



2007 Minerals Yearbook

GREECE [ADVANCE RELEASE]

THE MINERAL INDUSTRY OF GREECE

By Harold R. Newman

The mineral industry, which consisted of the sectors that mine and process metallic and nonmetallic minerals and mineral fuels, was a small but important segment of the economy of Greece. Most of the Greek companies that dealt in metals fabrication, mining of industrial minerals, or refined metals production or processing were well-established and had a strong export orientation. Greece's estimated exports in 2007 totaled \$23.9 billion, which included petroleum refined products, \$1.5 billion; aluminum ores and concentrates, including alumina, \$152 million; nonferrous base metal waste and scrap, \$57 million; and liquefied propane, \$43 million (Index Mundi, 2007).

Minerals in the National Economy

The metallic minerals sector involved a relatively small number of large capital-intensive companies that were, in some cases, vertically integrated and engaged in both mining and metallurgical processing. The industrial minerals sector was more prominent in the national economy than was the metals sector owing to the value of industrial mineral exports. A relatively small industrial base, lack of adequate investment, and the distance from European Union (EU) markets have tended to restrict the export potential of the country.

Production

Production of mineral commodities in Greece was closely tied to the export market. About 50% of the country's mineral production was exported. In terms of the value of production, bauxite was the most important of Greece's mineral commodities. The country also had some deposits of chromite, gold, lead, nickel, and zinc. Aluminum was the only metal produced, other than steel. Aluminum was important in the metals sector. Steel was produced mostly from imported scrap. The country also produced lignite coal and petroleum.

In 2007, Greece was estimated to have produced about 9% of the world's bentonite, slightly more than 3% of the world's magnesite, and more than 1% of the world's bauxite and nickel. It was the world's leading producer of perlite and the second ranked producer of pumice (Bolen, 2008; Bray, 2008; Kramer, 2008; Kuck, 2008).

The country's mineral production levels were more or less the same as in 2006 with a small increase in production of alumina, nickel, and steel in 2007. These changes were related mostly to changes in demand for those particular commodities (table 1).

Structure of the Mineral Industry

The major mineral commodities and the companies that produced them in 2007 are listed in table 2. The structure of the mineral industry changed little from that of 2006. The companies were privately owned, with Government ownership limited to the energy sector.

Commodity Review

Metals

Bauxite and Alumina.—Greece was a leading bauxite producer in the EU, and S&B Industrial Minerals S.A. controlled most of the significant bauxite reserves in Greece. Bauxite is the principal raw material used in the production of alumina, which is the major source of aluminum. The major bauxite deposits are located in central Greece within the Parnassos-Ghiona geotectonic zone and on Evoia Island. Greece's estimated 100 million metric tons (Mt) of bauxite reserves were of boehmitic and diasporic type. Although the bauxite ore had an average aluminum oxide content of 53%, it also had a high silica content that made it hard to process (S&B Industrial Minerals S.A., 2007a).

Gold.—European Goldfields Ltd. completed the acquisition of an additional 30% interest in Hellas Gold S.A., which owned three gold and base-metal deposits in northern Greece. These were the Olympias deposit, which contained gold, lead, silver, and zinc; the Skouries copper/gold deposit; and the polymetallic Stratoni deposit. In 2007 European Goldfields' total interest in Hellas Gold was 95% (European Goldfields Ltd., 2007a).

European Goldfields announced the sale of 50,000 metric tons (t) of gold-bearing pyrite concentrates from a stockpile of material previously produced from the Olympias Mine to Celtic Resources Holding plc. This was in addition to the 9,000 t of concentrates sold to Celtic Resources in November 2006.

Lead and Zinc.—The total estimated proven and probable reserves at Stratoni in 2006 were 1.9 Mt at grades of 8.1% lead and 10.8% zinc. Production of ore was expected to reach 170,000 metric tons per year (t/yr) by 2007 and to increase to 400,000 t/yr by 2010. Based on historical production levels, the Stratoni Mine was expected to produce at grades of between 8% and 10% lead and between 8% and 10% zinc, with a rate of recovery for concentrator metals of about 90% (European Goldfields Ltd., 2007b).

Nickel.—Larco G.M.M.S.A. was among the leading ferronickel producers in the world and, of those countries in Europe that used domestic nickel ores, was a leading producer of nickel. Larco had three main mines—the Evia open pit, which had an annual production of about 1.5 Mt of ore; the Agios Ioannis underground mine, which produced about 700,000 t/yr of ore; and the Kastoria open pit, which produced about 300,000 t/yr of ore. The Larymna metallurgical plant consisted of four rotary kilns, five electric arc furnaces, and two converters and had a total capacity of 25,000 t/yr (Larco G.M.M.S.A., 2007).

