



2013 Minerals Yearbook

PORTUGAL

THE MINERAL INDUSTRY OF PORTUGAL

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Portugal is endowed with rich metallic and nonmetallic mineral resources, such as antimony, beryllium, copper, feldspar, germanium, indium, iron ore, kaolin, limestone, marble, niobium, tantalum, tin, tungsten, uranium, and zinc. Half of the Iberian Pyrite Belt (IPB) is in Portuguese territory, where volcanogenic massive sulfide deposits such as the Neves-Corvo deposit have been exploited. The IPB is considered the primary source of base metals in the European Union (EU), and is under extensive exploration for various metallic minerals (Veiga, 2013).

In 2013, mineral commodities produced in Portugal included copper, lithium (seventh after Australia, Chile, China, Argentina, Zimbabwe, and the United States), ornamental stone, tungsten [ninth after China, Russia, Canada, Vietnam, Bolivia, Austria, Congo (Kinshasa), and Rwanda], as well as feldspar, gypsum, kaolin, salt, silver, and talc. The Government's initial strategic efforts to boost the mineral resources sector in Portugal were focused on metallic minerals, as documented in the National Strategy for Geological Resources—Mineral Resources, which was published by the Presidency of the Council of Ministers on August 30, 2012 (table 1; Presidency of the Council of Ministers, 2012, p. 7; Jaskula, 2015; Shedd, 2015).

Minerals in the National Economy

In 2013, Portugal's real gross domestic product (GDP) decreased by 1.4% compared with a 3.3% decrease in 2012. The easing of GDP contraction was a result of increased external demand combined with a smaller contraction of domestic demand. Domestic demand decreased by 2.3% compared with 6.6% in 2012, and exports of goods increased by 4.5%. Gross value added (GVA) for the industry sector was \$28.9 billion, which was a 0.7% increase compared with that of 2012. GVA by construction sector was \$9.3 billion, which was a 13.1% decrease compared with that of 2012, owing to the Government's austerity programs. Portugal's mining and mineral processing industries represented 2.6% of total industrial production. The total value of marketed production and industrial services was \$111.5 billion in 2013, a 0.3% increase compared with that of 2012, of which the manufacture of coke and refined petroleum products accounted for 13.2%, and manufacture of basic metals (iron and steel and ferro-alloys, other first processed iron and steel, and aluminum and aluminum products) and fabricated metal products (except machinery and equipment) accounted for 3.2% (Instituto Nacional de Estatística, 2014a, p. 7, 13; 2014b, p. 30, 285, 289, 298, 305, 459, 475).

Production

Production of most metallic minerals in Portugal increased in 2013, led by zinc with an increase of 70% to 51,026 metric tons (t), and silver with an increase of 36% to 37,025 kilograms.

The increase in zinc production was attributed to increased output from the Neves-Corvo Mine. Production of copper, the most valuable export commodity in the country, increased by 4.3% to 77,236 t. Secondary lead production decreased by 20% to 4,000 t. Tungsten mine output decreased by 9.3% to 692 t. The production of most industrial minerals (except marble) decreased due to the considerable contraction of the construction industry. Production of petroleum refinery products increased by 7.3% to 147 million barrels (Mbbbl). Portugal did not produce coal, crude oil, natural gas, or uranium in 2013 (table 1; Instituto Nacional de Estatística, 2014b, p. 289; Lundin Mining Corp., 2014a).

Structure of the Mineral Industry

Table 2 is a list of major mineral industry facilities, their locations, and their production capacities.

Mineral Trade

Portugal's exports amounted to \$69.5 billion in 2013, which was a 4.5% increase from the value in 2012. Imports amounted to \$83.7 billion in 2013, which was a 0.9% increase from the value in 2012. The ratio of the sum of the exports and imports of goods to the GDP was 61.6% in 2013. The leading export partners were, in terms of value, Spain (which received 23.6% of Portugal's exports) and Germany and France (11.6% each). The leading import partners were Spain (supplied 32.2% of Portugal's imports), Germany (11.4%), and France (6.7%) (Instituto Nacional de Estatística, 2014b, p. 381–383, 386–387).

