

THE MINERAL INDUSTRY OF GREECE

By Harold R. Newman

The metals sector of Greece is a small but important part of the national economy. Bauxite is the most important of Greek metal deposits, but there are also deposits of chromite, gold, iron, lead, nickel, and zinc. Aluminum is produced from domestic sources of bauxite and alumina and, therefore, is important in the domestically integrated metals sector. The steel produced is mostly from imported scrap.

The industrial minerals sector was more important in the national economy than the metals sector in 1996. The more important commodities were bentonite, magnesite, and perlite. Important export products were bentonite, magnesite, perlite, and pumice. Privatization efforts were continuing in the magnesite and refractories industries. (*See table 1.*)

Production of mineral commodities in Greece has been closely tied to the export market. As the global recession eased and prices rose, exports of commodities produced in Greece increased. Detailed trade data for Greece have not been received in the recent past, but general information indicates that the other members of the European Union (EU) have continued to strengthen their positions as the principal destinations and sources of Greek mineral exports and imports. Selected Greek companies with major equity owners are shown in table 2.

Environmental concerns are the responsibility of the Ministry of Environment, Town Planning and Public Works. The Government takes an active role in environmental programs for the protection of the environment. The general laws enacted by the Government include law 1360/76 "About Siting Arrangement and Environment," the Presidential Executive Order 1180/81, and law 1650/86 about "Environmental Protection," which form the basis of the active legislative framework. For the harmonization with the EU's order 88/609 concerning emission limitations, the Government has executed the Ministry decision 58751/2370/15.4.93 including the limits of the main pollutants from electric powerplants.

Individual industrial concerns are charged with much of the responsibility of environmental protection. The Public Power Corp. (PPC) has underway projects for reducing sulfur dioxide emissions for powerplants in southern Greece while new electric precipitator filters were being installed in the lignite powerplant operations in northern Greece. In central Greece, the fuel oil powerplant of Ag. Georgios was being modified to burn natural gas. (Public Power Corporation, 1997, Overview/Environment, January 3, 1997, accessed May 21, 1997, on the World Wide Web at <http://www.newface.gr/ppc/environm.html>).

The Government's decision to import natural gas from Russia, and possibly Algeria, was based, in part, on the fact that it is much cleaner to burn natural gas than the traditional lignite.

Bauxite mining operations by Parnasse Bauxite Mining Co. continued through 1996. Parnasse's operations were mainly in the Itea area. Parnasse and the Silver and Baryte Ores Mining Co. S.A. merged into the Eliopoulos-Kyriacopoulos Group to form the largest Greek mining company. Delphi-Distomon S.A. also continued to produce bauxite with an estimated production of 870,000 metric tons in 1996, all of which was sold to Aluminium de Grèce S.A.'s operation at Distomon.

Interest in gold exploration continued in 1996. The joint-venture project between Silver and Baryte Ores Mining Co. S.A. of Greece and Renison Goldfields Consolidated Ltd. of Australia on the island of Milos was continuing with systematic sampling and investigation.

The Cassandra Group lead-zinc mines (Skouries and Olympias deposits) in northern Greece have produced lead, silver, and zinc for more than 30 years, but the gold mineralization in the associated pyrite has not been tapped. In late 1995, the mines were bought by TVX Hellas, an affiliate of TVX Gold Inc. of Canada, from creditors of the bankrupt Panhellenic Chemical and Fertilizers Corp. TVX Hellas announced it intended to invest \$200 million in 1996 to expand the mines and to construct a modern plant for refractory gold recovery from the coproduced pyrite. (Financial Times, 1996).

TVX announced that at the Skouries deposit drilling had indicated a "geologic resource" of 568 million tons grading 0.47 grams per ton of gold and 0.35% copper equating to more than 267 thousand kilograms of gold and more than 1.9 million tons of copper. (These estimates did not indicate cutoff grades.) Also, surface and underground drilling was continuing on the Olympias deposit to confirm previous ore reserve information and quality of the orebody. (TVX Gold Inc., 1997, Greek projects update, April 10, 1997, accessed May 21, 1997, on the World Wide Web at <http://www.tvxgold.com/pr041097.html>).

