



2010 Minerals Yearbook

PORTUGAL

THE MINERAL INDUSTRY OF PORTUGAL

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In 2010, Portugal was a significant world producer of lithium (fifth after Chile, Australia, China, and Argentina), tin (eleventh after China, Indonesia, Peru, Bolivia, Brazil and Congo (Kinshasa), Vietnam, and Australia, Malaysia, and Russia), and tungsten (fifth after China, Russia, Bolivia, and Australia) (Carlin, 2011; Jaskula, 2011; Shedd, 2011).

In 2010, the Portuguese economy reversed the recessive trend of 2008-9, and it is estimated that the country's gross domestic product (GDP) increased by 1.4%, primarily driven by the increased exports of goods and services. Portugal's GDP based on purchasing power parity was \$247 billion. The sectors that contributed to the country's GDP were services (74.7%), industry (22.9%), and agriculture (2.4%) (World Trade Organization, 2011).

In 2010, Portugal's exports amounted to \$45.5 billion compared with a revised \$44.7 billion in 2009 and included such products as machinery and tools (16.2%), crude oil products (9.8%), base metals (7.7%), minerals and mineral products (5.7%), chemical products (4.8%), and others (55.8%). Portugal's leading export partners were Spain (26.7%), Germany (13.1%), France (12.3%), Angola (7.2%), the United Kingdom (5.6%), Italy (3.8%), the United States (3.2%), and others (28.1%). The main export destination was the European Union (EU), whose 27 members received 74.2% of Portugal's exports. Portugal's imports amounted to \$68.8 billion compared with \$69.8 billion in 2009, and included such products as machinery and tools (19.1%), crude oil products (16.7%), oil products (12.7%), chemical products (10.3%), base metals (7.7%), minerals and mineral products (1.6%), and others (31.9%). Portugal's leading suppliers were Spain (32.4%), Germany (12.7%), France (8.7%), Italy (5.7%), the United Kingdom (5.4%), the Netherlands (3.3%), the United States (1.6%), and others (30.2%). The main import origination point was the EU, whose 27 members supplied 78% Portugal's imports (Federation of International Trade Associations, The, 2011; U.S. Central Intelligence Agency, 2011; U.S. Department of State, 2011; World Trade Organization, 2011).

Portugal's foreign direct investment (FDI) inflow was \$47 billion in 2010. This investment went mainly to commerce (36%), petroleum processing (23%), the financial sector (14%), transportation (10%), and others (17%). In 2010, unemployment increased to 10.8% from 9.5% in 2009 (U.S. Central Intelligence Agency, 2011; U.S. Department of State, 2011).

Minerals in the National Economy

Portugal remained one of the EU's leading copper, silver, tungsten, and zinc producers and a significant European producer of other metals, as well as of industrial minerals and mineral fuels. The Portuguese mineral sector was controlled by the Instituto Geologico e Mineiro. The Iberian Pyrite Belt (IPB) in south-central Portugal is an area known to host numerous

and very large base-metal deposits. The Aljustrel complex, which is located in the IPB, hosts five known volcanogenic massive sulfide (VMS) deposits; these types of deposits are an important source of copper and zinc. The mine was placed on care-and-maintenance status in 2008. The final feasibility study for Aljustrel estimated total reserves to be 13.8 million metric tons (Mt) at average grades of 5.5% zinc, 1.8% lead, and 63 grams per metric ton (g/t) silver (Direcção Geral de Energia e Geologia, 2011; MBendi Information Services (Pty) Ltd., 2011a, b, d).

Portugal's most valuable metallic mineral resources were copper, silver, tin, tungsten, and zinc. The most valuable resources of industrial minerals were high-quality lithium, marble, pyrites, and rock salt. The country had limited energy resources and depended upon imports for the bulk of its energy needs (Direcção Geral de Energia e Geologia, 2011; MBendi Information Services (Pty) Ltd., 2011a, d; U.S. Energy Information Administration, 2011).

