudi Arabia 35.
Colloidal, precipitated, sublimed		31	—	All from France.
Coal: All grades including briquets		267	—	Netherlands 200; West Germany 67.
Petroleum refinery products:				
Mineral jelly and wax	42-gallon barrels	535	1	Japan 354; United Kingdom 102.
Lubricants	do.	68,565	2,730	United Arab Emirates 30,688; Singapore 14,714; Netherlands 8,428.
Bituminous mixtures	do.	6,945	—	Saudi Arabia 5,406; Italy 921.

[1] Table prepared by Virginia A. Woodson. Comparable data not available for 1987.
[2] May include semimanufactures.

TABLE 3

QATAR: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
Cement	Qatar National Cement Co. (Government, 43%; private, 57%)	Umm Bab	550.
Fertilizer	Qatar Fertilizer Co. (QAFCO) (Government, 70%; Norsk Hydro AS-Norway, 25%; Davy Powergas Ltd.-United Kingdom (U.K.), 3%; Hambros Bank-U.K., 2%)	Umm Said	540, N content of ammonia. 350, N content of urea.
Natural gas, liquefied	Qatar General Petroleum Co. (QGPC) (Government, 100%)	do.	685.[1]
Petroleum, crude	do.	Dukhan	400.[1]
Petroleum, refinery products	QGPC; National Oil Distribution Co. (Government, 100%)	Umm Said	60.[1]
Iron and steel	Qatar Steel Co. (QASCO) (Government, 70%; Kobe Steel Ltd. of Japan, 20%; Tokyo Boeki Ltd., 10%)	do.	400.
Sulfur	Qatar Petrochemical Co. (QAPCO) (QGPC, 84%; Charbonnages de France-Chemie, 16%)	do.	25.

[1] Thousand barrels per day.

financing constraints have prevented QASCO from turning it into a new outlet.

Industrial Minerals

Qatar Fertilizer Co. (QAFCO) was the country's sole fertilizer producer. In 1989, QAFCO's plant at Umm Said produced over 780,000 tons of urea, 25% above its initial design capacity, and 714,000 tons of ammonia, also exceeding its capacity by 15%. Planned expansion of the complex will be completed in 1993. On completion, the plant's production capacity is expected to increase by 2,000 tons per day of urea and 1,000 tons per day of ammonia. The new plant is also expected to increase QAFCO's consumption of natural gas by 60 million cubic feet per day (MMcfd) to a total of 160 MMcfd. QAFCO intended to use the increased output to develop new markets in Europe and the United States.

Mineral Fuels

Natural Gas.—Natural gas was produced as associated gas from crude oil production and amounted to about 100 MMcfd. When phase I of the North Field development plan is completed at the end of 1990, the plant is expected to process about 800 MMcfd of gas, producing about 12.375 million barrels per year (MMbbl/yr) of liquefied petroleum gas and condensate for export.

The North Field, which is offshore at the northeast of Qatar Peninsula in water depths of about 15 to 70 meters, covered an area of about 6,000 square kilometers. The gas reservoirs were found in the Khuff formations at depths between 2,470 meters and 2,830 meters below sea level. The Khuff consists of four major formations designated K1 through K4. These are four different reservoir units within the Khuff formations. Thirteen exploratory wells have been drilled so far to delineate the extent of the field and evaluate its characteristics. The largest of the four reservoir units is K2, but K4 contains 55% of the expected gas in place. Reservoir units K2 and K3 combined contain 37% of the expected gas in place while K1 is expected to contain 8% of the gas in place.

Initial production will start at the crestal area of the K4 reservoir, which is considered to be the largest and richest of the four formations in terms of condensate concentration, estimated at 40 barrels per million cubic feet.

Petroleum.—In 1989, Qatar's oil production averaged 391,000 barrels per day (bbl/d), slightly above its OPEC allotted quota. The country was keen to continue its exploration program in an effort to increase crude oil production. To this end, two new exploration contracts were signed by the Government with Elf Aquitaine of France and Amoco Corp. of the United States.

Qatar General Petroleum Corp. (QGPC) proceeded with several projects designed to improve onshore and offshore production. Two of five foreign consulting firms were awarded contracts to design and supervise construction of a 100,000-bbl/d onshore production station in Al-Dibya near Dukhan and the Fahaheel oil production plant. Offshore improvements were also underway at the Idd al-Shargi, Maydan Mahzam, and Bul Hanine production stations.

QGPC was also planning to increase the capacities of the two refineries in Umm Said. The refineries were reported to be operating at about full capacity to meet increasing domestic consumption and foreign purchase orders. In 1989, QGPC bunkered 25% of its fuel oil produced and exported the remaining 75% to Far Eastern countries for production of lubricating oil that was not produced locally. According to the Middle East Business Weekly, the refineries were already exceeding their rated capacities, producing a combined output of about 62,000 bbl/d. Reports also indicated that local consumption of refined products had risen to about 18,000 bbl/d, and the remaining were exported. In 1989, QGPC commissioned its new $43 million products export terminal at Abu Hamur. The new terminal was linked by pipelines to the Umm Said refinery.

Reserves

Qatar was estimated to have the world's largest nonassociated gas reserves in the North Field. The North Field's recoverable gas reserves were put at 150 trillion cubic feet, with an estimated total reserves put at 350 trillion cubic feet. The country's recoverable oil reserves were believed to be about 2.5 billion barrels.

INFRASTRUCTURE

Qatar has continued to develop its infrastructure, although the petroleum and natural gas transportation facilities were already quite modern. There were 235 kilometers (km) of petroleum and 400 km of natural gas pipelines, running east to west from Doha to Dukhan and from Umm Said through Umm Bab to Dukhan. Other pipelines also link offshore fields in the Persian Gulf to Umm Said. Crude oil and gas were exported from four terminals: Halul Island, which serves the offshore fields; Umm Said, which services the onshore fields, and Ras Abu Abbud and Abu Hamur, which are used for refined products. Qatar also had a total of 1,500 km of highways, with 1,000 km of it paved and 500 km of it gravel or natural surface; an international airport at Doha; and major cargo ports at Doha, also known as Ad Dawhah, and Umm Said, also known as Musayid.

OUTLOOK

The Government expects to continue to give top priority to the North Field gas project. Owing to rapid depletion of existing oil reserves, crude oil production is anticipated to decline sharply by 1995. The development of the gasfields should help maintain current or perhaps even a better level of economic growth for the next decade.

Industrial developments such as the construction of the aluminum and ferroalloy plants will provide increased job opportunities for Qatar and diversify its metal industry. Natural gas will provide abundant cheap energy for Qatar's domestic industries, including alumimum, fertilizer, ferroalloy, petrochemicals, and steel. This in turn should provide a substantial cost benefit for exporting goods produced in these industries. Factors that may limit Qatar's economic development are its dependence on foreign labor and possible political instability of the Persian Gulf region. The completion of several natural gas projects with their long-term subcontracts for liquefied natural

gas may provide additional economic stability.

[1] Where necessary, values have been converted from Qatari riyals (QRS) to U.S. dollars at the rate of QRS3.64 = US$1.00 in 1989.

OTHER SOURCES OF INFORMATION

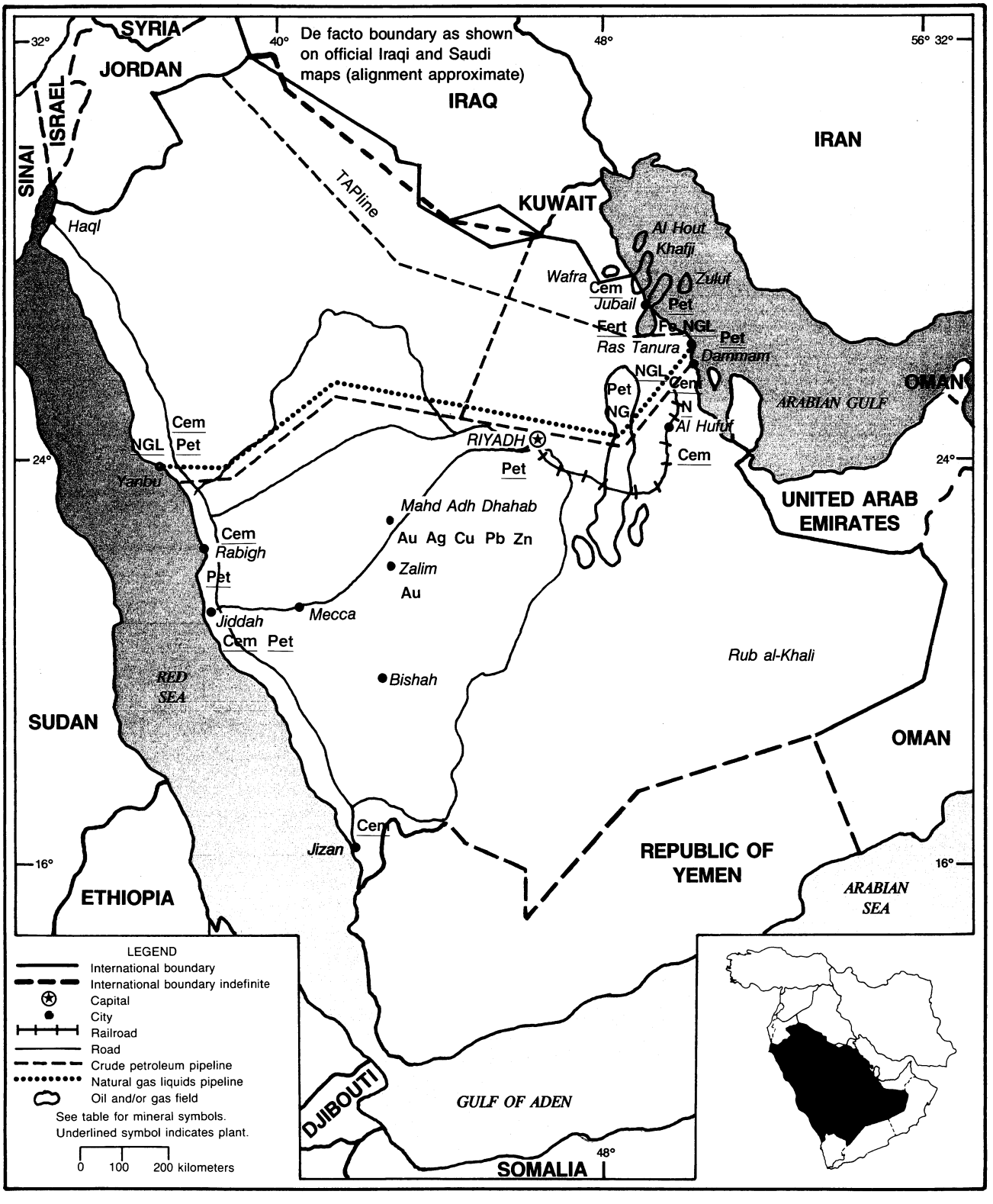
Agencies

Qatar General Petroleum Corp.
P.O. Box 3212
Doha, Qatar

National Oil Distribution Co.
P.O. Box 2244
Doha, Qatar

SAUDI ARABIA

AREA 2.2 million km² **POPULATION 17.1 million**



THE MINERAL INDUSTRY OF

SAUDI ARABIA

By Bernadette Michalski

The Saudi Arabian economy remained highly dependent on the hydrocarbon industry to generate finances needed for public expenditures and social and economic development. The industry supplied about 85% of budget revenues, virtually all of the export earnings, and 80% of the gross domestic product (GDP). The GDP has maintained a steady growth of 3% in recent years. Petroleum revenues increased by 20% over 1988 levels because prices remained relatively firm in spite of above-quota production by several members of the Organization for Petroleum Exporting Countries (OPEC). Abandoning its former position as swing producer, Saudi Arabia demanded an OPEC quota allocation equal to about 25% of all OPEC output. The OPEC quota for the first half of 1990 was 22 million barrels per day (MMbbl/d), including a quota allotment of 5.4 MMbbl/d for Saudi Arabia.

GOVERNMENT PROGRAMS AND POLICIES

Saudi Arabia's fourth 5-year Economic Development Plan covering the period from 1986 to 1990 continued to emphasize diversification and development of an industrial base not dependent on hydrocarbons. The Economic Development Plan for 1990–95 continued the same long-term objectives of the previous plans. However, additional emphasis was placed on expanding the revenue base, ensuring the maintainance of national economic stability through careful management of Government expenditure, consolidating the national economy's reliance on broadening private resources and activities, and providing job opportunities for the Saudi work force. The plan calls for the construction of 300 factories and proposed industrial investments of $5 billion[1] with about $3.5 billion in capital and commercial financing from the private sector. Local industry will continue to be protected by tariffs of up to 20% on imported goods.

PRODUCTION

Crude oil production, the kingdom's principal mineral commodity, averaged 5.15 MMbbl/d in 1989, slightly below the previous year's average of 5.29 MMbbl/d. In an effort to support the OPEC quota system, Saudi Arabian output was brought down to almost 5 MMbbl/d in January of 1989 from the nearly 7 MMbbl/d level of the previous month of December 1988. Output was further cut to 4.6 MMbbl/d in February and March. However, when several OPEC members once again disregarded their quotas, Saudi Arabian output was increased to about 5 MMbbl/d in April and May and remained well ahead of its OPEC quota for the rest of the year to ensure the kingdom a market share. Output for the first 6 months of 1990 averaged 5.67 MMbbl/d, about 5% in excess of the OPEC quota.

The commercial production of gold, silver, copper, and zinc commenced in 1988 with the opening of the Mahd adh Dhahab mine. A full year at capacity operation is anticipated for 1990.

Output of cement took a sharp downturn in the mid-1980's but showed signs of recovery by 1989 when new construction projects were awarded, including university and public building expansions as well as civilian and military airport expansions.

TRADE

Import licenses were not required, and exchange for payments abroad was obtained freely. Most imports were subject to customs duties at rates ranging from 12% to 20%. Imports from members of the Cooperation Council for the Arab States of the Gulf (GCC) were exempted, provided that at least 40% of the value added was affected in GCC countries and at least 51% of the capital of the producing firm was owned by citizens of GCC member countries.

Export licenses were not required, and no control was exercised over export proceeds. The reexport of certain imported items benefiting from Government subsidy was prohibited.

The monetary authorities and all other residents, including private persons, could freely and without license purchase, hold, and sell gold in any form, at home or abroad. They could also without license and without payment of any customs duty or tax import or export gold in any form with the exception of gold of 14 karats or less, the import of which was prohibited.

The United States and Japan were the kingdom's leading suppliers of imported goods, accounting for 17% and 16%, respectively. U.S. exports in 1989 were largely passenger automobiles, telecommunications equipment, and industrial machinery.

The principal markets for Saudi Arabian crude petroleum and products were, by volume, the United States, Europe, and Japan. Each nation and Western Europe imported well over a million barrels per day. The United States imported more than 1.1 MMbbl/d of crude oil from Saudi Arabia in 1989, and imports averaged near that figure in the first half of 1990. Petroleum product imports, mostly unfinished oils and gasoline, from Saudi Arabia averaged 110,000 barrels per day (bbl/d) in 1989 but rose to 145,000 bbl/d in the first 6 months of 1990.

STRUCTURE OF THE MINERAL INDUSTRY

All minerals, including the vast petroleum and natural gas reserves, were owned by the Government. Their exploitation was predominantly controlled by Government organizations.

COMMODITY REVIEW

Metals

Aluminum.—The 220,000-ton capacity aluminum smelter planned for Yanbu will obtain part of its feedstock requirements from Gove Aluminum (Australia), which had concluded a contract for the shipment of 100,000 tons of alumina annually for a 10-year period. About one-quarter of the plant's output was expected to be absorbed by local markets with the remainder exported. Saudi Arabian interests held 60% equity in the smelter, and foreign investors were offered the remaining equity. During 1989,

TABLE 1

SAUDI ARABIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity	1985	1986	1987	1988[p]	1989[e]
Copper: Cu content of concentrate and bullion[2] metric tons	—	—	—	[e]300	[3]765
Cement, hydraulic	[r]8,221	9,332	8,595	9,500	9,500
Gold:					
Mine output, gross weight:					
Ore metric tons	—	—	—	[e]40,000	100,000
Concentrate[2] do.	—	—	—	2,800	6,977
Bullion, crude, gross weight kilograms	—	—	—	[e]1,500	3,642
Au content of concentrate and bullion do.	—	—	—	[e]1,000	[3]2,900
Gas, natural:[4]					
Gross million cubic meters	32,083	40,500	39,070	41,050	42,000
Dry do.	20,275	24,000	19,500	22,650	23,000
Gypsum metric tons	410,000	373,000	373,000	375,000	375,000
Iron and steel: Metal, steel, crude	1,106	[e]1,100	1,365	1,614	1,800
Lead: Pb content of concentrate[2] metric tons	—	—	—	65	[4]205
Lime[e] do.	12,000	12,000	12,000	12,000	12,000
Natural gas liquids, all forms thousand 42-gallon barrels	123,370	149,650	125,896	149,145	149,650
Nitrogen: N content of ammonia	436	467	637	867	863
Petroleum:[4]					
Crude thousand 42-gallon barrels	1,236,620	1,841,425	1,535,555	1,850,000	1,879,000
Refinery products:[e]					
Gasoline do.	49,000	70,000	73,700	80,000	83,000
Jet fuel do.	4,100	11,600	11,600	12,000	12,000
Kerosene do.	10,300	7,300	7,300	8,000	9,000
Distillate fuel oil do.	86,900	108,000	109,000	115,000	110,000
Residual fuel oil do.	87,200	135,000	138,000	140,000	140,000
Unspecified do.	111,300	144,500	144,500	146,000	146,000
Refinery fuel and losses do.	14,000	19,000	19,000	19,000	19,000
Total do.	362,800	495,400	503,100	520,000	525,000
Silver: Ag content of concentrate and bullion[2] kilograms	—	—	—	[e]3,600	[3]13,321
Sulfur: Byproduct, all sources	1,068	1,446	1,432	1,378	1,400
Zinc: Zn content of concentrate[2] metric tons	—	—	—	[e]700	[3]2,580

[e] Estimated. [p] Preliminary. [r] Revised.

[1] Table includes data available through Sept. 1, 1990.

[2] Mahd adh Dhahab final products include a bulk flotation concentrate containing gold, silver, copper, lead, and zinc and a crude bullion containing gold, silver, and copper.

[3] Reported figure.

[4] Includes Saudi Arabian one-half share of production in the Kuwait-Saudi Arabia divided zone.

TABLE 2

SAUDI ARABIA: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity[1]
Cement	Saudi-Bahraini Cement Co. (Saudi Cement Co., 50%; Saudi stockholders, 35%; Gulf Enterpises Co. of Bahrain, 15%)	Ayn Dar, 75 km southwest of Dammam	1,800.
Do.	Saudi Cement Co. (Government, 100%)	Al-Hufuf	1,352.
Do.	Saudi-Kuwait Cement Co. (Saudi Arabia, 55%; Kuwait, 45%)	Al-Kharsaniyah, 64 km northwest of Jubail	3,000.
Do.	Arabian Cement Co. Ltd. (Government, 100%)	Jiddah Rabigh	650. 1,320.
Do.	Southern Province Cement Co. (Government, 100%)	Suq al-Ahad, 10 km northeast of Jizan	1,500.
Do.	Yanbu Cement Co. (Government, 100%)	Yanbu	1,460.
Fertilizer	Al-Jubail Fertilizer Co. (Samad) (Sabic, 50%; Taiwan Fertilizer Corp., 50%)	Jubail	632 urea. 300 ammonia.
Do.	National Chemical Fertilizer Co. (Ibn al-Baytar) (Sabic, 50%; Safco, 50%)	do.	500 ammonia. 500 urea. 500 NPK. 200 TSP. 100 DAP. 10 liquid fertilizer.
Do.	Saudi Arabian Fertilizer Co. (Safco) (Saudi Arabian private interests, 100%)	Dammam	330 urea. 200 ammonia. 100 sulfuric acid. 20 melamine.
Gold	General Petroleum and Mineral Organization (Government, 100%)	Mahd Adh Dhahab, 270 km northeast of Jiddah	150 ore.
Natural gas	Saudi Aramco (Government, 100%)	All oilfields, Eastern Province Khuff Zone, Eastern Province Abqaiq Gas Cap, Eastern Province	30,000.[2] 17,500.[2] 4,600.[2]
Natural gas liquids	Saudi Arabian Refining and Marketing Co. (Samarec) (Government, 100%)	Ju'aymah, 33 km northwest of Ras Tanura Yanbu	145,000.[3] 100,000.[3]
Do.	Saudi Aramco (Government, 100%)	Ras Tanura Shedgum, 150 km southwest of Dammam Uthmaniya, 30 km west of Al Hufuf Berri, 15 km north of Jubail	60,000.[3] 15,000.[2] 15,000.[2] 4,000.[2]
Petrochemicals	Saudi Petrochemical Co. (Sadaf) (Sabic, 50%; Pecten Saudi Arabia, 50%)	Jubail	760 ethylene. 560 ethylene chloride. 60 styrene. 300 industrial ethanol. 375 caustic soda.
Do.	National Methanol Co. (Ibn Sina) (Sabic, 50%; Celanese Arabian, 25%; Texas Eastern Arabian, 25%)	do.	770 methanol.
Do.	Saudi Methanol Co. (Al-Razi) (Sabic, 50%; Japan Saudi Arabia Methanol Co., 50%)	do.	630 methanol.
Do.	Arabian Petrochemical Co. (Sabic, 100%)	do.	650 ethylene. 100 polystyrene.
Do.	Saudi European Petrochemical Co. (Ibn Zahr) (Sabic, 70%; Ecofuel, 10%; Neste Oy, 10%; Arab Petroleum Investments Corp., 10%)	do.	500 methyl-tertiary-butyl-ether.

See footnotes at end of table.

TABLE 2—Continued

SAUDI ARABIA: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity[1]
Petroleum, crude	Saudi Aramco (Government, 100%)	Eastern Province and offshore	8,000.[4]
Do.	Arabian Oil Co. (AOC) (Japan Petroleum Trading Co., 80%; Kuwait, 10%; Saudi Arabia, 10%)	Khafji Al Hout	450.[4] 50.[4]
Do.	Texaco (former Getty Oil Co.) (Neutral zone production shared by Saudi Arabia and Kuwait)	Wafra South Fawaris South Umm Gudair	100.[4] 5.[4] 40.[4]
Petroleum products	Saudi Aramco (Government, 100%)	Ras Tanura	500.[4]
Do.	Rabigh Petroleum Refining Co. (Samarec, 50%; Petrola, 50%)	Rabigh	325.[4]
Do.	Jubail Petroleum Refining Co. (Samarec, 50%; Shell, 50%)	Jubail	250.[4]
Do.	Yanbu Petroleum Refining Co. (Samarec, 50%; Mobil, 50%)	Yanbu	250.[4]
Do.	Riyadh Oil Refinery Co. (Samarec, 100%)	Riyadh	135.[4]
Steel	Saudi Iron and Steel Co. (Hadeed) (SABIC, 85%; Korf Stahl-FRG, 15%)	Jubail	1,220.

[1] Thousand metric tons per year unless otherwise specified.
[2] Million cubic meters per year.
[3] Thousand barrels per year.
[4] Thousand barrels per day.

four companies that were already involved by contracts had further committed to capital investment: Bechtel (United States), project consultant; Pechiney (France), process technology; Alumix (Italy), engineering and construction contractor; and British Aerospace (United Kingdom). The plant was scheduled to come on-stream in 1992.

Gold.—At least six gold deposits have been discovered in the Arabian Shield. The Mahd adh Dhahab deposit, 275 kilometers (km) northeast of Jiddah, offered the most favorable recovery level at 27 grams per ton and a reserve of 1.1 million metric tons (MMmt). Petromine concluded a 1-year renewable agreement with the Gold Corp. (Australia) for refining. The first shipment of Saudi Arabian precious-metals concentrate was delivered for refining in Australia in February 1989. By 1990, the mine's first year of operation at full capacity, output is expected to reach 3,400 kilograms of gold and 15,300 kilograms of silver.

The Saudi Co. for Precious Metals, a joint venture between Petromin (Saudi Arabia) and Boliden (Sweden), was established in 1989 to develop the Sukhaybarat gold deposit, about 65 km southeast of Zalim, where reserves were reported at 8.4 MMmt yielding an average of 2.5 grams of gold per metric ton. Mine development activity began in March 1989, and initial production was scheduled to begin by April 1991. Eventual annual capacity was anticipated to be 600,000 tons of ore. Precious metals recovered from the mine were expected to be sold by competitive tendering to refineries in Europe and the Far East.

Other gold deposits have been discovered; these include Hiajar, 80 km northwest of Bishah; Bir Tawilah, 50 km east of Zalim; Al-Amar, 650 km northeast of Jiddah; and Al-Shukhtaliat, 50 km west of Zalim. Combined, these properties contain more than 10 MMmt of ore averaging from 3 to 25 grams of gold per ton.

