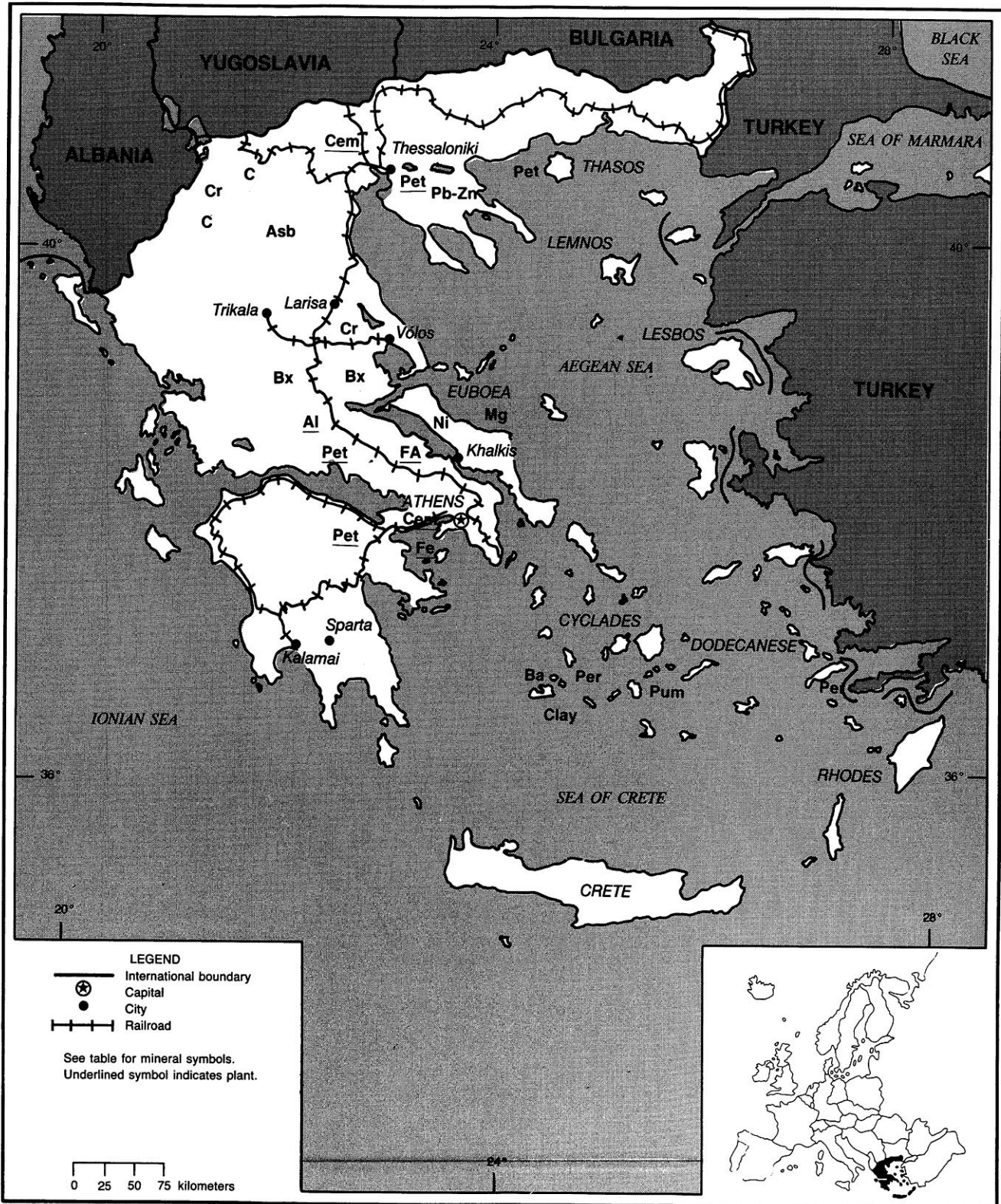


GREECE

AREA 133,000 km²

POPULATION 10.0 million



THE MINERAL INDUSTRY OF GREECE

By George A. Rabchevsky¹

Greece was the world's third largest producer of bentonite and perlite and a significant producer of bauxite and magnesite. The country was an important European producer of asbestos, chromite, ferrochromium, ferronickel, marble, perlite, pumice, and salt. The country is also a significant producer of cement.

The country's economy continued a downward trend in 1990. The growth of the GDP declined from about 2.8% in 1989 to 0.8% in 1990, while the rate of inflation increased from about 15% to nearly 23% during this period. Greece's mining, quarrying and mineral processing sectors continued to account for about 5% of the country's GDP.

GOVERNMENT POLICIES AND PROGRAMS

The Greek Mining Code of 1963 provided for exclusive state ownership and exploitation of certain minerals in specific areas of the country. Public Law 1116-81 of 1981 encouraged domestic and foreign investment in the less industrially developed areas of Greece. In 1982, this law was replaced by Law 1262, which introduced state participation in private programs and, in part, provided state grants for energy conservation projects, minerals and energy research, and technological improvement.

