

## Greek Mining/Metallurgical Industry. Review 2010-2011

Production data and best available estimates for various mineral commodities produced in Greece in the years 2010 and 2011 are listed in the following table. Reported values relating to mineral production are combined data from (a) statistics kept by the Mineral Resources Policy Directorate of the Ministry of Environment, Energy and Climate Change (YPEKA) and (b) annual statistics kept by the Mining Enterprises Association (SME). Also, the exports data for the Greek marble industry have come from the Greek Statistical Authority (ELSTAT) and was analysed by marmaronet.com.

In 2010 the sector experienced a significant decline in all areas, following the fall in demand and subsequently the prices of raw materials in the steel, construction, cement, and concrete



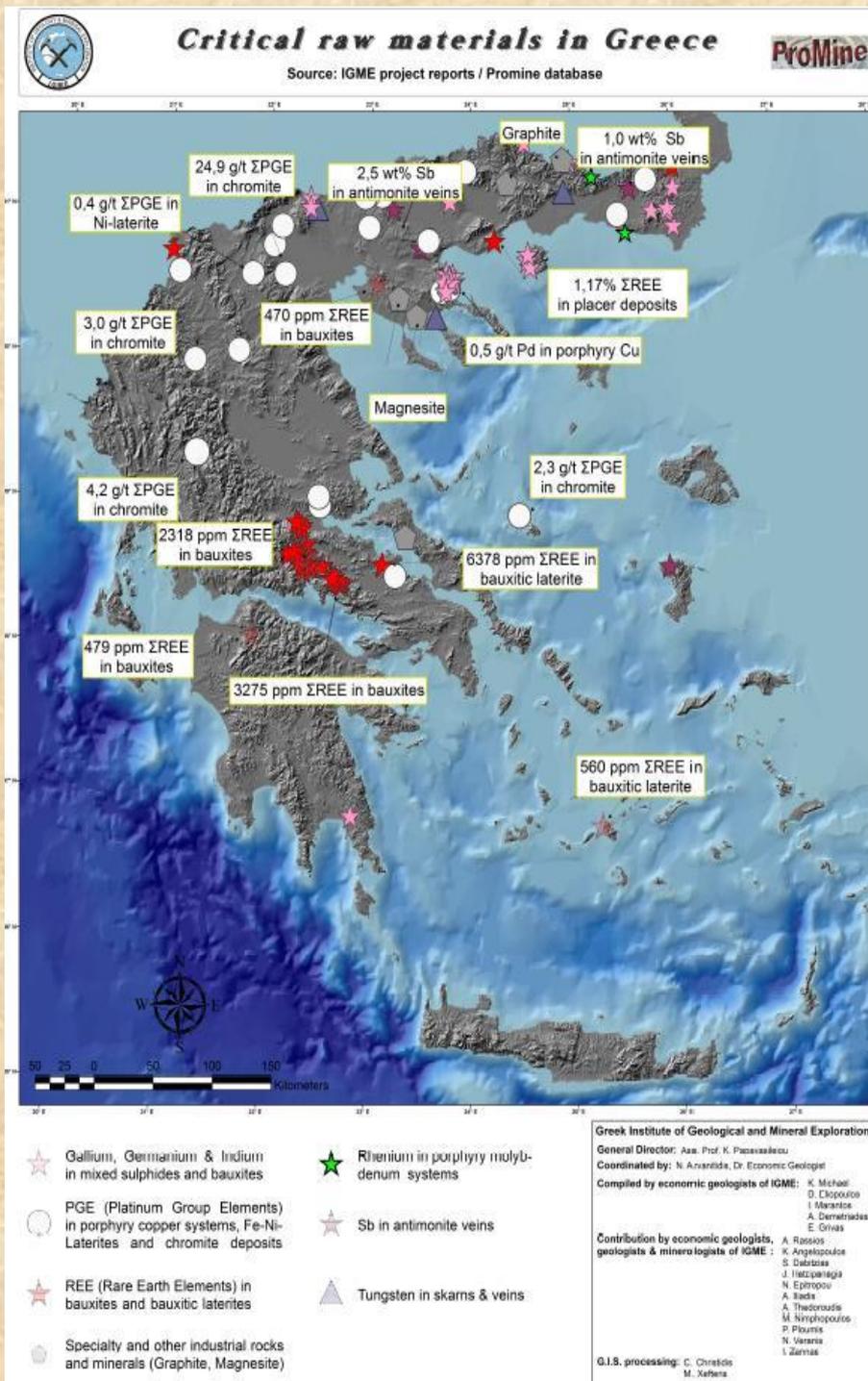
industries. The recession continued and was worsened by the severe economic problems and the lack of investment initiatives that could lead to domestic growth. In contrast to the shrinking domestic market, especially in construction field (aggregates, cement, ceramics, etc.), the tendency was to strengthen the export sector with regards to products placed on the international market (industrial minerals, aluminum, nickel, etc.)