Iron and Steel.—The Saudi Iron and Steel Co. (Hadeed), a Sabic subsidiary, operated a 1.22 MMmt annual capacity plant. Production was reported at about 1.5 MMmt in 1989, substantially above capacity. In March of 1990, a $100 million contract was awarded to Voest-Alpine (Austria) to virtually double the plant's annual capacity to 2 MMmt. The project, including modification of the existing electric arc furnaces and the installation of two ladle furnaces, was estimated to require 2 years to complete. In 1989, a steel reduction plant was under construction at the Jubail complex with the capacity to produce 650,000 tons of sponge iron annually.

Industrial Minerals

Cement.—Domestic construction activity grew by 7% in 1989 and was expected to increase by 10% in 1990. With the massing of United Nation's military troops on the Saudi Arabian border with Kuwait in August 1990, there was no doubt that level had been exceeded to support the requirements of the military.

The Yanbu Cement Co. produced at full capacity, 4,000 tons per day, in 1990. Plans have been announced to increase capacity by 15% by modifying the existing three kilns.

Phosphate.—Phosphate reserves of 4 billion tons have been discovered in the Tareif area. Near the close of 1989, phosphate deposits averaging 21% to 24% of P_2O_5 had been discovered near Al-Jalamid. The deposits were estimated to contain 120 MMmt of readily

minable ore. Exploitation rate was projected at 6 MMmt of run of mine ore annually producing 3 MMmt of concentrate averaging 30% to 35% P_2O_5 for a 20-year period. The concentrate would be transported 1,090 km to Jubail for use in the manufacture of diammonium phosphate, thus maximizing the utilization of natural gas and sulfur.

Potash.—Expansion plans for the National Chemical Fertilizer Co.'s Jubail plant include the capacity to produce 800,000 tons per year by 1991 of nitrogen-phosphate-potassium fertilizer.

Sulfur.—The production of sulfur of 99.8% purity approached 1.5 MMmt annually and was derived from the processing of petroleum and natural gas. While the demands of the domestic petrochemical industry continued to grow, most of the sulfur output was exported with markets among members of the GCC, India, Pakistan, Bangladesh, Tunisia, and Morocco.

Mineral Fuels

Natural Gas.—Most of the kingdom's natural gas was produced in association with crude petroleum. Until 1984, Saudi Arabia flared much of the gas it produced. The development of the Master Gas System, a network for recovering, processing, and distributing natural gas, permitted nearly full utilization.

Exploration and development activity in the mid-1980's resulted in nonassociated gas availability. Production capacity from the deep Khuff zone under the southern portion of the eastern province onshore oilfields was 56,500 cubic meters per day. Additional gas capacity of 13 million cubic meters per day was available in the form of gas caps created over the Abqaiq reservoir by gas that was previously reinjected.

A new natural gas source was discovered in late 1989. About 75 km southeast of Riyadh, the Dilam-1 wildcat struck a low-sulfur natural gas reservoir at a depth of 2,400 meters.

Associated natural gas from the Saudi Arabian-Kuwaiti divided zone will be harnessed and distributed to both nations. The plan involved gathering gas from the offshore Khafji field operated by Arabian Oil Co. (AOC) and pumping it to both nations. At present, the gas is being flared. The project called for the installation of gathering and compression facilities at Khafji. Saudi Arabia and Kuwait each owned 10% of AOC with majority interest held by Japanese companies; however, the natural gas project was to be wholly financed by Saudi Arabia and Kuwait with Saudi Aramco and the Kuwait Oil Co. bearing the responsibility of constructing the pipelines to their respective countries. Saudi Aramco had proposed construction of a 30-km submarine pipeline of 50-million-cubic-feet-per-day capacity to deliver gas to the offshore Zuluf facilities. The gas will be combined with Zuluf gas and piped to onshore facilities at Safaniya through a pipeline already in operation.

Petroleum.—**Exploration.**—Five new oilfields yielding light low-sulfur crude oil and one natural gasfield were discovered in the central region outside the traditional concession areas during 1989 and the first half of 1990: Al-Hawtah, 190 km south of Riyadh; Ragheeb, 123 km southeast of Riyadh; Na'eem; Dilum; Hazmiya, 205 km south of Riyadh; and the natural gasfield, Al-Hilwah, 137 km south of Riyadh. The discoveries had been made in a 4,000-square-kilometer area at depths ranging from 1,800 to 2,800 meters. Reserve delineation and development plans were under study.

Production.—Government-owned Saudi Aramco retained its position as the world's largest oil company based on oil and gas reserves, production, product sales, and refining capacity. Sustainable production capacity, including output from the Kuwait-Saudi Arabia divided zone, was estimated at 8 MMbbl/d in mid-1990, well below the kingdom's peak output of nearly 10 MMbbl/d a decade earlier. Actual production averaged nearly 5.7 MMbbl/d in the first half of 1990, representing a significant increase over the more than 5.1 MMbbl/d produced in 1989.

Excess production capacity of about 2 MMbbl/d and large reserves had afforded the kingdom some flexibility on production and export decisions. The Saudi Arabian policy had been oriented toward generating sufficient revenue for domestic economic needs and preserving long-term market prospects for petroleum.

Refining.—Refining capacity rose by 325,000 bbl/d with the January 1990 commissioning of the topping and hydrodesulfurization plant at Rabigh, thus bringing the kingdom's total refining capacity to more than 1.8 MMbbl/d. When operating at full capacity the plant can produce 156,000 bbl/d of fuel oil, 47,000 bbl/d of diesel fuel, 36,000 bbl/d of jet fuel, 77,000 bbl/d of gasoline, and 75,000 bbl/d of naphtha.

Petrochemicals.—The Saudi Basic Industries Corp. (Sabic) produced an estimated 5.3 MMmt of petrochemicals in 1989, exclusive of ethylene reprocessed into other products. Domestic sales absorbed 18%, 32% was exported to the Far East, 19% to Europe, and the remainder was exported throughout the world with 3% sold to the United States. The price decline in world petrochemical markets in the fourth quarter reduced Sabic's profits by an estimated 5% from the peak level of $947 million in 1988.

Reserves

The reevaluation of existing reserves and the recent successful exploration activities outside the traditional concession area confirmed by a wide margin Saudi Arabia's strategic position as the world leader in crude oil reserves.

TABLE 3

SAUDI ARABIA: RESERVES OF MINERAL COMMODITIES

Commodity	Reserves
Gold	2.1 million metric tons containing 20 to 30 grams per ton. 18.0 million metric tons containing 1 to 7 grams per ton.
Petroleum	253,500 million barrels.
Natural gas	5,125 billion cubic meters.

INFRASTRUCTURE

Construction activities of the mid-1970's through the 1980's have created a basic infrastructure. Highways totaled 74,000 km, half of which was bituminous surfaced and the remainder gravel and improved earth. Railroad lines totaled 886 km of 1.435-meter standard guage.

Further expansion of the East-West pipeline was underway. The maximum throughput on Petroline, which runs from Abqaiq in the Arabian Gulf to Yanbu on the Red Sea, was being raised to 4.8 MMbbl/d through the installation of additional pumps and turbines at the 11 pumping stations now in operation along the line. Originally, the pipeline operated at 1.8 MMbbl/d and was expanded to 3.6 MMbbl/d with the construction of a parallel pipeline.

The completion of the second phase of Iraq's oil pipeline transiting the Arabian Peninsula from the Gulf to the Red Sea at Yanbu was reported in January 1990. The 1,600-km pipeline had a reported capacity of 1.5 MMbbl/d, but did not operate after the Iraqi invasion of Kuwait in August.

OUTLOOK

The kingdom will remain highly dependent on foreign expertise and labor. There was an estimated foreign work force of 3 million, accounting for about two-thirds of the total labor force in 1989. The reliance on foreign expertise and foreign labor, particularly in the advanced industries, continues as the transfer of modern industrial and management techniques to the national population progresses at a slow pace.

Most of the national income is dependent upon markets outside the kingdom; consequently, the economy will remain vulnerable to sudden changes in volume and pattern of worldwide trade in crude and refined petroleum and petrochemicals.

The threat of an Iraqi invasion following the August 2, 1990, Iraqi takeover of Kuwait will lead to cancellation or closure of petroleum transit arrangements, natural gas trade, and production and processing arrangements with Kuwait in the divided zone.

[1] Where necessary, values have been converted from Saudi riyals (SRls) to U.S. dollars at the rate of SRls3.7450 = US$1.00.

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Agencies

Ministry of Petroleum and Natural Resources
Jiddah, Saudi Arabia

Saudi Aramco
Dhahran, Saudi Arabia

Directorate General of Mineral Resources
Jiddah, Saudi Arabia

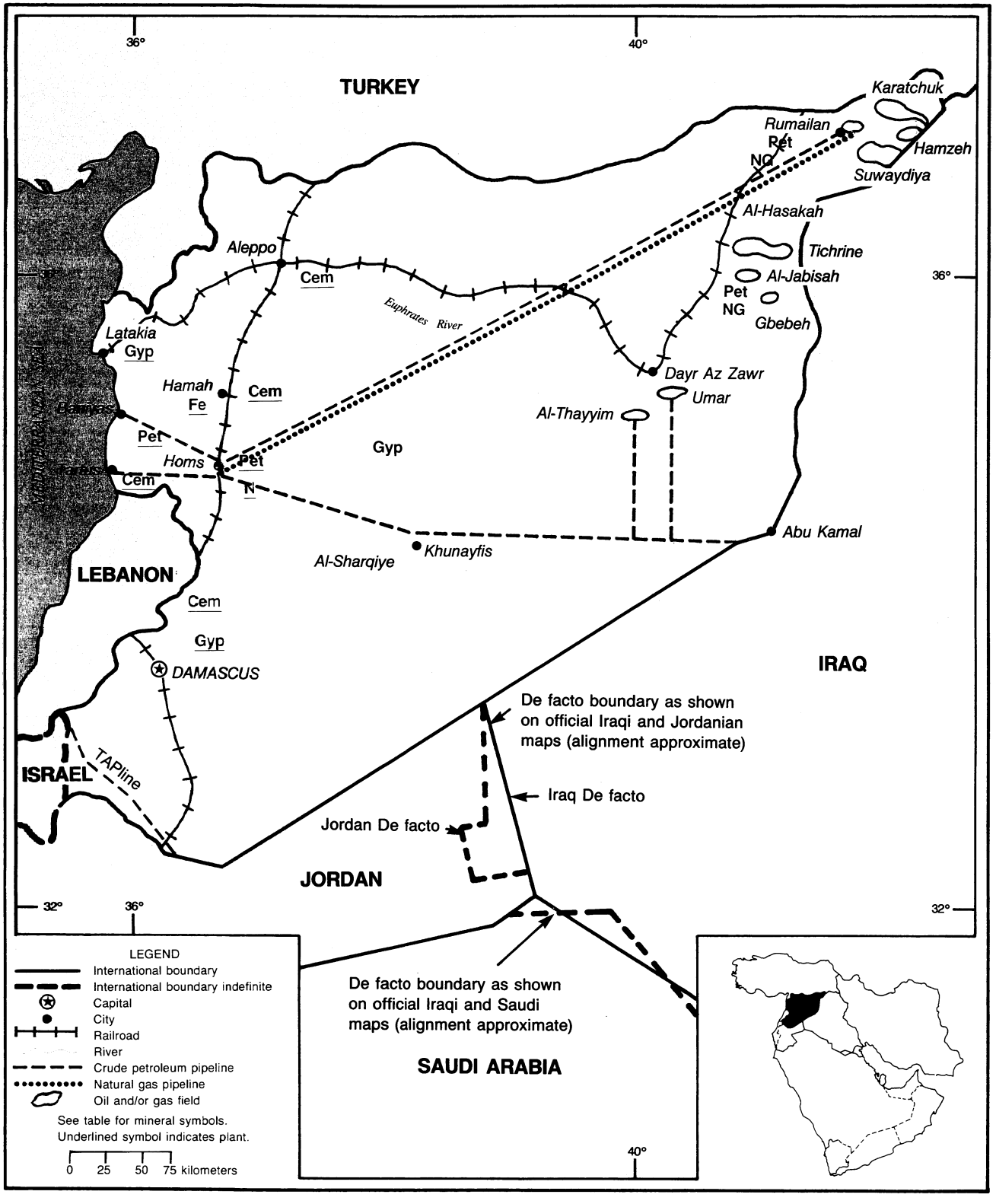
Publications

Kingdom of Saudi Arabia, Ministry of Finance and National Economy, Central Department of Statistics, Statistical Yearbook, annual.

Saudi Arabian Monetary Agency, Research and Statistics Department, Statistical Summary, annual.

SYRIA

AREA 185,180 km² **POPULATION 12.0 million**



THE MINERAL INDUSTRY OF

SYRIA

By Bernadette Michalski

The mineral industry of Syria contributed about 15% to the gross national product of this principally agrarian nation. The significance of the minerals industry has increased since 1987 with the development of crude petroleum fields yielding low-sulfur light crude oil. These commanded more favorable prices on world markets and permitted a reduction in imports of such crude oils that are required for blending with the heavier Syrian crudes in the Homs and Baniyas refineries. Other significant mineral industries included: gypsum and phosphate rock mining, the manufacture of fertilizers and cement, the manufacture of steel from domestic and imported scrap, and natural gas production and processing. Developments in the natural gas industry included improved utilization of associated natural gas. Nonassociated gas was developed as fuel for the electric power industry and as feedstock for the production of ammonia. A natural gas processing plant was constructed for the extraction of natural gas liquids and the recovery of sulfur.

GOVERNMENT POLICIES AND PROGRAMS

The Government controls all mineral exploration and production in Syria. Several non-Syrian companies conducted mineral exploration activities on behalf of the Syrian Government. Discovery of hydrocarbons in northeast Syria in the late 1950's was followed by inconclusive negotiations with foreign firms for the joint exploitation of these fields. As a result, the Syrian Government's General Petroleum Authority issued a decree in 1964 prohibiting the granting of concessions to foreign firms and vested sole authority for exploration and development of Syrian hydrocarbon resources with the General Petroleum Authority. Production commenced in 1968 from the Suwaydiyah Field in the extreme northeast section of the country. By 1974, the Government made a major policy shift reversing the earlier policy and permitted the granting of oil exploration concessions to foreign firms. Should exploration result in commercial crude oil discoveries, a joint operating company would be formed, owned one-half by the foreign partner and one-half by the Government-owned Syrian Petroleum Co. The foreign partner would be compensated for operating costs through a percentage of the oil produced. For operating costs, this was 12% to 15% depending on the size of the well. The first companies to enter into exploration agreements under the new policy were U.S. Shell Pecten with a concession in the Dayr az-Zawd area and Marathon Oil Co. with a concession in the Palmyra/Homs area. By 1990, at least 13 other foreign companies had entered into hydrocarbon exploration agreements with the Syrian Government.

Because Syria lacks both foreign aid in substantial amounts and the credit rating necessary to obtain development loans, foreign investment in the hydrocarbon industry was encouraged.

Another major policy shift was effected in early 1990 when Syria restored diplomatic relations with Egypt after a 10-year-long breach. The improved relationships should add to the stability of the region and consequently should improve the investment climate.

PRODUCTION

Syria attained self-sufficiency in crude petroleum in 1989 with output from the Dayr az-Zawr region supplying crudes of 36° to 41° American Petroleum Institute (API) gravity to blend with the 18° to 25° API gravity crudes from the northeastern fields. Domestic production of lighter crudes negated the requirement for imported blending crudes, thus favorably affecting the nation's foreign exchange position.

Production of the nonhydrocarbon minerals remained, for the most part, below capacity levels. Lack of investment capital has precluded mineral exploration, deposit development, or equipment repair, replacement, or improvement.

TRADE

Syria reported a trade surplus of nearly $1 billion in 1989, the first surplus in three decades. Total imports were estimated at more than $2 billion. Government import restrictions, combined with the nation's newly acquired position as net exporter of petroleum, were the principal reasons for the surplus. Petroleum revenues more than doubled in 1989, exceeding $800 million, and accounted for more than one-fourth of all exports which were estimated at $3 billion. Although Europe was the principal market for Syria's petroleum, crude and unfinished petroleum shipments to the United States' east and gulf coasts totaled 5.6 million barrels valued at approximately $100 million in 1989.

Exports of Syria's other significant mineral, phosphate rock, dropped by nearly 10% in 1989 to 1.7 million tons. The principal export market for Syrian phosphates remained Eastern Europe. The Western European market was mixed while exports to France and Yugoslavia remained strong and exports to Spain and Turkey were considerably reduced, reflecting a slump in the fertilizer industries in these countries.

STRUCTURE OF THE MINERAL INDUSTRY

The mineral industry was owned and controlled by the Syrian Government. Hydrocarbon exploration concessions, however, have been granted to foreign companies operating on behalf of the Syrian Government. When commercial hydrocarbons were discovered and developed, a production sharing agreement with the Government-owned Syrian

TABLE 1

SYRIA: PRODUCTION OF MINERAL COMMODITIES[1]

Commodity		1985	1986	1987	1988[p]	1989[e]
Cement, hydraulic	thousand tons	4,296	4,200	3,870	3,330	[2]3,501
Gas, natural:[e]						
Gross	million cubic feet	18,000	[r]28,000	[r]43,000	[r]45,000	50,000
Dry	do.	5,400	[r]9,000	[r]22,000	[r]23,000	35,000
Gypsum	tons	160,250	160,000	248,000	179,000	180,000
Iron and steel: Metal: Steel, crude[e]	do.	69,000	69,000	69,000	70,000	70,000
Natural gas liquids[e]	thousand 42-gallon barrels	500	500	500	500	500
Nitrogen: N content of ammonia	tons	132,450	136,984	92,533	78,700	[2]122,500
Petroleum:						
Crude	thousand 42-gallon barrels	61,100	68,000	84,570	100,000	140,000
Refinery products:						
Liquefied petroleum gas	do.	1,240	2,030	1,763	1,900	1,900
Gasoline	do.	8,202	8,453	7,242	7,300	7,400
Naphtha	do.	5,270	5,355	5,124	5,100	5,200
Jet fuel	do.	1,968	2,352	2,624	2,700	2,700
Kerosene	do.	1,271	1,705	1,565	1,600	1,600
Distillate fuel oil	do.	27,602	19,709	21,750	21,800	21,800
Residual fuel oil	do.	31,300	32,514	34,500	34,500	34,500
Asphalt	do.	2,855	1,654	1,357	1,400	1,400
Other	do.	1,765	1,880	1,900	1,900	1,900
Total	do.	81,473	75,652	77,825	78,200	78,400
Phosphate rock	thousand tons	1,270	1,606	1,986	2,186	[2]2,256
Salt	tons	[e]87,000	[e]87,000	81,000	127,000	[2]137,950
Stone, sand and gravel:						
Stone: Dimension, marble	cubic meters	[e]71,000	[e]71,000	15,062	17,804	18,000
Sand and gravel[e]	thousand tons	[e]6,000	[e]6,000	[e]6,000	[2]8,000	8,000
Sulfur, byproduct of petroleum and natural gas	do.	35	[r]40	[r e]40	[r e]40	40

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through June 1, 1990.
[2]Reported figure.

Petroleum Co. was activated. All mining, processing, manufacturing, and distribution companies were Government-operated firms.

COMMODITY REVIEW

Industrial Minerals

Fertilizers.—The Homs chemical plant, beset with chronic problems since its inauguration in the early 1980's, was closed in the third quarter of 1989.

Phosphate Rock.—The General Co. for Phosphate and Mines (GECOPHAM), the Government-owned phosphate mining company, experienced reduced foreign and domestic sales in 1989. The phosphate rock produced by GECOPHAM is of relatively low grade (65% to 68% bone-phosphate-lime), and the sales expansion experienced in the 1986 to 1988 period was attributed to the increased involvement in phosphate marketing when the Government actively engaged in negotiating trade treaties.

MINERAL FUELS

Natural Gas.—The Al-Furat Petroleum Company has invited bids for construction of a natural gas pipeline linking the Umar Field near Dayr az-Zawr to Damascus and construction of a gas-processing plant with a daily capacity of 160 million cubic feet. The Umar natural gas is to be used to fuel the 400 megawatt Tishreen power station. Completion of the gas supply system and powerplant was scheduled for November 1991. Natural gas from the west Palmyra fields operated by Marathon Oil Co. will provide gas for the Mhardeh and Baniyas powerplants. The Syrian Petroleum Co. requested bids for the exploration of five gasfields northeast of the southern Palmyrides and development of fields at Al Dubaiat, Arak, and Al Hail.

Petroleum.—Encouraged by the success

TABLE 2

SYRIA: STRUCTURE OF THE MINERAL INDUSTRY

(Thousand metric tons per year unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Capacity
Cement	General Organization for Cement and Building Materials (Government ownership 100%)	Mill at Tartus	1,655
		Mill at Hamah	405
		Mill at Musslemieh	300
		Mill at Al-Rastan	123
Gypsum	General Organization for Marble and Gypsum (Government ownership 100%)	Mine near Damascus	250
		Mine near Latakia	100
Natural gas	Syrian Petroleum Co. (Government ownership 100%)	Al-Hasakah gathering center for natural gas from the northeastern fields	[1]35,000
Petroleum:			
Crude	Syrian Petroleum Co. (Government ownership 100%)	Northeastern fields (including Suwaydiyah, Al-Jabisah, Gbebeh, Tichrine, Karatchuk, and Rumaylah)	[2]160,000
Do.	Al-Furat Petroleum Co. (Syrian Petroleum Co. 50%, Shell Pecten Co. 15.625%, Syria Shell Co. 15.625%, Deminex 18.75%)	Al-Thayyim (including Ash Shola and Al-Kharrata) 10 kilometers South of Dayr az-Zawr	[2]100,000
Do.	do.	Umar northeast of Al-Thayyim Al-Ward (including Al-Asharah, Jido, Tanak, and Tavyani East)	[2]100,000
Products	Baniyas Refining Co. (Government ownership 100%)	Refinery at Baniyas	[2]126,350
Do.	Homs Refining Co. (Government ownership 100%)	Refinery at Homs	[2]117,400
Phosphate rock	General Co. for phosphates and mines (GECOPHAM) (Government ownership 100%)	Khunayfis	400
Do.	do.	Al-Sharqiye Eastern A 20 kilometers south of Khunayfis	600
Do.	do.	Al-Sharqiye Eastern B 26 kilometers southeast of Khunayfis	400
Salt	General Co. for phosphates and mines (GECOPHAM) (Government ownership 100%)	Mine near Dayr az-Zawr	60
		Mine 35 kilometers southeast of Aleppo	100
Steel	General Co. for Iron and Steel Products (Government ownership 100%)	Plant 8 kilometers north of Hamah	120
Sulfur	Baniyas Refining Co. (Government ownership 100%)	Refinery at Baniyas	85
Do.	Homs Refining Co. (Government ownership 100%)	Refinery at Homs	87
Do.	Syrian Petroleum Co. (Government ownership 100%)	Gas treatment plant at Al-Hasakah in northeast Syria	8

[1]Million cubic feet.
[2]Barrels per day.

of Pecten in the Dayr az-Zawr concession and the resulting discovery of commercial quantities of light crude oils with low sulfur content, as well as the Marathon Oil Co.'s commercial natural gas discoveries in the Palmyra/Homs area, 13 or more additional foreign firms engaged in hydrocarbon exploration activities in Syria in 1990. These firms included ARCO, British Petroleum, Elf Aquitaine, Enron, Neste, Occidental, Pentagon, Phoenix, Royal Dutch Shell, Tricentenol, Total CFP, and UNOCAL. Although most of the new exploration activity was centered in east central Syria near Dayr az-Zawr, concessions were also awarded in the Palmyra area, in a region south of Damascus, and in the extreme northeast region near the Syrian Petroleum Co.'s producing fields.

Production from the Umar Field, 440 kilometers northwest of Damascus near Dayr az-Zawr, was realized in January 1989 and reached production levels of

100,000 barrels per day (bbl/d) in March. Technical difficulties precluded sustaining this level of production. When the pressure dropped sharply, output was reduced to 80,000 bbl/d in April and to 30,000 bbl/d by June. The field was found to be fractured, necessitating the drilling of additional wells and the adoption of enhanced recovery techniques. When additional wells are drilled and enhanced recovery systems are placed in operation, production is expected to be restored to 100,000 bbl/d levels by 1991. Two smaller wells were also brought on-stream in August 1989, with production anticipated at 50,000 bbl/d when fully operational.

The Al-Thayyem Field near Dayr-az-Zawr supplied an average of 60,000 bbl/d of light crude to the Homs refinery. The neighboring Al-Ward Field contributed an additional 40,000 bbl/d, and the Umar Field averaged 40,000 bbl/d. Wells in the Al-Sham concession produced 80,000 bbl/d. The Dayr az-Zawr Field produced about 30,000 bbl/d. Total production for Syria, including the heavier crudes from the northeastern fields, was about 380,000 bbl/d in 1989.

