

## SPAIN

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**A**ccording to estimates by the Bank of Spain, the Spanish economy grew by 2% (to €664,000 million) during the year 2002. This was considerably lower than the growth achieved in 2001 although it was in line with European growth rates. The bank notes that consumer demand stabilised and investment in equipment improved although activity in the key construction sector moderated, with a marked slowdown towards the end of the year. There was some deterioration in the balance of payments, with higher imports and lower exports. The latter reflected in part the weakness of the European economy. Global political and economical uncertainty during the year also had an impact, restraining investment plans encouraging higher oil prices and contributing to the appreciation of the euro against the dollar.

### **Energy minerals**

Spain's hard-coal production decreased by 2.2% during 2002; lignite output was largely unchanged. Employment in the coal sector continued to decline and according to the annual report of the National Federation of Coal Mines Managers (Carbuni3n), which represents a workforce of some 13,500, the number employed has reduced by almost 50% over the past six years. Productivity has improved, however, with 1,112 t of coal equivalent produced per man in 2002, compared with 1,045 t in 2001. According to the report, productivity has increased by 41% since 1997, due mainly to the closure of the less productive operations. The most significant event in the coal sector in 2002 was undoubtedly the publication of the Sector Aid Regulation which identifies two types of financial assistance: aid to keep access to reserves and aid granted for definitive closure. (Table 1.)

Spain's oil production held above 30,000 t in 2002 and was derived entirely from Mediterranean offshore deposits. Similarly, natural gas production was maintained at a level in excess of 500 million m<sup>3</sup>, 90% being obtained from the Poseidon field in the Gulf of Cadiz. Uranium mining at Ciudad Rodrigo (Salamanca) has now terminated and only 54 t of U<sub>3</sub>O<sub>8</sub> was produced by heap-leaching tailings residues.

### **Metallic minerals**

The year 2002 has been the most troublesome period for Spanish metallic mining for some time, with a number of important operations in the Iberian Pyrite Belt of southwestern Spain having closed down. Resource depletion was one reason, eg, exhaustion of the gossan gold resources at Filon Sur (Cia Filon Sur) and at Rio Tinto (Minas de Rio Tinto), and exhaustion of polymetallic sulphide ore at Sotiel and Migollas (Navan Resources).

A second reason for mine closures was the failure of some operations to be profitable in light of weak metal prices, eg, Aguas Teñidas (Navan Resources) and Cerro Colorado (Minas de Rio Tinto).

In addition, there are few new projects, and although MK Gold's Las Cruces copper project has obtained the requisite environmental permits, the project is still waiting for definitive approval by the Industry Council of the regional government. Mine development will require an investment of some €420 million and will create 270 permanent jobs. Reserves total 16 Mt at an average grade of 5.94% Cu, and should yield in excess of 830,000 t of metal. It is envisaged that the ore will be processed by pressure leaching in autoclaves followed by solvent extraction electrowinning (SX/EW). Daily ore throughput would be 3,500 t and the planned copper recovery would be 89%. Annual production would amount to some 72,000 t of high-purity cathodes, and operating costs are expected to be as low as US\$0.33/lb. (Table 2.)

Fortunately, the crisis facing the mines in the Iberian Pyrite Belt has not affected the technological research into the treatment of zinc concentrates using ferric leaching. The objective is to leach an intermediate zinc concentrate, thereby substantially improving the flotation balance. The pilot plant has continued working without interruption, treating 3-5 kg/h, and adding the SX/EW sections for the zinc and copper, has achieved recoveries of 98% for zinc and 80% for copper. The project is financed by Junta de Andalucía (regional government) and the Instituto Geológico y Minero de España.

The year 2002 was the last full year of production for Asturiana de Zinc's Reocin mine. It mined 889,681 t of ore (324,749 t from underground and 564,932 t from open pit) with average grades of 0.85% Pb and 8.09% Zn. Beneficiation produced 8,346 t of lead flotation concentrates (73.4% Pb) and 115,533 t of zinc concentrates (60.5% Zn). Metal production was 6,126 t of lead and 69,897 t of zinc, representing recoveries of 80.3% and 96% respectively. In the final year.