where the demand and prices rallied largely to pre-crisis levels. In 2010, a total sales volume of quarry/mining/metallurgical products over 1 billion euros (1.1 billion euros) was achieved, of which 790 million was comprised of exports (72%).

In 2011, the same trend continued with the export sector producing satisfactory results, while the downturn in the domestic sector deepened widely. Specifically, in 2011, the production of basic metal production of primary non-ferrous metals (alumina/aluminum and ferronickel/nickel) significantly increased along with export activity in all the individual products.

For nickel (Ni), 2011 was one of the best years as LARKO GMMAE reached an increase of more than 30% in nickel production, which amounted to 18.527 tn nickel. The annual turnover amounted to 311.12 million € (239.5 million € in 2010) and even greater was the increase in the volume of sales/exports, which strengthened by 40% to 18.594 tonnes (a historical record in sales), mainly due to increased demand for stainless steel and the reopening of electric furnaces in the Larymna ferronickel plant.

For aluminium (Al), the production exceeded 167 thousand tn (140 thousand tn in 2010) absorbing over 80% of Greek production of bauxite and achieving marginally profitable use for Aluminium SA.



During the year 2011, there was an 11% increase in the proportion of exports to total sales for aluminum products by (from 55% in 2010 to 66% in 2011).

There was a corresponding increase in production of nickeliferous laterite ore (the total laterite ore production used to feed the Larymna metallurgical ferronickel plant amounted to 2.23 million tn increased by 14% from 2010), while the domestic production of bauxite surpassed 2.3 million tn. (increased by 13% from 2010).

The production of mixed sulphide Pb-Zn ores (lead, zinc and iron concentrates) from HELLAS GOLD SA remained at previous levels (over 214 thousand dry tn) and products of enrichment (concentrates of lead sulphide and zinc sulphide after differential flotation) exported as a whole exceeded a value of 38.3 million € (18,4 m € for Pb and 19.9 m € for Zn), maintaining 2010 levels.

Grecial Magnesite SA, a leading magnesite producer and exporter in the EU and worldwide, managed to

maintain previous levels of magnesium ore exploitation (over 540 thousand tn of raw material) and production of magnesium compounds (dead-burned and caustic-calcined magnesia, 69 and 79 thousand tn respectively) with a total sales value for 2011 of approximately 40 million €, of which 37 million are from exports.

Industrial minerals, predominantly the export sector, continued in 2011 to recover from the severe downturn of 2009, mainly due to the improvement in world commodity markets. Specifically, the production of bentonite and perlite remained at 2010 levels, with a relative reduction of bentonite (1.2 million tn) and a relative increase for perlite (842 thousand tn). Note that Greece is the largest bentonite producer in the EU and S & B Industrial Minerals SA is the largest bentonite export company in the world (production of 1.16 million tn in 2011 from mines of Milos island) with a total sales value of over 69 million € (100% of which is exports).