Reserves

The Syrian Ministry of Oil, Electricity, and Natural Resources announced in early 1990 reevaluated hydrocarbon mineral reserves which substantially increased natural gas reserves from the 113 billion cubic meters announced in 1989. The Ministry's reserve figure for phosphate rock was reported in 1982.

INFRASTRUCTURE

Railway transportation was available in northern and western Syria servicing the major cities and the three principal ports of Tartus, Latakia, and Baniyas. The Iraq Petroleum Co. (IPC) pipeline traverses Syria from east to west. The Syrian Petroleum Co. pipelines carry crude petroleum and natural gas from the northeastern fields to the refineries, powerplants, and port facilities in the west. The long-closed trans-Arabian pipeline crosses southern Syria into Lebanon. The IPC pipeline was originally intended as Iraq's conduit to the Mediterranean while also supplying light blending crudes to the Homs refinery. With the onset of production from the Dayr Az-Zawr area two spur lines were constructed connecting the Al-Thayyim Field along with its smaller satellite fields and the Umar Field to the IPC pipeline at the T-2 pumping station.

TABLE 3

SYRIA: RESERVES OF MAJOR MINERAL COMMODITIES

Commodity	Reserve
Natural gas	17,500–24,500 billion cubic feet
Petroleum	2,000 million barrels
Phosphate rock	1,000 million tons

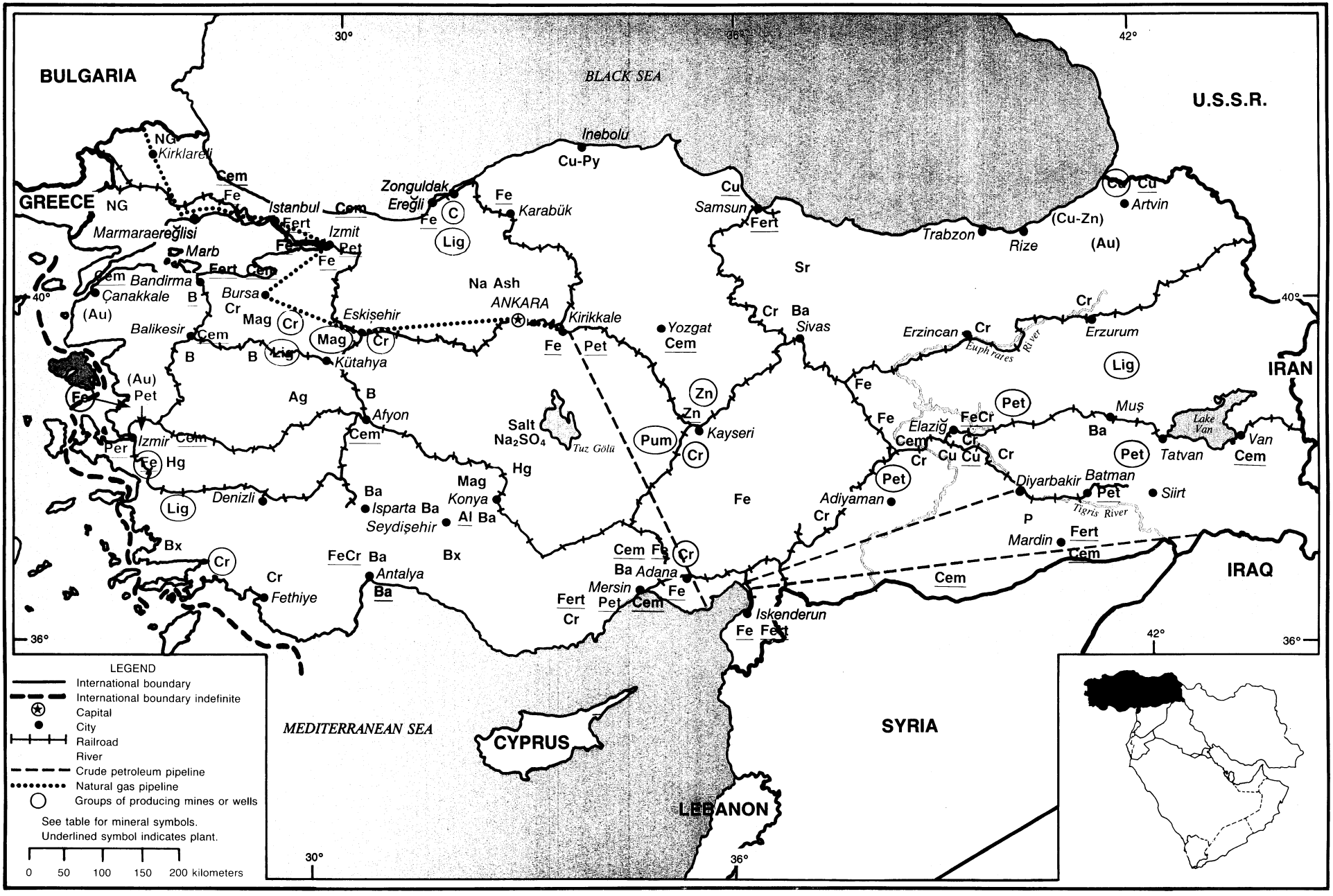
OUTLOOK

The discovery of nonassociated natural gas fields and the increased utilization of associated natural gas have prompted the Government to target this fuel as the source for 30% of Syria's energy consumption by the year 2000, thus increasing petroleum export potential.

Recent developments in the nation's petroleum and natural gas industry have resulted in both the encouragement of foreign capital investment and a more favorable trade position. The restoration of diplomatic relations with Egypt should improve stability and regional trade relationships; however, Syria remains burdened by its costly defense programs.

TURKEY

AREA 780,580 km² **POPULATION 56.7 million**



THE MINERAL INDUSTRY OF

TURKEY

By Hendrik G. van Oss

Turkey's very diverse mineral industry experienced strong growth in 1989, largely as a result of expanded capacity at many of the country's operations. Turkey has more than 800 mining establishments, although most of these are very small. A wide variety of deposits are exploited, if only on an artisanal scale, commonly with significant cumulative results. Turkey is a major producer of industrial minerals. Turkey ranked first in the world in the production of emery and second in the world in the production of boron minerals (boron content), soda ash (trona), and strontium (celestite). The country ranked third in the production of perlite and pumice, and was a significant world producer of barite, magnesite, and marble. Turkey was third in the world in chromite production and sixth in mercury output. In 1989, Turkey was the 11th largest cement producer in the world and ranked 21st in iron and steel production. Capacity expansion projects have been undertaken or are being planned by a large number of the country's mineral producers; this expansion is especially pronounced in the cement and iron and steel sectors.

Turkey's gross domestic product (GDP) grew about 11% to $71.8 billion[1] in 1989. Primary mineral sales, including exports, were equal to only about 1.5% to 2% of GDP. However, this estimate does not include the manufactured mineral commodity component of total sales, an important consideration in a diversified economy such as Turkey's. If the estimated domestic and export sales value of manufactured mineral commodities, including cement, ferroalloys, fertilizers, iron and steel products, refined metals, and refined petroleum products, is included, the total sales value of mineral commodities climbs to an estimated $14 billion. Also included are petroleum and natural gas piping revenues, but not other mineral commodity transport and shiploading fees for want of data. Mineral commodity sector wages amounted to an estimated $300 to $315 million.

Mineral commodities accounted for about 20.5% of Turkey's total exports and about 45% of the country's imports in 1989. In addition, significant revenues were earned from the transit of mineral commodities, particularly crude oil, through Turkey from other countries in the region. Turkey had a $4.1 billion trade deficit in 1989. Despite the trade deficit, Turkey's current account balance showed a $966 million surplus, largely because of tourism revenues and remittances from Turkish workers abroad. Turkey's major trading partners include the United States, various European countries, the U.S.S.R., and its neighboring countries in the Middle East. Turkish trade has been adversely affected by the war in the Middle East. In honoring the U.N. sanctions against Iraq, Turkey lost its major supplier of crude oil and a number of other commodities, and lost significant revenues from transit services for Persian Gulf country exports.

GOVERNMENT POLICIES AND PROGRAMS

The Turkish Government has been actively involved in mining for many years, traditionally through large parastatals. In more recent years, the Government has encouraged increased mineral exports and mining investment in Turkey. This encouragement has come through the 1985 Mining Law and various recent investment decrees. One of the most significant outcomes of this recent legislation is that foreign companies are now on the same legal footing as domestic companies in terms of such factors as taxes and access to exploration permits.

The Government introduced export subsidies and a number of import restrictions in the early 1980's to encourage exports and domestic plant capacity expansion. These policies had the desired effect of promoting production growth but also spurred severe inflation and a high degree of debt. The rapid growth of the economy began to slow in 1988 and continued to slow in 1989. Under pressure from some of Turkey's European trading partners, the Government eliminated the system of export subsidies in early 1989, but attempted to compensate in part for this by reducing import tariffs and restrictions. The change in policy has had a major negative effect on the country's private-sector steelmakers, who found their unsubsidized products uncompetitive in the international market. The iron and steel sector's problems have been compounded by the general slowdown in the economy, particularly in Government infrastructural spending, which has greatly reduced domestic demand for steel. The country's cement makers have also been hurt by the slowdown and have been unable to take advantage of the capacity expansions at most of the cement plants.

Several years of very high inflation have led to very large wage increase demands, including those by public-sector steelworkers and cementworkers. Demands for 300% to 500% raises have been settled instead with raises averaging 100% to 150%, but at a cost of several serious and prolonged strikes in 1989 and 1990.

The Government has embarked on a major privatization program. A number of public-sector mineral commodity producers are destined to be privatized, including the petrochemical manufacturer Petrokimya Anonim Şirketi (Petkim), cement companies under Türkiye Çimento Sanayii T.A.Ş. (Çitosan), and the Government shares in a major integrated steel plant. Initial efforts to sell assets to foreign companies have been partly stymied by successful lawsuits claiming that shares should first be offered to the general public. Although public demand in 1990 was high for such shares, the availability of investment capital for the general public is perceived to be limited. The Government has expressed concern that the court rulings will make it difficult to attract foreign investment and that valuable opportunities for improvements in management and technology will thereby be lost.

The common use in Turkey of lignite coal as domestic heating fuel and in powerplants is a major cause of the severe air pollution in cities. A large number of deaths have been directly attributed to air pollution, and this has led to legal opposition to planned new coal-fired powerplants. In response, the Government has begun to impose environmental controls on industries, particularly new ones, and has accelerated plans for the expansion of the country's natural gas pipeline infrastructure, which will largely use imported gas. It is intended that, where possible, natural gas will be substituted for coal and lignite for domestic and industrial uses. The Government has embarked on a program to expand the country's electrical generation capacity, mainly through the construction of hydroelectric facilities. Some of these are part of major regional programs aimed at increasing agricultural production. The latter is expected to greatly increase the country's consumption of fertilizers.

PRODUCTION

The production of most mineral commodities increased in 1989, commonly as a result of recent capacity expansion projects at many of the mines and plants. A significant exception was the public-sector iron and steel industry, which suffered a lengthy strike during the year. Iron ore production fell significantly as a result, and the steel industry lost approximately 1.4 million metric tons (MMmt) of production. Owing to increased output from the private-sector steel mills, overall steel production was virtually unchanged. Pumice production fell significantly owing to a decline in local and export demand.

TRADE

Total mineral commodity exports in 1989 were worth about $2.4 billion. Mineral commodity imports totaled an estimated $7 billion, of which fuels, including refined petroleum products, made up almost 50%. The total value of Turkish exports fell 1% in 1989 to about $11.627 billion. The decline was largely owing to a drought-induced decrease in agriculture products exports, and the loss early in the year of Government export subsidies on a wide range of manufactured goods. The elimination of export subsidies was in part a response to pressure from the European Community (EC). Agricultural products accounted for 18% of total exports. Industrial product exports, including secondary mineral products other than fuels, accounted for 69% of total exports. Textiles were the single largest export commodity in 1989, accounting for 32.6% of total exports.

Turkish imports totaled $15.763 billion in 1989, a 10% increase. Much of the increase reflects the removal of a number of import restrictions during the year and the establishment of a gold exchange.

TABLE 1

TURKEY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1985	1986	1987	1988[p]	1989[p]
METALS					
Aluminum:					
Bauxite	213,752	r280,401	259,075	269,437	549,756
Alumina:					
Gross weight	113,303	144,396	95,236	181,657	200,560
Al content	59,065	75,274	49,647	94,699	104,552
Metal, smelter	54,100	60,017	41,685	56,692	61,776
Antimony:					
Ore, mine output:					
Gross weight	r43,389	r45,112	51,399	42,640	29,896
Sb content	1,909	2,752	2,344	1,877	e1,350
Concentrates:					
Gross weight	2,097	2,117	2,591	2,303	1,801
Sb content	1,361	1,376	1,674	1,370	e1,165
Regulus	r315	r252	204	62	5
Cadmium	32	6	11	22	e22
Chromite:					
Gross weight (34% to 43% Cr_2O_3	876,807	r1,040,130	1,048,927	1,157,075	1,498,995
Salable product	588,576	r617,652	762,071	851,425	e1,000,000
Copper:					
Mine output:					
Gross weight (exclusive of pyrite)	2,228,167	2,374,862	2,645,367	3,135,661	3,822,516

See footnotes at end of table.

TABLE 1—Continued

TURKEY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[p]
METALS—Continued						
Copper—Continued						
Mine output—Continued						
Cu content of ore		r29,505	r26,085	31,531	37,746	e45,900
Cu content of pyrite		623	108	564	1,946	e2,120
Concentrates (exclusive of pyrite):						
Gross weight		161,017	119,184	136,729	167,701	e204,500
Cu content		26,795	21,130	25,778	28,509	e35,000
Metal:						
Smelter output		r33,887	35,466	19,247	12,910	21,129
Refined[e]		60,600	75,100	75,600	r90,000	101,000
Iron and steel:						
Iron ore:						
Gross weight	thousand tons	r3,995	5,249	5,366	5,481	3,602
Fe content	do.	2,130	2,833	2,881	2,983	e1,960
Metal:						
Pig iron and ferroalloys:						
Ferrochromium		r50,000	50,000	52,530	54,030	59,715
Ferrosilicon		6,900	7,000	4,400	5,200	4,970
Pig iron and other ferroalloys	thousand tons	3,193	3,666	4,438	4,916	4,044
Steel, crude including castings	do.	4,961	5,928	7,044	7,982	7,934
Lead:						
Mine output, Pb and Pb-Zn ores:						
Gross weight		208,490	231,256	236,907	286,269	371,536
Pb content		9,790	9,626	9,463	10,212	e13,000
Concentrates:						
Gross weight		27,918	32,234	31,447	37,332	e45,000
Pb content		6,446	7,516	7,274	9,396	e10,500
Metal, refined[e]		10,000	9,600	10,000	11,000	7,000
Manganese ore, gross weight[2]		10,750	r7,770	e7,000	[3]—	—
Mercury	kilograms	226,328	261,649	210,519	97,359	197,364
Silver, mine output, Ag content[e]	do.	6,800	6,800	8,800	r22,500	28,500
Tungsten, W content of concentrate		r184	r206	163	125	e100
Zinc:						
Mine output, Zn and Pb-Zn ore:						
Gross weight		300,206	325,613	355,252	387,844	e440,000
Zn content		r39,674	r40,574	42,223	37,494	e38,600
Concentrates:						
Gross weight		27,918	37,770	40,273	44,639	e71,000
Zn content		7,482	11,979	13,517	14,418	e27,000
Metal, smelter, primary[e]		22,200	15,400	r22,200	r22,500	24,200
INDUSTRIAL MINERALS						
Abrasives, natural: Emery		15,648	6,333	9,171	12,267	7,780
Asbestos:						
Run of mine		29,039	30,981	10,097	1,296	—
Fiber		932	1,098	806	e50	—
Barite, run of mine		r230,497	r330,758	291,913	405,017	434,664

See footnotes at end of table.

TABLE 1—Continued

TURKEY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[p]
INDUSTRIAL MINERALS—Continued						
Boron minerals:						
Run of mine		1,543,240	1,635,600	1,629,345	2,043,628	1,990,339
Concentrates		954,359	928,010	980,150	1,230,828	1,174,520
Cement, hydraulic	thousand tons	17,581	r20,004	21,980	22,675	23,796
Clays:						
Bentonite		r42,040	r62,367	89,262	80,218	90,336
Kaolin		r68,870	91,893	126,119	204,478	257,389
Other		r165,405	187,349	310,002	368,241	298,813
Diatomite		re6,000	re6,000	5,149	r3—	—
Feldspar, run of mine		e10,000	12,180	30,336	82,225	90,751
Fluorspar		9,805	1,604	e10,000	13,240	e13,000
Graphite		e5,000	r3,586	11,760	12,911	11,302
Gypsum		78,058	128,051	301,743	231,218	223,485
Lime[e]	thousand tons	1,000	1,100	1,100	1,500	1,400
Magnesite, crude ore		r1,136,714	r1,306,645	1,189,667	1,125,844	1,238,123
Meerschaum	kilograms	16,800	9,600	8,300	6,450	9,450
Nitrogen: N content of ammonia		r217,545	r190,180	329,771	re308,600	e308,000
Perlite		r60,146	r103,129	143,958	154,231	142,890
Phosphate rock (salable product)		r38,525	r2,700	19,197	74,230	84,810
Pumice[e 4]		r452,242	r534,917	r760,661	r1,470,675	665,476
Pyrites, cuprous, gross weight		26,032	10,153	51,245	176,964	192,738
Salt, NaCl, all types	thousand tons	1,189	1,172	1,218	1,358	e1,350
Silica sand, run of mine	do.	r491	re700	1,374	1,337	e1,500
Sodium compounds, n.e.s.:						
Soda ash (trona)[e]		300,000	330,000	376,000	379,000	381,000
Sulfate, concentrates		48,154	58,603	82,628	79,427	e80,000
Stone:						
Dolomite		882,593	527,452	394,187	262,773	e250,000
Limestone, other than for cement[e]	thousand tons	r2,500	r2,500	2,700	r3,200	2,800
Marble[e]	do.	r430	r460	r490	r515	540
Quartzite		r318,846	490,310	541,226	885,059	563,480
Strontium minerals: Celestite[e]		35,000	40,000	49,000	54,000	59,000
Sulfates, natural, n.e.s.: Aluminum sulfate (alunite)		11,578	r14,584	12,726	11,173	7,366
Sulfur:						
Native, other than Frasch		r42,671	r40,051	39,325	30,030	22,960
S content of pyrites		r11,557	r4,152	22,035	75,387	e83,000
Byproduct:						
Petroleum		5,268	6,504	8,615	15,684	13,166
Other[e]		18,000	22,000	11,000	5,000	49,000
Total[e]		r77,496	r72,707	r80,975	r126,101	168,126
Talc		e40,000	e35,000	e15,000	5,397	5,614
MINERAL FUELS AND RELATED MATERIALS						
Asphalt, natural		r522,736	607,167	631,159	624,113	407,988
Carbon black[e]		20,000	20,000	5533,141	5531,955	32,000
Coal:						
Anthracite	thousand tons	r7,260	r7,015	7,084	6,688	6,259
Bituminous	do.	523	r607	630	626	408

See footnotes at end of table.

TABLE 1—Continued

TURKEY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[p]
MINERAL FUELS AND RELATED MATERIALS—Continued						
Coal—Continued						
Lignite	thousand tons	r39,437	r45,470	46,481	39,025	51,981
Coke and semicoke:						
Metallurgical	do.	re2,500	r2,771	2,912	e3,035	e2,676
Gashouse	do.	e100	r117	105	e109	e100
Breeze	do.	re200	r247	259	e270	e260
Total	do.	re2,800	r3,135	3,276	3,414	3,036
Gas, natural:						
Gross[e]	thousand cubic meters	r850,000	r850,000	850,000	850,000	850,000
Marketed	do.	r67,736	r456,715	297,125	99,167	173,822
Petroleum:						
Crude	thousand 42-gallon barrels	15,110	17,138	18,830	18,360	20,596
Refinery products:						
Liquefied petroleum gas	do.	5,379	r5,608	6,511	8,029	7,770
Gasoline	do.	18,681	r18,512	20,020	19,204	19,847
Naphtha	do.	205	r250	102	91	245
Jet fuel	do.	2,875	r3,459	3,561	4,505	4,373
Kerosene	do.	3,585	r2,272	3,043	3,902	2,691
Distillate fuel oil	do.	r88,499	r95,363	110,901	118,056	107,195
Lubricants	do.	1,174	r1,360	re1,500	1,726	1,833
Residual fuel oil	do.	r45,288	r47,353	56,517	62,471	53,326
Asphalt	do.	3,405	r3,955	5,517	3,993	2,583
Refinery fuel and losses	do.	2,388	r2,388	2,898	2,940	e2,600
Unspecified	do.	r8,145	r10,618	13,016	14,753	12,982
Total	do.	r179,624	r191,138	re223,586	239,670	e215,445

[e]Estimated. [p]Preliminary. [r]Revised.

[1]Table includes data available through Jan. 10, 1991. Limestone quarried for cement manufacture is substantial; however, information is inadequate to make accurate estimates of output levels.

[2]Does not include manganiferous iron ore from the Devici Mine, production of which amounts to several hundred thousand tons annually, and which has a manganese content of 3% to 5%.

[3]Revised to zero.

[4]Turkish pumice production is officially reported in cubic meters, and has a density reported to range from 0.5 to 1.0 tons per cubic meter. Values in this table have been converted using 1 cubic meter = 0.75 tons.

[5]Reported figure.

The bulk of Turkey's trade in 1989 was with the EC, the United States, the U.S.S.R., and various Middle Eastern countries, notably Iraq and Iran. Trade with the U.S.S.R. mostly involved a long-term barter arrangement exchanging large quantities of Soviet natural gas and certain technical services for Turkish goods and services. Mineral commodity trade with the Middle East mainly involved petroleum, for which Turkey is 85% import-reliant, in exchange for cement, fertilizers, and iron and steel. Turkey also provided transit services for Middle East exports, notably petroleum. Trade with Iraq, particularly for Turkish steel, has declined significantly since 1988 owing to the Government's termination of export credits to Iraq, and general instability in the region. Turkey's compliance with U.N. trade sanctions against Iraq has caused major trade problems for Turkey. In terms of mineral commodities, it is estimated that the shutoff of Iraqi crude oil piped through Turkey will cost about $300 million annually in lost transit fees, and that oil tanker truck transit fee losses will be about $120 million annually. In addition, the Persian Gulf region traditionally has supplied 55% to 65% of Turkey's crude oil imports and a large proportion of its sulfur imports. New sources of these commodities were being sought.

Turkish primary nonfuel mineral exports increased about 15% to about $430 million. Exports of mineral fuels, including refinery products, declined about 23% to about $255 million. Manufactured mineral commodity exports by the Etibank group, such as alumina, boron chemicals, and ferrochrome, increased about 8% to almost $139 million. Iron and steel exports were worth $1,350 million, a 7.5% decline in part owing to Turkish exporters having to raise their iron and steel prices by about $45 per metric ton (mt) to make up for the loss of export subsidies. Cement exports amounted to an estimated $8.5 million, and manufactured fertilizer exports were estimated to have been about $200 million.