In 2013, the value of imported mining and quarrying products was \$13.1 billion, which accounted for 15.6% of the total value of imported goods. Energy producing materials made up 98.8% of the total imported mining and quarrying products. The value of exported mining and quarrying products was \$1.03 billion, which accounted for 1.5% of the total value of exported goods. Mining and quarrying of metal ores and industrial minerals made up 82.4% (in terms of value) of the total of exported mining and quarrying products. Base metals and mineral fuels accounted for 7.8% and 10.4% of the value of exported goods and 7.6% and 19.6% of the value of imported goods, respectively. The export of base metals decreased by 0.6% compared with 2012. Ornamental stone was a valuable industrial mineral in Portugal; production levels and export volumes have been steadily increasing in recent years. The country had limited energy resources and depended upon imports for the bulk of its energy needs (Veiga, 2013; Instituto Nacional de Estatística, 2014b, p. 385, 390, 402, 403, 459; U.S. Energy Information Administration, 2014).

Commodity Review

Metals

Copper and Zinc.—Lundin Mining Corp. of Canada, through its wholly owned subsidiary Sociedade Mineira de Neves-Corvo S.A. (Somincor), had 100% ownership in the Neves-Corvo copper-zinc underground mine, which is located 100 kilometers (km) north of Faro, in the western area of the IPB. The company held a mining concession covering an area of 13.5 square kilometers (km²), located in the parishes of Santa Barbara de Padroes and Senhora da Graca de Padroes, for exploitation of cobalt, copper, gold, lead, silver, tin, and zinc for an initial period of 50 years (from November 1994). As of June 30, the proven reserves and probable reserves (reported as 2P reserves) at Neves-Corvo were 27 million metric tons (Mt) of copper-rich ores grading 2.9% copper, 0.8% zinc, 0.2% lead, and 37 grams per metric ton (g/t) silver, and 23 Mt of zinc-rich ores grading 7.4% zinc, 0.4% copper, 1.8% lead, and 70 g/t silver (Lundin Mining Corp., 2013, p. 1, 6).

The capacity of the Neves-Corvo's copper plant was about 2.6 million metric tons per year (Mt/yr) of ore and 300,000 metric tons per year (t/yr) of concentrate production. Its zinc plant capacity was about 1.0 Mt/yr of ore and 100,000 t/yr of concentrate production. In 2013, copper production from the Neves-Corvo copper mine was 56,544 t of copper content in concentrate grading 23.6% copper compared with 58,559 t in 2012. The slight decrease in copper production was owing to the lower metallurgical recovery in 2013 (84.5% in 2013 compared with 88.2% in 2012), although the throughput of ore was slightly higher than in 2012. Zinc production was 53,382 t of zinc content in concentrate grading 47.7% zinc compared with 30,008 t in 2012. The increase was a result of higher throughput levels after completion of the plant expansion project and higher zinc grade from initial production in the deeper section of the Lombador ore body. The mine also produced 1,496 t of lead in concentrate as a byproduct from the zinc circuit, which was the first salable lead concentrate produced at Neves-Corvo. The company expected the Lombador phase 1 underground development to ramp up zinc production to in excess of 60,000 t/yr by 2014. The 2014 production targets of Neves-Corvo were 50,000 to 55,000 t of copper content and 60,000 to 65,000 t of zinc content in concentrates. The mine had 910 full-time employees in 2013 (Veiga, 2013; Lundin Mining Corp., 2013, p. 2, 3; 2014a; 2014b).

Gold.—Colt Resources held two exploration licenses for its Boa Fe Gold Project, which is located in the Alentejo Region of Portugal, approximately 100 km east of Lisbon. According to the mineral resource estimate report released by Colt Resources on March 4, 2013, the indicated resource was 6.07 Mt grading 1.74 g/t gold, and the inferred resource was 1.554 Mt grading 1.69 g/t gold. In May, Colt published a preliminary economic assessment (PEA) report that concluded that the project may be economically viable. The environmental impact assessment for the property was approved on July 1 (Colt Resources Inc., 2014, p. 3–4).