Industrial Minerals

Bentonite.—S&B was the leading bentonite producer in Europe with sales of more than 1 million metric tons per year (Mt/yr); it was also the world's second ranked bentonite

producer after the United States. S&B remained focused on supplying bentonite for foundries and the drilling industry. S&B mined bentonite from its reserves on the Island of Milos and produced about 85% of total Greek bentonite output (Invest in Greece Agency, 2007).

Cement.—Heracles General Cement S.A., which was a subsidiary of the Lafarge Group of France, owned three cement plants and was the leading processor of carbonate material and the leading producer of cement and clinker in Greece. The company had one plant in Volos, which was the largest-capacity cement plant in Europe (4.6 Mt/yr), one plant in Halkis Evia, and one plant in Milaki Evia. The total combined production capacity of the three plants was 9.6 Mt/yr.

Lafarge announced the acquisition of the National Bank of Greece's 26% interest (18.5 million shares) in Heracles at a price of €321.6 million (\$418.9 million¹). As a result of this transaction, Lafarge increased its ownership in Heracles to 78.7% in 2007 from 52.7% in 2006 (Global Cement Magazine, 2007).

Gypsum.—Lava Mining and Quarrying Co.'s gypsum quarry is located at Altsi on the Island of Crete. Quarrying was carried out using explosives, and the quarried material was then fed to trucks by means loaders and transported to the crushing plant. The production capacity of the quarry was 500,000 t/yr. The end product that came from the plant consisted of anhydrite and hydrous gypsum that was used in the production of cement (Lava Mining and Quarrying Co., 2007a).

Magnesium.—Grecian Magnesite S.A. (GM) was the leading magnesite producer and exporter in the EU and ranked among the leading magnesia producers and exporters in the world. More than 90% of its total magnesite output was exported. GM's open pit mine and plant were located southeast of Thessaloniki in the Chalkidiki region. GM extracted about 2.5 Mt/yr to produce 200,000 t/yr of final product. GM produced and marketed caustic calcined magnesite, dead-burned magnesia, and raw magnesite (Industrial Minerals, 2007).

Perlite.—With a production capacity of 650,000 t/yr, S&B was the leading producer of raw perlite worldwide and the leader in the European market for perlite used in building materials, cryogenics, formed products, and horticulture, and as filter aids. More than 90% of S&B's production was exported. S&B mined perlite on Milos Island (S&B Industrial Minerals S.A., 2007b).

Pumice.—Lava Mining and Quarrying Co. was the leading pumice exporter in the world. The company produced pumice from its deposit located on the Island of Yali. The deposit had been formed by volcanic action of the adjacent volcano at Nissiros. Production was about 100,000 t/yr (Lava Mining and Quarrying Co., 2007b).

Stone, Dimension.—Quarries of marble were located all around Greece, both on the mainland and the islands. The marble industry was active in the quarrying, processing, and sale of blocks and finished products. More than 60 different marble types in many colors (ash, black, brown, green, pink, red, and multicolored) were available. The Greek marble industry continued to play a leading role in the international market with

the export of blocks, slabs, and tiles (Greekmarble.eu Guide, 2007).

Mineral Fuels and Other Sources of Energy

Coal.—Lignite (brown coal) is Greece's only significant fossil fuel resource, with estimated reserves of 3,900 Mt. Public Power Corp. (PPC) was Greece's major producer of lignite, which was the predominant fuel used in electricity generation in Greece. Most PPC lignite was produced from the Ptolemais-Amyntaion Basin; lesser amounts were produced from the Megalopolis Basin. Because the country has no anthracite or bituminous coal reserves, it imported hard coal from, in descending order of amount imported, South Africa, Russia, Venezuela, and Colombia. Lignite accounted for about 65% of the raw material for the country's power generation (U.S. Energy Information Administration, 2007).

Natural Gas and Petroleum.—With Greece's limited natural gas reserves and petroleum resources, production was negligible. Its Mediterranean location, however, makes it conveniently close to several important producing regions, such as the Caspian Sea area, the Middle East, and North Africa, which supply its energy requirements.

The Governments of Greece and Turkey agreed to initiate construction of a \$440 million natural gas pipeline to the Caspian region; the gas would then be transported from the Caspian region through Greece, Italy, and Turkey to the EU. The 300-kilometer pipeline would provide the EU with its first supply of natural gas from the Caspian region. The pipeline would link the Greek and the Turkish networks and eventually carry gas from Azerbaijan to Italy. Initially, 750 million cubic meters per year of Azerbaijani natural gas would be exported to Greece (Alexander's Gas & Oil Connections, 2007).