The EC took about 47% of Turkey's total exports in 1989. The Federal Republic of Germany was Turkey's single biggest customer in 1989, taking 18.7% of all exports. Italy was second with 8.4%, followed by the United States, 8.3%; the U.S.S.R., 6%; United Kingdom, 5.3%, France, 5.1%; Iran, 4.8%, Netherlands,

TABLE 2

TURKEY: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	104,525	79,997	33,977	France 46,020.
Oxides and hydroxides	17,746	66,430	—	U.S.S.R. 36,944; Iran 14,760; China 12,985.
Metal including alloys:				
Scrap	13	33	—	All to West Germany.
Unwrought	320	6,326	—	Italy 2,722; United Kingdom 2,202; Belgium-Luxembourg 1,016.
Semimanufactures	25,450	29,989	5,065	West Germany 4,802; Iraq 3,944; Italy 3,734.
Antimony:				
Ore and concentrate	4,084	1,644	—	Austria 761; Belgium-Luxembourg 482; France 300.
Metal including alloys, all forms	665	12,383	—	Iraq 12,140.
Arsenic: Ore and concentrate	24	72	—	All to Iraq.
Bismuth: Metal including alloys, all forms	—	21	—	All to Yugoslavia.
Cadmium: Metal including alloys, all forms	9	—		
Cesium and rubidium: Metal including alloys, all forms	—	50	—	All to Jordan.
Chromium:				
Ore and concentrate	569,733	843,115	152,500	Yugoslavia 139,169; China 77,609; Romania 58,124.
Oxides and hydroxides kilograms	—	55	—	All to Cyprus.
Cobalt:				
Oxides and hydroxides	(2)	200	—	All to Taiwan.
Metal including alloys, all forms kilograms	—	9	—	All to Libya.
Columbium and tantalum: Metal including alloys, all forms: Tantalum do.	—	40	—	All to Austria.
Copper:				
Ore and concentrate	—	47,908	—	Japan 15,015; Yugoslavia 9,338; Spain 7,995.
Matte and speiss including cement copper	14	1	—	All to Saudi Arabia.
Sulfate kilograms	675	400	—	All to Iraq.
Metal including alloys:				
Unwrought	6,554	5,458	—	Romania 2,567; Yugoslavia 1,000; Greece 885.
Semimanufactures	25,659	29,146	1,552	Algeria 8,690; Iraq 5,383; Egypt 4,767.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite	27,933	38,493	—	All to Iraq.
Pyrite, roasted	—	7,810	—	Iraq 7,750.
Metal:				
Scrap	5,169	7,407	—	West Germany 5,904; India 712.
Pig iron, cast iron, related materials	122,051	101,778	—	Italy 59,156; Saudi Arabia 22,488; Yugoslavia 10,999.
Ferroalloys:				
Ferrochromium	41,224	59,451	35,500	Japan 8,200; Finland 4,500.
Ferrosilicon	1	20	—	All to West Germany.
Steel, primary forms	905,119	1,418,010	1,582	Taiwan 687,636; Iran 168,837; Japan 95,259.

See footnotes at end of table.

TABLE 2—Continued

TURKEY: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS—Continued				
Iron and steel—Continued				
Metal—Continued				
Semimanufactures:				
Bars, rods, angles, shapes, sections thousand tons	1,359	1,807	219	Iraq 311; Iran 198; Algeria 135.
Universals, plates, sheets	r274,555	564,569	3,822	China 102,967; Iran 98,420; Iraq 71,796.
Hoop and strip	35,708	20,202	—	Iraq 10,352; Syria 9,274.
Rails and accessories	11	57	—	U.S.S.R. 25; Libya 24.
Wire	8,510	21,656	81	Syria 7,186; Libya 6,489.
Tubes, pipes, fittings	228,110	241,241	22,346	U.S.S.R. 53,599; Iran 40,993; United Kingdom 34,436.
Castings and forgings, rough	119	466	—	West Germany 289; Libya 113.
Lead:				
Ore and concentrate[3]	1,954	2,908	—	Bulgaria 1,737; Greece 1,160.
Oxides	188	52	—	Iraq 35; Iran 17.
Metal including alloys:				
Unwrought	629	37	—	Mainly to Iraq.
Semimanufactures	60	43	—	Iraq 40.
Magnesium: Metal including alloys, semimanufactures	30	197	—	All to West Germany.
Manganese:				
Ore and concentrate, metallurgical-grade	28	—		
Oxides	40	737	—	All to Iraq.
Mercury	101	183	—	Netherlands 174; Iraq 6.
Molybdenum: Metal including alloys, all forms	1	—		
Nickel: Metal including alloys, semimanufactures	—	158	—	Mainly to Iraq.
Silver: Metal including alloys, unwrought and partly wrought kilograms	250	1,358	—	Saudi Arabia 1,250; Netherlands 96.
Tin: Metal including alloys:				
Scrap do.	—	68	—	All to Iran.
Unwrought	16	(2)	—	Mainly to Libya.
Semimanufactures	43	47	—	Iraq 26; Israel 19.
Titanium: Oxides	21	37	—	Iraq 36.
Tungsten: Ore and concentrate	832	433	388	Hong Kong 45.
Uranium and thorium: Ore and concentrate	—	1,000	—	All to Romania.
Zinc:				
Ore and concentrate[3]	r13,422	31,451	—	Bulgaria 13,100; Belgium-Luxembourg 8,840; Italy 3,572.
Oxides	1,988	874	—	Belgium-Luxembourg 521; Portugal 132.
Ash and residue containing zinc	268	489	—	West Germany 369; Belgium-Luxembourg 80.
Metal including alloys:				
Unwrought	1,174	922	—	China 600; Iraq 282.
Semimanufactures	753	1,109	—	Iraq 945; Iran 145.
Other:				
Ores and concentrates	9,668	38,493	—	All to Iraq.
Oxides and hydroxides	30	3	—	Mainly to Iraq.
Ashes and residues	201	952	—	West Germany 800; Austria 80.

See footnotes at end of table.

TABLE 2—Continued

TURKEY: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	109,876	123,212	10,562	Italy 25,043; France 23,502.
Artificial:				
Corundum	500	—		
Silicon carbide	—	380	—	All to West Germany.
Grinding and polishing wheels and stones	342	906	—	Iraq 816; Libya 30.
Asbestos, crude kilograms	—	200	—	All to Jordan.
Barite and witherite	231,026	233,899	4,025	U.S.S.R. 108,586; Egypt 39,198; Italy 14,151.
Boron materials:				
Crude natural borates	720,231	852,517	216,185	Italy 119,104; France 103,070; Japan 64,870.
Oxides and acids	17,945	130,538	12,348	Italy 23,546; Japan 13,950; Iran 9,718.
Cement	315,039	244,505	—	Egypt 128,062; Algeria 17,450.
Chalk	2,786	2,833	—	Libya 1,759; United Kingdom 462.
Clays, crude:				
Bentonite	24,740	26,227	—	Netherlands 8,020; Iraq 4,706; Austria 4,500.
Chamotte earth	36,201	23,572	—	Romania 18,000; United Kingdom 3,000.
Fire clay	2,000	60	—	All to Iraq.
Kaolin	25,726	12,113	—	Lebanon 9,600; Yugoslavia 1,900.
Unspecified	1,990	286	—	Italy 210; Saudi Arabia 40; Jordan 25.
Diatomite and other infusorial earth	2,693	513	—	All to Iraq.
Feldspar	17,898	20,094	—	Egypt 11,335; Algeria 2,600; Italy 2,044.
Fertilizer materials: Manufactured:				
Ammonia	3	3	—	Cyprus 2; Libya 1.
Nitrogenous	225,896	308,364	—	China 86,002; West Germany 55,362; Taiwan 42,000.
Phosphatic	352,991	448,627	6,500	U.S.S.R. 242,551; Syria 70,335; Pakistan 61,000.
Potassic	4	200	—	All to Cyprus.
Unspecified and mixed	242,324	565,404	—	Iran 440,911; Pakistan 25,000; Italy 22,750.
Fluorspar	277	—		
Graphite, natural	4	4	—	Cyprus 2; Iraq 1.
Gypsum and plaster	1,280	14,227	—	China 12,500; Egypt 1,040.
Lime	11,692	10,699	—	Cyprus 10,025.
Magnesium compounds:				
Magnesite, crude	32,069	80,806	—	Greece 56,086; Italy 16,420.
Oxides and hydroxides	134,025	133,913	1,763	Austria 28,191; West Germany 22,550; Yugoslavia 15,000.
Meerschaum, amber, jet	2	1	—	All to West Germany.
Mica:				
Crude including splittings and waste	121	34	—	United Kingdom 20; Nigeria 10.
Worked including agglomerated splittings	18	4	—	Mainly to Cyprus.
Perlite	75,617	86,823	—	Belgium-Luxembourg 23,130; France 18,850; United Kingdom 14,130.
Phosphates, crude	22	525	—	Netherlands 365; Saudi Arabia 160.
Pigments, mineral:				
Natural, crude	82	391	—	West Germany 304; Iraq 62.
Iron oxides and hydroxides, processed	262	97	—	Iraq 37; Libya 34; Saudi Arabia 13.

See footnotes at end of table.

TABLE 2—Continued

TURKEY: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Precious and semiprecious stones other than diamond: Synthetic value, thousands	$1	—		
Salt and brine	17,387	20,312	—	Iraq 18,408.
Sodium compounds, n.e.s.:				
Soda ash, natural and manufactured	137,564	129,190	—	Iran 55,178; Iraq 17,516; Italy 13,375.
Sulfate, natural and manufactured	21,429	20,350	—	Iraq 14,289; Sudan 2,798; Iran 2,455.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	46,153	82,308	96	Israel 35,984; Italy 21,913; Switzerland 5,907.
Worked	22,170	48,061	5,117	West Germany 20,112; Netherlands 14,379.
Dolomite, chiefly refractory-grade	57	1,655	—	Cyprus 1,570.
Gravel and crushed rock	862	1,261	—	Libya 317; undetermined 908.
Limestone other than dimension	92	—		
Quartz and quartzite	87	165	—	Iraq 67; Egypt 50; Syria 48.
Sand other than metal-bearing	11,296	8,759	—	Iraq 4,660; Iran 4,002.
Strontium: Sulfate (celestite)	65,081	55,800	—	West Germany 48,300; Japan 6,000.
Sulfur:				
Elemental: Crude including native and byproduct	3	—		
Dioxide	31	7	—	All to Iran.
Sulfuric acid	6	71	—	Cyprus 67.
Talc, steatite, soapstone, pyrophyllite	334	651	—	Iraq 413; Italy 112.
Other:				
Crude	94	—		
Slag and dross, not metal-bearing	13,415	20,220	—	Cyprus 20,200.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	499	56	—	All to Libya.
Carbon black	298	298	—	Mainly to Iraq.
Coal:				
Anthracite and bituminous	—	154	—	Iraq 153.
Lignite including briquets	3,350	3,364	—	All to Cyprus.
Coke and semicoke	433	220	—	Syria 143; Saudi Arabia 55.
Peat including briquets and litter	—	200	—	All to Cyprus.
Petroleum refinery products:				
Gasoline thousand 42-gallon barrels	3,047	2,727	—	Italy 1,658; Japan 245; Egypt 244.
Mineral jelly and wax do.	13	29	—	West Germany 15; Republic of South Africa 8.
Kerosene and jet fuel do.	471	2,398	259	Iran 1,240; Italy 489.
Distillate fuel oil do.	r12,243	24,553	1,281	Italy 16,981; Greece 2,678; United Kingdom 1,390.
Lubricants do.	10	574	—	Cyprus 573.
Residual fuel oil do.	r21	26	—	All to Cyprus.
Asphalt do.	r419	250	—	Italy 108; Lebanon 77; Algeria 34.
Bituminous mixtures do.	1	2	—	Cyprus 1; Libya 1.
Petroleum coke do.	2	5	—	Cyprus 3; Greece 1.

rRevised.
[1]Table prepared by Virginia A. Woodson.
[2]Less than 1/2 unit.
[3]Includes content of polymetallic ores.

3.4%; Iraq, 3.8%, and Saudi Arabia, 3.1%. Imports of Turkish goods by the United States increased 28% in 1989 and were dominated by agricultural products, textiles, and steel.

Crude oil, refined petroleum products, and natural gas accounted for about $3.2 billion or 46% of total imports of mineral commodities. Iron and steel imports amounted to $2.22 billion. Gold imports for the new gold exchange amounted to $1.06 billion, compared with legal gold imports of only $32 million in 1988. Fertilizer imports amounted to an estimated $325 million. Primary nonfuel mineral imports totaled an estimated $200 million.

Crude oil imports fell about 15% to 139 million barrels, but because of higher world oil prices, the value of the imports fell only about 13% to about $2.3 billion. Natural gas imports soared sixfold to 3.107 billion cubic meters, worth about $135 million, reflecting the first full year of imports of gas from the U.S.S.R. Imports of liquid petroleum gas increased 25% to 9 million cubic meters. The 34% value increase in iron and steel imports was in response to a strike-induced shortage of domestic production from the public-sector steel industry. The estimated 35% increase in the cost of fertilizer imports was the result of higher fertilizer prices in 1989.

Turkey's main overall import sources were the Federal Republic of Germany, 14%; the United States, 13.2%; and Iraq, 10.5%. Turkish imports from the United States were largely of machinery, iron and steel products and scrap, coal, and chemicals. Official data on U.S. exports to Turkey, however, are incomplete because they do not include sales of U.S. products through European subsidiaries of American companies.

TABLE 3

TURKEY: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals: Alkali metals	22	—		
Aluminum:				
Ore and concentrate	40,461	55,684	7,827	China 36,993; Republic of South Africa 6,071.
Oxides and hydroxides	1,499	2,293	8	West Germany 1,519; France 510.
Metal including alloys:				
Scrap	4,314	1,305	—	West Germany 874; Cyprus 167.
Unwrought	89,638	59,193	831	Yugoslavia 17,341; Canada 15,308; Spain 4,424.
Semimanufactures	8,539	6,698	99	West Germany 2,536; Yugoslavia 901; Netherlands 602.
Antimony:				
Ore and concentrate kilograms	—	800	—	All from Morocco.
Oxides	164	164	96	China 45; France 10.
Arsenic:				
Oxides and acids	137	171	—	France 90; United Kingdom 74.
Metal including alloys, all forms	28	7	—	Sweden 5; China 2.
Bismuth: Metal including alloys, all forms	3	3	—	Republic of Korea 1; Netherlands 1.
Cadmium:				
Oxides and hydroxides	23	9	—	Belgium-Luxembourg 7; West Germany 2.
Metal including alloys, all forms	—	1	—	Mainly from Belgium-Luxembourg.
Chromium:				
Ore and concentrate	2	—		
Oxides and hydroxides	368	404	65	Italy 212; West Germany 76.
Metal including alloys, all forms	1	8	1	Switzerland 3; West Germany 2.
Cobalt:				
Oxides and hydroxides	54	49	—	Belgium-Luxembourg 18; Finland 15; Netherlands 14.
Metal including alloys, all forms	2	24	1	West Germany 18.
Columbium and tantalum: Metal including alloys, all forms: Tantalum kilograms	30	17	—	West Germany 13; Belgium-Luxembourg 4.

See footnotes at end of table.

TABLE 3—Continued

TURKEY: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS—Continued				
Copper:				
Ore and concentrate (excluding cupreous pyrite)	150	813	—	Chile 499; Cyprus 313.
Matte and speiss including cement copper	947	1,237	—	Zaire 972; Republic of South Africa 244.
Oxides and hydroxides	32	71	—	West Germany 66; Norway 5.
Sulfate	547	1,476	—	Yugoslavia 921; U.S.S.R. 478.
Metal including alloys:				
Scrap	223	1,715	—	Saudi Arabia 1,487; Iraq 98.
Unwrought	73,108	47,974	(2)	Republic of South Africa 19,951; Chile 17,272.
Semimanufactures	25,330	22,823	23	West Germany 10,747; Saudi Arabia 3,059; Greece 2,060.
Gold: Metal including alloys, unwrought and partly wrought[3] kilograms	47	35	—	All from West Germany.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite thousand tons	r1,892	1,798	—	Republic of South Africa 617; Australia 274; India 230.
Metal:				
Scrap do.	2,831	3,037	1,929	Netherlands 337; United Kingdom 274.
Pig iron, cast iron, related materials	152,978	182,960	35,000	U.S.S.R. 87,532; Venezuela 24,257.
Ferroalloys:				
Ferroaluminum	40	40	—	All from United Kingdom.
Ferrochromium	4	8	—	United Kingdom 4; Sweden 2.
Ferromanganese	41,707	35,965	—	Republic of South Africa 21,835; France 6,964.
Ferromolybdenum	200	200	10	Austria 71; China 45; United Kingdom 29.
Ferrosilicomanganese	28,049	31,892	—	Republic of South Africa 19,545; U.S.S.R. 6,940.
Ferrosilicon	27,035	24,783	—	Norway 11,402; Yugoslavia 9,124.
Silicon metal	1,166	1,307	—	China 572; Sweden 320; Norway 215.
Unspecified	r1,045	1,038	2	Norway 361; France 249; United Kingdom 234.
Steel, primary forms thousand tons	1,893	1,155	(2)	Brazil 474; U.S.S.R. 139; Yugoslavia 97.
Semimanufactures:				
Bars, rods, angles, shapes, sections	304,860	266,313	130	Yugoslavia 70,582; Romania 62,073; Italy 62,007.
Universals, plates, sheets	984,775	754,442	4,668	Belgium-Luxembourg 169,505; France 141,019; West Germany 131,979.
Hoop and strip	9,212	2,913	(2)	Italy 695; Belgium-Luxembourg 331; West Germany 138.
Rails and accessories	9,656	93,103	—	Italy 43,486; Republic of South Africa 39,883.
Wire	14,609	793	35	Sweden 261; Netherlands 183; West Germany 77.
Tubes, pipes, fittings	244,464	90,756	6,688	West Germany 28,935; France 24,217; Venezuela 7,649.
Castings and forgings, rough value, thousands	$729	—		
Lead:				
Oxides	478	718	(2)	Spain 475; France 120; West Germany 102.
Metal including alloys:				
Scrap	2,773	2,036	—	Finland 987; United Kingdom 562; Ireland 203.
Unwrought	13,629	15,754	—	Spain 4,640; Italy 4,472; Belgium-Luxembourg 3,309.
Semimanufactures	3	16	2	West Germany 11; Belgium-Luxembourg 3.

See footnotes at end of table.

TABLE 3—Continued

TURKEY: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS—Continued					
Lithium:					
Oxides and hydroxides		51	76	1	West Germany 40; Netherlands 30.
Metal including alloys, all forms		(2)	1	—	All from United Kingdom.
Magnesium: Metal including alloys:					
Unwrought		147	302	20	Norway 202; France 48; West Germany 20.
Semimanufactures		50	27	—	Belgium-Luxembourg 10; West Germany 10.
Manganese:					
Ore and concentrate, metallurgical-grade		1,618	1,496	—	Belgium-Luxembourg 1,011; Brazil 420.
Oxides		698	1,311	(2)	Belgium-Luxembourg 759; China 253; Greece 210.
Metal including alloys, all forms		(2)	106	5	Netherlands 44; United Kingdom 21; Belgium-Luxembourg 20.
Mercury	kilograms	264	52	—	All from West Germany.
Molybdenum:					
Oxides and hydroxides	do.	1,038	1,143	—	Mainly from West Germany.
Metal including alloys, all forms		14	9	(2)	Australia 5; Belgium-Luxembourg 2.
Nickel:					
Matte and speiss		34	—		
Oxides and hydroxides		26	17	(2)	United Kingdom 5; Czechoslovakia 3; Finland 3.
Metal including alloys:					
Unwrought		1,157	800	—	Canada 341; United Kingdom 133; Finland 82.
Semimanufactures		752	121	4	West Germany 46; Austria 26.
Platinum-group metals: Metals including alloys, unwrought and partly wrought	kilograms	321	227	19	United Kingdom 114; Republic of South Africa 47; West Germany 40.
Selenium, elemental	do.	31	50	—	West Germany 31; Belgium-Luxembourg 16.
Silver: Metal including alloys, unwrought and partly wrought[3]	do.	15,359	10,155	1	West Germany 6,660; Switzerland 1,878.
Tellurium, elemental	do.	10,126	50	—	All from United Kingdom.
Tin:					
Ore and concentrate		2,026	—		
Oxides		19	75	—	West Germany 70.
Metal including alloys:					
Scrap		—	1	—	All from Italy.
Unwrought		1,052	897	15	United Kingdom 498; Brazil 196; Indonesia 90.
Semimanufactures		6	11	(2)	West Germany 8.
Titanium:					
Ore and concentrate		4,527	3,219	—	Australia 2,178; Republic of South Africa 779.
Oxides		2,917	2,445	—	West Germany 870; United Kingdom 790; Hong Kong 262.
Tungsten:					
Oxides and hydroxides	kilograms	316	135	—	West Germany 134; United Kingdom 1.
Metal including alloys, all forms		66	71	1	Belgium-Luxembourg 30; West Germany 22.
Vanadium: Oxides and hydroxides		137	109	109	
Zinc:					
Ore and concentrate		—	3,503	—	Iran 2,633; United Kingdom 870.
Oxides		327	506	—	West Germany 465; France 20.
Ash and residue containing zinc		453	343	—	All from Cyprus.

See footnotes at end of table.

TABLE 3—Continued

TURKEY: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS—Continued					
Zinc—Continued					
Metal including alloys:					
Scrap		785	499	—	All from Yugoslavia.
Unwrought		33,616	19,071	46	Italy 7,474; Belgium-Luxembourg 6,360; Yugoslavia 2,775.
Semimanufactures		253	36	(2)	West Germany 15; Belgium-Luxembourg 12.
Zirconium: Ore and concentrate		757	620	—	Italy 535; Republic of South Africa 80.
Other:					
Ores and concentrates		5,287	—		
Oxides and hydroxides		r250	606	8	Japan 140; France 126; West Germany 116.
Base metals including alloys, all forms		156	—		
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.		242	12	(2)	Mainly from United Kingdom.
Artificial: Corundum		2,807	2,903	1	Poland 776; Austria 605; West Germany 569.
Dust and powder of precious and semiprecious stones including diamond	value, thousands	$2,145	$2,570	$102	Ireland $1,689; Zaire $366.
Grinding and polishing wheels and stones		245	470	19	West Germany 99; Italy 96; Czechoslovakia 52.
Asbestos, crude		33,341	38,058	—	Canada 12,268; Greece 10,371; Zimbabwe 5,206.
Boron materials:					
Crude natural borates		29	162	—	Mainly from Italy.
Oxides and acids		7	179	—	West Germany 100; United Kingdom 78.
Bromine	kilograms	—	344	30	West Germany 314.
Cement	thousand tons	1,834	1,816	—	U.S.S.R. 717; Iraq 642; Greece 164.
Chalk		33	34	—	France 24; Spain 10.
Clays, crude:					
Bentonite		402	30	20	United Kingdom 9.
Chamotte earth		114	913	—	France 863; United Kingdom 50.
Fire clay		47	124	—	West Germany 70; United Kingdom 54.
Kaolin		10,031	9,433	1,613	United Kingdom 6,006; Portugal 1,000.
Unspecified		r4,205	3,794	11	United Kingdom 3,256; West Germany 376.
Cryolite and chiolite		22	2	—	Denmark 1; United Kingdom 1.
Diamond, natural:					
Gem, not set or strung[4]	carats	45,000	30,000	—	All from Belgium-Luxembourg.
Industrial stones	do.	145,000	70,000	—	Netherlands 45,000; Zaire 10,000.
Diatomite and other infusorial earth		147	131	50	France 66; United Kingdom 6.
Feldspar		—	22	—	United Kingdom 20; West Germany 2.
Fertilizer materials:					
Crude, n.e.s.		16,881	13,517	—	U.S.S.R. 7,000; Israel 6,517.
Manufactured:					
Ammonia		590,662	713,465	1,200	U.S.S.R. 547,374; Saudi Arabia 131,944.
Nitrogenous	thousand tons	1,914	1,193	21	Romania 512; Italy 143; Yugoslavia 98.
Phosphatic		74,065	98,127	—	Iraq 66,617; Romania 29,510.
Potassic		42,142	60,358	—	Israel 31,667; Jordan 10,500; U.S.S.R. 5,500.
Unspecified and mixed		815,050	584,865	253,853	Romania 171,906; Norway 40,700.

See footnotes at end of table.

TABLE 3—Continued

TURKEY: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Fluorspar		80	436	—	Mexico 215; West Germany 96; Netherlands 60.
Graphite, natural		509	453	—	West Germany 369; China 82.
Gypsum and plaster		35,173	35,890	77	Cyprus 35,716.
Iodine		5	4	1	Canada 1; West Germany 1.
Kyanite and related materials: Andalusite		1,121	1,402	—	Republic of South Africa 1,002; Italy 400.
Lime		(2)	127	—	Iran 126.
Magnesium compounds:					
Magnesite, crude	kilograms	100	—		
Oxides and hydroxides		141	238	10	West Germany 171; Austria 24; France 10.
Mica:					
Crude including splittings and waste		9	7	—	West Germany 5; Spain 1.
Worked including agglomerated splittings		65	55	(2)	Belgium-Luxembourg 21; Spain 13; West Germany 7.
Phosphates, crude		813,581	995,330	(2)	Jordan 574,150; Israel 143,275; Tunisia 129,816.
Phosphorous, elemental		56	37	(2)	West Germany 27; China 6.
Pigments, mineral: Iron oxides and hydroxides, processed		1,729	650	76	West Germany 501; Japan 64.
Precious and semiprecious stones other than diamond:					
Natural	kilograms	1,218	1,255	—	Hong Kong 727; Italy 152.
Synthetic	do.	133	4,483	—	Taiwan 3,297; Hong Kong 1,050.
Pyrite, unroasted:					
Cupreous		37,556	64,155	—	Norway 35,695; Sweden 18,545.
Other		34,579	30	—	Italy 20; West Germany 10.
Quartz crystal, piezoelectric	kilograms	10	1	—	All from West Germany.
Salt and brine		486	12,126	—	Iran 11,748.
Sodium compounds, n.e.s.:					
Soda ash, manufactured		17	46	—	Italy 44.
Sulfate, manufactured		73,465	83,419	3,120	France 26,763; Yugoslavia 8,989; Bulgaria 3,167.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		4	179	—	Israel 100; Italy 61.
Worked		80	169	15	Italy 143.
Dolomite, chiefly refractory-grade	kilograms	185	1,850	—	West Germany 1,300; Norway 550.
Gravel and crushed rock		368	305	1	West Germany 148; Italy 125.
Limestone other than dimension	kilograms	6,100	10	10	
Quartz and quartzite		312	334	—	West Germany 200; Sweden 89.
Sand other than metal-bearing		6,218	8,183	5	Belgium-Luxembourg 8,078.
Sulfur:					
Elemental:					
Crude including native and byproduct		108,254	139,115	—	Iraq 70,612; Saudi Arabia 45,850; Poland 22,000.
Colloidal, precipitated, sublimed		59	46	1	West Germany 31; France 14.
Dioxide		—	6	—	Mainly from West Germany.
Sulfuric acid		165,810	100,925	(2)	Italy 84,926; Spain 15,948.
Talc, steatite, soapstone, pyrophyllite		506	689	—	West Germany 235; Australia 100; Austria 100.