Tungsten.—Sojitz Beralt Tin & Wolfram (Portugal) S.A., which is owned by Sojitz Corp. of Japan, operated the Panasquiera tungsten mine located in Beira Baixa Province

in the east-central region of Portugal. The mine was one of the EU's leading producers of tungsten concentrates, with a production capacity of 1,300 t/yr of tungsten trioxide (WO₃) concentrate. In 2013, the concentrate production of the mill was 1,174 t compared with 1,303 t in 2012. The tungsten content in concentrate was 692 t compared with 763 t in 2012 (table 1; Veiga, 2013).

On February 20, Colt Resources Inc. of Canada was awarded an provisional mining license for the Tabuaco Tungsten Project, which is located in the north-central region of Portugal, approximately 300 km northeast of Lisbon. The license encompasses an area of 45 km². According to the mineral resource report released by Colt Resources on October 3, indicated resources were estimated to be 1.495 Mt grading 0.55% WO₃, and inferred resources were estimated to be 1.23 Mt grading 0.59% WO₃. In October, Colt published a PEA report that concluded that the project may be economically viable. A feasibility study consisting of additional infill drilling and a limited amount of resource expansion drilling started in 2013 (Colt Resources Inc., 2014, p. 5–6).

Industrial Minerals

Cement.—In 2013, consumption of cement in Portugal declined by 25% owing to the negative effects on the construction industry of the Government's austerity programs. Cement production, however, was estimated to be higher than in 2012 owing to increased external demands (Cimentos de Portugal, SGPS, S.A., 2014, p. 20).

Cimentos de Portugal, SGPS, S.A., which was owned by Grupo Camargo Correa, continued to be Portugal's leading cement producer. The company was among the 10 largest international cement producers in the world; it had 40 plants worldwide and the capacity to produce 46 Mt/yr of cement. Its cement production capacity in Portugal was 9.1 Mt/yr and about 55% of the domestic market share. In 2013, domestic sales decreased by 24% to 1.5 Mt and exports increased by 75% to 2.5 Mt. Total sales increased by 18% compared with 2012. The capacity utilization for clinker processing increased to 62.9% from 49.7% in 2012. As of the end of 2013, the company employed 868 people in Portugal, which was 20.4% less than 2012. Companhia Geralde de Cal e Cimento, S.A. produced 2.2 Mt of cement in 2013, which was 5% lower than 2012 production. Domestic sales were 1.1 Mt and external sales were 1.5 Mt, representing a 21% decrease and a 1% increase from 2012, respectively (Cimentos de Portugal, SGPS, S.A., 2014, p. 11, 20; Companhia Geralde de Cal e Cimento, S.A., 2014, p. 22).

Stone, Dimension.—Portugal is the second-ranked ornamental stone exporting country in the world in terms of export volume per capita. A recent study estimated total available resources of 410 million cubic meters, including 274 million cubic meters of granite, 76 million cubic meters of limestone, 51 million cubic meters of marble, and 9 million cubic meters of slate. Granite was mined in the central and northern regions of Portugal, marble was mined in the Alentejo region, and limestone was mined in the Macico Calcario Estremenho Region. A cream-colored limestone with a texture

marked by thin sedimentary laminations was the most desirable Portuguese ornamental stone, and it was in high demand in China (Carvalho and others, 2013; Veiga, 2013).

Mineral Fuels and Other Sources of Energy

Refined Petroleum Products.—Petroleos de Portugal S.A. (Petrogal), a wholly owned subsidiary of Galp Energia, SGPS, S.A., operated two crude oil refineries in Portugal. The two refineries had a total capacity of 330,000 barrels per day (bbl/d). In 2013, about 87.5 Mbbbl of crude oil was processed, compared with 81.8 Mbbbl in 2012. Crude oils were imported from West Africa (59% of total), former Soviet Union countries (21%), the Middle East (12%), and other areas. In 2013, a total of 17 Mt of refined products were sold, of which 4 Mt was sold in markets outside of the Iberian Peninsula (representing a 21% increase compared with 2012). On January 10, the new hydrocracking complex, which had a processing capacity of 43,000 bbl/d of heavy vacuum gasoil, started commercial production at the Sines refinery. This project was a part of the company's \$2.05 billion upgrade program aimed at increasing the production of diesel in line with market demand (Galp Energia, SGPS, S.A., 2013; 2014, p. 7, 9, 18, 38–40, 98).