Portugal's mining and mineral processing industries represented about 1% of the GDP in 2010. The mineral sector employed about 31,400, or 0.6% of the labor force total of 5.6 million. As a target for FDI, Portugal was overshadowed by lower cost producers in Asia and Central Europe (Instituto Nacional de Estatística, 2011; U.S. Central Intelligence Agency, 2011).

Production

Portugal's industrial minerals sector was a producer of a variety of materials; the dimension stone and rock salt sectors continued to be particularly important segments of the mineral industry in terms of value and trade. Portugal was one of the leading producers of mined copper, silver, tin, tungsten, and zinc concentrates in the EU and a significant producer of barite and talc (table 1; Direcção Geral de Energia e Geologia, 2011).

Structure of the Mineral Industry

Lundin Mining Corp. of Canada's operations in Portugal included the Lombador copper-zinc project and the Neves-Corvo copper-zinc mine. The company had begun feasibility studies for the development of the Lombador base-metals mine and the expansion of the Neves-Corvo zinc mine, and expanded mining operations at both mines were expected to begin by 2012. Lundin Mining was also set to conduct greenfield exploration for base and precious metals near the Neves-Corvo Mine. Sojitz Beralt Tin & Wolfram (Portugal) S.A. mined tungsten at its Panasqueira Mine, which is located in Beira Baixa Province in the east-central region of Portugal (Lundin Mining Corp., 2011a; 2011b, p. 1-2; MBendi Information Services (Pty) Ltd., 2011d).

Lusosider Aços Planos S.A. and SN Servicos S.A. were Portugal's leading steel producers. Cimentos de Portugal, SGPS, S.A. (CIMPOR) was a regionally significant producer

of cement. With the exception of copper, dimension stone, and tungsten, production of other minerals and related materials had only domestic significance. Some of the leading mineral-related companies were partially owned or controlled by the Government, and some operations were privately owned. In 2010, Portugal had only two metallic mines in operation—the Neves-Corvo copper mine and the Panasqueira tungsten mine (table 2; Cimentos de Portugal, SGPS, S.A., 2011a, b; Lundin Mining Corp., 2011a; MBendi Information Services (Pty) Ltd., 2011a).

Commodity Review

Metals

Copper and Zinc.—Production from the Neves-Corvo Mine was 74,426 metric tons (t) of copper concentrate in 2010 compared with 86,500 t in 2009, which was a decrease of almost 14%. Neves-Corvo's current production capacity was about 2.2 million metric tons per year (Mt/yr) of ore and 100,000 metric tons per year (t/yr) of copper concentrate. Neves-Corvo produced 6,421 t of zinc in 2010 compared with 501 t in 2009 (table 1; Direcção Geral de Energia e Geologia, 2011). According to the mine's owner, Lundin Mining, as of early 2011, Neves-Corvo's copper-rich ores amounted to 23.3 Mt grading 3.6% copper, 1.0% zinc, 0.3% lead, and 43 g/t silver, and the mine's zinc-rich ores amounted to 42.6 Mt grading 6.9% zinc, 1.7% lead, 0.4% copper, and 62 g/t silver (Instituto Nacional de Estatística, 2011; Lundin Mining Corp., 2011b, p. 1; MBendi Information Services (Pty) Ltd., 2011a).

Tungsten.—Production from the Panasqueira tungsten mine was 799 t in concentrate (W content) in 2010 compared with 823 t in 2009, which was a decrease of almost 3%. The Panasqueira Mine was operated by Sojitz and continued to be one of the EU's leading producers of tungsten concentrates with a capacity to produce 1,400 t/yr of tungsten oxide (WO₃) concentrate. According to Sojitz, the mine had proven and probable reserves of 1.4 Mt at a grade of 0.233% WO₃, additional indicated resources of 3.3 Mt at a grade of 0.263% WO₃, and inferred resources of 1.6 Mt at a grade of 0.224% WO₃. The main end-use application for tungsten was in the manufacture of cemented carbides (60%), steel and alloys (21%), electrical and electronics products (11%), and catalysts and pigments (8%) (Direcção Geral de Energia e Geologia, 2011; MBendi Information Services (Pty) Ltd., 2011d).