See footnotes at end of table.

TABLE 3—Continued

TURKEY: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
Other:					
Crude		5,565	6,251	4	Italy 2,321; West Germany 2,262; United Kingdom 1,147.
Slag and dross, not metal-bearing		175	5,425	—	All from France.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		68	42	22	United Kingdom 20.
Carbon black		15,066	16,700	77	Italy 10,997; Portugal 2,460.
Coal:					
Anthracite and bituminous	thousand tons	3,442	4,460	908	Australia 1,981; Republic of South Africa 1,225.
Lignite including briquets		392,885	228,644	—	Republic of South Africa 85,159; U.S.S.R. 82,677; China 60,808.
Coke and semicoke		32,695	85,414	67,776	Yugoslavia 10,851.
Peat including briquets and litter		216	267	—	Netherlands 167; West Germany 100.
Petroleum:					
Crude	thousand 42-gallon barrels	141,782	160,709	—	Iraq 90,183; Iran 40,154; Saudi Arabia 10,231.
Refinery products:					
Liquefied petroleum gas	do.	8,195	7,229	—	Kuwait 4,844; Iraq 2,238.
Gasoline	do.	134	5,679	—	U.S.S.R. 2,269; Iraq 1,570; Saudi Arabia 603.
Mineral jelly and wax	do.	16	23	(2)	United Kingdom 16; West Germany 7.
Kerosene and jet fuel	do.	77	—		
Distillate fuel oil	do.	35,132	(2)	(2)	Mainly from Sweden.
Lubricants	do.	207	225	24	Iraq 76; Greece 75; West Germany 24.
Residual fuel oil	do.	7	25	—	All from Iran.
Asphalt	do.	201	684	—	Spain 644.
Bitumen and other residues	do.	202	—		
Bituminous mixtures	do.	20	2	(2)	Mainly from France.
Petroleum coke	do.	1,495	2,718	2,027	Romania 276; Syria 150.

[r]Revised.
[1]Table prepared by Virginia A. Woodson.
[2]Less than 1/2 unit.
[3]Nonmonetary.
[4]May include industrial.

STRUCTURE OF THE MINERAL INDUSTRY

The Turkish mining industry is characterized by a number of large, state-owned conglomerates, and a very large number of private producers. Private-sector producers range from large concerns with several hundred employees or more, to family-operated mines with only a few employees. More than 800 mining establishments were listed as in operation in 1988, the latest year for which such information was available. The state-owned enterprises are a major part of the mineral industry. Etibank and its subsidiaries dominate or produce the country's entire output of such commodities as aluminum, boron minerals and chemicals, blister copper, ferrochrome, mercury and zinc. Other parastatals dominate production of such commodities as iron ore and iron and steel, petroleum and natural gas, coal, cement, and fertilizers. State participation in Turkey's mineral industry is being gradually reduced by the implementation of the Government's privatization plans.

Maden Tetkik ve Arama Enstitüsü (MTA) is the state agency responsible for geologic exploration and research in Turkey. Apart from doing its own exploration, MTA can provide laboratory and field services for private-sector exploration efforts. Until recently, MTA had first refusal rights for all exploration concessions in Turkey, but it now must bid on such concessions on an equal basis with domestic and foreign exploration companies.

Approximately 180,000 workers are employed in the mineral commodities industries. The largest employers are the coal and lignite producers, with a total of about 80,000 employees; the iron and steel producers, with almost 44,000 employees; and the cement producers, with

about 22,000 workers. Total annual wages exceed $300 million, but this will likely increase sharply in the future given the high inflation rate in Turkey and large public-sector wage settlements in 1989 and 1990.

TABLE 4

TURKEY: STRUCTURE OF THE MINERAL INDUSTRY

Commodities	Major producing companies (ownership)	Location of main facilities	Capacity[1]
Aluminum	Etibank Milas Boksit İşletmeleri Müdürlüğü (Government, 100%)	Open pit mine at Milas, 127 kilometers southwest of Denizli	150,000 diaspore.
Do.	Etibank Seydişehir Alüminyum Tesisleri Müessesesi Müdürlüğü (Government, 100%)	Mortaş bauxite mine, at Akseki, 40 kilometers south of Seydişehir	400,000 bauxite.
Do.	do.	Alumina refinery and aluminum smelter at Seydişehir	200,000 alumina; 60,000 aluminum.
Barite	Barit Maden Türk A.Ş.	Mines near Sivas and Adana	220,000 ground barite.
Do.	Baser Maden Sanayi ve Ticaret A.Ş.	Mines at Isparta and Konya	90,000 ground barite.
Do.	Emas Endüstri Mineralleri A.Ş.	Mine at Muş	100,000 ground barite.
Do.	Etibank Beyşehir Barit İşletmesi (Government, 100%)	Mine at Beyşehir, 72 kilometers southwest of Konya	70,000 ore.
Do.	Etibank Antalya Elektrometalurji Sanayi İşletmesi Müessesesi Müdürlüğü (Government, 100%)	Grinding plant at Antalya	100,000 ground barite.
Do.	Polbar Barit Endüstrisi A.Ş.	Mine near Antalya	120,000 ground barite.
Boron minerals	Etibank Bigadiç Madençilic İşletmeleri (Government, 100%)	Bigadiç, 38 kilometers southeast of Balikesir	200,000 colemanite concentrate; 115,000 ulexite concentrate.
Do.	Etibank Emet Kolemanit İşletmeleri (Government, 100%)	Emet, 62 kilometers west-southwest of Kütahya	500,000 colemanite concentrate.
Do.	Etibank Kestelek Kolemanit İşletmeleri (Government, 100%)	Kestelek, 80 kilometers west-southwest of Bursa	100,000 colemanite concentrate.
Do.	Etibank Kirka Boraks İşletmeleri Müessesesi Müdürlüğü (Government, 100%)	Kirka, 61 kilometers north of Afyon	500,000 tincal concentrate.
Cement	Akçimento Ticaret A.Ş.	Büyükçekmece, 30 kilometers west of Istanbul	3.0.[2]
Do.	Aslan Çimento A.Ş.	Darica, 40 kilometers southeast of Istanbul	2.0.[2]
Do.	Bati Anadolu Çimento Sanayii A.Ş.	Bornova, 10 kilometers northeast of Izmir	2.5.[2]
Do.	Çanakkale Çimento Sanayi A.Ş.	Çanakkale	1.4.[2]
Do.	CIMSA - Çimento Sanayi ve Ticaret A.Ş.	Mersin	1.8.[2]
Do.	Çitosan (General Directorate) (Government, 100%)	22 plants	10.2.[2]
Do.	Çukorova Çimento Sanayi T.A.Ş. (Army Mutual Fund, 49%; Çitosan, 47%; others, 4%)	Adana	1.8.[2]
Do.	Yibitas-Yozgat Çimento Fabrikasi	Yozgat, 168 kilometers east of Ankara	2.4.[2]
Do.	Other private sector and mixed public-private sector companies.	12 plants	8.3.[2]
Chromium			
Chromite ores and concentrates	Etibank Şark Kromlari İşletmesi Müessesesi Müdürlüğü (Government, 100%)	Mines at Güleman, 80 kilometers southeast of Elazig	150,000 lump ore; 70,000 concentrate.
Do.	Etibank Üçköprü Maden İşletmesi Müessesesi Müdürlüğü (Government, 100%)	Mines in Göcek District, near Fethiye	50,000 lump ore; 30,000 concentrate.
Do.	Birlik Madencilik Ticaret ve Sanayi A.Ş.	Kayseri	240,000 lump ore.

See footnotes at end of table.

TABLE 4—Continued

TURKEY: STRUCTURE OF THE MINERAL INDUSTRY

Commodities	Major producing companies (ownership)	Location of main facilities	Capacity[1]
Chromium—Continued			
Chromite ores and concentrates—Continued	Akpaş Madencilik ve Paz. ve Ticaret A.Ş.	Mines at Erzurum, Erzincan, and Kayseri	200,000 lump ore; 70,000 concentrate.
Do.	Bilfer Madencilik A.Ş.	Mines at Kayseri and Sivas	100,000 lump ore; 45,000 concentrate.
Do.	Türk Maadin Şirketi (AŞ)	Mines at Köyceğiz, 56 kilometers northwest of Fethiye, and at Eskişehir	24,000 lump ore; 88,000 concentrate.
Do.	Dedeman Madecilik Turizm Sanayi ve Ticaret A.Ş.	Kayseri	56,000 lump ore.
Do.	Egemetal Madencilik A.Ş.	Mines at Bursa, Mersin, Eskişehir, and Erzurum	35,000 lump ore; 40,000 concentrate.
Do.	Pinar Madencilik ve Turizm A.Ş.	Mines at Kayseri and Adana	25,000 lump ore; 14,400 concentrate.
Do.	Akdeniz Madencilik Ticaret ve Sanayi A.Ş.	Adana	25,000[e] lump ore.
Do.	Other (9) private producers.	Mines at Köyceğiz, Bursa, Adana, Iskenderun, Eskişehir	114,000 lump ore; 12,000 concentrate.
Ferrochrome	Etibank Elazığ Ferrokrom Işletmesi (Government, 100%)	Ferrochrome plant at Elazığ	100,000 high-carbon ferrochrome.
Do.	Etibank Antalya Elektrometalurji Sanayi Işletmesi Müessesesi Müdürlüğü (Government, 100%)	Ferrochrome plant at Antalya	10,000 low-carbon ferrochrome.
Copper	Etibank Küre Bakirli Pirit Işletmesi Müessesesi Müdürlüğü (Government, 100%)	Open pit copper and pyrite mine at Küre, 14 kilometers south of Inebolu	90,000 copper concentrates; 460,000 pyrite concentrates.
Do.	Etibank Ergani Bakir Işletmesi Müessesesi Müdürlüğü (Government, 100%)	Open pit mine and smelter at Ergani, 59 kilometers southeast of Elazığ	16,000 blister copper.
Do.	Karadeniz Bakir Işletmeleri A.Ş. (Etibank, 99.9%)	Murgul, Damar, and Çakmakkaya mines and smelter near Artvin	175,000[e] copper concentrates; 20,000[e] blister.
Do.	do.	Open pit Kutlular Mine near Trabzon	15,000[e] copper concentrate.
Do.	do.	Underground mine near Küre	95,000[e] ore.
Do.	do.	Smelter and acid plant at Samsun	38,000 blister.
Iron and steel			
Iron ore	Türkiye Demir ve Çelik Işletmeleri Genel Müdürlüğü (TDÇI), (Government, 100%)	Divriği Mines, 115 kilometers northwest of Elazığ	3[e 2] run of mine ore; 1.1[2] pellets; 600,000 concentrate; 500,000 lump ore.
Do.	do.	Deveci Mine at Hekimhan, 112 kilometers west of Elazığ	750,000[e] ore.
Steel	TDÇI (Government, 100%)	Iskenderun	2.2[2] crude steel.
Do.	do.	Karabük	0.60[2] crude steel.
Do.	Ereğli Demir ve Çelik Fabrikalari T.A.Ş. (Erdemir), (Government, 51.5%)	Ereğli	2.0[2] crude steel.
Do.	Makina ve Kimya Endüstrisi Kurumu (MKEK), (Government, 100%)	Kirikkale, 62 kilometers east of Ankara	60,000 crude steel.
Do.	Çolakoğlu Metalurji A.Ş.	Izmit	650,000 semifinished steel.
Do.	Çukurova Çelik Endüstrisi A.Ş.	Aliağa, 40 kilometers north-northeast of Izmir	2.0[2] semifinished steel.
Do.	Diler Demir Çelik Endüstri ve Ticaret A.Ş.	Near Istanbul	310,000 semifinished ateel.

See footnotes at end of table.

TABLE 4—Continued

TURKEY: STRUCTURE OF THE MINERAL INDUSTRY

Commodities	Major producing companies (ownership)	Location of main facilities	Capacity[1]
Iron and Steel—Continued			
Steel—Continued	Ekinciler Demir ve Çelik Sanayi A.Ş.	Arc furnace and 1 rolling mill at Iskenderun. Also rolling mills at Adana, Karabük, and Payas	550,000 semifinished steel.
Do.	Habaş Sinai ve Tibbi Gazlar Istihsal Endüstrisi A.Ş.	Aliağa	600,000 semifinished steel.
Do.	Izmir Demir Çelik Sanayi A.Ş.	Izmir	500,000 semifinished steel.
Do.	Kroman Çelik Sanayii A.Ş.	Gebze, 40 kilometers southeast of Istanbul	360,000 semifinished steel.
Do.	Metaş Izmir Metalurji Fabrikasi T.A.Ş.	Izmir	450,000 special steels and semifinished steel.
Do.	Other private-sector companies.	8 plants	830,000 special steels and semifinished steel.
Magnesite	Çitosan Konya Krom Magnezit Tugla Sanayii A.Ş. (Government, 100%)	Konya	40,000 dead-burned magnesite; 38,000 bricks; 12,000 mortar.
Do.	Comag Continental Madencilik Sanayii Tic. A.Ş.	Mines at Tavslani, 40 kilometers northwest of Kütahya, and near Bursa	40,000 calcined magnesite.
Do.	Kümas Kütahya Manyezit Işletmeleri A.Ş. (Government, 100%)	Kütahya	144,000 dead-burned magnesite; 46,000 bricks.
Do.	Magnesit A.Ş.	Mine at Margi, 50 kilometers northeast of Eskişehir	60,000 dead-burned magnesite.
Mercury	Etibank Haliköy Maden Işletmesi (Government, 100%)	Mine near Odemis, about 70 kilometers southeast of Izmir	190 mercury.
Do.	Etibank Konya Civa Işletmesi (Government, 100%)	Mine at Sarayönü, 47 kilometers north of Konya	100 mercury.
Phosphate rock	Etibank Güneydoğu Anadolu Fosfatlari Işletmesi (Government, 100%)	Open pit mine at Mazidağı, 30 kilometers northwest of Mardin	125,000 concentrate.
Strontium	Barit Maden Türk A.Ş.	Mine at Akkaya, 120 kilometers northeast of Sivas	75,000 concentrate.

[1]Metric tons per year unless otherwise specified.
[2]Million metric tons per year.

COMMODITY REVIEW

Metal

Aluminum.—As part of the general trade agreement with the U.S.S.R., Turkey signed an agreement in 1989 for Soviet assistance in modernizing and expanding Etibank's aluminum smelter at Seydişehir. The smelter had originally been built by the U.S.S.R. The plant's capacity was to be increased from the yearend 1989 capacity of 60,000 metric tons per year (mt/yr) aluminum to 120,000 mt/yr, and eventually to 200,000 mt/yr. Because the plant was soon to lose its preferential rates for electricity, a major component of the modernization program was to reduce the plant's electricity consumption. Both West and East European firms have tendered for the contract to supply the necessary energy-saving equipment.

Antimony.—Turkish antimony production has declined since 1987, largely owing to low world antimony prices. One of the country's four or five remaining private-sector producers, Özdemir Antimuan Madenleri Ltd. Şti., appears to have been a casualty of these low prices and closed down in early 1990.

Chromite.—As in previous years, about 25% of Turkey's chromite ores and concentrates were produced by Etibank, the only public-sector producer in the country and the largest single producer. In addition, all of Turkey's ferrochrome and related ferroalloys were produced by Etibank. In March and October 1989, respectively, Etibank brought on-line two new ferrochrome furnaces at its plant at Elaziğ. Startup of the second furnace had been delayed due to the need, reportedly, to run additional electric lines to the plant. The new furnaces each have a capacity of 50,000 mt/yr of high-carbon ferrochrome and supplement the combined 50,000-mt/yr capacity of the plant's existing two furnaces. Reportedly, this expanded capacity will be more than adequate to process all of Etibank's own ores and will eliminate export of chromite concentrates. In addition, the company plans to increase its chromite ore and concentrate output from both existing and new mines to feed the Elaziğ plant. One of the mines in the Elaziğ area, Kefdağ, was to be converted from underground to open pit operations; tenders went out during 1989 for the open pit mining contract. Although the Kefdağ deposit is

large by Turkish standards, it is relatively low grade and, in conventional processing, produces a somewhat lower grade concentrate than is ideal for ferrochrome conversion.

Etibank has been involved in expanding the capacity of its Şarkkromlari concentrator at the Elaziğ plant to efficiently exploit the expanded output from Kefdağ and from other company mines in the Elaziğ area. This expansion was reported as having been completed in 1989, and the concentrator was expected to be fully operational in 1990. At full capacity, it will produce 250,000 mt/yr of a 44% Cr_2O_3 chromite concentrate. Until the company can meet its chromite needs from its own mines, Etibank will continue to purchase chromite ores and concentrates from neighboring private-sector mines for conversion to ferrochrome.

In early 1990, private-sector company Egemetal Madencilik A.Ş. formed a 50-50 joint venture with three Korean firms to develop a chromite mine near Orhaneli, 266 kilometers (km) south of Istanbul. Development work on the mine was expected to commence in April 1990, and the company had plans to erect a 40,000-mt/yr ferrochrome plant on the site starting in 1991, to be in operation in 1993. The joint venture was to ship 20,000 mt/yr of ferrochrome to Korea.

Turkish exports in 1989 of chromite ore and concentrates totaled almost 915,000 tons, worth $115 million, of which Etibank's exports were less than 2%. Yugoslavia was the biggest buyer of Turkish chromite, taking 15%; followed by Norway, 12%; Sweden, 10%; the United States, 10%; Romania, 9%; and China, 9%. Etibank exported almost 45,800 tons of ferrochrome in 1989, worth $46.2 million. The United States was by far the largest buyer of Turkish ferrochrome, taking 38,750 tons in 1989.

Copper and Zinc.—The production of copper ore, copper concentrates, and blister copper is dominated by Etibank and its wholly owned subsidiary Karadeniz Bakir Işletmeleri A.Ş. (KBI). The latter is responsible for about 75% of Turkey's copper output.

Etibank continued with its plans to commence underground mining at its Küre establishment near Inebolu, for which it expected to issue tenders in 1990. The new cuprous pyrite concentrator at Küre was completed late in 1988 and was operated at 75% of its capacity during 1989. Etibank planned to use the concentrator at full capacity in 1990. The copper and pyrite concentrates are shipped to the nearby KBI smelter at Samsun for both copper smelting and sulfuric acid production. Etibank's own copper smelter facilities are at its Ergani mine complex southeast of Elaziğ. Exploration, in cooperation with MTA, was ongoing there for additional reserves.

Rehabilitation and expansion of the KBI copper smelter were also completed in 1989, and the facility was expected to be fully operational in 1990. At full capacity, the Samsun smelter will be capable of meeting about 50% of Turkey's annual needs. KBI also operates a small smelter at Artvin. Most of KBI's copper ore comes from mines near Artvin and a smaller mine near Trabzon. KBI also operates a small underground mine near Küre; output from this mine is sold to Etibank for concentration prior to smelting at Samsun. The sulfuric acid plant at Samsun has also been rehabilitated and can supply, at full capacity, about 50% of the acid needs of the nearby Turkish Fertilizer Industries (TUSGAS) fertilizer plant.

Metall Mining Corp. of Canada announced toward yearend 1989 that it was undertaking final feasibility studies of the development of the Çayeli copper-zinc-silver deposit 23 km northeast of Rize. The study included operational results of a pilot plant processing ore from an exploration adit completed in 1988, and the completed feasibility report was expected to be available in early 1990. Given a favorable recommendation by the feasibility report, it was anticipated that production from the underground mine could begin as early as 1992. The mine's reserves are said to be adequate for a 30-year operation, producing about 600,000 mt/yr of ore and about 100,000 mt/yr each of copper and zinc concentrates. It is anticipated that most of the concentrates will be shipped to European smelters. The operating company, Çayeli Bakir Işletmeleri A.Ş., is 49% owned by Metall; 45% by Etibank; and 6% by the Turkish company Gama Industri. Metallsgesellschaft AG of Germany holds 63% of Metall.

In September 1989, it was announced that Çinko Kurşun Metal Sanayii A.Ş. (ÇINKUR), owned 98% by Etibank, was being offered for sale as part of the Government's privatization program. The ÇINKUR facility is Turkey's only zinc smelter and refinery, and has a capacity of about 30,000 mt/yr of zinc and about 60,000 mt/yr of lead. It is undergoing expansion to 40,000-mt/yr capacity for zinc and an additional 40,000-mt/yr of lead. Zinc and lead-zinc ores for the complex are supplied largely by nearby private-sector mines in the Kayseri area, but the expanded plant capacity will allow treatment of a portion of the future Çayeli mine output.

Gold and Silver.—In response to a long-flourishing illegal gold trade, the Government opened a gold exchange in March 1989. The Turkish Central Bank was designated as the only legal importer and exporter of unworked gold. The new exchange allows gold to be traded against hard currency, and it was hoped that it would both reduce smuggling of gold into the country and draw out some of the gold believed to be horded. The Turkish population was believed to have horded about 500,000 kg of gold, and it was estimated that about 70,000 kg of gold was smuggled into Turkey in 1988. This smuggled gold, worth an estimated $780 to $900 million, vastly exceeded legal gold imports, which were worth only $32 million. By yearend 1989, the Central Bank had imported about 90,000 kg of gold, worth about $1.06 billion, virtually all of which was sold during the year. Gold sales in 1990 amounted to about 129,000 kg by October, and it was anticipated that sales would reach 150,000 kg or more for the year. It was believed that the high level of sales in 1990 was in part a response to unrest in the Persian Gulf countries and included sales by foreign nationals from that region.

Turkey appears to have an annual production of 15 to 30 kg of gold from a small mine near Izmir, operated by Or Madencilik Tic. ve San. Ltd. Şti.

A number of international exploration companies, as well as MTA, were actively engaged in gold exploration in Turkey during 1989. Most of this work was in northeast Turkey, along the Black Sea coast, in western Anatolia, and in south-central Turkey. No verifiable discoveries were announced during 1989. In May 1990, Cominco Resources International announced high-grade gold intercepts in its drilling program on two properties about 55 km southwest of Artvin. No reserves were announced. Metall Mining Corp. of Canada also had an announcement in May of high-grade gold drill and trench intercepts on its Dikili property, about 70 km north of Izmir. The assays

were the result of a surface exploration program begun in mid-1989 and of drilling begun at yearend. A second phase of drilling was slated for August 1990, and it was anticipated that preliminary reserve estimates would be available in early 1991. Metall has a one-third interest in the property, the remainder of which is held by ACM Gold of Australia.

In 1990, MTA completed a 10-month exploration program on the Arapdağı property near Izmir; the program included drilling 23 holes. Preliminary reserve estimates were 300,000 mt grading 9 grams of gold per ton.

Turkish production of silver is from Etibank's silver mine at Gümüşköy, 60 km southwest of Kütahya, and as byproduct of base metals mining. Reported silver output from the mine at Gümüşköy increased 38% to 21,721 kg. Based upon reported tonnage mined, this improved output appears to represent a 115% improvement in recovered grade to about 180 grams of silver per ton. Thus it appears that reported problems with the mine's screening plant may have been solved.

Iron and Steel.—The Turkish iron and steel industry is characterized by state-owned integrated plants and private-sector plants. State-owned Türkiye Demir ve Çelik Işletmeleri (TDÇI) is Turkey's largest producer of iron ore; it and state-controlled Ereğli Demir ve Çelik Fabrikalari (Erdemir) produce about 50% of the country's steel.

Iron Ore.—About 75% of Turkey's iron ore production is by TDÇI, largely from the Divriği Mines northwest of Elaziğ. The remainder comes from a number of small private-sector mines. A 3-month strike was experienced at Divriği in 1989, with the result that iron ore production declined about 33% to about 1.6 MMmt. This was about 40% less than the planned output for the year. Plant output declined only 9% to 1.4 MMmt, in part mitigated by continued shipments to the plant of ore from private-sector mines in the area. Imports of iron ore for blending, including pellets, totaled 2.6 MMmt in 1989. Imports were expected to increase to about 3.5 MMmt in 1990, largely because of capacity expansion projects at the integrated steel mills.