To facilitate the transition from public to private control of the minerals industry, the new Government, in its policy declaration (April 24, 1990), outlined basic principles to reverse recession and relieve inflation. The new policy would support private companies and seek to liquidate or sell virtually all bankrupt public companies and subsidiary companies of state-owned banks. The new Law 1892/31-07-90 established incentives for industry to introduce pollution-reducing technology and to relocate high-pollution plants away from urban areas.¹

PRODUCTION

In 1990, production of the following metals and metal ores increased slightly:

alumina, aluminum, bauxite, manganese concentrate, nickel, silver, steel, tin, and zinc mine output. Production of industrial minerals, such as barite, cement, kaolin, magnesite, and nitrogen have also risen slightly. The output of lignite continued to grow, while crude oil production continued to fall.

TRADE

Greece's total exports in 1990 were about 6% higher than those in 1989. General exports to the Federal Republic of Germany, Greece's major trading partner, and to the United States rose by 13% and 32%, respectively. In 1990, Greece continued to export cement, magnesium compounds, and pumice to the United States.

STRUCTURE OF THE MINERAL INDUSTRY

Greece's mineral industry employed about 210,000 workers including 4,000 in metal minerals, 6,000 in the mineral fuels sector, 15,000 in the industrial minerals sector, and 185,000 in metallurgical operations.

The mineral industry of Greece was composed of privately owned and state-owned enterprises. The Ministry of Energy and Natural Resources was the Government agency responsible for exploration, mining, metallurgical, and energy developments. The Government participated in the mineral industry either directly through enterprises such as the Hellenic Industrial and Mining Investment Co. (HIMIC) or through shareholdings in private companies. HIMIC was the principal shareholder in the Lavrion-based lead producer Greek Metallurgical & Mining Co. of Lavrion S.A., in the chromite and ferrochrome producer, Hellenic Ferroalloys S.A., and in Aegean Metallurgical Industries S.A., which conducted exploration and development work for gold, lead, silver, and zinc. The Government also controlled the mining and processing operations under the auspices of the Hellenic Industrial Develop-

ment Bank, the National Bank of Greece, and the National Bank for Industrial Development.

The major private companies in Greece were Aluminium de Grece S.A., a subsidiary of Pechiney of France; the Bodossakis Group (lead and zinc concentrates, nickel ore, and ferronickel); the Eliopolis-Kyriacopoulos Group (barite, bauxite, and perlite); Magnomin General Mining Co. S.A. (magnesite); and the Titan Cement Co. S.A.

The major production and processing companies in Greece are listed in table 2.

COMMODITY REVIEW

Metals

Aluminum and Bauxite.—Bauxite has provided the basis for the country's aluminum industry, and Greece was well established as a producer and exporter of alumina, aluminum metal, bauxite, and a wide range of products based on aluminum. Underground mining accounted for 50% of Greece's total bauxite mine production. Greek bauxite was exported to Canada, France, the Federal Republic of Germany, Italy, the Netherlands, Romania, the U.S.S.R., and Yugoslavia.

The country's principal deposits of bauxite occurred to the north of the Gulf of Corinth in the areas of Distomon, Elikonas, Ghiona, Itea, and Parnassos. Other deposits were found in the district of Eleusis, Mandra, and Megara to the west of Athens; Oeti near Lamia; Kimi on the island of Euboea; and on the island of Amorgos in the Cyclades. Deposits in the Florina area of central northern Greece are also under investigation.

The largest producer of bauxite, Bauxites Parnasse Mining S.A. (BPM), had the capacity to produce about 2 Mmt/a of processed and graded bauxite from mines at Euboea, Ghiona, Itea, and Parnassos. BPM began its operations in 1924 with the discovery of bauxite deposits in Parnassos-Ghiona-Oiti mountain ranges. The company produced more than 65% of Greece's bauxite output. The company's main processing plant and shipping facility was at