Rio Narcea Gold Mines Ltd is Europe's largest gold producer and Spain's only gold mining company, and exploits deposits at El Valle and Carlés in Asturias in northern Spain. Last year it produced 5.5 t (177,225 oz) of gold at a cash operating cost of US\$145/oz, compared with 124,363 oz in 2001 at US\$185/oz. The improvement was achieved through higher-grade production from the rich Charnela zone (7.8 g/t Au) at El Valle, and higher metal recoveries in the concentration plant, up from 91.2% in 2001 to 94.4%. Mill throughput amounted to 753,000 t (649,000 t).

Rio Narcea continued with its preparations for underground development. This began in December at Carles with access being re-established to the two existing ramp systems, and at El Valle the construction of a 1.9 km access ramp and a ventilation system beneath the Boinas East pit are nearing completion.

The company is increasing its exploration budget this year to US\$7.4 million, of which US\$4.4 million will be for gold projects, primarily resource drilling at El Valle and Carles, and infilling drilling at the Corcoeste property where a 4,000 m drilling programme to define reserves in the Monica zone has begun.

The company has received a positive bankable feasibility study for its Aguablanca Ni-Cu-PGM deposit in southern Spain and mine construction is scheduled to start this year.

Spain's mercury producer Minas de Almaden suspended mining during 2002 but the metallurgical plant continued production, using stocks of mineral accumulated during prior years, and produced 726 t of metal. Environmental control in the plant was improved by the installation of a new desulphurisation system for the combustion gases.

### **Non-metallic minerals**

The production of non-metallic minerals, generally, showed modest growth. Foreign participation in the sector continues to grow. For example, Kemira Chemicals Oy, a TiO<sub>2</sub> pigments producer from Finland, acquired the calcium sulphate pigments manufacturer, Cargas Blancas, a subsidiary of the larger producer Yesos Ibéricos. Kemira Chemicals purchased the Besalu installations and mine in the northwest of Spain, where Cargas Blancas uses natural gypsum rather than synthetics for pigments manufacture because of the high purity of the ore that it quarries. Annual production capacity has risen to 100,000 t, and is destined mainly for fine paper manufacture. (Table 3.)

In other fields, the Swiss engineering enterprise Mezo AG has installed two salt-purification plants with a 100 t/h processing capacity using evaporation and crystallisation processes, each costing €5.5 million. One of them has been installed for Solvay Química SL in its Suria's operation and the other for Ercros Industrial SL which mines the saline diapir in Cardona. In the same evaporite basin, the only enterprise mining potassic salts, Iberpotash, has decided to renew an old extraction shaft (Cabanesses) rather than construct a new one. It is being re-equipped with the latest technology, and should permit output to be raised from 3,000 t to nearly 10,000 t/d. This year, these innovations should increase output still further. It will be necessary to employ an additional 136 contract workers and the total investment amounts to some €23 million.

Spanish industrial minerals producers are also spreading their wings. For example, Minerales y Productos Derivados SA (Minersa), the major European fluorspar producer, has acquired 30% of the Vergenoeg mine in South Africa controlled by the Meteorex group. The mine has a production capacity of 100,000 t/y of acid-grade fluorspar. Minersa will contribute its marketing and metallurgical expertise. An addition, an affiliate of the Minersa group, Sepiolsa, purchased a majority 51% interest in the Senegalese attapulgite producer, Senegal Mines, as a first step towards achieving 80% ownership. Another Spanish special-clays producer, Tolsa, has acquired an interest in SSPT, also a Senegalese attapulgite producer. A restructuring of Spain's quartz sector, involving most of the old, established producers, has resulted in one enterprise, Sibelco, controlling about 80% of national production. Most companies in the Spanish industrial minerals sector have obtained their certification of environmental quality, as quality exigency of industrial products. Talcs of Luzenac (Rio Tinto group) recently obtained their accreditation.