Steel.—TDÇI is the largest of the three state-owned steel companies and is normally the largest steel producer in Turkey. TDÇI operates the Karabük and Iskenderun steel mills. In common with state-owned companies in some other economic sectors, TDÇI was plagued by labor disputes during 1989. These disputes involved a wage increase demand of 500%. Worker slowdown during a 60-day strike injunction period early in 1989 and a subsequent strike of 127 days led to an estimated 1.4 MMmt loss in steel production. Karabük's production fell 45% to 322,100 tons, and Iskenderun's output fell almost 48% to 930,955 tons. An agreement was reached in early September giving the workers a 120% wage increase plus certain other benefits.

The state-controlled Erdemir is Turkey's single largest steel mill. The mill did not report any work stoppages in 1989 and experienced a production increase of 11% to 2,013,583 tons. Profits doubled in 1989 to $186 million. Early in 1990, the Government, as part of its privatization program, announced that it would sell its 51.5% stake in Erdemir beginning April 9. Public demand for the shares was high; the first lot of shares was sold out the first day.

In contrast to the poor overall public-sector steel mill output, the private-sector mills achieved a record overall production of 4,627,392 tons, a 23% increase. This was due in part to capacity expansion projects at many of the private-sector plants and reduced output of semifinished products and semimanufactures from strike-bound TDÇI. However, the private-sector producers were unable to fully capitalize on the TDÇI strike because it coincided with reduced domestic demand and the removal, in April 1989, of export subsidies for steel. As a result, domestic steel prices failed to increase significantly, and the Turkish private-sector producers found their high-cost output relatively uncompetitive in European markets. Compounding the problem was the Government's temporary suspension in March 1989 of import restrictions on specific semimanufactures. This was done in anticipation of the TDÇI strike and a shortage of semimanufactures on the market. TDÇI was thus able to stock up on inexpensive East European semimanufactures and did not have to buy as much from the domestic producers. Consequently, the private-sector was left with surplus production, and some producers faced severe financial difficulties. Financial problems related to poor sales in 1989 and large debts incurred during capacity expansion forced Metaş Izmir Metalurji Fabrikasi to suspend operations in May 1990.

The Turkish steel industry has been positively affected by high domestic demand for steel in construction projects, and by Government-sponsored export incentives, experienced during much of the 1980's. Apart from the establishment of new companies, many companies have undertaken or have planned plant capacity expansion projects. Most of the growth has been in the private-sector, which has led to a relative product imbalance, notably a surplus of long products and a shortage of flat products. The private-sector production is of relatively high cost, owing to the high cost of electricity and the need to import some forms of semifinished products and ferrous scrap as feed. In 1989, Turkey imported 3.14 MMmt of ferrous scrap worth about $483 million from the United States. This was about 26% of total U.S. scrap sales and about 71% of total Turkish scrap imports. With the rapid expansion of the natural gas distribution in Turkey, it will become feasible to build a number of gas-fired sponge iron plants to provide electric arc furnace feed in lieu of scrap. This will necessitate increasing the country's imports of iron ore.

In 1989, Voest Alpine of Austria was awarded an $80 million contract by Erdemir to modernize the basic oxygen furnace. The work, scheduled to be completed in late 1993, will give Erdemir an additional annual capacity of 2.0 to 2.8 MMmt raw steel capacity. In early 1990, Voest Alpine was awarded a $180 million contract for two new single-strand continuous casting machines. The new machines will give Erdemir a total increased annual capacity of 1.7 MMmt, and are scheduled to come on stream in 1992. Erdemir hopes to have an annual output capacity 3 MMmt of flats by 1993. Erdemir has begun soliciting bids to build a new blast furnace, and new pickling and galvanizing lines for one of the plant's cold mills. Erdemir has also solicited tenders to modernize and expand its port facilities.

TDÇI has plans to modernize and expand Iskenderun. By the end of the 1990's, the company hopes to have increased the hot-metal capacity to 3.5 MMmt per year and the rolling mill capacity to 2.6 MMmt per year. The upgrade will include the installation of two continuous casting machines having capacities of 600,000 mt/yr and 450,000

mt/yr respectively; the latter is to be on-stream in 1992. A contract was signed in September 1989 with Morgårdshammar and ABB Drives AB, both of Sweden, and a local contractor to upgrade the wire rod mill. Other improvements to Iskenderun will be to increase the oxygen blowing rate in the furnaces and to install a sponge iron plant. At Karabük, TDÇI is planning to install a new casting machine and a new ladle furnace by 1991. A new oxygen (KORF) furnace was fired in February 1989, and blast furnace modernization was completed early in 1990. The company also commenced building a new harbor to take, initially, ships of 60,000 deadweight tons (dwt), to be increased later to 120,000 dwt.

Many of the private-sector mills are continuing to modernize and expand their plants. Çukurova Çelik was planning to modernize four electric arc furnaces to increase capacity to 2 MMmt per year. In early 1990, a new company, Sivas Demir Çelik, commissioned its wire rod and bar mill; the company planned to be in operation in 1991. In early 1990, Çemtaş Çelik Makina Sanayi ve Ticaret A.Ş. started construction of a new 25-ton-capacity electric arc furnace, which was expected to be on-line by about September, and was expected to increase the company's production capacity to 120,000 mt/yr. Reportedly, Turkey's first natural gas-fired iron and steel plant, Kaptan Demir Çelik Trakya Entegre Tesisleri, has gone into production in northwest Thrace. Its capacity is reported to be 600 mt per day.

Industrial Minerals

Boron.—The production of boron minerals is virtually all by Etibank, as is the production of boron chemicals. Etibank's production of boron chemicals is from its Kirka and Bandirma plants, and totaled 178,280 tons in 1989. The Kirka plant has the capacity to produce 160,000 mt/yr of borax pentahydrate, known as Etibor-46; 17,000 mt/yr of borax decahydrate; and 60,000 mt/yr of anhydrous borax (Etibor-65). At the Bandirma Boraks ve Asit Fabrikalari Işletmesi plant, production capacities are: 5,000 mt/yr of borax pentahydrate; 50,000 mt/yr of borax decahydrate, 20,000 mt/yr of sodium perborate, and 35,000 mt/yr of boric acid. A 15,000-mt/yr hydrogen peroxide plant was commissioned at Bandirma in 1989 and was expected to be in operation in 1990. Output from the new plant will be used in the manufacture of sodium perborate and will replace imported hydrogen peroxide for this purpose.

Exports of boron minerals in 1989 totaled 820,791 tons worth almost $169 million; all but about 5,000 tons were by Etibank. Exports of boron chemicals totaled 141,579 tons worth $42.5 million. The United States was Etibank's biggest customer for borates in 1989, taking 166,686 tons of boron minerals and 27,885 tons of refined products. Italy was second, taking 129,498 tons of boron minerals and 28,945 tons of boron chemicals.

Cement.—State-owned Çitosan has about one-half of Turkey's cement mills and about one-third of the country's cement production capacity. As part of its general privatization scheme, the Government signed an agreement in September 1989 to sell 5 of Çitosan's 22 cement plants to Société des Ciments Français of France for $110 million. The cement plants involved had a combined capacity of 2 MMmt per year. Opposition parties in the Government filed suit to block this sale, however, citing Turkish legal requirements that all such divestitures be first offered to the public. In January, a court issued a 90-day injunction on the sale, despite the fact that Ciments Français had already paid $85 million of the purchase price. Both the company and the Government appealed the injunction, which, however, was upheld by a court decision in April 1990. The decision was appealed further but was upheld in July 1990 by the Turkish Council of State. It was unclear what effect this decision would have on the rest of the Government's privatization plans.

Ciments Français was also negotiating to buy Çanakkale Çimento, and in March 1990, announced that was going to purchase 60% of Anadolu Çimentoleri T.A.Ş. in Istanbul. In January 1990, it was reported that another French company, Lafarge Coppée, had agreed to purchase Aslan Çimento, which has about 25% of the Istanbul area cement market.

Despite strong demand early in the year, there was very little overall growth in demand for cement in 1989. This was largely because the Government, in April, began cutting back on mass housing fund subsidies and various infrastructural projects. The lack of demand hurt Turkish private-sector producers, many of which had undertaken capacity expansion projects in anticipation of a continuation of the 20% market demand increase experienced since 1983. Nevertheless, few producers indicated that they would postpone expansion projects, citing favorable population growth forecasts.

In anticipation of a strike by Çitosan's 10,500 cement workers, the Government, early in 1990, relaxed cement import restrictions and made plans to import 2 MMmt of cement to prepare for the building season. The strike commenced in late March but ended in early May when a 2-year agreement was reached. The agreement provided for a 100% wage increase in 1990 and a further 60% increase in 1991, together with large supplements in both years.

Phosphate Rock.—Etibank completed construction at its new phosphate concentrator and fertilizer plant at Mazidağı. Etibank has not been successful in attracting foreign investors in the venture and, in 1989, requested that the Government create a special establishment to manage the project.

Soda Ash (Trona).—For a number of years, Etibank has been planning to develop an underground mine on the Beypazari trona deposit. Originally, FMC Corp. of the United States was to have been a partner in the operation, but the company pulled out in 1989. In 1990, Etibank solicited bids from several European countries for a joint venture in the project. Planned output for the mine is 750,000 mt/yr.

Mineral Fuels

Public-sector companies dominate Turkey's production of mineral fuels. Türkiye Petrolleri Anonim Ortakliği (TPAO) produces about one-half of Turkey's crude oil and all of its marketed gas, and through its subsidiaries controls oil refining, oil and gas piping, and a significant proportion of the country's fertilizer production. Türkiye Kömür Işletmeleri (TKI) dominates Turkey's coal production.

Coal.—In early 1990, TKI announced that they would be seeking bids to construct an $80 to $100 million lignite washery at the Tuncbilek Mine about 50 km west-northwest of Kutahya. The new washery is to have a throughput capacity of 3 MMmt per year, and will supplement an existing washery of similar capacity. The mine produces about 4.2 MMmt/yr of lignite. A similar washery is to be set up at the Soma Mine 120 km west of Denizli, which already has a

washery capacity of 800,000 mt/yr. It is hoped that the new washeries will lead to a somewhat cleaner burning product for the mines.

Natural Gas.—In August 1989, the French company Technigaz won a $218 million contract to build a liquefied petroleum gas (LPG) terminal and regassification plant at Marmaraereğlisi in Thrace. The facility, to be completed in 1992, is to have a capacity of 2 billion cubic feet per year. The plant will feed Algerian and Libyan LPG into the existing natural gas line bringing Soviet natural gas to Istanbul and Ankara, and will be operated by BOTAŞ, the pipeline subsidiary of TPAO. A 22-km pipeline will be constructed to connect the new terminal with the existing line.

Petroleum and Petrochemicals.—In 1989, TPAO drilled 42 exploration holes and 9 development holes. Nine of the exploration holes were drilled in joint venture with foreign companies. TPAO made three oil and one natural gas discoveries during the year. The G. Karakus-1, Cendere-1, and B. Kentalan-3 wells in southeast Turkey were all petroleum discoveries. The Cendere discovery was a joint venture with Atlantic Richfield Corp. The new field is in Adiyaman Province and is expected to produce 1,200 barrels per day. The Karakus well, also in Adiyaman, was expected to produce 4,500 barrels per day. The Karacaoğlan-1 well, near Kirklareli in Thrace, was the natural gas discovery. It is expected to yield about 150,000 cubic meters and 22 barrels of liquified natural gas per day. TPAO, together with a German geophysical firm and a German subsidiary of Texaco Inc., shot 1,506 line km of seismic over Iskenderun Bay.

A number of companies were active in exploration during the year. In late 1989, Mobil Oil Corp. announced that it would resume exploration in Turkey, after a 19-year gap. The company has four exploration licenses in Siirt and Diyarbakir Provinces near Lake Van. Chevron Corp. has an exploration permit in southeast Turkey near the Iraqi border, but has delayed work because of civil unrest in the area.

TPAO put 35 new wells into production in 1989; these new wells produced 15% of the company's total production of 12.9 million barrels during the year.

Italian company Snamprogetti and its Turkish partner Tefken won a $292 million contract to build a hydrocracker at the Turkish Petroleum Refinery Corp. (TÜPRAŞ) refinery at Aliağa. The new unit will convert low-value fuel oil to motor fuels. In early 1989, TÜPRAŞ awarded a contract to the Japanese firm JGC Corp. and its Turkish partner Kutlutaş to build a hydrocracker at the Central Anatolian Refinery at Kirikkale near Ankara, and a third hydrocracker, at the Izmit refinery, is planned.

Reserves

Turkey has large reserves of certain industrial minerals and of lignite, but the country's reserves for most metallic commodities are not large by world standards. Reserves of metallic commodities minable by large-scale methods are known for bauxite, chromite, copper and copper-zinc, iron ore, and silver. Early results from several recent gold exploration efforts indicate a likelihood that the country has minable gold resources; however, no reserves have been published as yet. In terms of industrial minerals, Turkey's most significant reserves are in boron, barite, magnesite, perlite, pumice, limestone, and marble.

Turkey is a geologically and mineralogically diverse country and, with the exception of a few commodities, is characterized by a relatively large number of small deposits rather than a few large ones. According to the State Institute of Statistics, there were 838 mining establishments in Turkey in 1988. There are also many closed or long-idle operations potentially having additional reserves, and many as yet unexploited deposits that might warrant exploitation on at least an artisanal level. Given the low wage levels in Turkey, many deposits are able to be mined at a scale that would not be economic in Europe or North America. Many of these deposits have not had their reserves well-delineated, and for many that have, reserves have only been outlined to relatively shallow depths—suitable for hand mining methods. Many of the "reserves" cited in the literature are given without grades, or are of uneconomic grades in terms of modern, large scale mining standards. Consequently, many of the published "reserve" data would be considered "resources," by Western standards, but may very well be minable on an artisanal basis. This is especially true for most of Turkey's base metal and chromite deposits. Summaries of Turkey's mineral inventory can be found in an investment brochure put out by the Government[2] and in reports by MTA[3,4].

Minable bauxite reserves are known at Milas, southwest of Denizli, and at Mortaş, south of Seydişehir. According to Etibank, the Milas deposit has reserves of 23 MMmt grading 58% alumina, and the Mortaş area has 40 MMmt grading 50% to 69% alumina.

Chromite reserves are not well defined and are spread out over well in excess of 500 chromite deposits. Most of these are small. In 1988, there were 114 chromite mining establishments listed as in production. MTA estimates that total chromite reserves amount to about 31 MMmt of ore grading 30% to 48% Cr_2O_3 within a larger inventory of lower grade material. Given the economics of mining in Turkey, it is likely that many of the explored deposits will be mined and that Turkey will continue to be a significant producer of chromite for many years.

According to the would-be operator, the Çayeli copper-zinc massive sulfide ore body contains proven plus probable reserves of about 15 MMmt, grading 4.5% copper, 7.5% zinc, 52 parts per million silver, and 1.1 parts per million gold. Etibank's nearby Siirt Madenköy massive sulfide deposit is reported by MTA to have proven plus probable reserves of 25 MMmt grading 1.40% copper, within which is an inventory of 11.2 MMmt grading 2.24% copper and 0.9% zinc.

MTA lists Turkey's mercury reserves as 5.5 MMmt grading 0.15% to 0.30% mercury.

According to TDÇI, iron ore reserves at its Divriği Mine amount to 100 MMmt of mostly magnetite ore grading 54% to 58% iron. At the company's Hekhimhan (Devici) mines, there are reserves of 86 MMmt of siderite ore grading 40% to 50% iron and 3% to 5% manganese, and about 5 MMmt of limonite ore reportedly of similar grade.

Etibank's Gümüşköy silver mine reportedly contains reserves of 19.2 MMmt grading 193.7 grams of silver per ton.

Turkey has significant reserves of a number of industrial minerals. Although they are not well defined, Turkey's reserves of boron minerals (tincal, ulexite, colemanite) are believed to be the largest in the world. MTA lists estimated reserves of 2 billion tons. Etibank's proven and probable reserves at Bigadiç, Emet, and Kirka total in excess of 300

MMmt grading 27% to 40% B_2O_3. Turkey has immense deposits of marble; total reserves have not been defined for the country. Etibank's deposit on Marmara Island alone is estimated to contain 10 million cubic meters. Similarly, Turkey's limestone reserves are immense but not well defined. Perlite and pumice reserves have not been well measured, but many millions of tons of each are known. Etibank's Mazidağı phosphate deposit is reported to have proven reserves of 62 MMmt. The Beypazari soda ash (trona) deposit, according to Etibank, has reserves of 178 MMmt grading 45.5% Na_2CO_3.

Turkey's reserves of petroleum and natural gas are not well known. TPAO speculates that the country's petroleum reserves may be about 2 billion barrels. Its Karakus Field is believed to have reserves of 112 million barrels. Turkey has large lignite reserves; MTA estimates that these total 8 billion tons. Hard coal reserves, most of which are near Zonguldak, are given by MTA as 1.4 billion tons. However, the geology in the Zonguldak Basin makes for very difficult, labor intensive mining conditions, and it is not clear what proportion of the reserves will be economic over the long term.

INFRASTRUCTURE

Turkey has a fairly well-developed road and railroad infrastructure, and both are heavily used for the transport of mineral commodities. Turkey has 8,401 km of railroad, all of which are 1.435-meter standard gauge, and 479 km of which are electrified. In 1989, the railroads carried about 13 MMmt of freight, the mineral commodity component of which comprised 8.5 MMmt of ore and mine supplies; 267,000 tons of fuel oil; and 111,000 tons of fertilizers.

Turkey has about 50,000 km of roads, of which about 54% are paved. Most of the country's mineral production and imports, including a significant proportion of fuel imports, is transported by truck.

Turkey has 2,092 km of crude oil and 2,321 km of petroleum products pipelines. The longest stretch of pipeline is the 986-km line connecting Iraq with the Turkish oil-shipping port of Dörtyol, 28 km north of Iskenderun. Most of the other lines connect oil-receiving ports with the country's refineries. Turkey has 842 km of natural gas pipeline, which is used to import natural gas from the U.S.S.R. and extends from the Bulgarian border to Ankara. The Government plans to significantly extend the natural gas pipeline grid, including a direct connection from the U.S.S.R. into eastern Anatolia.

Turkey has many ports capable of handling mineral commodity shipments. Many are undergoing capacity expansion projects.

Turkey generated 50,642 million kilowatt hours (kWh) of electricity in 1989, of which 65% was from thermal plants and virtually all of the rest from hydroelectric plants. The parastatal Türkiye Elektrik Kurumu produced 89% of the thermal output and about 95% of the hydroelectric output. Of the total thermal output, 64% was generated by lignite-burning plants and 27% was by fuel oil plants. Hydroelectric output was 17.8 million kWh, a 38% decline resulting from drought conditions during the year. In 1988, the latest year for which data are available, the major industrial electricity consumers were the iron and steel industry, which consumed 4,014 million kWh; the chemical industry, with 3,502 million kWh; and the non-ferrous basic industries, with 2,560 million kWh. The coal and lignite mines consumed 780 million kWh, and the other mines consumed a total of 290 million kWh.

Total electrical generating capacity in 1989 was about 15,000 megawatts (MW), of which thermal plants accounted for 8,160 MW, and hydroelectric power plants 6,543 MW. Geothermal plants have a total capacity of 21 MW. Turkey is in the process of greatly expanding its electrical generating capacity, mostly through the construction of about 50 new plants, most of which will be hydroelectric installations. The largest of the projects is the Southeast Anatolian Project, which involves the construction of 21 dams and 17 hydroelectric stations, and which alone will have a capacity of 8,000 MW. The Atatürk Dam on the Euphrates River will provide 2,400 MW of this. The dam was inaugurated in August 1990 and is scheduled for completion in 1994.

OUTLOOK

The production of most mineral commodities will likely increase, owing to the capacity expansion at many of the facilities. Government policies to open large new areas of Turkey to agricultural development will provide a market for an increased output of Turkish fertilizers and provide an incentive for the expanded production of phosphate rock. Increased electrical generating capacity may reduce production costs for a number of commodities, notably steel, and may thus make Turkish exports more competitive on world markets. Turkish use of natural gas will increase dramatically, and will help reduce air pollution by reducing the need to burn soft coal. It appears likely that the Çayeli copper deposit will be put into production; this and the development of new reserves at the existing copper mines will result in a significant increase in the production of copper, zinc, and byproduct silver. Given the large number of companies exploring for gold in Turkey, it seems very likely that several gold mines will open by 1995. Similarly, a significant increase in the production of petroleum and natural gas can be expected.

[1]Where necessary, values have been converted from Turkish lira (TL) to U.S. dollars at the rate of TL2120.78 = US$1.00.

[2]Government of Turkey. Turkey—The Mining Industry: Opportunities for Investors., 1985.

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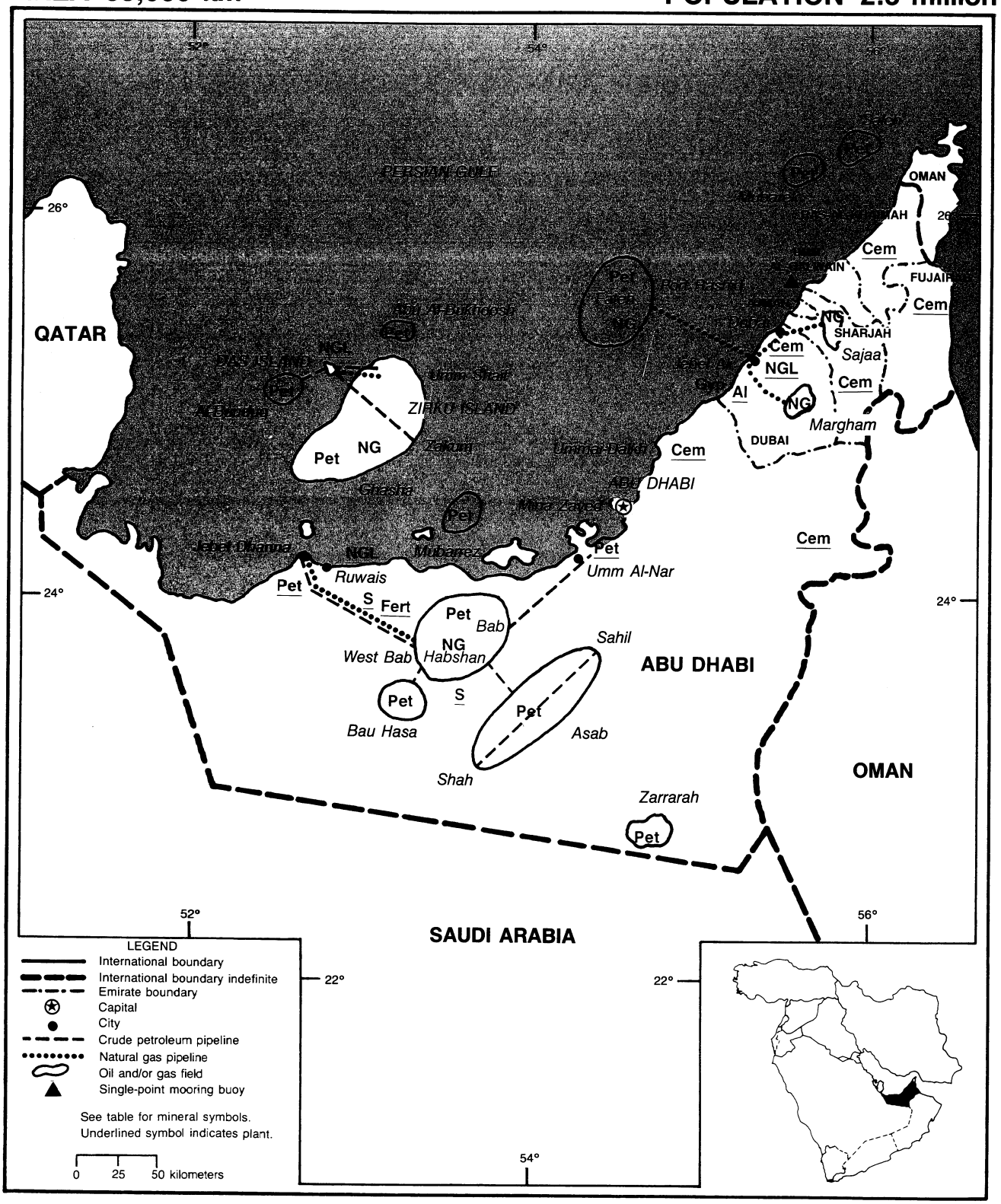
UNITED ARAB EMIRATES

AREA 83,000 km² **POPULATION 2.3 million**



THE MINERAL INDUSTRY OF

THE UNITED ARAB EMIRATES

By Audie L. King

Despite efforts to diversify the economy, oil and gas still account for more than 75% of export revenues. As of 1988, the last year that such data were available, the United Arab Emirates ranked 12th in world production of crude oil, 3d in proven petroleum reserves, 6th in natural gas plant liquid production, 12th in dry natural gas production, and 3d in proven natural gas reserves.

