



# 2007 Minerals Yearbook

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PORTUGAL

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# THE MINERAL INDUSTRY OF PORTUGAL

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In 2007, Portugal was a significant European mineral producer and one of Europe's leading copper producers. It was also a significant world producer of lithium (seventh after Chile, Australia, China, Argentina, Russia, and Canada), tin (tenth after China, Indonesia, Peru, Bolivia, Brazil, Russia, Vietnam, Malaysia, and Australia) and tungsten (fifth after China, Russia, Canada, Australia, and Bolivia) (Carlin, 2008; MBendi Information Services (Pty) Ltd., 2008b; Ober, 2008; Shedd, 2008).

Portugal's Iberian Pyrite Belt (IPB) zone has several base- and precious-metal projects, which are undergoing feasibility studies. All Portuguese mineral activities are controlled by the Instituto Geológico e Mineiro (IGM). The IPB, which has 85 identified mineral deposits, was an important source of base metals in the European Union (EU) (MBendi Information Services (Pty) Ltd., 2008b).

## Minerals in the National Economy

Portugal has significant mineral wealth. The most important metallic mineral resources are copper, silver, tin, tungsten, and uranium. The most important resources of industrial minerals are high-quality marble, pyrites, and rock salt. The country has limited energy resources and depended upon imports for the bulk of its energy needs (Direcção Geral de Energia e Geologia, 2008; MBendi Information Services (Pty) Ltd., 2008b, c; U.S. Energy Information Administration, 2008).

The Government continued with the country's privatization program by proceeding with legislation that would privatize many state-owned companies. Privatization was helping the country regain confidence in the Government's macroeconomic management and creating conditions that would lead to lower inflation and interest rates. The mining and mineral processing industries represented about 1% of the gross domestic product (GDP) in 2007. The mineral sector employed about 32,000, or 1% of the industrial sector's total of 3.2 million. As a target for foreign direct investment, Portugal has been overshadowed by lower-cost producers in Central Europe and Asia (Instituto Nacional de Estatística, 2008; U.S. Central Intelligence Agency, 2008).

## Production

Portugal's industrial minerals sector was a modern and efficient producer of a variety of materials, most notably dimension stone and minerals for the manufacture of ceramics. The dimension stone industry continued to be an important segment of the mining industry in terms of value and trade. The country was one of the leading producers of mined copper and silver in the EU and an important producer of feldspar, salt rock, talc, and tungsten concentrates (table 1).

## Structure of the Mineral Industry

In early 2007, the Canadian corporations Eurozinc Mining Corp. and Lundin Mining Corp. merged, and the new company, Lundin Mining Corp. (LMC). In Portugal, LMC acquired the Neves Corvo copper-zinc mine, the Aljustrel zinc-lead-silver mine, and the Lombador zinc project. The Aljustrel Mine entered into production on December 16, 2007. The Lombador zinc project's feasibility study was scheduled to start in 2008, and mining operations were expected to start by 2011-12. LMC was set to conduct greenfields exploration for base and precious metals near the Neves Corvo Mine (NCM), as well. Beralt Tin & Wolfram (Portugal) SARL (Beralt) mined tungsten at its Panasqueira Mine, which is located in central Portugal (Lundin Mining Corp., 2008a, b; MBendi Information Services (Pty) Ltd., 2008c, e; Resource Investor Company, 2008).

Lusosider Aços Planos S.A. and SN Servicos S.A. were the major steel producers. Cimentos de Portugal, SGPS, S.A. (Cimpor) was an important producer of cement. With the exception of copper, dimension stone, and tungsten, production of 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 (table 2).