Industrial Minerals

Cement.—Portugal produced 7.2 Mt of cement in 2010 compared with almost 6.9 Mt in 2009. CIMPOR continued to be Portugal's leading cement producer and the second ranked cement producer on the Iberian Peninsula after Cemex España S.A. In addition to cement, CIMPOR also produced aggregates, dry mortars, and precast concrete products. In line with the world economy, 2010 was a year of transition for Portugal's cement industry after the recession of 2009. Domestic cement consumption decreased by 5.6 Mt in 2010 from 6.1 Mt in 2009, or by about 7%. The development of Portugal's infrastructure

was expected to increase demand for CIMPOR's products in the foreseeable future, in spite of the financial crisis (Cimentos de Portugal, SGPS, S.A., 2011a-c).

Salt.—Rock salt was the most valuable of the industrial minerals produced in Portugal. The production of rock salt totaled 618,961 t in 2010 compared with a revised 594,578 t in 2009 (Direcção Geral de Energia e Geologia, 2011).

Mineral Fuels and Other Sources of Energy

Petroleum, Natural Gas, and Coal.—In 2010, Portugal continued to rely on imported energy resources, such as petroleum (75%), natural gas (10%), and coal (5%) for electricity generation. The country's leading domestic energy resource was hydropower, which is an unreliable source of power because it depends on rainfall. Portugal had two crude oil refineries, which were located in the coastal cities of Porto and Sines. Argus Resources Ltd. of the United Kingdom built the petroleum refinery located 90 kilometers south of Lisbon at Sines; the refinery had a production capacity of 250,000 barrels per day (bbl/d) and cost about \$5 billion to build. Government-owned Petróleos de Portugal (Petrogal) operated both refineries, which had a combined capacity of 304,200 bbl/d. The Government was planning to invest about \$2 billion to upgrade the country's refining processes during 2011-12. The political and legal issues surrounding the EU-Russia energy relationship continued to be under review, owing to the 2009 disruption of gas supply to the EU by way of Ukraine, which raised questions concerning the reliability of the energy supply from Russia. Production data for mineral fuels and refined products are shown in table 1 (MBendi Information Services (Pty) Ltd., 2011c; U.S. Energy Information Administration, 2011).

Renewable Energy.—Owing to Portugal's heavy dependence on imported energy, the country was emphasizing solar, wave, and wind power investment. The Government was planning to invest about \$11 billion in renewable energy projects by 2012, of which \$2.5 billion would be for building the infrastructure for wind power. In 2010, the wind power production capacity in Portugal increased to 3,898 megawatts (MW) from 3,535 MW in 2009. The leading European countries with wind power installations were Germany (27,214 MW), Spain (20,676 MW), Italy (5,797 MW), France (5,660 MW), the United Kingdom (5,204 MW), Portugal (3,898 MW), Sweden (2,163 MW), and Ireland (1,428 MW) (BP p.l.c., 2011, p. 41; European Wind Energy Association, 2011, p. 5–6).

Outlook

Portugal is the EU's leading producer of copper, lithium, rock salt, silver, tungsten, and zinc. Feasibility studies for potential gold and other base-metal projects were under way in the Portuguese zone of the IPB, which continued to be a prime target for exploration. The IPB appears to have good potential for additional mineral deposits on the basis of the large VMS deposits developed in the past. Owing in part to the debt crisis in the eurozone, the Portuguese Government is considering increasing investments in energy alternative sources, such as

hydropower, solar, wave, wind, and other renewable energy sources to make the country less dependent on imported energy. The Government is also considering improvements in efficiency and performance of energy alternative sources by way of improved technical and operating efficiencies; maintaining a solid financial position to support the country's rating and to keep appropriate levels of leverage among the EU countries (Alexander's Gas & Oil Connections, 2011; MBendi Information Services (Pty) Ltd., 2011d).