Contributions of other mineral-based industries were small and generally related to the construction industry.

The Dubai Aluminum Co. (Dubal) was the only major metal producer in the United Arab Emirates. It produced about 168,000 tons of aluminum metal from imported alumina in 1989. An expansion project currently underway will increase Dubal's capacity by 40% to about 228,000 tons. The natural-gas-powered electricity generating station at Dubal's aluminum refinery, which also produced 109.5 million liters of desalinated water annually, was being enlarged.

Cement manufacturing was the largest "nonfuel" mineral-based industry. There were plants in most of the Emirates, and limestone was mined in several localities to provide feedstock for the clinker. Production capacity was higher than domestic demand, allowing for some exports.

GOVERNMENT POLICIES AND PROGRAMS

Since the early 1970's, when the Abu Dhabi National Oil Co. (Adnoc) was formed with the purpose of giving the state an interest in all areas of the oil and gas industry, all of the Emirates have exercised increasing control over the nation's mineral wealth. All mineral resources were owned and controlled by the individual Emirates and only loosely administered by the federal Government. The Ministry of Petroleum and Mineral Resources coordinated federal United Arab Emirates activities in the international community.

The most common method of developing new deposits and establishing new processing plants was for Emirate-controlled companies to form partnerships with foreign companies. The Government retained a controlling interest in most recently formed companies. Agreements that gave foreign companies temporary rights to oil and gas deposits in exchange for development work were also common.

PRODUCTION

The gross domestic product of the United Arab Emirates grew by 14.9% in 1989 to $27.66 billion. Most of this growth was due to the increased value of the oil and gas sector's output, which surged by 30.7% to $10.5 billion. Increased demand for oil and gas allowed the United Arab Emirates to step up its production in 1989 from 1.6 million barrels per day during the first half of the year to almost its full rated capacity rate of 2.4 million barrels per day in November and December. Resurgence of economic activity in the Persian Gulf following the cease fire between Iran and Iraq also benefited the nonoil mineral industries. A building boom increased demand for cement and a more stable trade in the Persian Gulf boosted demand for fertilizer and allowed the Ruwais ammonia and urea plant to operate at 120% of design capacity.

TRADE

A large increase in oil revenues during 1989 reinforced the importance of crude oil to the United Arab Emirates' trade performance. A 47.1% rise in oil revenues during 1989 resulted in crude oil's share of total export earnings increasing from 60% in 1988 to 77% in 1989. Similarly, a 30.7% increase in the value of the oil sector's output, from $8.1 billion to $10.5 billion, resulted in a 52.7% rise in the United Arab Emirates' trade surplus.

In 1989, the United Arab Emirates exported $15.6 billion and imported $10.1 billion, resulting in a $5.5 billion trade surplus. The United States received 4.4% of the United Arab Emirates' exports and accounted for 12% of the country's imports. Petroleum products accounted for almost all of the United Arab Emirates' exports to the United States. The United Arab Emirates' imports from the United States consisted mainly of machinery and manufactured chemical and metal products.

In 1988, the last year for which such data was available, 47.7% of all crude oil exports went to Japan. France took 15%, and the United States took 5% of total crude oil exports. Other important buyers of the country's crude oil include South Korea, Singapore, and the Federal Republic of Germany.

Much of the natural gas produced in the United Arab Emirates was for domestic consumption. It was used in the country's energy intensive industries that owe their existence to the availability of an inexpensive source of power, such as the aluminum smelter in Dubai, the fertilizer plant at Ruwais, and cement plants in nearly all of the Emirates.

Japan was also the most important destination for the United Arab Emirates' liquefied natural gas exports. The United States imported 939,000 barrels of liquefied natural gas in 1989.

Refinery products were shipped mainly to the Far East and to other Middle Eastern countries.

Aluminum was an important export for the United Arab Emirates. Japan was the largest customer, taking 64% in 1988, the last year for which such data was available. The United States took 11.5% of the aluminum exports. Taiwan and South Korea took 7.3% and 2.8%, respectively, while the local market absorbed 4.5%. In all, about 161,000 tons was exported.

Bahrain and Kuwait emerged as the United Arab Emirates' most significant cement customers. Together they

TABLE 1

UNITED ARAB EMIRATES: PRODUCTION OF MINERAL COMMODITIES[1]

Emirate[2] and commodity[3]		1985	1986	1987	1988[p]	1989[e]
ABU DHABI						
Cement, hydraulic[4]	thousand metric tons	[e]800	[e]800	700	750	700
Gas, natural:						
Gross	million cubic meters	12,640	16,000	16,000	17,000	18,000
Dry, marketed	do.	10,100	10,200	11,300	13,000	13,700
Natural gas plant liquids[e]	thousand 42-gallon barrels	[r]38,500	[r]42,340	42,560	45,240	48,000
Fertilizer:						
Ammonia:						
Gross weight[4]	metric tons	[e]343,000	[e]354,000	378,000	361,000	396,000
N content	do.	282,000	291,000	311,000	297,000	326,000
Urea:						
Gross weight[4]	do.	[e]481,000	[e]495,000	529,600	524,000	579,000
N content	do.	224,000	231,000	247,000	244,000	270,000
Petroleum:						
Crude	thousand 42-gallon barrels	287,700	348,555	365,000	401,000	530,000
Refinery products:						
Liquefied petroleum gas	do.	2,300	2,300	2,920	3,000	3,100
Gasoline	do.	8,330	8,370	9,855	9,900	10,300
Jet fuel	do.	8,325	8,350	8,395	8,400	8,700
Kerosene	do.	310	270	4,015	4,025	4,200
Distillate fuel oil	do.	15,516	15,666	17,895	17,900	18,700
Residual fuel oil	do.	15,975	16,083	16,425	16,500	17,200
Naphtha	do.	10,753	12,836	9,855	10,300	10,700
Total	do.	61,509	63,875	69,360	70,025	72,900
Sulfur, byproduct:[e]						
From petroleum refining	metric tons	1,000	11,000	8,000	10,000	10,000
From natural gas processing	do.	104,000	104,000	97,000	100,000	70,000
Total	do.	105,000	115,000	105,000	110,000	80,000
AJMAN						
Cement, hydraulic[4]	thousand metric tons	[e]200	[e]250	356	380	112
DUBAI						
Aluminum, metal, primary ingot[4]	metric tons	153,186	154,838	154,832	162,000	168,250
Cement, hydraulic[4]	thousand metric tons	[e]800	[e]500	500	500	600
Gas, natural:						
Gross	million cubic meters	5,250	5,670	6,370	6,500	8,400
Dry, marketed	do.	2,130	2,300	2,550	2,630	3,400
Gypsum[e]	thousand metric tons	80	80	80	80	80
Natural gas plant liquids:[e]						
Propane, butane	thousand 42-gallon barrels	[r]7,000	[r]7,000	7,000	6,960	7,000
Condensate	do.	12,400	12,400	12,400	12,400	12,400
Petroleum, crude	do.	128,200	127,400	137,300	129,700	148,000
FUJAIRAH						
Cement, hydraulic[4]	thousand metric tons	[e]550	[e]500	380	465	465
RAS AL-KHAIMAH						
Cement, hydraulic[4]	thousand metric tons	1,200	360	890	950	950
Gas, natural: dry	million cubic meters	[r]516	[r]516	516	310	130

See footnotes at end of table.

TABLE 1—Continued

UNITED ARAB EMIRATES: PRODUCTION OF MINERAL COMMODITIES[1]

Emirate[2] and commodity[3]		1985	1986	1987	1988[p]	1989[e]
RAS AL-KHAIMAH—Continued						
Lime[e]	thousand metric tons	45	45	45	45	45
Natural gas condensate	thousand 42-gallon barrels	3,640	r3,650	3,650	2,550	730
SHARJAH						
Cement, hydraulic[4]	thousand metric tons	e700	330	280	240	285
Gas, natural:[e]						
Gross[e]	million cubic meters	r5,110	r5,000	5,000	5,000	5,000
Dry marketed[e]	do.	r3,000	r3,000	3,000	3,000	3,000
Natural gas plant liquids:[e]						
Propane, butane	thousand 42-gallon barrels	r1,800	r2,800	3,000	3,194	3,200
Condensate	do.	r19,000	r17,000	15,000	13,000	13,000
Petroleum, crude	do.	r1,800	r2,400	3,000	3,600	4,000

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through Oct. 8, 1990.
[2]In addition to the emirates listed, Umm Al-Qaiwain reported no mineral production, but presumably produced small quantities of crude construction materials.
[3]In addition to the commodities listed, crude construction materials such as common clays, stone, and sand and gravel presumably are produced, but output is not recorded quantitatively, and general information is inadequate to make reliable estimates of output levels.
[4]Reported figure.

absorbed 1.2 to 1.4 million tons per year of clinker and cement. According to one producer in the United Arab Emirates, sales to Bangladesh, South Yemen, Japan, and various African states were increasing.

STRUCTURE OF THE MINERAL INDUSTRY

During the past 20 years the trend has been for the Governments of the various Emirates to own larger and larger portions of companies involved in all aspects of the minerals industry. Abu Dhabi, the Emirate richest in mineral wealth, passed a law in 1976 making the Government of Abu Dhabi the sole owner of all associated or nonassociated natural gas discovered in the Emirate. Adnoc managed these resources for the Government. It was authorized to form partnerships with foreign companies as long as it maintained at least a 51% interest. The first company to be formed after the gas ownership law went into effect was the Abu Dhabi Gas Liquefaction Co. (Adgas). It operated a plant on Das Island that processed offshore associated gas, producing liquefied natural gas and liquefied petroleum gas for export to Japan. Another company, Abu Dhabi Gas Industries (Gasco), processed onshore gas at its facility at Ruwais. It produced liquefied petroleum gas and condensate, most of which was exported to Japan.

Abu Dhabi restructured the organization of its state run oil and gas sector. It created a Supreme Petroleum Council to take over the role of the Abu Dhabi Department of Petroleum and the Board of Directors of Adnoc.

COMMODITY REVIEW

Metals

Aluminum.—Dubal produced at 22% above its plants nominal capacity in 1988, and production increased another 2% in 1989 to about 168,000 tons. Falling prices, however, decreased the total value of 1989's production by 25% to $328 million. Major technological improvements were made during 1989, including the introduction of a more efficient computer system and other alterations to the metallurgical design of the smelter that will allow for the increased production of value added products.

Dubai was planning to increase its production capacity of aluminum to take advantage of relatively high world aluminum prices and low production costs that, owing to the availability of inexpensive energy, averaged 43% lower than world averages. Dubal announced that it would increase its production capacity to 235,000 tons of hot metal per year by 1991 from a nominal capacity of 135,000 tons. The plans called for the installation of a new pot line. The United Kingdom's Wimpey Major Products had the subcontract for the work, and Dubai's Al Futtaim Wimpey was coordinating the project. It was estimated that the improvements would cost up to $100 million and would require that 1,000 workers be brought in to work on the scheme.

Iron.—Private investors are investigating the possibility of setting up an iron and steel plant in Sharjah.

The Dubai-based Gulf Organization for Industrial Consulting announced that it was promoting a plan to build a plant to produce ferroalloys. The plant would possibly be in Fujairah.

Industrial Minerals

Cement.—Cement sales in the United Arab Emirates have doubled since mid-1988 to almost 2.5 million tons. Domestic demand for cement improved after the cease fire in the Persian Gulf fueled private-sector spending, particularly in Dubai. Older buildings in the United

TABLE 2

UNITED ARAB EMIRATES: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity
Aluminum	Dubai Aluminum Co. Ltd. (Government, 80%. Southwire Corp., 7.5%; Nissho Iwai, 7.5%; various local interests, 5%)	Jebel Ali, Dubai	140.[1]
Cement	Al Ain Cement Co. (Government, 100%)	Al Ain, Abu Dhabi	800.[1]
Do.	Fujairah Cement Industries (Government, 21%; private, 79%)	Dibba, Fujairah	750.[1]
Do.	Gulf Cement Co. (Government, 25%; Kuwait Government, 25%; private, 50%)	Al Nakheel, Ras Al-Khaimah	1,000.[1]
Do.	Jebel Ali Cement Co. (Sheikh Hamdan	Jebel Ali, Dubai	100.[1]
Do.	Maktoum, 100%)		
Do.	National Cement Co. Ltd. (Government, 100%)	Dubai, Dubai	650.[1]
Do.	Sharjah Cement and Industrial Development Co. Ltd. (private, 100%)	Sharjah, Sharjah	1,100.[1]
Do.	Union Cement Co. (Government is the major share holder)	Union, Ras Al-Khaimah	1,100.[1]
Do.	White Cement and Construction Co. (private, 100%)	Khor Kuwair, Ras Al-Khaimah	300.[1]
Diabase	Rockwool Co. (ownership not available)	Fujairah and Ras Al-Khaimah	NA.
Fertilizer	Ruwais Fertilizer Industries (Government, 66.7%; Total CFP, 33.3%)	Ruwais, Abu Dhabi	400[1] ammonia. 580[1] urea.
Gypsum	General Gypsum Co.	Jebel Ali, Dubai	80.[1]
Natural gas	Abu Dhabi Co. for Onshore Oil Operations (Adco) (Government, 60%; Total CFP, 15%; Shell Oil Co., 15%)	Associated gas from the oilfields: Asab, Sahil, Bab, and Bau Hasa. Onshore, Abu Dhabi	4,644[2] gross.
Do.	Abu Dhabi Marine Operating Co. (Adma-Opco) (Government, 60%; BP, 15%; Total CFP, 15%)	Associated gas from the Umm Shaif oilfield. Offshore, Abu Dhabi	6,200.[2]
Do.	Dubai Marine Areas Ltd.- Dubai Petroleum Co. (Government, 15%; Conoco, 15%; Total CFP, 25%; Repsol, 25%; Rheinoel, 10%; Wintershall, 5%; Dubai Sun Oil Co., 5%)	Associated gas from the oilfields: Fateh, Southwest Fateh and Rashid. Offshore, Dubai	7,000[2] gross.
Do.	Arco Oil and Gas Co. (Arco in partnership with Britoil)	Nonassociated gas from the Margham gasfield. Onshore, Dubai	4,134[2] gross. 9,125[3] condensate.
Do.	Abu Dhabi National Oil Co. (Adnoc) (Government, 100%)	Two processing plants. Habshan, Abu Dhabi	7,300[2] dry.
Do.	Dubai National Gas (Dugas) (Government, 80%; Canadian Sunningdale Oils Ltd., 20%)	Processing plant located at Jebel Ali, Dubai	1,344[2] dry. 7,113[3] liquefied petroleum gas. 3,285[3] condensate.
Do.	Ras Al Khaimah Gas Commission (Government, 100%)	Associated gas from the Saleh oilfield. Offshore, Ras Al-Khaimah	568[2] dry. 475[3] liquefied petroleum gas. 146[3] condensate.
Do.	Sharjah Liquefaction Co. (Government, 60%; Amoco Sarjah Co., 25%; Itoh 7.5%; Tokyo Boeki, 7.5%)	Processing plant located at Ash Shariqah, Sharjah. Near the Sajaa gasfield	4,600[3] liquefied petroleum gas. 2,600[3] condensate.
Do.	Amoco Sharjah Oil Co. (Standard Oil Co., 100%)	Nonassociated gas from the Sajaa gasfield. Onshore, Sharjah	1,800[2] dry. 3,193[3] liquefied petroleum gas. 13,140[3] condensate.
Do.	Abu Dhabi Gas Liquefaction Co. (Adgas) (Government, 51%; Mitsui, 22.05%; BP, 16.3%; Total CFP, 8.2%; Mitsui Liq. Gas, 2.45%)	Processing plant located at Das Island. Offshore, Abu Dhabi	26,000[3] liquefied natural gas. 16,750[3] liquefied petroleum gas.
Do.	Abu Dhabi Gas Industries Ltd. (Gasco) (Government, 68%; Total CFP, 15%; Shell Oil Co., 15%; Partex, 2%)	Liquefaction plants located at the Bu Hasa, Bab, and Asab oil fields. Fractionation plant located at Ruwais, Abu Dhabi	58,000[3] liquefied petroleum gas.

See footnotes at end of table.

TABLE 2—Continued

UNITED ARAB EMIRATES: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity
Petroleum, crude	Abu Dhabi Co. for Onshore Operations (Adco) (Government, 60%; Total CFP, 15%; Shell Oil Co., 15%)	Asab, Bab, Bu Hasa, and Sahil oilfields, onshore, Abu Dhabi	365,000.[2]
Do.	Abu Dhabi Marine Operating Co. (Adam-Opco) (Government, 60%; Total CFP, 15%; BP, 15%)	Umm Shaif and Zakum oilfields, offshore, Abu Dhabi	208,000.[2]
Do.	Zakum Development Co. (Government, 88%; Jodco, 12%)	Upper Zakum oilfield, offshore, Abu Dhabi	113,000.[2]
Do.	Total Abu Al Bukhoosh Oil Co. (TBK) (Total CFP, 51%; Canadian Sunningdale Oil Ltd., 12.25%; Amerada Hess, 12.25%; Charter, 24.5%)	Al Bukhoosh oilfield, offshore, Abu Dhabi	21,900.[2]
Do.	Umm Al Dalkh Development Co. (Udeco) (Government, 50%; Jodco, 12%)	Umm Al Dalkh and Satah oilfields, offshore, Abu Dhabi	14,600.[2]
Do.	Al Bunduq Oil Co. Ltd. (BOC) (Bp, 33.3%; United Petroleum Development Co. Ltd., 33.3%)	Al Bunduq oilfield, offshore, Abu Dhabi	11,000.[2]
Do.	Abu Dhabi Oil Co. (Adoc) (Cosmo Oil, 51%; Nippon Mining, 25.6%; Japan National Oil Corp., 17.8%; other Japanese companies, 5%)	Mubarraz oilfield, offshore, Abu Dhabi	7,300.[2]
Do.	Mubarraz Oil Co. (Moco) (Adoc, 23.3%; Japan National Oil Corp., 43.4%; Cosmo Oil, 22.2%; Nippon Mining, 11.1%)	Umm Al-Anbar oilfield, near Mubarraz, offshore, Abu Dhabi	4,300.[2]
Do.	Dubai Marine Areas Ltd.-Dubai Petroleum Co. Dubai Petroleum Co., 15%; Repsol, 25%; Rheinoel, 10%; Wintershall, 5%; Dubai Sun Oil Co., 5%)	Fateh, Southwest Fateh and Rashid oilfields, offshore, Dubai	127,750.[2]
Do.	Crescent Petroleum Co. (CPC) (Buttes Gas and Oil Co., 98.2%; other, 1.8%)	Mubarek oilfield, offshore, Sharjah.	3,650.[2]
Petroleum, refined	Abu Dhabi National Oil Co. (Government, 100%)	Ruwais and Umm Al-Nar, Abu Dhabi	71,200.[2]
Sulfur	do.	Habshan, Abu Dhabi Ruwais, Abu Dhabi	292.[1] 10.[1]

NA Not available.
[1]Million tons per year.
[2]Million cubic meters per year.
[3]Million barrels per year.

Arab Emirates were deteriorating rapidly because water used in cement manufacturing before the early 1970's was too high in salt content. Local laws were requiring that all buildings that were at least 15 years old and 4 stories or higher be demolished and replaced with safer structures. During the next 2 years, local authorities anticipated that some 200 20-story buildings, 2,000 residential dwellings, and two 5-star hotels would be built. The United Arab Emirates produced 4.6 to 5 million tons of cement per year and had the capacity to grind 9 million tons of clinker.

Diabase.—Rockwool factories in Fujaira and Ras Al-Khaimah used local diabase from the Semail Ophiolite Suite as feedstock to manufacture products used in thermal insulation.

Fertilizer.—Ruwais Fertilizer Industries (Fertil) had began discussions with Rashtriya Chemicals and Fertilizers Ltd. (RCFL) about a possible joint venture involving the construction of a second ammonia plant in the United Arab Emirates. It would have a 1,000-ton-per-day nitrogen capacity or 1,350-ton-per-day ammonia capacity. If a new plant was not built, Fertil was considering doubling the capacities of the ammonia and urea plants at its Ruwais facilities. Fertil had recently installed a hydrogen extraction unit at its ammonia plant that effectively boosted capacity by 6%.

Gypsum.—Gypsum, a minor additive in ordinary portland cement, was extracted by the General Gypsum Co. from the Jabel Ali deposit near Dubai. A very large, high-quality gypsum and celestite deposit at Al Ain had so far been unexploited.

Phosphorus.—A 150,000-ton-per-year capacity phosphoric acid plant was to be built in Jebel Ali. The plant was being set up by Emirates Narmanda Industries (ENI), a joint venture of India's Gujarat Narmanda Valley Fertilizer Co.

(GNFC) and the Abu Dhabi-based Mozak International. The Indian Government had agreed to purchase the entire output for 10 years. ENI says that the plant should begin operation sometime in 1990.

Sulfur.—Adnoc decided to combine its sulfur-producing facilities at Ruwais. The plans were to move the solid sulfur recovery plant at its Habshan gas-processing plant to Ruwais. A new plant would also be built at Ruwais to treat 550 tons per day of liquid sulfur that would be recovered from two units installed at Das Island but never utilized. If fully implemented, this would almost double the United Arab Emirates' sulfur production.

Mineral Fuels

Natural Gas.—In October, Adnoc awarded a contract to Technip, a French engineering firm, to develop a new nonassociated gas deposit in the Abu Al-Bukhoosh oilfield. Once developed, Total CFP would operate the gas production facilities.

Late in the year Gasco started to reactivate the gas plant at the Bab oilfield following Adco's announcement that it would restart production after having been shut down for 3 years.

Adgas decided to study the possibility of almost doubling the capacity of its Das Island plant to 50 million barrels-per-year (bbl/yr) plans were for another plant to be built on Das Island that would produce about 23-million bbl/yr liquefied natural gas and 2.7 million bbl/yr liquefied petroleum gas.

Petroleum, Crude.—Abu Dhabi had plans to expand its total crude oil production capacity by 70% to 2.5 million barrels per day (bbl/d) by 1995. The main expansion projects were to be in the Upper Zakum Field and in the onshore Bab Field that was reopened in 1989 after having been shut down since 1986. Early in 1989, Adco announced its plans to double the Bab Field's capacity by 1991 to 80,000 to 100,000 bbl/d. Adnoc announced in May 1990 that it intended to drill 100 new wells in the Upper Zakum Field and expand its capacity to 500,000 bbl/d by 1992.

The Abu Dhabi Marine Operating Co. (ADMA-OPCO) had completed a project that would enable it to maintain reservoir pressure and condensate recovery in the Umm Shaif Field.

Mubarraz Oil Co.'s Umm Al-Anbar Field entered production in February 1989. It had reserves estimated at 40 million barrels and is currently producing 12,000 bbl/d.

Petroleum, Refined.—Adnoc reported that a fire in the hydrocracking plant of Abu Dhabi's 120,000 bbl/d Ruwais refinery would not disrupt production. It also postponed maintenance shutdown of the Ruwais refinery and restarted the 75,000 bbl/d Umm Al-Nar refinery after a monthlong overhaul.

Adnoc planned to expand its refinery capacity at its two refineries at Ruwais and Umm Al-Nar to a combined capacity of 300,000 bbl/d. Production in 1989 averaged 214,000 bbl/d. Pending approval from the Supreme Petroleum Council, additional hydrotreatment facilities could be operational at the Umm Al-Nar plant by late 1991. A base oil lube plant would be built later at the Ruwais plant.

In July 1989, the Indian company, Reliance Industries, announced that it was seeking partners to develop a 120,000 bbl/d plant in Jebel Ali, Dubai. The proposed facility would include a hydrocracker and a visbreaker. The output would be exported to India by the Indian Oil Corp. The projected cost of the project was $900 million and Reliance was prepared to invest $120 million.

Ducham, a new subsidiary of the Dubai-based Star Corp. announced plans in March to build a $40 million gasoline plant in Jebel Ali. Its planned capacity was 20,000 bbl/d of unleaded gasoline, 360 tons per day of aromatics, and 240 tons-per-day of raffinate.

Pipelines.—ADMA-OPCO laid gas lines from the Umm Shaif Field to the liquefied petroleum gas plant on Das Island to be used as a backup supply to the export facility.

A 68-kilometer pipeline designed to transport natural gas from Arco's Margham Field to the Dugas liquefaction plant at Jebel Ali was completed in April 1989. It would supply Dugas with 4,750 millions of cubic meters per year of wet natural gas.