Motor Oil (Hellas) Corinth Refineries S.A. announced that it was proceeding with the construction of a new crude distillation unit, which would have a capacity of about 60,000 barrels per day (bbl/d). The project was part of the company's ongoing refinery expansion program. When installation of the new unit is completed, the total refinery capacity will be 170,000 bbl/d. The company also expected additional benefits from the use of its own-produced straight-run fuel oil, from the optimization of crude supply, and from the ability to process new types of crude oil (Capital Link Inc., 2007).

Renewable Energy.—In order to meet EU mandates, renewable electricity generation projects were on the rise in Greece. The Government was developing procedures for the licensing of electricity production from renewable energy sources and high-performance heating electricity coproduction. This was another step towards implementing a new energy policy and offering more access to renewable energy sources in the country's energy balance. Investments in renewable energy sources projects were expected to total €2.5 billion (\$3.35 billion) by 2010 (Power Engineering, 2007).

Outlook

Greece is expected to remain a major supplier of industrial minerals to the international market. Mineral exploration

¹Where necessary, values have been converted from European Union euros (€) to U.S. dollars (US\$) at a rate of €0.77=US\$1.00.

activities in Greece will be intensified to secure additional high-quality reserves of various minerals. The Government is expected to be involved in planning investment programs to improve the existing installations and lower operating costs. The development of renewable energy sources will continue to be emphasized.

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TABLE 1
GREECE: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity ²	2003	2004	2005	2006	2007 ^c
METALS					
Aluminum:					
Bauxite	2,442,312	2,396,065	2,441,443	2,162,900	2,163,000
Alumina, Al ₂ O ₃	758,800	786,000	782,000	775,000 ^e	780,000
Metal:					
Primary	167,797	167,300	163,286	164,800	166,300 ³
Secondary ^e	3,000	3,000	3,000	3,000	3,000
Chromite:					
Ore, crude:	1,590	1,568	1,477	1,450	1,400
Iron and steel:					
Iron ore and concentrate, nickeliferous, Fe content ^e	600,000	575,000	575,000	575,000	575,000
Metal:					
Steel, crude	1,701,000	1,967,000	2,266,000	2,416,000	2,554,000
Ferroalloys, ferronickel, gross weight	95,376	95,230	102,162	100,000 ^e	100,000
Lead:^c					
Mine output, Pb content	2,000	--	3,000	10,500	15,000
Metal, secondary	4 ³	4	4	4	4
Manganese:^e					
Ore, crude:					
Gross weight	100	100	100	100	100
Mn content	15	15	15	15	15
Concentrate:					
Gross weight	20	20	20	20	20
Mn content	15	15	15	15	15
Nickel:					
Ore:					
Gross weight ^c	2,700	2,700	2,800	2,700	2,700
Ni content of nickeliferous iron ore	21,410	21,700	23,210	21,670	21,200
Metal, Ni content of ferronickel	18,000 ^e	18,115	19,235	17,700	18,000
Silver, mine output, Ag content	79,200	--	2,300	25,900	38,300
Zinc, mine output, Zn content by analysis	30,400	-- ^e	1,300	16,414	18,000
INDUSTRIAL MINERALS					
Abrasives, natural emery ^c	8,000 ³	8,000	8,000	8,000	8,000
Barite, concentrate ^c	100	50	30	--	--
Cement, hydraulic	14,638	15,039	15,166	15,000 ^e	15,000
Clays:					
Bentonite:					
Crude	1,156,642	1,030,556	1,124,795	1,125,000	950,000
Processed	10,835	8,606	2,450	2,500 ^e	2,500
Kaolin:					
Crude	59,680	53,438	49,912	50,000 ^e	60,000
Processed ^e	300	300	300	300	300
Feldspar	102,800	88,274	100,586	100,000 ^e	100,000
Gypsum and anhydrite	731,785	856,606	865,216	865,000 ^e	865,000
Magnesite:					
Crude	549,049	499,474	475,670	500,000 ^e	500,000
Dead-burned	43,713	50,813	58,089	58,000 ^e	58,000
Caustic-calcined	98,357	89,095	68,065	70,000 ^e	70,000
Huntite, crude ^c	18,000	18,000	18,000	18,000	18,000
Nitrogen, N content of ammonia	123,300	131,500	130,000	130,000 ^e	130,000
Perlite:					
Crude	1,079,036	1,053,388	1,075,129	1,100,000 ^e	1,100,000
Screened	739,729	525,000 ^e	550,000	550,000 ^e	550,000
Pozzolan, Santorin earth	1,383,546	1,255,590	1,458,850	1,500,000 ^e	1,500,000

See footnotes at end of table.