TABLE 1
GREECE: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity ²	1986	1987	1988	1989 ^p	1990 ^e
METALS					
Aluminum:					
Bauxite, gross weight thousand tons	2,231	2,467	2,443	2,602	2,700
Alumina, gross weight do.	307	518	515	521	530
Metal:					
Primary	124,400	126,750	150,801	144,833	150,000
Secondary ^e	7,000	7,000	7,000	7,000	7,000
Chromite:					
Run-of-mine ore	217,979	211,599	180,836	187,322	160,000
Marketable products:					
Direct-shipping ore ^e	16,000	16,000	14,000	15,000	13,000
Concentrate	60,063	63,825	49,535	47,324	45,000
Iron and steel:					
Iron ore and concentrate, nickeliferous:³					
Gross weight thousand tons	1,600	1,083	1,573	2,013	2,000
Fe content do.	650	423	640	820	800
Metal:					
Pig iron ^e do.	160	160	160	160	160
Ferrosilicon	38,260	40,000	44,150	43,500	30,300
Ferronickel	10,324	5,000	44,000	54,000	54,500
Steel, crude thousand tons	1,010	907	959	958	999
Lead:					
Mine output, Pb content	20,873	20,600	23,060	22,330	23,500
Metal:					
Smelter, primary	15,800	700	15,100	5,700	5,600
Refined: Primary ⁵	15,700	700	13,100	5,600	5,200
Secondary	3,600	2,000	2,000	1,400	2,000
Total	19,300	2,700	15,100	7,000	7,200
Manganese:					
Ore, crude:					
Gross weight	32,585	19,010	17,830	18,925	18,500
Mn content	10,759	6,277	5,900	6,000	6,000
Concentrate:					
Gross weight	4,560	4,024	3,725	3,034	3,980
Mn content	2,234	1,932	1,825	1,487	1,950
Nickel:					
Ni content of nickeliferous iron ore ⁶	14,400	9,740	14,200	18,117	18,500
Ni content of alloys	2,581	9,202	13,131	16,097	16,200
Silver: Mine output, Ag content	54	52	61	60	62
Tin metal, secondary ^e	40	40	40	40	40
Zinc mine output, Zn content	22,257	20,700	21,200	25,025	26,500
INDUSTRIAL MINERALS					
Abrasives, natural: Emery	7,500	7,500	7,500	7,000	7,000
Asbestos:					
Ore thousand tons	3,927	3,384	4,000	4,500	4,000
Processed	51,355	60,134	71,000	72,500	65,600
Barite:					
Crude ore	2,227	4,800	1,316	1,247	1,300
Concentrate	2,305	1,881	1,407	1,218	1,250

See footnotes at end of table.

TABLE 1—Continued

GREECE: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity ²	1986	1987	1988	1989 ^a	1990 ^a
INDUSTRIAL MATERIALS—Continued					
Cement, hydraulic thousand tons	13,341	13,168	13,053	12,535	413,944
Clays:					
Bentonite:					
Crude	1,317,825	1,300,525	730,501	1,096,177	1,000,000
Processed	352,587	360,831	502,537	529,802	500,000
Kaolin:					
Crude	141,210	144,634	127,395	67,234	90,000
Processed	3,532	5,720	4,163	6,946	7,000
Fluorspar, grade unspecified ^c	150	200	200	200	200
Gypsum and anhydrite ^c	500,000	500,000	500,000	450,000	450,000
Magnesite:					
Crude thousand tons	944	842	848	904	900
Dead-burned	248,114	222,807	237,595	214,945	215,000
Caustic-calcined	126,069	119,096	124,140	111,826	112,000
Nitrogen: N content of ammonia ^c	241,310	254,000	263,000	242,000	257,000
Perlite:					
Crude	357,347	360,831	361,849	390,180	350,000
Screened	184,148	208,352	211,404	217,305	220,000
Pozzolan (Santorin earth) thousand tons	1,005	814	358	786	785
Pumice	860,047	779,885	752,525	640,152	600,000
Pyrites, gross weight	150,245	148,972	130,129	97,051	97,000
Salt, all types ^c thousand tons	150	150	150	150	145
Silica (probably silica sand) ^c	38,000	38,000	38,000	461,144	60,000
Sodium compounds:^c					
Carbonate	1,000	1,000	1,000	900	900
Sulfate	8,000	7,000	7,000	6,000	6,000
Stone: Marble ^c cubic meters	150,000	150,000	150,000	4365,146	300,000
Sulfur:^c					
S content of pyrites thousand tons	466	465	70	70	70
Byproduct of petroleum do.	5	5	5	5	5
Natural gas do.	135	135	135	135	135
Total do.	206	205	210	210	210
Talc and steatite	1,731	1,507	1,587	1,600	1,600
MINERAL FUELS AND RELATED MATERIALS					
Coal including briquets:					
Lignite thousand tons	37,976	43,100	48,091	51,903	52,000
Lignite briquets ^c do.	110	120	120	120	120
Coke:^c					
Coke oven do.	305	305	305	300	300
Gashouse do.	16	18	19	16	16
Gas:					
Manufactured, gasworks ^c thousand cubic meters	425	425	1,784	1,784	1,784
Natural ^c million cubic meters	62	62	84	84	85
Petroleum:					
Crude thousand 42-gallon barrels	9,500	8,798	8,043	6,568	45,997
As reported thousand metric tons	1,320	1,223	1,118	913	900
Refinery products:					
Gasoline do.	15,000	23,650	20,596	26,656	28,551

See footnotes at end of table.