Also, Greece is the leading country in perlite production worldwide, with a wide range of uses of the product which is constantly expanding: more than 60% in construction, 25% for agricultural purposes, and the remainder in foundry applications, such as filter media, specialty insulations, etc. The S & B Industrial Minerals SA produced in 2011, 385 thousand tn perlite (raw material from mines in Tsigrado and Traxilas, Milos island, achieving a total sales value of 33,4 million € (99.5% exports).

In 2011, production of huntite/hydromagnesite (crude product), from WHITE MINERALS SA, a subsidiary of Ankerpoort, amounted in 2011 to 23.800 thousand tn, showing a steady upward trend in both production and sales compared to the previous year. Olivine production increased significantly reaching 55 thousand tn of crude ore (THERMOLITH SA) while attapulgite clays (GEOELLAS) and amphibolites (FIBRAN SA) maintained their export levels using mostly existing reserves to feed their factories in 2011.

However, despite this relatively good performance for ores, metals and industrial minerals, where demand remains high and there is a clear export orientation, the prolonged downturn in the domestic market led sector companies that produce other products mainly for the home market (for instance, aggregates) to problematic operation and in some cases closure. Specifically, in 2010, the sector of construction aggregate materials fell to 50 million tn and in 2011 to 35-38 million tn, marking an unprecedented downturn. Also, silica and pozzolan related industries faced negative performance due to shrinkage of domestic construction. It is indicative that for 2011, the production of silica (by the LAVA SA) from Milos island was only 1671 tn and the total annual country production of pozzolan did not exceed the historic low of 350 thousand tn. Calcium carbonate (marble, building mortars, etc.) and pumice remained at low output levels below 500 thousand tn.



The domestic production of brown coal ("lignite") exceeded 56.80 million tn, a slight increase compared to 2010 (55.96 million tn). Based on the above data, in 2011, the contribution of lignite in the energy mix on the interconnected system of the country exceeded 55%, while the corresponding participation in the whole country (including non-interconnected islands) was 49.5%, demonstrating the dominance of lignite reserves in the country's energy scene.

The industry of marble products and ornamental stone, despite the severe impact of the economic crisis on domestic consumption, mainly managed to maintain and improve production by approximately 10%. For 2010-11, the total production of marble products exceeded 1 million tn annually, while Greek exports of marble sector exceeded their total 753.8 thousand tn worth over 155 million € (in 2010) and 830.8 thousand tn worth more than 205 million € (in 2011), increased annually by more than 10% in quantity and 30% in value. Specifically, in 2011, marble exports to China, the main market for Greek marble, totaled 377.4 thousand tn worth over 75

million €, representing 45.4% of total quantity and 36.9% of the total value of Greek marble exports.

In 2011, emery production (from Naxos island) fell to 5.900 tn (from 7000 tn in 2010), largely resulting an effort to control the stock of almost 130 thousand tn kept in outdoor storage for which there was a serious effort for market promotion. Hopefully, a significant amount (more than 30 thousand tn) has been already marketed in the first half of 2012 (ELMIN SA).

Greece has the potential to become a near-term gold producer with a number of exploration companies active in the country. Hellas Gold SA (owned by Eldorado Gold Corp. Canada) is developing a project including mining and processing at the Skouries gold-copper project, and the initiation of mining at the Olympias polymetallic project. The company has completed a feasibility study at Skouries outlining potential annual production of 200.000oz of gold and 40.000 tn of copper. Eldorado Gold Corp. is also developing the Perama Hill gold project through its wholly-owned subsidiary Thracean Gold Mining SA. In 2011, the company submitted the EIA which was approved by the Ministry of Environment in early 2012 while in March the project was incorporated in the process of "fast track". Once operational, Perama Hill is anticipated to produce 110,000oz/y of gold at a cash operating cost of US\$278/oz. For the gold project in Sapes, the mining THRACE SA (owned today by Glory Resources Ltd Australia) has submitted a preliminary EIA study which is currently being evaluated by the Ministry of Environment.



in 2011, the State (Ministry of Environment, YPEKA) completed the new reformed Regulation on Mining and Quarrying Activities (KMLE, MD 2223/11) satisfying a long-standing demand of the industry with regard to health and safety in extractive areas. There was also a new law drafted on biodiversity directly concerning mining activity (N.3937/2011), Law on Environmental Authorisation (N.4014/2011) including Law 4001/2011, which has specific provisions for extension of licenses and

leases for quarrying (Article 183). The most important legal change was the adoption in 2011 of the National Policy for the Strategic Planning and Exploitation of Mineral Resources, which was developed in collaboration with all stakeholders to respond to the situation and modern needs and in the context of European integration initiative on raw materials (RMI).