TABLE 1—Continued
GREECE: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity ²	2003	2004	2005	2006	2007 ^c
INDUSTRIAL MINERALS—Continued					
Pumice	893,000	835,000	852,000	850,000	900,000
Salt, all types	192,161	187,522	198,024	195,000	195,000
Silica ^c	130,000	125,000	125,000	125,000	125,000
Sodium compounds:^c					
Carbonate	750	750	750	750	750
Sulfate	5,000	5,000	5,000	5,000	5,000
Stone:^c					
Dolomite	90,000	40,000	60,000	60,000	60,000
Marble	233,436 ³	144,860 ³	151,180 ³	150,000	150,000
Flysch	75,000	158,887 ³	93,509 ³	95,000	95,000
Quartz, microcrystalline	150	150	150	150	150
Sulfur:^c					
S content of pyrites	9,500	9,500	9,500	9,500	9,000
Byproduct, natural gas and petroleum	162,000	160,000	160,000	160,000	150,000
Talc and steatite	500	200	250	250	200
MINERAL FUELS AND RELATED MATERIALS					
Coal:					
Lignite	69,411	71,237	73,585	74,000 ^c	74,000
Lignite briquets ^c	32,000	35,000	36,000	36,000	36,000
Gas:^c					
Manufactured, gasworks	15	15	15	15	15
Natural	36	23	16	16	16
Natural gas plant liquids	350	140	140 ^c	140	140
Petroleum:					
Crude	1,026	997	756	760 ^c	760
Refinery products:					
Liquefied petroleum gas ^c	8,932 ³	8,900	8,900	8,900	8,900
Gasoline	32,725	33,150	32,725	32,000 ^c	32,000
Naphtha	7,905	8,245	8,330	8,400	8,400
Mineral jelly and wax ^c	20	20	20	20 ^c	20
Jet fuel	14,400	15,600	16,000	16,000 ^c	16,000
Kerosene	116	116 ^c	132	130 ^c	130
Distillate fuel oil	41,776	42,522	43,268	42,000 ^c	42,000
Refinery gas	3,710	4,200	4,900	4,800 ^c	4,800
Lubricants	1,260	1,225	1,260	1,200 ^c	1,200
Residual fuel oil	49,617	49,950	50,616	50,000 ^c	50,000
Bitumen	3,151	3,100	3,121	3,000 ^c	3,000
Petroleum coke	880	935	990	1,000 ^c	1,000
Other	756	770	980	900 ^c	900
Refinery fuel and losses	7,490	7,490	7,500	7,500 ^c	7,500
Total	172,738	176,223	178,742	176,000 ^c	176,000

^cEstimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. ¹Revised. do. Ditto. -- Zero.

¹Table includes data available through September 2008.

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

³Reported figure.