## Commodity Review

### Metals

**Copper and Zinc.**—Production from the NCM was 90,247 metric tons (t) in concentrate in 2007 compared with 78,660 t in 2006, which was an increase of almost 15%. The country's copper output was valued at \$405 million, which was 5.1% higher than that of 2006; the increase in value was a result of the increase in the price of copper to \$2.91 per pound in 2007 from \$2.77 per pound in 2006. NCM's current production capacity was about 2.2 million metric tons per year (Mt/yr) of mine ore output and 90,200 metric tons per year (t/yr) of copper concentrate. In 2007, zinc production supplanted tin production, as there were insufficient tin reserves remaining in the deposit to support full-time production. NCM produced 24,380 t of zinc in 2007 compared with 7,505 t in 2006 as a result of the full implementation of productivity improvement systems at the mine (table 1). The mine had estimated proven copper reserves of 6,835 million metric tons (Mt) at an average grade of 5.73%, estimated probable copper reserves of 9,975 Mt at an average grade of 5.29%, and estimated probable zinc reserves of 10,626 Mt at an average grade of 7.96% (Instituto Nacional de Estatística, 2008; Lundin Mining Corp., 2008a, c, d; MBendi Information Services (Pty) Ltd., 2008b; Resource Investor Co., 2008).

**Tungsten.**—Production from the Panasqueira tungsten mine in Beira Baixa Province of central Portugal was 1,067 t in concentrate (W content) in 2007 compared with 984 t in 2006, which was an increase of 8.4%. The Panasqueira Mine was operated by Beralt 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 (WO<sub>3</sub>) concentrate. According to Beralt, the mine has proven and probable reserves of 1.4 Mt at a grade of 0.233% WO<sub>3</sub> and additional indicated (3.3 Mt at a grade of 0.263% WO<sub>3</sub>) and inferred (1.6 Mt at a grade of 0.224% WO<sub>3</sub>) resources. Beralt announced that development of the mine was proceeding smoothly owing to the introduction of new underground equipment and that a refurbishment program was also underway. The main end-use application for tungsten was in the manufacture of cemented carbides (60%), steel and alloy (21%), electrical and electronics products (11%), and catalysts and pigments (8%) (table 1; MBendi Information Services (Pty) Ltd., 2008c, e).

### *Industrial Minerals*

**Cement.**—Portugal produced 12.6 Mt of cement in 2007 compared with 8.3 Mt in 2006, which was an increase of almost 52%. Cimpor was Portugal's leading cement producer and was the second ranked cement company on the Iberian Peninsula after Cemex España S.A. In addition to cement, Cimpor also produced aggregates, precast concrete products, and dry mortars. The development of Portugal's infrastructure was expected to create a substantial demand for Cimpor's products in the coming years (Cemex España S.A., 2008; Cimentos de Portugal, SGPS, S.A., 2008).

**Stone, Dimension.**—Marble was the most valuable of the stone products and accounted for the majority of stone production. The main area for marble quarrying continued to be the Evora District (Cimentos de Portugal, SGPS, S.A., 2008).

### *Mineral Fuels*

**Petroleum, Natural Gas, and Coal.**—Portugal had limited domestic energy resources and imported about 90% of its energy requirements, of which about 70% was petroleum; 10%, natural gas; and 5%, coal for electricity generation. The country's leading domestic energy resource was unreliable hydropower, which depended on at least short periods of rainfall. Portugal had two oil refineries that were operated by Petróleos de Portugal (Petrogal). They were located in the Porto and the Sines terminals, and had a combined capacity of 305,000 barrels per day (bbl/d). The Government of Portugal was planning to invest \$1.8 billion to upgrade the country's refining processes by 2010. Owing to Portugal's heavy dependence on imported energy, the country is emphasizing solar, wave, and wind power investment. The Government was planning to invest \$10.8 billion in renewable energy projects by 2012, of which infrastructure for wind power would cost about \$2.3 billion. The Government signed an agreement with Argus Resources of the United Kingdom to build a petroleum refinery that would be the largest, in terms of production, on the Iberian Peninsula. The project would be built 90 kilometers south of Lisbon at Sines.

The refinery, which was to be completed by 2010, was expected to cost \$4.7 billion and would have a production capacity of 250,000 bbl/d (Alexander's Gas & Oil Connections, 2008; MBendi Information Services (Pty) Ltd., 2008a, d).

### **Outlook**

Portugal is Europe's leading producer of copper, tin, and tungsten. Some gold and base-metal projects were undergoing feasibility studies in the Portuguese zone of the IPB, which continued to be of interest to mining companies as a prime target for exploration. The IPB appears to have good potential for success on the basis of the large volcanogenic massive sulfide deposits discovered in the zone. Increased production of granite, marble, and slate in Portugal is also possible. Owing to its dependence on imported energy, the Portuguese Government plans to increase its investments in hydropower, solar power, wave power, and wind power (MBendi Information Services (Pty) Ltd., 2008c).