TABLE 1—Continued

GREECE: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity ²	1986	1987	1988	1989 ^p	1990 ^e
MINERAL FUELS AND RELATED MATERIALS—Continued					
Petroleum—Continued					
Refinery products—Continued					
Jet fuel do.	*11,000	13,024	15,968	13,976	14,500
Kerosene do.	*300	193	202	116	117
Distillate fuel oil do.	*25,000	28,758	28,407	27,848	27,900
Residual fuel oil do.	*28,000	39,460	40,080	35,211	*35,497
Lubricants do.	*800	*800	1,281	1,148	1,200
Other ^c do.	3,500	3,500	3,700	*3,700	3,700
Refinery fuel and losses ^c do.	4,000	4,000	4,620	*4,700	4,700
Total ^e do.	87,600	113,385	114,854	*113,355	116,165

^eEstimate. ^pPreliminary. ^rRevised.¹Table includes data available through July 1991.²In addition to the commodities listed, a variety of other crude construction materials (clays, sand and gravel, and stone) is produced, but output is not reported, and available information is inadequate to make reliable estimates of output levels. Cobalt is also produced and is included with "Nickel."³Ni content is also reported under "Nickel."⁴Reported figure.⁵Includes antimonial lead and hard lead.⁶Also includes Co content.

TABLE 2

GREECE: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Alumina	Aluminium de Grèce S.A.	Distomon, in Boeotia area	600
Aluminum	do.	do.	145
Asbestos	Asbestos Mines of Northern Greece S.A.	Mines and plants at Zidani, near Kozani	110
Barite	Silver and Baryte Ores Mining Co. S.A.	Milos Island	10
Bauxite	Bauxites Parnasse Mining Co. S.A. (Kyriacopoulos Group)	Mines in Parnassos-Ghion area; Pasha, Euboea Island	2,000
Do.	Eleusis Bauxites Mines, S.A. (ELBAU-MIN)	Plant in Itea. Mines near Eleusis, Itea, Kimi, and Lamia	700
Do.	Delphi-Distomon S.A.; Hellenic Bauxites of Distomon S.A.; Delphi Bauxites S.A.	Opencast mines at Delphi-Distomon area	500
Do.	Greek Helicon Bauxites G.L. Barlos Industrial & Mining Co. S.A.	Mines at Distomon (Elixon), Beotia..	300
Do.	do.	Processing plant at Distomon, Beotia	380
Bentonites:			
Crude	Mediterranean Bentonite Co. S.A.	Surface mines on Milos Island Processing plant at Livorno, Italy	20
Do.	Mykobar Mining Co. S.A.	Mines at Adams, Milos Island	180
Do.	Silver and Baryte Ores Mining Co.	do.	400
Processed	do.	Plants at Adamas Bay, Aghia Anna, and Vouthia Bay, on Milos Island	470
Cement	Halkis Cement Co. S.A.	Micro-Vathi plant, west-central Euboea	3,000
Do.	Halyps Cement S.A.	Paralia Aspropyrgos plant, Athens	800
Do.	Heracles General Cement Co. S.A.	Two plants at Euboea	1,900
Do.	do.	Six plants at Volos	4,600

TABLE 2—Continued

GREECE: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Cement—Continued	Titan Cement Co. S.A.	Eleuis plant, Athens region	1,100
Do.	do.	Kamari plant, Boeotia	2,400
Do.	do.	Patras plant, northern Peloponnesus	1,900
Do.	do.	Salonica plant, Salonica	1,400
Chromite	Financial-Mining Industrial and Shipping Corp. (FIMISCO)	Tsingeli mines near Volos	25
Do.	Hellenic Ferroalloy S.A. (ELSI)	Skoumtsa mines in Vourinos, near Kozani	350
Do.	do.	Concentrator at Skoumtsa	110
Coal, lignite	Public Power Corp. (DEH)	Aliveri Mine, Euboea Island	420
Do.	do.	Megalopolis Mine, central Peloponnesus	7,000
Do.	do.	Ptolemais Mine, near Kozani	28,000
Ferroalloys: Ferrochrome	Hellenic Ferroalloy S.A.	Tsingeli near Volos	45
Ferronickel, Ni content	Hellenic Mining & Metallurgical Co. of Larymna (LARCO)	Larymna Metallurgical Plant	16
Lead: Metal in concentrate	Hellenic Chemical Products and Fertilizer S.A.	Kassandra mines (Olympias; Stratoni), northeast Chalkidiki	31
Smelter	Greek Metallurgical & Mining Co. of Lavrion S.A. (EMMEL) (closed in 1989)	Lavrion, Attica area near Athens	20
Magnesite, concentrate	Financial-Mining-Industrial and Shipping Corp.	Mines at Gerorema, Kakavos, and Parakevoremma at Mantoudhi, northern Euboea Island	350
Do.	Mining Trading & Manufacturing Ltd. (closed in 1989)	Mines at Tamvakas near Mantoudhi	150
Do.	Grecian Magnesite S.A.	Mines at Yerakini and Kastri in Chalkidiki	300
Do.	Magnomin General Mining Co. S.A.	Mines at Vavdos, Chalkidiki Processing plant at Vavdos	68 66
Do.	Gambino Co.	Underground mine at Kimassi, Euboea Island	100
Manganese (battery grade MnO ₂ concentrate)	Eleusis Bauxite Mines S.A.	Nevrokopi, Drama	1
Do.	Christoforidis Mining S.A.	Mines at Neochorion, Chalkidiki	100
Do.	Gambino Co.	Underground mine at Stratoni, Chalkidiki	200
Natural gas million cubic feet per day	Public Petroleum Corp. (DEP) east of Thasos Island	Prinos offshore gasfield and oilfield,	4,416
Nickel, ore	Hellenic Mining & Metallurgical Co. of Larymna	Agios Ioannis mines near Larymna	500
Do.	do.	Mines at Euboea	2,500
Perlite	Silver and Baryte Ores Mining Co. S.A.	Kos and Milos Islands	300
Do.	General Enterprises Sarides S.A.	Milos Island	70
Do.	Milopan S.A.	Milos Island	165
Do.	Peletico Hellas S.A.	do.	20
Do.	N. Bouras & Co.	Kos Island	75
Petroleum, refined barrels per day	Hellenic Aspropyrgos Refinery S.A.	Aspropyrgos	95,000
Do. do.	Motor Oil (Hellas) Corinth Refineries S.A.	Aghii Theodori, Corinth	140,000
Do. do.	Petrola Hellas S.A.	Eleusis	100,000
Do. do.	Thessaloniki Refining Co. A.E.	Thessaloniki	76,000