Larco S.A. continued to improve its overall efficiency and to increase its production of nickel. The company announced a new \$5 million investment in its facilities in 1996. This was to be expanded by an additional \$10 million in 1996. Larco is a major partner in a research project financed by the EU to develop an expert system for the exploration of nickel ore. (Mining Journal, 1997).

The Hellenic Mineral Mining Co. continued asbestos mining operations at the Zidani Mine near Kozani. Almost all of the 78,000 tons of various grades of asbestos fibers produced were exported. The fibers are suitable for mixed applications, such as asbestos cement pipes and roofing applications.

Barytine Co. was the leading producer of industrial minerals. The company is a major producer of bentonite, kaolinite, and

perlite most of which comes from the island of Milos. Lava S.A. specialized in industrial minerals with production of gypsum from the island of Crete, pozzolan from Milos, and pumice from the island of Yali.

Grecian Magnesite S.A., a leading producer in the European market of calcined and dead-burned magnesia continued its policy of improving productivity and engaging in research and development projects. A \$2 million project that involved the construction of a new crushing plant was underway. This was expected to improve magnesite recovery along with reducing costs.

Financial-Mining-Industrial and Shipping Corp. (FIMISCO) a state-controlled company, was acquired by Viomagn-Fimisco, a joint venture of the lignite producer Violignit and Alpha Finance, an investment bank. The former FIMISCO was a major producer of dead-burned magnesia and refractory bricks.

The Greek marble industry continued to expand in 1996. Greece's marble industry played a leading role in the international dimension stone market as a result of the marble's wide range of colors and uses. Greek marble is available in a variety of colors—ash, black, brown, green, pink, red, and multicolored and is produced in almost all areas of the country.

The industry was active in three steps of processing: the quarrying of marble blocks, the cutting of marble blocks, and the sale of the blocks and finished products. About 80% of the marble was sold as finished products; the remainder was sold in rough slab and block form.

PPC, a state-controlled agency, is the exclusive producer of lignite, the predominant fuel in electricity generation in Greece.

PPC was continuing exploration in the basins of Amyntaion, Elasson, Florina, Megalopis, and Ptolemais in 1996. PPC has estimated reserves of 6.8 billion tons from which 4 billion tons was estimated to be economically recoverable by open-cast mining. (Public Power Corp., 1997, Overview/Lignite Mines, January 19, 1997, accessed May 5, 1997 on the World Wide Web at <http://www.newfaces.gr/ppc/mines.html>).

In the petroleum sector, Public Petroleum Corp. opened bidding for concessions and received offers for six areas: Epirus, Aitolokarnania, and Achaia (onshore) and south of Corfou, Patraikos Bay and Katakolon (offshore). These offers were expected to be evaluated by yearend 1996.

The railroad system in Greece, all Government owned, totaled 2,479 kilometers (km), of which 1,565 km was 1.435-meter (m) standard-gauge track, 892 km 1.000-m gauge track, 100 km of double track, and 22-km 0.750-m narrow-gauge track. The highway and road system totaled 38,938 km, of which 16,090 km was paved, 13,676 km was crushed stone and gravel, 5,632 km was improved earth, and 3,540 km was unimproved earth. The inland waterway system was 80 km, consisting of three coastal canals and three unconnected rivers. The major ports are Piraeus and Thessaloniki.

References Cited

- Financial Times [London], 1996, TVX gold projects, October 29, 1996, p. 16.
Mining Annual Review, 1997, Western Europe—Greece: Mining Journal [London], May, folio 83.