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TABLE 1
PORTUGAL: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity	2006	2007	2008	2009	2010 ^P
METALS					
Aluminum, secondary ^c	18	18	18	18	18
thousand metric tons					
Arsenic, white ^c	15	15	15	15	15
Beryl, concentrate, gross weight ^c	5	5	5	5	5
Copper, mine output, Cu content	78,660	90,247	89,504 ^r	86,500	74,426 ²
Iron and steel:					
Iron ore and concentrate, manganiferous: ^c					
Gross weight	14,000	14,000	14,000	14,000	14,000
Fe content	10,000	10,000	10,000	10,000	10,000
Metal: ^c					
Pig iron	100	100	100	100	100
thousand metric tons					
Steel:					
Crude	1,400	1,400	1,400	1,400	1,400
do.					
Hot rolled	800	800	800	800	800
do.					
Lead, refined, secondary ^c	3,000	3,000	3,000	3,000	3,000
Manganese, Mn content of iron ore ^c	300	300	300	300	300
Silver, mine output, Ag content	20,076	24,167	28,800 ^r	22,450 ²	23,710 ²
kilograms					
Tin, mine output, Sn content	25	41	29	34 ²	22 ²
Tungsten mine output, W content	984	846	982 ^r	823 ²	799 ²
Zinc:					
Mine output, Zn content	7,505	24,380	39,224 ^r	501 ²	6,421 ²
Metal, primary ^c	--	--	--	--	--
INDUSTRIAL MINERALS					
Barite	24	25	171 ^r	1,078 ²	15 ²
Calcium carbonate ^c	100,000	100,000	100,000	100,000	100,000
Cement, hydraulic	8,340	12,631	6,650	6,900 ³	7,200 ³
thousand metric tons					
Clays:					
Kaolin ⁴	167,792	183,598	231,346 ^r	274,925 ^r	284,715 ²
Refractory	307,512	320,253	NA	NA	NA
Feldspar	257,570	168,606	157,539 ^r	151,976 ^r	113,327 ²
Gypsum and anhydrite	366,590	418,035	372,731 ^r	335,189 ^r	NA ²
Lime, hydrated and quicklime ^c	200,000	200,000	200,000	200,000	200,000
Lithium minerals, lepidolite	28,497	34,755	34,888 ^r	37,359 ^r	40,609 ²
Nitrogen, N content of ammonia ^c	244,000	244,000	244,000	244,000	244,000
Pyrite and pyrrhotite, including cuprous, gross weight ^c	8,000	8,000	8,000	8,000	8,000
Salt, rock	586,190	590,588	606,545 ^r	594,578 ^r	618,961 ²
Sand	8,757	9,849	NA	9,585 ^r	NA ²
thousand metric tons					
Sodium compounds, n.e.s.: ^{e,5}					
Soda ash	150,000	150,000	150,000	150,000	150,000
Sulfate	50,000	50,000	50,000	50,000	50,000
Stone:					
Basalt	384,138	398,767	NA	326,730 ^r	NA ²
Calcareous:					
Dolomite	1,136	1,035	NA	144 ^r	NA ²
thousand metric tons					
Limestone, marl, calcite	48,015	48,955	NA	43,277 ^r	NA ²
do.					
Marble	837	741	578 ^r	572 ^r	NA ²
do.					
Gabbro ^c	100	100	100	100	100
do.					
Granite:					
Crushed	26,779	NA	NA	NA	NA
do.					
Ornamental	710	1,020	877 ^r	934 ^r	NA ²
do.					
Graywacke	253	189	NA	NA	NA
do.					
Ophite	43	42	NA	NA	NA
do.					
Quartz	5	7	9 ^r	35 ^r	31 ²
do.					
Quartzite	197	78	NA	NA	NA
do.					

See footnotes at end of table.