### **References Cited**

- Alexander's Gas & Oil Connections, 2008, Portugal plans EUR 8.1 bn investment in renewable energy by 2012: Alexander's Gas & Oil Connections. (Accessed January 15, 2009, at <http://www.gasandoil.com/goc/news/nfe71728.htm>.)
- Carlin, J.F., Jr., 2008, Tin: U.S. Geological Survey Mineral Commodity Summaries 2008, p. 176-177.
- Cemex España S.A., 2008, Cemento—España: Cemex España S.A. (Accessed January 13, 2009, at [http://www.cemex.es/ce/ce\\_lp.html](http://www.cemex.es/ce/ce_lp.html).)
- Cimentos de Portugal, SGPS, S.A., 2008, CIMPOR—Cimentos de Portugal: Cimentos de Portugal, SGPS, S.A. (Accessed January 13, 2009, at <http://www.cimpor.com/>.)
- Direcção Geral de Energia e Geologia, 2008, Divisão para a Pesquisa e Exploração de Petróleo: Direcção Geral de Energia e Geologia. (Accessed December 22, 2008, at [http://www.dgge/intro\\_en.htm](http://www.dgge/intro_en.htm).)
- Instituto Nacional de Estatística, 2008, Statistics Portugal: Instituto Nacional de Estatística. (Accessed December 23, 2008, at [http://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine\\_indicadores&indOcorrCod=0000](http://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_indicadores&indOcorrCod=0000).)
- Lundin Mining Corp., 2008a, Aljustrel zinc-lead-silver mine—Portugal: Lundin Mining Corp. (Accessed January 13, 2009, at <http://www.lundinmining.com/s/Aljustrel.asp>.)
- Lundin Mining Corp., 2008b, Neves-Corvo copper-zinc mine—Portugal: Lundin Mining Corp. (Accessed January 13, 2009, at <http://www.lundinmining.com/s/Neves-Corvo.asp>.)
- Lundin Mining Corp., 2008c, Quarterly operations update—Aljustrel zinc-lead-silver mine—Portugal: Lundin Mining Corp. (Accessed January 13, 2009, at <http://www.lundinmining.com/s/QOU.asp?ReportID=289882>.)
- Lundin Mining Corp., 2008d, Quarterly operations update—Neves-Corvo copper-zinc mine—Portugal: Lundin Mining Corp. (Accessed January 13, 2009, at <http://www.lundinmining.com/s/QOU.asp?ReportID=289873>.)
- MBendi Information Services (Pty) Ltd., 2008a, Portugal—Mining—Coal mining: MBendi Information Services (Pty) Ltd. (Accessed December 22, 2008, at <http://www.mbendi.com/indy/ing/coal/eu/po/p0005.htm>.)
- MBendi Information Services (Pty) Ltd., 2008b, Portugal—Mining—Copper mining: MBendi Information Services (Pty) Ltd., December. (Accessed December 22, 2008, at <http://www.mbendi.com/indy/ing/cppt/eu/po/p0005.htm>.)
- MBendi Information Services (Pty) Ltd., 2008c, Portugal—Mining—Overview: MBendi Information Services (Pty) Ltd., December. (Accessed December 22, 2008, at <http://www.mbendi.com/indy/ing/eu/po/p0005.htm>.)
- MBendi Information Services (Pty) Ltd., 2008d, Portugal—Oil and gas—Exploration & production: MBendi Information Services (Pty) Ltd. (Accessed December 22, 2008, at <http://www.mbendi.com/indy/oilg/eu/po/p0005.htm>.)

MBendi Information Services (Pty) Ltd., 2008e, Portugal—Panasqueira—Tungsten: MBendi Information Services (Pty) Ltd., December. (Accessed December 22, 2008, at <http://www.mbendi.com/facility/f15e.htm>.)

Ober, J.A., 2008, Lithium: U.S. Geological Survey Mineral Commodity Summaries 2008, p. 98-99.

Resource Investor Co., 2008, Lundin's higher zinc reserve estimates at Neves-Corvo Mine: Resource Investor Co. (Accessed April 25, 2008, at <http://www.resourceinvestor.com/pebble.asp?relid=41539>.)