TABLE 1
GREECE: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/	1992	1993	1994	1995	1996 e/
METALS					
Aluminum:					
Bauxite	2,078,445	2,205,498	2,196,371	2,005,800 r/	1,881,000
Alumina, Al ₂ O ₃ equivalent	611,600	614,900	548,000	629,700 r/	601,000
Metal:					
Primary	150,850	146,800	144,300	130,900 r/	130,300
Secondary e/	3,000	3,000	3,000	3,000	3,000
Chromite:					
Run-of-mine	5,000 e/	3,500 e/	--	--	--
Marketable products, concentrate	--	3,697	1,960	--	--
Iron and steel:					
Iron ore and concentrate, nickeliferous, Fe content e/ 3/	610,000	575,000	810,000	800,000	800,000
Metal:					
Steel, crude	923,510	1,031,000 r/	847,612	939,170	950,000
Ferrous alloys, ferronickel e/	65,000	45,000	63,000	65,000	65,000
Lead, mine output, Pb content by analysis	27,496	28,812	28,404	20,400 r/	20,000
Manganese: e/					
Ore, crude:					
Gross weight	14,677 4/	10,000	8,600	9,000	9,000
Mn content	2,133	2,082 r/	1,960 r/	2,000 r/	2,000
Concentrate:					
Gross weight	3,000	2,500	2,500	2,500	2,500
Mn content	2,283	1,125	900	1,000	1,000
Nickel:					
Ore:					
Gross weight	1,500,000	1,570,000	1,944,018	2,000,000 e/	2,000,000
Ni content of nickeliferous iron ore	17,000	12,900	18,821	19,947	20,000
Metal, Ni content of ferronickel	15,424 r/	10,931 r/	16,197	17,164	17,800
Silver, mine output, Ag content kilograms	63,300	53,500 r/	44,900 r/	33,000 r/	30,000
Tin, metal, secondary e/	200	200	150	150	150
Zinc, mine output, Zn content by analysis	26,742	24,854	17,200 r/	14,500 r/	12,000
INDUSTRIAL MINERALS					
Abrasives, natural, emery e/					
	7,500	7,100	7,500	7,500	7,000
Asbestos:					
Ore	2,178,820	3,626,000	4,647,033	4,500,000 e/	5,000,000
Processed, fibers	28,592	56,940	55,502	55,000 r/	78,000
Barite:					
Ore, crude e/	1,000	1,000	1,000	1,000	1,000
Concentrate	907	988	701	700	685
Cement, hydraulic thousand tons	10,700	12,618 r/	12,636 r/	12,000 e/	12,000
Clays:					
Bentonite:					
Crude	600,083	677,578 r/	697,773	770,000 r/	800,000
Processed	431,292	527,000	583,140	642,950 r/	594,000
Kaolin:					
Crude	201,705	89,473 r/	117,254	125,000 e/	125,000
Processed	10,993	8,000 r/	650 r/	700 r/	700
Feldspar	26,600	15,000	35,000	30,000 e/	30,000
Gypsum and anhydrite	452,037	445,600 r/	453,722	450,000	450,000
Magnesite:					
Crude	471,220	479,999 r/	575,472 r/	520,000 r/	500,000
Dead-burned	63,447	66,000	77,000	69,500	70,000
Caustic-calcined e/	55,000	124,000	151,600	206,500	200,000
Nitrogen, N content of ammonia	140,000	57,400	55,000	60,000 e/	60,000
Perlite:					
Crude	505,348	548,574 r/	468,699	440,000 e/	445,000
Screened	398,360	350,000	371,945	360,000 e/	350,000
Pozzolan (Santorin earth)	664,785	600,000	649,608	600,000 e/	600,000
Pumice	635,578	600,000	635,470	600,000 e/	600,000
Salt, all types	143,184 r/	175,159 r/	192,000 r/	200,000 r/ e/	200,000

See footnotes at end of table.