In the field of geothermal energy, the Ministry of Environment (YPEKA) launched and commissioned four international bids for exploiting geothermal high temperature areas in Evros, Nestos, Chios, Samothraki, with investments totaling 200 million €. It has also been announced by the same ministry a second round of international competitions for other four areas of high temperatures in Kavala, Sperhios, Ikaria and Soussaki, totaling a 63 million euro investment.

Note that all of the geothermal fields in the country which can be directly used as investment exceed 400 million €, with capacity of up to 300 MW of electricity.

In the hydrocarbon sector, the production of crude oil and natural gas (from Prinos deposits) decreased by 24% while natural gas production maintained at almost the same levels as in 2010. According to the financial results announced by Energean Oil & Gas in 2011, the group turnover amounted to 60.85 million € (versus 41,8 million € in 2010), recording an increase of 45,5%. It should be noted that Greece imports nearly all the oil and natural gas it consumes, annually spending about 5% of GDP and KAVALA OIL SA (Subsidiary of Energean Oil & Gas) is the only company extracting oil and natural gas in Greece.

Also, in 2011, the Ministry of Environment modernized the existing permitting process for search, exploration and exploitation of hydrocarbons (Law 2289/95) with the adoption of Law 4001/2011 (Vol. II). The same law established the "National Hydrocarbons Agency, EDEY SA" which will manage the exclusive rights of the Greek government in the search, exploration and exploitation of hydrocarbons. Also, in accordance with Law 4001/2011, the Ministry of Environment issued a tender for participation in seismic data acquisition research for non-exclusive use in the maritime area in Western and Southern Greece. An international bidding process was also launched for a direct grant of the Greek government for exploration and exploitation of hydrocarbons in the process of "open door" in three areas: Patraikos Bay, Ioannina and West Katakolon Peloponissos. Both competitions were completed in 2012.

## GREECE : PRODUCTION OF MINERAL COMMODITIES

### METALS, INDUSTRIAL MINERALS, MINERAL FUELS AND RELATED MATERIALS

COMMODITY PRODUCTION	Quantity in Metric tons unless otherwise specified	
	2010	2011
Bauxite	1.993.826 <sup>1</sup>	2.300.000 <sup>1</sup>
Aluminium, primary (Foundry Line)	139.824 <sup>2</sup>	167.490 <sup>2</sup>
Alumina, calcined (Al <sub>2</sub> O <sub>3</sub> )	661.882	683.030
Alumina, hydrated (Al <sub>2</sub> O <sub>3</sub> )	785.100	809.700 <sup>3</sup>
Mixed sulphide ore	230.134	214.943 <sup>4</sup>
Galena, PbS (metric tons of concentrates)	17.674	16.592
Zinc blend , ZnS (metric tons of concentrates)	40.592	39.127
FeS <sub>2</sub> (metric tons of concentrates)	0	0
Nickeliferous ores (laterites)	1.902.976	2.235.966
Ferronickel:	69.596	93.905
Ni content of ferronickel	13.956	18.527
Slag by-product (coarse)	57.156	69.674
Slag by-product (fine, -5mm)	59.500	79.011
Magnesite, crude	513.487	541.813 <sup>5</sup>
Dead-burned magnesia	31.594	38.343
Caustic-calcined magnesia	61.628	59.838
Basic monolithic refractories	36.031	45.202
Bentonite, crude	1.384.118 <sup>6</sup>	1.188.442 <sup>6</sup>
Attapulgitic clay <sup>6</sup>	39.012 <sup>7</sup>	17.748 <sup>8</sup>