TABLE 2—Continued

GREECE: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Pozzolan (Santorin earth)	Lava Mining & Quarrying Co. Ltd.	Quarries on Ghyali Island	800
Steel, crude	Halyvourgia Thessalias S.A.	Steelworks at Volos (Operates two 35-ton electric arc furnaces)	1,500 300 200
Do.	Halyvourgiki, Inc.	Steelworks at Eleusis (Three 100-ton electric arc furnaces)	1,200
Do.	Helleniki Halivourgia S.A.	Steelworks at Aspropyrgos (Operates two 55-ton electric arc furnaces)	400
Do.	Metallurgiki Halyps S.A. (closed in 1988)	Steelworks at Almyros, near Volos (Operates two 50-ton electric arc furnaces)	300
Do.	Sidenor S.A. (also known as Halivorgia Voviou Ellados S.A.)	Steelworks at Nea Maguisia, near Thessaloniki (Operates two 50-ton and two 30-ton electric arc furnaces)	350
Zinc in concentrate	Hellenic Chemical Products and Fertilizer Co.	Kassandra mines (Olympias, Stratoni), northeast Chalkidiki	25

Itea Bay. About 65% of the company's production was exported, and the remainder sold to Aluminium de Grece S.A. (AIG) under a long-term contract.

Delphi Bauxites S.A., Delphi-Distomon S.A., and Hellenic Bauxites of Distomon S.A. are subsidiaries of AIG, which produced both alumina and aluminum metal. Almost all of the bauxite mined by these companies was consumed by the parent company. Output from the mines in Distomon and Itea amounted to between 400,000 and 500,000 mt/a. AIG has operated a 600,000-mt/a alumina refinery at Distomon since 1965. Exports of alumina amounted to about 200,000 mt/a.

Elikon Bauxites-GL Barlos S.A. mined bauxite in the Elikon Mountains south of Levadia, with a capacity of about 400,000 mt/a.

Eleusis Bauxites Mines S.A. (ELBAUMIN) operated mines primarily at Eleusis and Lamia, which together produced approximately 300,000 mt/a of bauxite. The Eleusis plant produced cement-grade bauxite, while the Lamia plant produced a range of bauxite grades.

AIG operated the only aluminum smelter at Distomon, with a capacity of 145,000 mt/a. About 60,000 tons was exported annually, primarily to France and Italy.

The much delayed Greek-U.S.S.R. alumina plant, at Thisvi in Boeotia, remained under construction in 1990. The U.S.S.R. was to provide technology and some machinery and equipment. The U.S. firm

Kaiser Engineering Inc., of California, was to provide construction management services. France and Germany were also participants in this project. It is planned that once the 600,000-mt/a capacity alumina plant is built, the U.S.S.R. will absorb the entire output of the plant for the next 10 years and possibly longer. The alumina plant was scheduled to be in operation by 1994.²

Chromite.—Greek chromite production has undergone a major revival in the 1980's in response to the growth of the domestic ferroalloys industry and particularly for the ferrochrome plant established in 1984. Hellenic Ferroalloys S.A. (ELSI), mostly Government owned through HIMIC, produced chromite ore and operated a ferrochrome plant at Tsingeli near Almyros, southwest of Volos. ELSI operated the Skoumtsa Mine in the Vourinos area near Kozani, with a capacity of about 350,000 mt/a of run-of-mine ore and a 110,000 mt/a concentrator at Skoumtsa. Three underground mines and one surface mine were planned for development in the Vourinos area: Aetoraches, Koursoumia, Rizo, and Voidolakkas.³ The Tsingeli ferrochrome plant began operation in 1983. Reportedly, a new furnace at the plant was under construction, which would more than double its capacity.