TABLE 1--Continued
GREECE: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/	1992	1993	1994	1995	1996 e/
INDUSTRIAL MINERALS--Continued					
Silica sand e/	10,000	10,000	10,000	10,000	10,000
Sodium compounds: e/					
Carbonate	750	750	750	750	750
Sulfate	6,000	6,000	6,000	6,000	6,000
Stone, marble cubic meters	384,840	300,000	160,181	200,000 e/	200,000
Sulfur: e/					
S content of pyrites	25,000	25,000	25,637 4/	25,000	25,000
Byproduct:					
Natural gas	110,000 r/	100,000 r/	100,000 r/	100,000 r/	100,000
Petroleum	5,000	9,000	5,000	5,000	9,000
Total sulfur	140,000	134,000	130,637	130,000	134,000
Talc and steatite e/	2,240 4/	700	400	500	400
MINERAL FUELS AND RELATED MATERIALS					
Coal:					
Lignite thousand tons	55,090	54,817	57,533	56,533	58,950
Lignite briquets	122,000	62,000	56,000	50,000	50,000
Coke, gashouse e/	15,000	15,000	13,000	14,000	15,000
Gas:					
Manufactured, gasworks e/ million cubic meters	18	18	15	16	15
Natural do.	107	82	38	35	35
Natural gas plant liquids thousand 42-gallon barrels	--	290	360	350 e/	350
Petroleum:					
Crude thousand tons	659	537	549	465 e/	475
Refinery products:					
Liquefied petroleum gas do.	4,930	4,650	5,450	5,500 e/	5,000
Gasoline do.	31,700	29,500	30,300	30,000 e/	30,000
Naphtha do.	3,430	1,230	4,670	4,500 e/	4,500
Mineral jelly and wax e/ do.	15	15	15	15	15
Jet fuel do.	10,600	10,100	12,700	12,000 e/	12,000
Kerosene do.	101	78	194	150 e/	150
Distillate fuel oil do.	28,200	24,300	27,800	26,000 e/	26,000
Refinery gas e/ do.	2,100	2,100	2,100	2,000	2,000
Lubricants e/ do.	800	800	1,000	1,000	1,000
Residual fuel oil do.	35,200	29,400	35,400	36,000 e/	36,000
Bitumen e/ do.	1,500	1,500	1,500	1,500	1,500
Petroleum coke e/ do.	525	525	525	500	500
Other e/ do.	400	400	400	400	400
Refinery fuel and losses do.	9,210	5,970	5,660	6,000 e/	5,500
Total e/ do.	128,711	110,568	127,714	125,565	124,565

e/ Estimated. r/ Revised.

1/ Table includes data available through March 1997.

2/ In addition to the commodities listed, other crude construction materials are produced, but no basis exists for estimation of production.

3/ Iron content of the nickeliferous ore mined for its nickel content. There is no indication that this iron is recovered, except as the iron content of ferronickel.

4/ Reported figure.

TABLE 2
GREECE: STRUCTURE OF THE MINERAL INDUSTRY FOR 1996

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Alumina	Aluminium de Grèce S.A. (Pechiney of France, 60%)	Distomon, in Boeotia area	640
Aluminum	do.	do.	160
Asbestos	Asbestos Mines of Northern Greece S.A. (MAVE) (Hellenic Industrial Development Bank-Government, 95%; International Finance Corp., 5%)	Mines at Zidani, near Kozani	110
Barite	Silver and Baryte Ores Mining Co. S.A. (Eliopoulos-Kyriacopoulos Group)	Milos Island	10
Bauxite	Bauxites Parnasse Mining Co. S.A. (Eliopoulos-Kyriacopoulos Group)	Mines in Parnasse-Ghion-Pasha areas	2,000
Do.	Eleusis Bauxites Mines, S.A. (ELBAUMIN) (National Bank of Greece)	Plant in Drama and Eleusis; mines near Drama, Itea, Kimi, and Mandra	700
Do.	Delphi-Distomon S.A.; Hellenic Bauxites of Distomon S.A.; (Aluminium de Grèce S.A.) Delphi Bauxites S.A.	Opencast mines at Delphi-Distomon area	500
Do.	Am. E. Barlos-Bauxite Hellas Mining S.A.	Mines at Distomon (Elixon), Beotia; Plant at Distomon, Beotia	300 200
Bentonite:			
Crude	Mediterranean Bentonite Co. S.A. (Industria Chemica Mineraria S.p.A., Italy)	Surface mines on Milos Island	20
Do.	Mykobar Mining Co. S.A. (MI Drilling Fluids)	Mines at Adamas, Milos Island Plants at Adamas, Milos Island	180 150
Do.	Silver and Baryte Ores Mining Co. S.A.	Mines at Adamas, Milos Island	500
Processed	do.	Plant at Voudia Bay, Milos Island	400
Cement	Halkis Cement Co. S.A.	Micro-Vathi plant, west-central Euboea	3,000
Do.	Halyps Cement S.A. (Ciments Français, France)	Paralia Aspropyrgos plant, Athens	800
Do.	Heracles General Cement Co. S.A. (Industrial Reconstruction Organization [IRO], 69.8%)	Plant at Milaki Plant at Volos	1900 4600
Do.	Titan Cement Co. S.A.	Elefsis plant, Athens area Kamari plant, Boeotia Patras plant, northern Peloponnesus Salonica plant, Salonica	400 2,600 1,900 1,650
Chromite	Financial-Mining-Industrial and Shipping Corp. (FIMISCO) (IRO)	Tsingeli mines and plant near Volos	25
Gold, Au in concentrate	TVX Hellas (TVX Gold Inc., Canada)	Kassandra mines, Olympiada	25
Ferroalloys:			
Ferronickel, Ni content	General Mining & Metallurgical Co. SA (LARCO) (IRO)	Larymna Metallurgical plant	25
Lead: Mine: Pb in concentrate	TVX Hellas (TVX Gold Inc., Canada)	Kassandra mines (Olympias; Stratoni), northeast Chalkidiki	
Lignite	Public Power Corp. (DEH) (Government)	Aliveri mine, Euboea Island Megalopolis mine, central Peloponnesus Ptolemais mine, near Kozani	420 7,000 28,000
Magnesite, concentrate	Financial-Mining-Industrial and Shipping Corp. (FIMISCO) (Government owned - IRO)	Mines at Gerorema, Kakavos, and Paraskevorema at Mantoudhi, northern Euboea Island	350
Do.	Grecian Magnesite S.A. (operations suspended in 1992)	Mines at Yerakini and Kastri in Chalkidiki	400
Do.	Magnomin-General Mining Co. S.A. (A subsidiary of Radex Eraclit Industrie Beteiligungs GmbH, Austria)	Mines at Vavdos, Chalkidiki Processing plant at Vavdos	68 60
Manganese, (battery-grade MnO ₂ concentrate)	Eleusis Bauxite Mines Mining, Industrial and Shipping S.A. (National Bank of Greece [OAE])	Nevrokopi, Drama	4
Natural gas	million cubic meters per day Public Petroleum Corp. (DEP) (Government)	Prinos offshore gasfield and oilfield, east of Thasos Island	125
Nickel, ore	General Mining & Metallurgical Co. S.A. (LARCO) (IRO)	Agios Ioannis mines near Larymna Mines at Euboea	500 2,500