TABLE 1—Continued
 PORTUGAL: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity	2006	2007	2008	2009	2010 ^p	
INDUSTRIAL MINERALS—Continued						
Stone—Continued:						
Schist	thousand metric tons	156	820	NA	679 ^r	NA ²
Slate	do.	35	38	38 ^r	20 ^r	NA ²
Syenite	do.	159	131	NA	NA	NA
Sulfur, byproduct, all sources ^c		25,000	25,000	25,000	25,000	25,000
Talc		5,517	12,367	11,220 ^r	11,567	11,951 ²
MINERAL FUELS AND RELATED MATERIALS						
Coke, metallurgical ^c	thousand metric tons	300	300	300	300	300
Gas, manufactured ^c	thousand cubic meters	125	125	125	125	125
Petroleum production ⁶	thousand 42-gallon barrels	1,822	2,321	2,730	1,728	1,723
Petroleum refinery products: ^e						
Liquefied petroleum gas	thousand 42-gallon barrels	4,616	4,176	4,444	4,450	4,450
Gasoline	do.	23,036	21,683	17,805	18,000	18,000
Kerosene and jet fuel	do.	--	6,516	6,508	6,500	6,500
Distillate fuel oil	do.	37,710	35,396	34,846	35,000	35,000
Residual fuel oil	do.	22,234	19,834	19,099	19,000	19,000
Unspecified	do.	15,599	15,323	15,709	16,000	16,000
Refinery fuel and losses	do.	3,800	3,800	3,800	3,800	3,800
Total	do.	106,995	106,728	102,211	102,750	102,750

^cEstimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. ^pPreliminary. ^rRevised. do. Ditto.

NA Not available. -- Zero.

¹Table includes data available through July 31, 2011.

²Reported figure.

³Reported by Cimentos de Portugal, SGPS, S.A. (CIMPOR).

⁴Includes washed and unwashed kaolin.

⁵Not elsewhere specified.

⁶Reported figure. Source: U.S. Energy Information Administration 2006–10.

Source: USGS Minerals Questionnaires, Portugal, 2007–8 and 2009–10.

TABLE 2
PORTUGAL: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(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.)	Mine and plant at Fatima	100
Cement		Cimentos de Portugal, SGPS, S.A. (CIMPOR) (Government, 100%)	Plants (3) at Alhandra, Loule, and Souselas	12,000
Copper, concentrate		Lundin Mining Corp.	Neves Corvo Mine near Castro Verde	100
Do.		do.	Aljustrel Mine near Castro Verde	20
Diatomite		Sociedade Anglo-Portuguesa de Diatomite Lda.	Mines at Obidos and Rolica	150
Feldspar		A.J. da Fonseca Lda.	Seixigal Quarry, Chaves	10
Ferroalloys		Electrometalúrgia S.A.R.L.	Plant at Setubal	100
Kaolin		Saibrais Arelas e Caulinos S.A. (Denain Anzin Mineraux S.A.)	Mines at Casal dos Braçais and Mosteiros	175
Petroleum, refined	42-gallon barrels per day	Petróleos de Portugal (Petrogal) (Government, 100%)	Refineries at Porto and Sines	305,000
Do.	do.	Argus Resources Ltd. (private, 100%)	Refinery at Sines	250,000
Pyrite		Pirites Alentejanas S.A. (EuroZinc Mining Corp.)	Mine at Aljustrel, plant at Setubal	100
Steel, crude		SN Servicos S.A. (Metalúrgica Galaica S.A., 100%)	Steelworks at Maia and Seixal	600
Do.		Lusosider Aços Planos S.A. (Corus Group, 50%, and Sollac S.A., 50%)	Rolling mill at Seixal	800
Tin		Primary Metals Corp.	Neves Corvo Mine near Castro Verde	15
Tungsten, concentrate	metric tons	Beralt Tin & Wolfram (Portugal) SARL	Panasqueira Mine and plant at Barroca	1,400
Uranium	do.	Empresa Nacional de Urânio S.A. (Government, 100%)	Mines at Guargia, plant at Urgeirica	150
Zinc, concentrate	do.	Lundin Mining Corp.	Neves Corvo Mine near Castro Verde	25,000
Do.	do.	do.	Aljustrel Mine near Castro Verde	20
Zinc, refined	do.	RMC Quimigal S.A.R.L.	Electrolytic plant at Barreiro	12
Do., do.	Ditto.			