Reserves.—Following a recent reevaluation of the nation's mineral reserves, the United Arab Emirates moved into third place in both petroleum and natural gas reserves. Its proven petroleum reserves were estimated to be more than 98 billion barrels, enough to last 145 years at the average 1989 production level of 1,850,000 bbl/d. The proven natural gas reserves were now estimated to be 9.77 trillion cubic meters. This was a 71.6% increase from the last estimate of 5.69 trillion cubic meters. At the 1989 rate of production of 28 billion cubic meters, the United Arab Emirates' natural gas reserves would last 349 years.

INFRASTRUCTURE

A network consisting of 830 kilometers of crude oil pipelines and 870 kilometers of natural gas and natural gas liquid pipelines connect the United Arab Emirates' oil- and gasfields to numerous loading facilities. Abu Dhabi had nine crude oil tanker terminals at Das Island, Jebel Dhanna, Ruwais, Abu Al-Bukhoosh, Mina Zayed, Mubarraz, Umm Al-Nar, Zirku Island, and Dalma Island. The terminals at Das Island and Ruwais also included facilities for loading natural gas liquids. Dubai had three crude oil and gas terminals at Jebel Ali, Fateh, and Port Rashid. Sharjah had two terminals for the export of oil and gas that were located at Mubarak and Sharjah.

The United Arab Emirates had an adequate highway system consisting of 2,000 kilometers of paved roads, including the Trans-Arabian Highway. Major port facilities were at Jebel, Dhanna, Das Island, Umm Al-Nar, Abu Dhabi, Jebel Ali, and Dubai. There were major airports at Abu Dhabi, Dubai, and Sharjah.

OUTLOOK

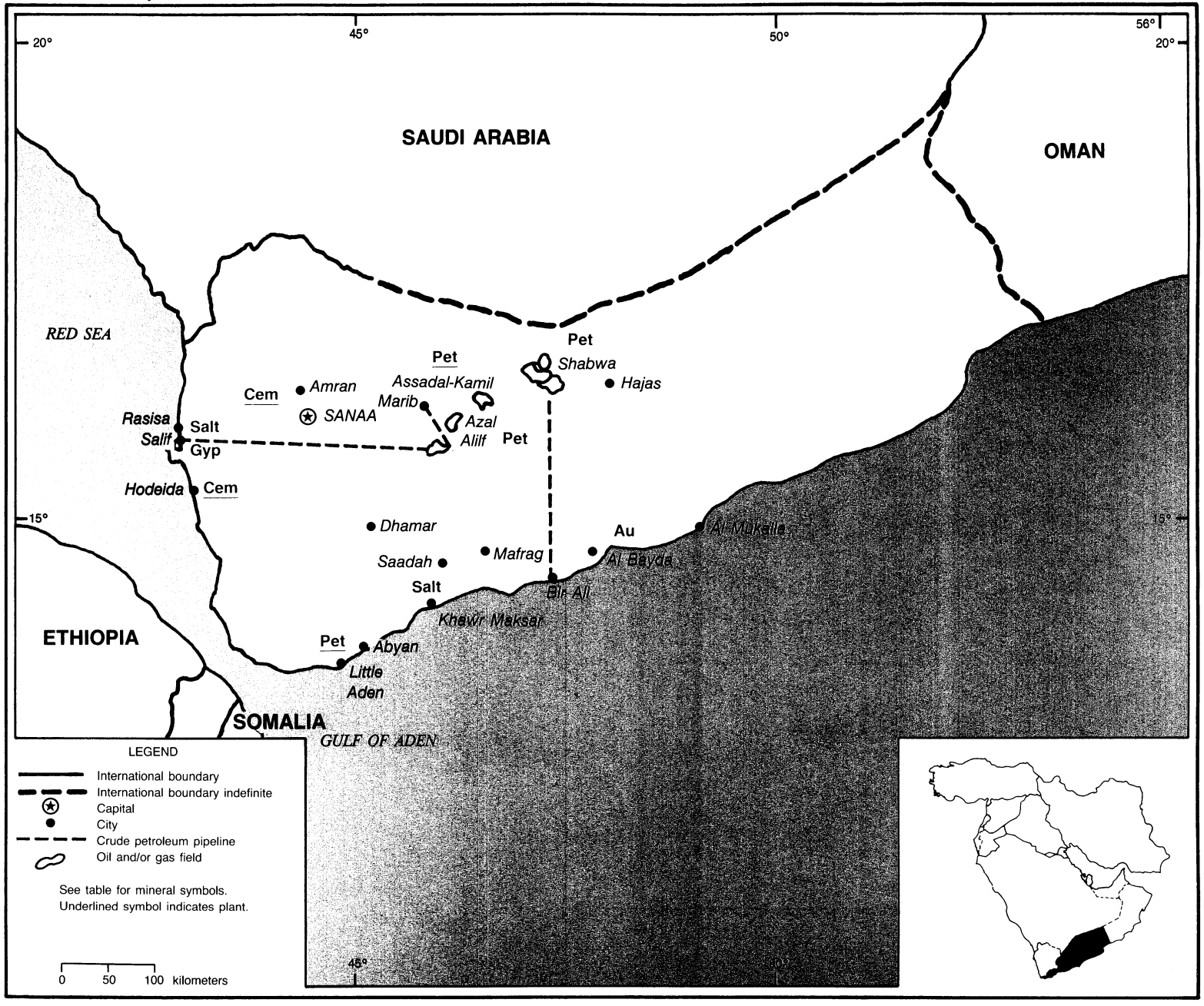
The United Arab Emirates' economy probably benefited more from the relative economic stability enjoyed in the Persian Gulf region following the 1988 cease fire between Iraq and Iran than any other country. The current unrest in the Middle East may slow down the United Arab Emirates' plans to increase the relative importance of its nonoil sector to its total economy. Higher oil prices and greater demand for crude oil will, however, more than compensate for any adverse effects that a regional conflict may have on business confidence. If the United Arab Emirates' current building plans are fulfilled, it is clear that exports of cement will decrease. The representatives of some companies believe that the United Arab Emirates may become a net importer of

cement in 1990. Imports of manufactured goods from the United States, such as aluminum doors, glass, paint, and plumbing supplies are expected to increase.

[1]Where necessary, values have been converted from Emirian dirhams (Dh) to U.S. dollars at the rate of Dh3.70 = US$1.00.

REPUBLIC OF YEMEN

AREA 482,000 km² **POPULATION 13 million**



THE MINERAL INDUSTRY OF THE

REPUBLIC OF YEMEN

By Bernadette Michalski

At the merger of the two sovereign nations, the People's Democratic Republic of Yemen and the Yemen Arab Republic, on May 22, 1990, petroleum contributed nearly 13% and mining contributed about 1% of the newly formed Republic of Yemen's gross domestic product of about $7 billion. Preliminary estimates of the new nation's outstanding debt, including previously unreported loans from Eastern Europe to the former People's Democratic Republic of Yemen, were more than $7 billion.

The Republic of Yemen has been basically an agrarian economy. Mineral industry activity had been confined to the refining of foreign crude oil and the production of cement, dimension stone, gypsum, and salt until the Alif Field was discovered to contain commercial quantities of crude oil in November 1985. Other commercial discoveries followed, including the Azal, Asaad Al-Kamil, Amal, and Ayyad Fields. These discoveries were on both sides of the border that divided the two former countries. While a joint exploration agreement had been signed in 1988 that awarded a concession straddling the border area, the merger of the two nations in 1990 facilitated exploration and development.

GOVERNMENT POLICIES AND PROGRAMS

Comprehensive political and economic reforms were introduced in mid-1989 and in early 1990 in anticipation of unification. One of the reforms was a new investment law that sanctioned limited private investment. It encouraged the infusion of capital by foreign and local enterprises to elevate national income and expand the base of the economy.

Under the investment law, new projects would be entitled to a 3-year tax holiday, and provision was made for the remittance of profits and capital abroad. Investors would receive tax and customs exemptions on the importation of machinery, tools, equipment, and building materials. Tax and customs exemptions would also apply to imported raw materials for 3 years commencing from the date of actual operation. In addition, 50% of dividends paid to shareholders or investors would be exempted from tax.

The United States restored diplomatic relations with the People's Democratic Republic of Yemen on April 30, 1990 after a 21-year break in relations. Ties with Washington were cut in June 1969 after the formation of a pro-Soviet Government.

PRODUCTION

Mineral production is limited to the extraction and processing of crude oil, gypsum, rock and brine salt, and to the manufacture of cement. Despite recent discoveries of crude petroleum, full development remains dependent upon pipeline construction, refinery modernization, and expanded port facilities and storage terminals. The underutilized 170,000-barrel-per-day (bbl/d) capacity refinery at Aden processes crude oil for domestic consumption and accepts contract processing for a few regional producers, particularly Iraq, Kuwait, and the United Arab Emirates, as well as for the U.S.S.R. Iraq made the first delivery to the expanded port facilities at Aden on November 19, 1989, with over 1 million barrels of crude oil for contract processing. A small refinery with a 10,000-bbl/d capacity topping unit and a 2,500-bbl/d reformer has been in operation at Marib since 1986, processing crude oil from the Alif Field.

TRADE

Crude oil exports were estimated to be $600 million in 1989 and accounted for nearly 90% of total exports, according to the Central Bank of Yemen and the International Monetary Fund. Crude oil imported by the United States alone was valued at over $255 million in 1989.

By comparison, crude oil export revenues were reported at $432 million in 1988. About one-third of the nation's crude oil exports, equivalent to over 9 million barrels valued at $134 million, was delivered to the United States in 1988. Increased export volumes and improved prices should bring 1990 petroleum export values nearer to $1 billion. U.S. imports during the first 6 months of 1990 alone were valued at more than $250 million. Although increased revenues from petroleum exports should improve the new Republic's balance of payments position, total imports, including fuels, lubricants, raw materials, and consumer goods, exceeded the value of exports by about $1 billion in 1989. Remittances from over 1 million expatriate workers in Saudi Arabia and other Gulf countries help to finance imports. However, since the peak year of 1982 when the total was $1.5 billion, remittances have been severely reduced to about $4 million in 1989.

All trade with Israel is prohibited. Most exports are subject to individual licensing. Only the monetary authorities and authorized dealers may purchase or sell gold bullion.

TABLE 1

REPUBLIC OF YEMEN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[e]
Cement	thousand tons	[r]750	[r]560	760	646	[2]700
Gypsum		25,000	53,000	50,000	60,000	[2]63,000
Petroleum:						
Crude	thousand 42-gallon barrels	—	2,700	7,800	60,390	71,550
Refinery products:						
Gasoline	do.	1,785	2,256	2,633	2,725	2,725
Kerosene	do.	1,356	1,240	1,240	1,250	1,250
Distillate fuel oil	do.	8,205	9,523	9,478	9,530	9,535
Residual fuel oil	do.	9,320	8,919	10,113	10,135	10,140
Other[e]	do.	230	900	1,000	1,000	1,000
Total	do.	20,896	22,838	24,464	24,640	24,650
Salt[e]		225,000	375,000	238,000	225,000	230,000

[e] Estimated. [p] Preliminary. [r] Revised.
[1] Table includes data available through June 30, 1990.
[2] Reported figure.

STRUCTURE OF THE MINERAL INDUSTRY

Although the Republic of Yemen encourages private investment, as of mid-1990 the new Government had little time to implement any privatization program. The cement industry remains totally Government-owned as well as most of the mineral industry activities in the former People's Republic of Yemen.

Crude oil, the nation's principal mineral commodity, was originally discovered and developed in the Marib al-Jawf region by the Yemen Hunt Oil Co. of the United States on a production-sharing basis with the Government. The Government receives 70% of production of the first 100,000 bbl/d, with an additional 5% for each 100,000 bbl/d increment until capped at 90% for all production of 400,000 bbl/d and above. Production from the Shabwa region was developed by the U.S.S.R. under service contract for the Government, and all crude oil output is Government-owned. However, output from the region has been limited pending infrastructure development and resolution of technical problems. To facilitate development of the Shabwa region, the original 35,000-square-kilometer (km^2) U.S.S.R. contract area has been divided into nine blocks. Of this total, at least six blocks are to be offered to commercial oil companies on a production-sharing basis.

COMMODITY REVIEW

Metals

The Government has signed an agreement with Jordan in 1989 to set up a regional project for gold exploration. In late 1989, an agreement was also signed in Moscow that called for the recommencement of development of gold at Wadi Medden, about 95 kilometers (km) southwest of Al-Mukalla on the Gulf of Aden coast.

Industrial Minerals

Cement.—The Yemen Corp. for the Production and Marketing of Cement awarded a design and construction supervision contract for the turnkey Al-Buh cement works near Mafrag to Rendel Palmer and Tritton of the United Kingdom. The 500,000-ton-per-year-capacity cement plant was financed by Japan's Overseas Economic Cooperation Fund at $145 million. Completion of this project will elevate the nation's total annual cement production capacity to 1.25 million tons. Existing plants, the Japanese built 500,000-ton-per-year-capacity Amran plant and the 250,000-ton-per-year-capacity Bajil plant constructed by the U.S.S.R., were being considered for modernization and expansion.

Dimension Stone.—The Arab Mining Co. (ARMICO) of Jordan recommended to the National Co. for Industrial and Building Materials the establishment of a marble quarry at Hajaj to supply the domestic market. A granite quarry was recommended for Al-Bayda with a processing plant at Sanaa to supply both block and finished granite for the export market. ARMICO projects development cost at $9.5 million. Project completion is anticipated to require 2 years.

Salt.—Present salt operations are centered at Salif, where rock salt is mined, and at Khawi Maksar, where brine is evaporated. China has signed an agreement to provide a loan for the development of the salt industry.

Mineral Fuels

Exploration.—The Government signed a production-sharing agreement in early 1990 with Petro-Canada for oil exploration in the 12,000-km^2 Habrout region in the Mahra governorate in the east near the Oman border. Exploration will be in

TABLE 2

REPUBLIC OF YEMEN: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity[1]
Cement	Government (100% ownership)	Bajil (near Hodeida)	250
		Amran	500
Gypsum	Yemen Salt Mining Corp.	Salif	75
Petroleum, crude	Yemen Exploration and Production Co. (Yemen Hunt Oil Co., 51%; Exxon Corp., 49%)	Alif[2]	[3]180
		Azal	[3]20
		Asaad al-Kamil	[3]25
Do.	Shabwa Petroleum (Government, 100%)	Western Ayyad	[3]50
		Amal	[3]50
Petroleum refinery products	Yemen Exploration and Production Co. (Yemen Hunt Oil Co., 51%; Exxon Corp., 49%)	Marib	[3]10
Do.	Aden Refining Co.	Little Aden	[3]170
Salt	Yemen Salt Mining Corp.	Salif	400
Do.	Public Salt Organization (Government, 100%)	Khaw-Maksahr	80

[1] Thousand metric tons per year unless otherwise specified.
[2] In 1984, the Yemen Hunt Oil Co. sold 24.5% of its equity in the Alif Field to the South Korean Consortium (Yukong 65%, Korean Petroleum Development Corp. 10%, Hyundai Corp. 10%, and Sam Wham Corp. 15%). In 1985, Exxon purchased 49% interest of Hunt's remaining equity in the Alif Field (then reduced to 75.5%) and 49% in the remaining Marib-Jawf concession as a whole.
[3] Thousand barrels per day.

in three main phases over a 6-year exploration period at an estimated cost of $27 million.

Texaco Inc. acquired Exxon's relinquished holdings in a 22,000-km^2 concession adjacent to the Marib al-Jawf region in February 1989. After drilling two dry holes, Texaco announced it was relinquishing the concession in May 1990. Texaco Exploration Yemen Inc. acquired a 50% stake in the Total Cie. Francaise des Petroles' onshore and offshore concession in the Al-Mukha region. The two firms relinquished the acreage in late 1989.

In February 1990, Phillips Petroleum of the United States acquired 67% interest in Canada's International Petroleum Corp.'s 4,300-km^2 concession in the Upper Wadi al-Jawf region.

Société Nationale Elf Aquitaine (France), British Petroleum Co., and London and Scottish Marine Oil (United Kingdom) completed an offshore seismic survey in their 19,374-km^2 Aden-Abyan concession near yearend 1989 and announced plans to initiate drilling in early 1990.

A joint-venture exploration agreement covering a 14,000-km^2 block near the concession operated by Elf Aquitaine was entered into by Tullow Oil of Ireland, 33%, and the Bin Ham Group of the United Arab Emirates, 67%.

The Yemen Co. for Investment in Oil and Mineral Resources was formed in 1988 to award concessions in the 2,200-km^2 corridor between the oil-bearing zones of Marib al-Jawf in the former Yemen Arab Republic and Shabwa in the former People's Democratic Republic of Yemen. The company signed a provisional exploration agreement in December 1989 with a consortium representing companies from four nations, France, Kuwait, the United States, and the U.S.S.R., for oil exploration and development rights in the area straddling the former border. The final agreement was signed on March 14, 1990. However, by the following June, the U.S.S.R. withdrew from the venture, having failed to meet its agreed share of investment amounting to approximately $5 million.

Production.—The Yemen Exploration and Production Co. (YEPC), a joint venture between Yemen Hunt Oil Co. of the United States at 51% equity and the Exxon Corp. of the United States at 49% equity, confirmed the commercial potential of the Asaad al-Kamil oilfield and gasfield in the Marib/Al-Jawf region about 16 km north of the Azal Field. The field covered about 60 km^2 and contained an estimated 133 million barrels of crude and condensate as well as 76 billion cubic meters of associated gas in place. This represents the company's fifth commercial field. Sixteen wells were drilled, nine of which yielded crude oil of 40° to 43° API gravity crude with traces of sulfur at 0.02%. Seven wells yielded natural gas and condensate at the level of about 30 barrels of condensate per 28,000 cubic meters. The field was scheduled to enter production following completion of a pipeline link-up with the existing 430-km pipeline network connecting production facilities to the export terminal at Ras Issa near Salif on the Red Sea. The terminal consists of a 9-km offshore pipeline linked to a 400,000-deadweight-tons storage tanker. The tanker will feed offtake vessels via a single point mooring.

The YEPC concession has yielded these discoveries: the Alif Field with 47 oil completions on production and the Azal Field with 11 oil completions on production. Two smaller fields were also declared commercial in September 1988, the Jabal-Noqum and the Saih Ben Yazn Fields, each with one oil completion on production .

The U.S.S.R.'s Technoexport was contracted to develop the Shabwa area. With the development of the Eastern Ayyad, Western Ayyad, and Amal Fields, output from the region was projected to eventually attain levels of 150,000 bbl/d of low sulfur crude oil ranging from 35° to 43° API gravity. A 190-km pipeline with three pumping stations was expected to be completed by January 1990 to trans-

port the crude oil to a floating storage facility at Bir Ali. As of mid-1990, the pipeline was about 10 km short of the coast. Until completion of the pipeline, production from Shabwa must be trucked to the Aden refinery, placing limitations on output of about 5,700 bbl/d. The Gulf of Aden terminal at Bir Ali will serve to load tankers for crude oil delivery to the domestic refinery at Aden or for delivery to international markets.

Refining.—The Aden refinery is scheduled to undergo a $200 million modernization program, including new hydrocrackers, power units and storage facilities, that should enable it to process Shabwa crude oil. The refinery now operates at less than 40% of its annual capacity of 170,000 bbl/d. An agreement for delivery of 25,000 bbl/d of crude oil from Abu Dhabi for the second half of 1990 was finalized in May 1990 to counteract the dwindling source of supply from the U.S.S.R. Berth expansion plans at the Aden port allowed the accommodation of 120,000 deadweight tons tankers by the close of 1989 as compared with the original capacity of 50,000 deadweight tons.

The 10,000-bbl/d-capacity refinery at Marib operated at full capacity, providing petroleum products for the domestic market. A $28 million contract involving the Federal Republic of Germany's Mannesmann Anlagenbau was awarded in mid-1990 to build a 135,000-ton-per-year capacity plant for bottling liquefied petroleum gas (LPG) in Sanaa. Also under consideration were LPG bottling plant sites at Dhamar, Marib, Amran, and Saada.

Reserves

The combined estimated proven crude oil reserves of the newly formed Republic of Yemen were 4 billion barrels. Natural gas reserves were reported at 565 billion cubic meters of which 200 billion cubic meters are proven reserves in the Marib/Al Jawf region as announced in June 1989.

INFRASTRUCTURE

The Republic's road system totals 15,500 km of which only 4,000 is bituminous surfaced and the remainder is for the most part natural surfaced.

Seven ports are along the 1,906-km coastline. The Red Sea ports are Al Hudaydah, Al Mukha, Salif, and Ras al-Katib. The ports in the Gulf of Aden are Aden, Al Khalf, and Nishtun.

OUTLOOK

The union of the People's Democratic Republic of Yemen and the Yemen Arab Republic will facilitate development of the petroleum reserves situated in the former border area. With aid from the U.S.S.R. reduced, the particularly timely union would offer the former People's Democratic Republic of Yemen intergration with a substantially larger market in the former Yemen Arab Republic. The prospect of a sustained rise in oil prices during the coming years should lead to a steady growth in export earnings. Liberal exploration laws have attracted major and minor oil companies, and development finance is available.

OTHER SOURCES OF INFORMATION

The Petroleum and Mineral Resource Ministry
Sanaa, Republic of Yemen

The Ministry of Economy, Supply, and Trade
Sanaa, Republic of Yemen

MAP SYMBOLS

Commodity	Symbol
Alunite	Alu
Alumina	Al
Aluminum	AL
Andalusite	And
Antimony	Sb
Arsenic	As
Asbestos	Asb
Asphalt	Asp
Barite	Ba
Bauxite	Bx
Bentonite	Bent
Beryllium	Be
Bismuth	Bi
Bitumen (Natural)	Bit
Boron	B
Bromine	Br
Cadmium	Cd
Calcium	Ca
Carbon Black	CBl
Cement	Cem
Cesium	Cs
Chromite	Cr
Clays	Clay
Coal	C
Cobalt	Co
Columbium	Cb
Copper	Cu
Corundum	Cn
Cryolite	Cry
Diamond	Dm
Diatomite	Dia
Dolomite	Dol
Emerald	Em
Feldspar	Feld
Ferroalloys	FA
Ferrochrome	FeCr
Ferromanganese	FeMn
Ferronickel	FeNi
Ferrosilicon	FeSi
Fertilizer	Fert
Fluorspar	F
Gallium	Ga
Germanium	Ge
Gold	Au
Graphite	Gr
Gypsum	Gyp
Ilmenite	Il
Indium	In
Iron and Steel	Fe
Iron Ore	Fe
Kaolin	Kao
Kyanite	Ky
Lapis Lazuli	Laz
Lead	Pb
Lignite	Lig
Lime	Lime
Limestone	Ls
Liquefied Natural Gas	LNG
Liquefied Petroleum Gas	LPG
Lithium	Li
Magnesite	Mag
Magnesium	Mg
Manganese	Mn
Marble and Alabaster	Marb
Mercury	Hg
Mica	M
Molybdenum	Mo
Natural Gas	NG
Natural Gas Liquids	NGL
Nepheline Syenite	Neph
Nickel	Ni
Nitrates	Nit
Nitrogen (Ammonia Plants)	N
Oil Sands	OSs
Oil Shale	OSh
Olivine	Ol
Opal	Opal
Peat	Peat
Perlite	Per
Petroleum, Crude	Pet
Petroleum Refinery Products	Pet
Phosphate	P
Pig Iron	Pig
Pigments, Iron	Pigm
Platinum Group Metals	PGM
Potash	K
Precious and Semiprecious Stones	Gem
Pumice	Pum
Pyrite	Py
Pyrophyllite	Pyrp
Quartz or Quartzite	Qtz
Rare Earths	REE
Rhenium	Re
Rutile	Ru
Salt	Salt
Sand and Gravel	Sd/Gvl
Sandstone	Ss
Selenium	Se
Sepiolite, Meerschaum	Sep
Serpentine	Serp
Shale	Sh
Silicon	Si
Sillimanite	Slm
Silver	Ag
Soapstone	Soap
Soda Ash, Trona	NaAsh
Sodium Sulfate	$NaSO_4$
Stone	Stone
Strontium	Sr
Sulfur	S
Talc	Talc
Tantalum	Ta
Tellurium	Te
Thorium	Th
Tin	Sn
Titanium	Ti
Titanium Dioxide	TiO_2
Tungsten	W
Uranium	U
Vanadium	V
Vermiculite	Verm
Wollastonite	Wo
Wonderstone	Ws
Yttrium	Y
Zinc	Zn
Zirconium	Zr

MAP LEGEND

Symbol = Mine, including beneficiation plants, well

Circled Symbol = Group of producing mines or wells

Underlined Symbol = Processing plant or oil refinery, including smelters and metal refineries

(Symbol) = Undeveloped resource