TABLE 2--Continued
GREECE: STRUCTURE OF THE MINERAL INDUSTRY FOR 1996

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Perlite	Silver and Baryte Ores Mining Co. S.A.	Kos and Milos Islands Plant at Pireaus	250 300
Do.	Otavi Minen Hellas S.A. (Otavi Minen AG, Germany)	Milos Island	120
Do.	Peletico Hellas S.A. (Peletico Ltd. of Cyprus)	do.	20
Do.	N. Bourmas & Co.	Kos Island	75
Petroleum, refined	42-gallon 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
Pozzolan (Santorin earth)	Lava Mining & Quarrying Co. Ltd. (Heracles General Cement Co. S.A.)	Quarries on Ghyali Island	800
Steel, crude	Halyvourgia Thessalias S.A. (A subsidiary of Manassis Bros. and Voyatzis S.A. (65%); the balance, 35%, owned by state-owned National Investment Bank for Industrial Development - NIBID)	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 (two 55-ton electric furnaces)	400
Do.	Sidenor S.A. (also known as Halivorgia Voviou Ellados S.A.)	Steelworks at Nea Maguisia, near Thessaloniki (two 55-ton and two 30-ton electric arc furnaces)	350
Zinc: Mine: Zn in concentrate	TVX Hellas (TVX Gold Inc., Canada)	Kassandra mines (Olympias, Stratoni), northeast Chalkidiki	25

TABLE 3
GREECE: RESERVES OF SELECTED MINERAL COMMODITIES 1/
FOR 1994

(Million metric tons unless otherwise specified)

Commodity	Reserves
Asbestos	4
Barite	4
Bauxite	750
Chromite	16
Gas, natural	billion cubic meters 8
Iron	70
Lead, content of ore	.7
Lignite	3,570
Magnesite	50
Manganese, content of ore	2
Nickel, content of ore	3
Petroleum, crude	thousand barrels 41,000
Perlite	200
Pyrite	6
Zinc, content of ore	1.3

1/ Measured and inferred reserves.