Financial-Mining Industrial and Shipping Corp. (FIMISCO) was the only other chromite mining and processing operation in Greece, at Eretria, near Volos. FIMISCO

produced refractory-grade chromite from the Kastraki, Domokos-Nezeros, and Rothini mining areas. The capacity was 25,000 mt/a of refractory-grade material. Most of the refractory-grade chromite was used in the refractory plant at Fourni on Euboea island.⁴

About 15,000 tons of chromite was exported mainly to Germany. Greek ferrochrome exports amount to more than 40,000 tons.

Iron and Steel.—The country's steel production was mainly based on the electric arc process using imported scrap as raw material. A significant proportion of steel products was exported. In the ferroalloys sector, Greece was an important producer of ferrochrome and ferronickel, both of which were exported.

There were five major steel plants in Greece. Halyvourgiki Inc., the largest producer of crude steel, started production of concrete reinforcing steel bars in 1948 at Eleusis. Steel was produced in electric arc furnaces, and finished steel capacity amounted to 2 Mmt/a. The company also maintained its own port facility for unloading imported raw materials and for the export of products to Western Europe and the Far East.

Helleniki Halivourgia S.A., the second largest steel producer, Greece's longest established steelmaker, was founded in 1938. At its Aspropyrgos works, steel production was based on two 55-ton elec-

tric arc furnaces. Billets were produced in a continuous casting machine and hot-rolled products were produced in mills: The capacity of the plant was rated at 400,000 mt/a.

Other steel producers were Halypourgia Thessalias S.A., Metallurgiki Halyps S.A., and Sidnor S.A. The latter's plant was at Nea Magnisia near Thessaloniki, operating four electric arc furnaces, with a total raw steel capacity of 350,000 mt/a.

Hellenic Steel Co., with a finished steel capacity of 1 Mmt/a, was second only to Halypourgi Inc. in finished steel output in Greece. It operated a cold-rolling mill in Thessaloniki, producing coils, sheets and strips, galvanized sheets, and tinplate. Exports accounted for 60% of total production, destined to Western Europe, the United States, North Africa, and the Middle East.

The largest company operating in the stainless steel sector is Pyramis S.A., in Thessaloniki, producing sinks and tableware. There also were 10 other companies producing stainless steel.

Lead and Zinc.—Greece produced primary lead and manufactured lead-base products. Most of the country's Deposits of mixed sulfide ores are found in the northern provinces of Macedonia and Thrace. The Hellenic Chemical Products and Fertilizer Co. Ltd. operated the Kassandra Mines at Stratoni, northeast of Chalkidiki. Part of lead concentrate output was used domestically, and the remainder, as well as all zinc concentrates, was exported.

Production was based on the mixed sulfide ore deposits at Stratoni on the eastern side of the Chalkidiki peninsula. The Madem Lakkos-Mavres and the Olympiada Mines produced about 800,000 mt/a, yielding about 35,000 tons of lead sulfide concentrate, 45,000 tons of zinc sulfide concentrate, and 170,000 tons of pyrite concentrate. In addition, silver was recovered from the operations.

The Greek Metallurgical & Mining Co. of Lavrion S.A. closed its 20,000 mt/a-capacity lead smelter and refinery at Lavrion.

Manganese.—Greece has deposits of manganese oxide ore, pyrolusite, and rhodochrosite in the Chalkidiki and Drama areas of northern Greece. Exploitation of the Chalkidiki deposits has been sporadic, especially in the Neochorion area. Manganese ore was produced in the Drama area by Elbaumin, with a mine and a beneficiation plant at Nevrokopi and the

final processing plant in Drama. The company's principal product is battery-grade manganese dioxide, which was sold under the "Scalma" trade name.

Nickel.—Greece's production of nickel was based on lateritic iron silicate ores having a nickel content of about 1%. Mining operations were based at Pagonda and Vrissakia in the mountainous Psachna region of north-central Euboea island and at the St. John Mine on the mainland near Larymna. A new deposit was discovered in the Kastoria area in northern Greece. Ore from Euboea was crushed, graded, and homogenized before being transferred to barges for shipment to the metallurgical facility at Larymna. All nickel ore produced in Greece was converted to ferronickel. Three electric arc furnaces and two rotary kilns were in operation with an output of 12,000 to 16,000 mt/a of contained nickel in ferronickel product. Two other electric arc furnaces were held on standby for either increased ferronickel output or for the production of other ferroalloy products. All production was exported, primarily to Western Europe.

Operations were handled by Hellenic Mining & Metallurgical Co. of Larymna (LARCO). The 80% Government-owned LARCO was formerly part of the Bodossakis Group.