Renewable Energy.—In 2013, Portugal continued to rely on imported energy resources. The country imported about 86 Mbbbl of crude petroleum, 4.4 billion cubic meters of natural gas, and 5.4 Mt of coal during the year. Owing to Portugal's high dependence on imported energy sources, the country was emphasizing solar, wave, and wind power investments. In 2012 (the latest year for which data were available), the total power generation in the country was 46.5 thousand gigawatthours, among which thermal electricity accounted for 62.7%; wind power, 22.1%; hydropower, 14.3%; and geothermal and photovoltaic power, the balance. The sum of the renewable energy was 37.3%, compared with 17% in 2005. In the first quarter of 2013, Portugal obtained 70% of its energy requirement from renewable resources owing to the favorable weather conditions and reduced energy consumption. In this quarter, hydropower accounted for 37% of electricity in Portugal's grid and wind, 27%. Meanwhile energy consumption decreased by 2.3% owing to fewer working days and a warmer winter. Portugal added 196 megawatts of wind capacity in 2013 and reached 4.7 gigawatts of installed capacity by the end of the year, which was ranked seventh among EU countries (Romm, 2013; European Wind Energy Association, 2014, p. 4; Instituto Nacional de Estatística, 2014b, p. 471; U.S. Energy Information Administration, 2014).

Outlook

Production of metal ores and concentrates in Portugal is expected to increase in the coming years as a result of the expansion of current projects (such as the Neves-Corvo Mine), the promising advancement of new projects (such as the Lombador phase 1 underground mine development), as well as extensive exploration activities (such as the Tabuaco tungsten project and the Boa Fe gold project). Continued investments in alternative energy sources, particularly offshore wind, could

further decrease the country's dependence on imported energy, but that is not expected to happen in the short term.

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TABLE 1
PORTUGAL: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity ²	2009	2010	2011	2012	2013
METALS					
Copper, mine output, Cu content	86,500	74,426	79,686	74,043	77,236
Lead, refined, secondary	7,000 ^r	9,000 ^r	6,000 ^r	5,000 ^r	4,000
Silver, mine output, Ag content kilograms	22,450	23,710	28,380	27,244	37,025
Steel, crude thousand metric tons	1,614 ^r	1,543 ^r	1,942 ^r	1,960 ^r	2,050
Tin, mine output, Sn content	34	22	39	42	84
Tungsten mine output, W content	823	799	819	763	692
Zinc, mine output, Zn content	501	6,421	4,227	30,008	51,026
INDUSTRIAL MINERALS					
Barite	1,078	15	--	--	--
Cement, hydraulic thousand metric tons	6,900	7,200 ³	7,200 ³	7,200	7,500 ^e
Clay, kaolin, washed and unwashed	274,925	273,890	322,091	321,039 ^r	246,308
Feldspar	157,476	121,827	114,600	109,273	70,057
Gypsum and anhydrite	335,189	336,755	337,272	321,988	299,038
Lime, hydrated and quicklime ^e	70,000	60,000	60,000	60,000	60,000
Lithium minerals, pegmatite (1.5% Li)	37,359	40,109	37,534	20,698	19,940
Salt, rock	594,578	618,961	631,295	520,284	473,095
Sand thousand metric tons	9,585	7,933	7,209	7,248 ^r	6,110
Stone:					
Basalt	326,730	240,150	361,414	325,388 ^r	250,000 ⁴
Calcareous:					
Dolomite thousand metric tons	144	257	195	-- ^r	--
Limestone, marl, calcite do.	43,277	33,756	30,477	25,260 ^r	20,000 ⁴
Marble do.	572	94	125	292 ^r	418
Gabbro do.	100	693	94	467 ^r	262
Granite, ornamental do.	934	21,436	21,758	19,099 ^r	15,000 ⁴
Graywacke do.	NA	NA	526	104 ^r	74
Quartz do.	35	31	29	38	37
Quartzite do.	NA	45	53	42 ^r	NA
Schist do.	679	83	70	925 ^r	86
Slate do.	20	NA	NA	13 ^r	13
Talc	11,567	11,981	15,462	15,131	11,349
MINERAL FUELS AND RELATED MATERIALS					
Petroleum, refinery products ^e thousand 42-gallon barrels	130,000 ^r	142,000 ^r	128,000 ^r	137,000 ^r	147,000

^eEstimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. ^rRevised. do. Ditto. NA Not available. -- Zero.

¹Table includes data available through December 12, 2014.

²In addition to the commodities listed, ammonia, beryl concentrate, calcium carbonate, crushed granite, hot-rolled steel, iron ore and concentrate, manganese, manufactured gas, metallurgical coke, pig iron, pyrite and pyrrhotite (including cuprous), refractory clay, secondary aluminum, sodium compounds, sulfur, syenite, and white arsenic were thought to be produced, but information is inadequate to make reliable estimates of output.

³Reported by Cimentos de Portugal, SGPS, S.A.

⁴Estimated by Portugal statistics agency.

TABLE 2
PORTUGAL: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Calcium carbonate		Omya Mineral Portuguesa Lda. (Salmon & Cia Lda., 50%, and Omya AG, 50%)	Mine and plant at Fatima	100
Cement		Cimentos de Portugal, SGPS, S.A. (Cimpor) (Grupo Camargo Correa, 94.19%)	Plants (3) at Alhandra, Loule, and Souselas	9,100
Do.		Companhia Geral de Cal e Cimento, S.A. (Secil) [Sociedade de Investimento e Gestão, SGPS, S.A. (Semapa), 100%]	Plants at Setúbal, Leiria, and Alcobça	4,000
Clay, kaolin		Saibrais Arelas e Caulinos S.A. (Denain Anzin Mineraux S.A.)	Mines at Casal dos Bracais and Mosteiros	175
Copper, concentrate		Sociedade Mineira de Neves-Corvo (Somincor), S.A. (Lundin Mining Corp., 100%)	Neves-Corvo Mine near Castro Verde	300
Do.		do.	Lombador Mine near Castro Verde	20
Do.		Minas do Alentejo, S.A. (Almina)	Alentejo	NA
Diatomite		Sociedade Anglo-Portuguesa de Diatomite Lda.	Mines at Obidos and Rolica	150
Lithium minerals, pegmatite		Pegmatítica-Sociedade Mineira de Pegmatites Lda.	Mangualde	NA
Natural stone	thousand square meters	Airemármoreis – Extração de Mármoreis Lda.	Serra de Aire, 6 quarries	100
		Granital - Granitos de Portugal, S.A. (EIP Group, 60%)	Quarries at Bardeira, Chacins, Favaco, Maria Ribeira, Pedra da Moura, Pedra do Guarda, Preto F, and Rosa Sta. Eulalia	NA
Petroleum, refined	42-gallon barrels per day	Petróleos de Portugal S.A. (Galp Energia, SGPS, S.A., 100%)	Refineries at Porto and Sines	330,000
Pyrite		Minas do Alentejo, S.A. (Almina)	Alentejo	NA
Steel, crude		Siderurgia Nacional S.A. (Metalúrgica Galaica S.A., 100%)	Steelworks at Maia and Seixal	600
Steel, semimanufactured		Lusosider Aços Planos S.A.	Rolling mill at Seixal	550
Tin	metric tons	Sojitz Beral Tin & Wolfram (Portugal) S.A. (Sojitz Corp., 100%)	Panasqueira Mine and plant at Barroca	100
Tungsten, concentrate	do.	do.	do.	1,300
Zinc, concentrate		Sociedade Mineira de Neves-Corvo (Somincor), S.A. (Lundin Mining Corp., 100%)	Neves-Corvo Mine near Castro Verde	100

Do., do. Ditto. NA Not available.