Shedd, K.B., 2008, Tungsten: U.S. Geological Survey Mineral Commodity Summaries 2008, p. 182-183.

U.S. Central Intelligence Agency, 2008, Portugal, *in* The world factbook: U.S. Central Intelligence Agency. (Accessed December 23, 2008, at <https://www.cia.gov/library/publications/the-world-factbook/geos/po.html>.)

U.S. Energy Information Administration, 2008, Iberian Peninsula: U.S. Energy Information Administration country analysis brief. (Accessed December 23, 2008, at [http://www.eia.doe.gov/emeu/cabs/Iberian\\_Peninsula/Full.html](http://www.eia.doe.gov/emeu/cabs/Iberian_Peninsula/Full.html).)

TABLE 1  
PORTUGAL: PRODUCTION OF MINERAL COMMODITIES<sup>1</sup>

(Metric tons unless otherwise specified)

Commodity	2003	2004	2005	2006	2007 <sup>e</sup>
METALS					
Aluminum, secondary <sup>c</sup> thousand metric tons	18	16	18	18	18
Arsenic, white <sup>c</sup>	25	15	15	15	15
Beryl, concentrate, gross weight <sup>c</sup>	5	5	5	5	5
Copper, mine output, Cu content	77,581	95,743	89,541	78,660	90,247 <sup>2</sup>
Iron and steel:					
Iron ore and concentrate, manganiferous. <sup>e</sup>					
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:					
Pig iron <sup>c</sup> thousand metric tons	100	100	100	100	100
Steel:					
Crude do.	730	730	1,400	1,400 <sup>e</sup>	1,400
Hot rolled <sup>c</sup> do.	1,000	1,000	800	800	800
Lead, refined, secondary <sup>c</sup>	4,000	4,000	3,000	3,000	3,000
Manganese, Mn content of iron ore <sup>c</sup>	300	300	300	300	300
Silver, mine output, Ag content kilograms	21,800	24,400	23,786	20,076	24,167 <sup>2</sup>
Tin, mine output, Sn content	218	220	243	25	41 <sup>2</sup>
Tungsten mine output, W content	715	746	816	984 <sup>r</sup>	1,067 <sup>2</sup>
Zinc:					
Mine output, Zn content	NA	NA	NA	7,505	24,380 <sup>2</sup>
Metal, primary <sup>c</sup>	3,000	3,000	2,000	-- <sup>r</sup>	--
INDUSTRIAL MINERALS					
Barite	NA	NA	21	24	25 <sup>2</sup>
Calcium carbonate <sup>c</sup>	100,000	100,000	100,000	100,000	100,000
Cement, hydraulic thousand metric tons	8,567	8,843	8,438 <sup>r</sup>	8,340 <sup>r</sup>	12,631 <sup>2</sup>
Clays:					
Kaolin <sup>3</sup>	150,000	152,077	164,072	167,792 <sup>r</sup>	NA
Refractory	625,000	504,017	395,820	307,512 <sup>r</sup>	NA
Diatomite	300	--	--	--	-- <sup>2</sup>
Feldspar	126,116	98,262	133,344	257,570 <sup>r</sup>	371,952 <sup>2</sup>
Gypsum and anhydrite	419,799	461,212	389,180 <sup>r</sup>	366,590 <sup>r</sup>	NA
Lime, hydrated and quicklime <sup>c</sup>	200,000	200,000	200,000	200,000	200,000
Lithium minerals, lepidolite	24,606	28,696	26,185	28,497	34,755 <sup>2</sup>
Nitrogen, N content of ammonia	244,700	243,900	244,000	244,000	244,000
Pyrite and pyrrhotite, including cuprous, gross weight <sup>c</sup>	10,000	10,000	8,000	8,000	8,000
Salt, rock	602,035	661,704	597,945	586,190	590,588 <sup>2</sup>
Sand <sup>c</sup> thousand metric tons	10,000	10,000	7,336 <sup>2</sup>	8,757 <sup>2</sup>	NA
Sodium compounds, n.e.s.: <sup>c,4</sup>					
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	403,233	456,300	464,236	384,138 <sup>r</sup>	NA
Calcareous:					
Dolomite thousand metric tons	1,932	1,900 <sup>e</sup>	1,021	1,136 <sup>r</sup>	NA
Limestone, marl, calcite do.	48,780	51,355	51,025	48,015 <sup>r</sup>	NA
Marble do.	705	749	752	837 <sup>r</sup>	NA
Gabbro <sup>c</sup> do.	100	100	100	100	100
Granite:					
Crushed do.	30,000	29,665 <sup>r</sup>	30,000 <sup>e</sup>	26,779 <sup>r</sup>	NA
Ornamental do.	540	646 <sup>r</sup>	659	NA	NA
Graywacke do.	806	428	344 <sup>r</sup>	253 <sup>r</sup>	NA
Ophite do.	52	52	51	43 <sup>r</sup>	NA
Quartz <sup>c</sup> do.	16	5 <sup>2</sup>	5	5	5
Quartzite do.	414	301	256	197 <sup>r</sup>	NA