Huntite, crude	16.350	23.800
Pozzolan, Santorin earth	550.000	350.000*
Pozzolan, specific use (not cement industry)	79.600 <sup>9</sup>	49.733 <sup>9</sup>
Kaolin, crude	1.045	NA
Perlite, crude	790.100 <sup>10</sup>	842.870 <sup>10</sup>
Perlite, treated	440.000 <sup>11</sup>	507.235 <sup>11</sup>
Pumice	412.700	468.960
Silica (SiO <sub>2</sub> )	5.742 <sup>12</sup>	1.671 <sup>12</sup>
Gypsum and anhydrite, crude	574.768 <sup>13</sup>	590.000 <sup>13</sup>
Olivine	35.300	55.325
Amphibolite	23.453	23.263
Calcium Carbonate (CaCO <sub>3</sub> ), processed all sources	450.000 <sup>14</sup>	400.000 <sup>14</sup>
Feldspar	17.380 <sup>15</sup>	10.563 <sup>15</sup>
Quartz	30.794	11.241
CO <sub>2</sub> [liquid]	9.980	10.200
Zeolite	200	NA
Lignite	56.366.202	58.400.000
Crude oil, in barrels	894.002	675.504 <sup>16</sup>
Natural gas, in Nm <sup>3</sup> <sup>17</sup>	6.124.844	5.927.401 <sup>16</sup>
Salt, sea salt	164.765	174.500
Mineral Aggregates (sand, gravel, crushed stones etc.)	50.000.000*	38.000.000*
Marble, rough blocks in cubic meters	268.033	285.000
Marble, rough shapeless blocks	358.963	390.000
Marble chips	598.111	650.000*
Emery	7.000	5.900

NA: not available,

\*: estimated

(source: MinEnv, SME, Greek Statistical Authority ELSTAT)

<sup>1</sup> bauxite: S&B Industrial Minerals S.A., Delphi Distomo AME, Elmin AE

<sup>2</sup> electrolysis line 136.765 tn (for 2010) and 165.147 tn (for 2011)

<sup>3</sup> historic record for alumina hydrate production with parallel sales of 123.684 tn in 2011

<sup>4</sup> Metal content: Pb: 12.918 tn, Zn: 20.999 tn, Fe: 51.693 tn, Ag: 33.316 Kg, Au: 959,72 Kg

<sup>5</sup> Total production of raw magnesite from main enrichment unit and magnets plant.

<sup>6</sup> Bentonite: S&B Industrial Minerals S.A., BENTOMINE S.A., Sud Chiemie Hellas, Greek Mining Ltd., Mavroyiannis

<sup>7</sup> attapulgitis/palygorskite plus smectite/saponite clay <sup>8</sup> Raw material for knidi Grevena factory feeding (GEOELLAS)

<sup>9</sup> Pozzolan for specific use: construction pozzolanic mortars, fillers, e.g. from KYBOS SA and Greek Pozzolans SA

<sup>10</sup> Perlite: S&B Industrial Minerals S.A., EEKOM SA, Aegean Perlites S.A., MILOPAN S.A.

<sup>11</sup> Perlite: S&B Industrial Minerals S.A. <sup>12</sup> Silica: Lava Mining and Quarrying Co,

<sup>13</sup> Gypsum: Interbeton Construction Materials SA., Lava Mining and Quarrying Co, BPB HELLAS SA (BPB group), Knauf Gypsopoiia SA

<sup>14</sup> Calcium Carbonate (CaCO<sub>3</sub>) products, both amorphous and crystalline: construction mortars, fillers, marble powder, adhesive and sealant, marmoline, alfamix, iokal e.g. <sup>15</sup> feldspar: MEVIOR SA <sup>16</sup> KABAAA OIL A.E.

<sup>17</sup> Normal cubic meter (Nm<sup>3</sup>) is the Cubic meter measured at standard conditions (0 °C and 1 atm. pressure)

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