TABLE 2
GREECE: STRUCTURE OF THE MINERAL INDUSTRY IN 2007

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Alumina, Al ₂ O ₃		Aluminium de Grèce S.A. (AdG) (Mytilineos Holdings S.A., 53%)	Agios Nikolaos, Boeotia area	750
Aluminum		do.	do.	160
Asbestos		Hellenic Mineral Mining Co. S.A.	Mines at Zidani, near Kozani	100
Barite, BaSO ₄		S&B Industrial Minerals, S.A. (Eliopoulos-Kyriakopoulos Group)	Milos Island	1
Bauxite		do.	Mines at Phocis, plants at Phocis and Itea	2,000
Do.		Eleusis Bauxites Mines, S.A.	Mines near Drama, Itea, and Phthiotis-Phocis	300
Do.		do.	Plants in Aghia Marina, Drama, and Itea	400
Do.		Delphi-Distomon S.A.; Hellenic Bauxites of Distomon S.A. (Aluminium de Grèce S.A.)	Beotia and Phokifda mines, Delphi-Distomon area	500
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. (Silver & Baryte Ores Mining Co. S.A.)	Mines at Adamas, Milos Island	300
Do.		do.	Plants at Adamas, Milos Island	200
Do.		S&B Industrial Minerals, S.A. (Eliopoulos-Kyriakopoulos Group)	Mines at Adamas, Milos Island	600
Processed		do.	Plant at Voudia Bay, Milos Island	400
Cement		Halkis Cement Co. S.A. (Lafarge Group)	Micro-Vathi plant, west-central Euboea Island	3,000
Do.		Halyps Cement S.A. (Ciments Français)	Paralia Aspropyrgos plant, Athens	800
Do.		Heracles General Cement S.A. (Lafarge Group)	Plants at Halkis Evia, Milaki Evia, and Volos	9,600
Do.		Titan Cement Co. S.A.	Elefsis plant, Athens area	400
Do.		do.	Kamari plant, Boeotia	2,600
Do.		do.	Patras plant, northern Peloponnesus	1,900
Do.		do.	Salonica plant, Salonica	1,650
Ferroalloys, ferronickel, Ni content		Larco G.M.M. S.A.	Larymna metallurgical plant	25
Gold, Au in concentrate	kilograms	Hellas Gold S.A. (European Goldfields Ltd.)	Kassandra Mines (Olympias and Stratoni)	5,000
Gypsum		Lava Mining and Quarrying Co. S.A.	Altsi, Crete Island	500
Do.		Titan Cement Co. S.A.	do.	280
Hunite/hydromagnesite		Microfine S.A.	Mines in Kozani Basin	100
Lead, mine, Pb in concentrate		Hellas Gold S.A. (European Goldfields Ltd.)	Kassandra Mines (Olympias and Stratoni), northeastern Chalkidike	30
Lignite		Public Power Corp. (PPC) (Government)	Aliveri Mine, Euboea Island	420
Do.		do.	Megalopolis Mine, central Peloponnesus	7,000
Do.		do.	Ptolemais Mine, near Kozani	28,000
Magnesite, concentrate		Grecian Magnesite S.A. (GM)	Mine and plant at Gerakini and Kalives, Chalkidiki, northern Greece	200
Manganese, battery-grade MnO ₂		Eleusis Bauxite Mines Mining, Industrial and Shipping S.A. [National Bank of Greece (OAE)]	Nevrokopi, Drama	10
Marble, slab	cubic meters	Aghia Marina Marble Ltd.	Pallini	100,000
Do.	do.	Chris G. Karantanis & Sons Co.	Korinthos	60,000
Natural gas	million cubic meters per day	Public Petroleum Corp. (PPC) (Government)	Prinos offshore gasfield and oilfield, east of Thasos Island	125
Nickel, ore		Larco G.M.M. S.A.	Agios Ioannis Mine, near Larymna	700
Do.		do.	Evia Mine, near Larymna	1,500
Nitrogen, N content of ammonia		Phosphoric Fertilizers S.A.	Nea Karvall	150

See footnote at end of table.

TABLE 2--Continued
GREECE: STRUCTURE OF THE MINERAL INDUSTRY IN 2007

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Perlite		S&B Industrial Minerals, S.A. (Eliopoulos-Kyriakopoulos Group)	Mines on Kos and Milos Islands; plant at Pireaus	650
Do.		Otavi Minen Hellas S.A. (Otavi Minen AG, Germany)	Milos Island	150
Do.		Bouras Co.	Kos Island	50
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	170,000
Do.	do.	Petrola Hellas S.A.	Eleusis	100,000
Do.	do.	Thessaloniki Refining Co. A.E.	Thessaloniki	76,000
Pozzolan (Santorin earth)		Lava Mining and Quarrying Co. (Heracles General Cement Co. S.A.)	Xylokeratia, Milos Island	600
Do.		Titan Cement Co. S.A.	do.	300
Pumice		Lava Mining and Quarrying Co. (Heracles General Cement Co.)	Yali Island	100
Quartz (microcrystalline)		do.	Adamas, Milos Island	150
Steel, crude		Halyvourgia Thessalias S.A. (Manassis Bros. and Voyatzis S.A., 65%, and National Investment Bank for Industrial Development, 35%)	Steelworks at Volos	1,500
Do.		Sidenor Steel Products Manufacturing S.A.	Steelworks at Thessaalonili and Almyros	2,800
Do.		Halyvourgiki, Inc.	Steelworks at Eleusis	1,200
Do.		Hellenic Steel Co.	Steelworks at Thessaloniki	1,000
Do.		Corinth Pipeworks S.A. (CPW)	Steelworks at Thisvi	700
Zeolite		S&B Industrial Minerals, S.A. (Eliopoulos - Kyriakopoulos Group)	Mine at Pendalofos; plant at Ritsona	100
Zinc, mine, Zn in concentrate		Hellas Gold S.A. (European Goldfields Ltd.)	Kassandra Mines (Olympias and Stratoni), northeastern Chalkidike	30

Do., do. Ditto.