See footnotes at end of table.

TABLE 1—Continued  
 PORTUGAL: PRODUCTION OF MINERAL COMMODITIES<sup>1</sup>

(Metric tons unless otherwise specified)

Commodity	2003	2004	2005	2006	2007 <sup>c</sup>	
<b>INDUSTRIAL MINERALS—Continued</b>						
<b>Stone—Continued:</b>						
Schist	thousand metric tons	173	259	208	156 <sup>r</sup>	NA
Slate <sup>e</sup>	do.	38	36 <sup>2</sup>	33	NA	NA
Syenite	do.	160	116	109	159 <sup>r</sup>	NA
Sulfur, byproduct, all sources <sup>e</sup>		27,000	25,000	25,000	25,000	25,000
Talc		5,459	6,231	5,362	5,517	12,367 <sup>2</sup>
<b>MINERAL FUELS AND RELATED MATERIALS</b>						
Coke, metallurgical <sup>e</sup>	thousand metric tons	300	300	300	300	300
Gas, manufactured <sup>e</sup>	thousand cubic meters	125	125	125	125	125
<b>Petroleum refinery products:<sup>e</sup></b>						
Liquefied petroleum gas	thousand 42-gallon barrels	4,489 <sup>2</sup>	3,200	3,200	3,200	3,200
Gasoline	do.	23,469 <sup>2</sup>	20,000	20,000	20,000	20,000
Kerosene and jet fuel	do.	5,694 <sup>2</sup>	6,500	6,500	6,500	6,500
Distillate fuel oil	do.	37,084 <sup>2</sup>	30,000	30,000	30,000	30,000
Residual fuel oil	do.	17,995 <sup>2</sup>	19,000	19,000	19,000	19,000
Unspecified	do.	16,535 <sup>2</sup>	16,000	16,000	16,000	16,000
Refinery fuel and losses	do.	6,716 <sup>2</sup>	3,800	3,800	3,800	3,800
Total	do.	111,982 <sup>2</sup>	98,500	98,500	98,500	98,500

<sup>e</sup>Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. <sup>r</sup>Revised. do. Ditto. NA Not available. -- Zero.

<sup>1</sup>Table includes data available through June 30, 2008.

<sup>2</sup>Reported figure.

<sup>3</sup>Includes washed and unwashed kaolin.

<sup>4</sup>Not elsewhere specified.

Source: U.S. Geological Survey Minerals Questionnaire, Portugal, 2006-07.

TABLE 2  
PORTUGAL: 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
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. (LMC)	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		Saibraís Arelas e Caulinos S.A. (Denain Anzin Mineraux S.A.)	Mines at Casal dos Bracais and Mosteiros	175
Petroleum, refined	42-gallon barrels per day	Petróleos de Portugal (Petrogal) (Government, 100%)	Refineries at Porto and Sines	305,000
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	Beral Tin & Wolfram (Portugal) SARL	Panasqueira Mine and plant at Barroca	1,400
Uranium	do.	Empresa Nacional de Uranio S.A. (Government, 100%)	Mines at Guargia, plant at Urgeirica	150
Zinc, concentrate	do.	Lundin Mining Corp. (LMC)	Neves Corvo Mine near Castro Verde	25,000
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.			