Industrial Minerals

Cement.—Cement output, which had slumped slightly in recent years, increased to a year high in 1990. About 6 Mmt was exported. There were four major cement-producing companies in Greece. Titan Cement Co. S.A., a privately owned company, was the largest producer. The company had plants at Eleuis, Kamari, Patras, and Salonica. In 1990, Titan produced about 5 Mmt of cement. The Government-owned Heracles General Cement Co. S.A., with plants at Euboea and Olympos, was the second largest cement producer. The production capacities of its facilities totaled about 6 Mmt/a. Halkis Cement Co. S.A. and Halyps Cement S.A. were both privately owned. Most of the kilns operated primarily on coal, and fuel oil was used only to preheat a kiln after a stop.

Clays.—The deposits of bentonite occur on the island of Milos. The island, about 125 km southeast of Athens, was well endowed with industrial minerals. Barite, bentonite, kaolin, and perlite have been

mined on the island since 1933. The bentonite operations have expanded considerably in recent years. Bentonite from Greece was exported worldwide as drilling mud, foundry moulding clay, and for iron ore pelletizing.

Most bentonite mines and processing plants were at Vouthia Bay on the northern tip of Milos island. Although Silver & Baryte Ores Mining Co. S.A. (S&B) was the largest operator in Milos, there were several smaller operators, some of which shipped bentonite in crude form.

S&B also produces barite from two mines on the island of Milos, at Kavos and Pikridou. S&B also produces kaolin and perlite. About 90,000 tons of kaolin was produced on Milos in 1990, though the capacity was close to 200,000 t/a. The reason for the disparity between the two figures is that the company anticipated strong growth in demand for kaolin in the ceramics and paper industries. The company was considering plans for establishing a new grinding plant. Of the total production, about 6,000 tons was used for paper filler, 3,000 tons for paint and plastic filler and extender, and 80,000 tons for cement. Domestic markets accounted for about 80% of the total.⁵

Magnesite.—Magnesite deposits in Greece occur on the Chalkidiki peninsula in the north and on the northern tip of Euboea island. There were three companies in operation, with a total crude ore output of about 1 Mmt. Magnesite was mined from open-pit mines at depths of 60 m or more. The largest company, FIMISCO, produced magnesite from a large mine at Mantoudhi on Euboea island. Magnesite mining on Euboea island started in 1860. The magnesite deposits on the island were of vein and stockwork types, occurring in serpentine-peridotites. FIMISCO also had shiploading facilities only a few kilometers from its industrial facilities at Fourni. The second largest company, Grecian Magnesite Ltd., and the Magnomin General Mining Co. S.A. operated mines in the Chalkidiki area, in northern Greece. About 65% of production was exported, while the remainder was consumed by the Fourni basic refractories plant.

Marble.—Dionyssos-Pentelicon, about 15 km northeast of Athens, is the largest marble quarry in Greece. The quarry provided the marble that was used to build the Parthenon. It still produces a dense white marble, which, with time, turns to a faint

golden tint. Other Greek marbles show a wide range of colors and patterns. Most of the marble is exported, mainly to Europe and the Middle East, but also to the United States. Marble fabricating mills in Greece are as common as concrete-block plants in other countries. The Lazarides Co., with reportedly the largest export trade, produced 25,000 m² of polished architectural stone per day.⁶

Perlite.—Greece continued to be Europe's leading producer of perlite and was third in the world, after the United States and the U.S.S.R. Perlite was exported largely throughout Europe. The most important European deposits of perlite occur on the Aegean island of Milos. These deposits were reported to contain a total of 70 Mmt of measured reserves and 180 Mmt of inferred reserves. One of the longest established perlite producers on Milos was the S&B company of Athens. The company exploited three varieties of perlite from several opencast operations, and its output was transported to the company's primary processing plant at Vouthia Bay.

Perlite also was exploited on other islands, notably around Kefalos on the island of Kos in the Eastern Aegean Sea, close to the Turkish mainland. On the island of Kos, S&B and N. Bouras & Co. mined perlite from a deposit similar to that on Milos.⁷ Smaller deposits were also found on the islands of Nisiros and Lesvos, and in Western Thrace.

Pumice.—Pumiceous material is prominent in many of the volcanic islands of Greece. Extensive reserves of pumice were delineated on the islands of Ghyali (Yali) and Nissyros, in the Dodecanese group of islands. Pozzolan (Santorin earth), a devitrified volcanic tuff, occurs on the island of Thera (Santorini) in the Cyclades group of islands. However, production of pozzolan on Thera ceased in 1984. The only company active in the pumice industry in Greece was Lava Mining & Quarrying Co. Ltd., a wholly owned subsidiary of Heracles General Cement Co. operating quarries on the Ghyali island, north of Nissyros island. Lava's principal export markets were the Federal Republic of Germany, Italy, Spain, the United Kingdom and the United States. Other smaller markets included China, the Middle East, and North Africa.⁸

Mineral Fuels

Lignite.—A feasibility study was in preparation during the year for the mining

of a lignite deposit containing an estimated 4 Mmt of reserves. The deposit was located in the Kalavryta area of the Peloponnesus. Only the Government-owned Public Power Corp. mined lignite and generated electricity in Greece.

The country's lignite production was generally produced from open pit mines. Lignite production was concentrated mainly in two regions. Ptolemais, in northern Greece was the country's largest open pit lignite mine. The main consumers of lignite from Ptolemais were large thermal power stations, as well as a number of fertilizer and briquetting factories. The Ptolemais industrial area had the largest concentration of thermal powerplants in Greece. The second largest lignite producing area was at Megalopolis in the central Peloponnese region, which had two open pit mines and a powerplant. There were also smaller privately mined lignite deposits in the Florina Basin in Northern Greece.

The major coal users in Greece were the cement, electricity, steel, and ferronickel producers. Lignite accounted for the generation of about 90% of the country's electricity, while hydropower accounted for about 5%, and oil for them accounted for the rest. There were no nuclear powerplants in Greece.

Natural Gas and Petroleum.—The Government-owned Public Petroleum Corp. (DEP) was responsible for the exploration and production of natural gas and petroleum. Greece's gas and oilfields were operated offshore, east of Thasos island. In 1989, additional reserves of natural gas were discovered at Epanomi in the Chalkidiki area of northern Greece. When operational, daily output from this deposit was estimated to be about 200,000 m³. This would be equivalent to about 1% of the amount that will be imported from the U.S.S.R. Exploitation of this deposit was scheduled to commence by 1992.

Two major contracts have reportedly been concluded by the Government to build a gas pipeline (with the U.S.S.R.) and to buy LNG (from Algeria). The length of the pipeline will be 514 km, and should be completed in 1993.

In 1990, the production of crude petroleum continued to fall. Greece's entire petroleum production came from the Prinos offshore field in the Aegean Sea. DEP has been involved for a long time in the search for oil and gas through seismic work and drilling. Despite these efforts, no new major oilfields have been discovered. About 65% of Greece's crude petroleum require-

ments were met by imports from the Near East.

Reserves

Greece has sufficient reserves of bauxite, bentonite, chromite, lead, manganese, nickel, perlite, and zinc and a wide range of industrial minerals to satisfy many of the country's domestic and export needs well into the 21st century.

INFRASTRUCTURE

In Greece, there was 38,938 km of highways, of which 16,090 km was paved, 13,676 km consisted of crushed stone and gravel, 5,632 km of improved earth, and 3,540 km of unimproved earth. Railroads, all Government owned, covered 2,479 km in total. There was 80 km of inland waterways, consisting of three coastal canals and three unconnected rivers. Piraeus and Thessaloniki are Greece's major ports.

TABLE 3

GREECE: RESERVES¹ OF MAJOR MINERAL COMMODITIES FOR 1990

(Million metric tons)

Commodity	Reserves
Asbestos	4
Barite	4
Bauxite	750
Chromite	16
Iron	70
Lead, content of ore	.7
Lignite	3,570
Manganese, content of ore	2
Magnesite	50
Nickel, content of ore	2
Perlite	200
Pyrite	6
Zinc, content of ore	1.3

¹Measured and inferred reserves.

There are 26 km of pipeline for the transportation of crude oil and 547 km of pipeline for the transportation of refined products.

OUTLOOK

The outlook for 1991 and beyond depends on the Government's ability to implement

its new policies. Greece's Government plans to privatize about 300 state-owned companies in many sectors, such as chemicals, fertilizers, mining, and industrial abrasives. The economy will probably grow very little in real terms, but that should help to push down inflation and deficits. Industrial production will remain about the same. Greece will continue to export cement to Europe and aims to be a mining center for some items needed by EC industries.

¹Trade With Greece. The Athens Chamber of Commerce and Industry (Athens). No. 98, Jan.-Dec. 1990.

²Metal Bulletin (London). Mar. 4, 1991, p. 7.

³1990 Ferro Alloy Manual (Tokyo). Mar. 1991, p. 115.

⁴Industrial Minerals, Geology and World Deposits. Metal Bulletin Plc, Industrial Minerals Division (London). 1990, p. 47.

⁵Industrial Minerals (London). Feb. 1991, p. 30.

⁶Page 46 of work cited in footnote 6.

⁷Page 186 of work cited in footnote 6.

⁸Industrial Minerals (London). May 1990, p. 31.

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Agencies

The Institute of Geology and Mineral
Exploration (IGME)
70 Messoghion Street
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15 Valaoritou Street
106 71 Athens, Greece

Hellenic Industrial and Mining Investment
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105 64 Athens, Greece

Hellenic Industrial Development Bank
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18 El Venizelou Street
196 72 Athens, Greece
National Bank for Industrial Development
(ETBA)
14 Amalias Avenue
192 36 Athens, Greece
Public Power Corp. (DEH)
30 Halkocondyli
104 32 Athens, Greece
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119 Kifissias Maroussi
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