### **Exploration and development**

Rio Narcea Gold Mines Ltd is completing a definitive feasibility study of the Corcoeste gold deposit, located in the Malpica gold belt of Galicia in northwest Spain. Gold occurs in quartz veins within a suite of metamorphic rocks. Between 1998 and 2000, the company completed 16,000 m of trenching and 3,700 m of drilling in 58 holes. The previous owners completed 12,000 m of drilling in 69 holes. The results indicate five mineralised zones containing 192,000 oz of gold in 2.9 Mt of mineralised rock at an average grade of 1.54 g /t Au (measured and indicated reserves), plus a further 180,000 oz in the inferred resources category. The project estimates an annual production of 30,000 oz of gold with cash operating costs of around US\$179/oz. The project would employ a heap leaching process and the active carbon containing adsorbed gold would be transported to El Valle for elution and gold recovery. Pilot plant tests have yielded gold recoveries of 76%. The investment is estimated at €6 million, and Rio Narcea anticipates that environmental and operating permits will be granted by the end of 2003.

In line with its strategy of increasing its gold resources in northern Spain, in December 2002 Rio Narcea signed an agreement with Outokumpu Mining to acquire 70% of the latter's mining permits in Lugo, Galicia, including the Carla property in Villalba. Roman workings there are associated with hydrothermal gold mineralisation and magnetic anomalies indicate possible structural control by an intrusion only 90 km from El Valle. An exploration budget has been approved for the current year including provision for a 3,000 m drilling programme.

Rio Narcea's major focus in new project development, however, concerns the acquisition at the end of 2001, of the Aguablanca nickel and copper project. Rio Tinto and the Presur Consortium discovered this deposit in 1993 during an exploration programme for precious metals. Rio Narcea has already paid €4 million for the property and a further €1.5 million will be paid when production begins. Rio Tinto and Presur drilled 40,000 m to a depth of 700 m. In its feasibility study, Rio Narcea contemplates, as a first stage, an open-pit mine to a depth of 250 m, mining a total of 15.7 Mt of ore at an average grade of 0.66% Ni, 0.46% Cu and 0.47 g/t PGM. A conventional flotation plant will treat 1.5 Mt/y of ore which should yield 10,000 t/y of nickel, 7,000 t/y of copper and 775 kg/y of PGM over 11 years. The estimated investment required is €64.1 million.

Elsewhere, Rio Narcea is exploring a 5,000 km<sup>2</sup> area underlain by the Ossa Morena geological unit, specifically the Olivenza-Monesterio antiform, where up to 10 gabbro intrusions possessing mineralisation are present. It is also exploring the geological extension of this area in Portugal.

In the southwest of the Iberian Pyrite Belt, Newmont Mining Corp. has halted its investigation of the Lomero-Poyatos deposit after completing 2,500 m of drilling during 2001. It had an option with the owner of the property, Cambridge Minerals Resources plc. Cambridge, meanwhile, has commissioned the consultancy, Steffen Robertson and Kirsten Ltd (SRK), to undertake a conceptual mining study of Lomero-Poyatos. Using the JORC

code, SRK estimates a resource of 20.6 Mt averaging 3.1 g/t Au, for 2.1 Moz of contained gold. Of this amount, 18.8 Mt can be exploited by open pit, including 1.6 Mt at 5.1 g/t Au in the indicated resource category and 17.2 Mt at 2.9 g/t Au in the inferred category. The resource also includes 46 Moz of silver, 675,552 t of zinc and 250,600 t of copper. SRK also concludes that the deposit remains open at depth to the northeast where there is a coincident geophysical anomaly. The SRK conceptual mining study is based on a campaign of 8,000 m of drilling and envisages an open-pit mine to a depth of 100m, and operating costs equivalent to US\$211/oz Au. Also within the Iberian Pyrite Belt, Cambridge has signed a three-year exploration option with Metales Hispania, in respect of the San Telmo mining concessions.

Riomín is continuing its exploration programme for base and precious metals in the Iberian Pyrite Belt in joint ventures with Atlantic Copper and Dow Mining. In each, Riomín is the operator. Work has included geophysical surveying and 8,000 m of drilling. Some interesting intersections were obtained and work is now focusing on exploration over the most interesting anomalies.

Siemcalsa, an enterprise owned by Junta de Castilla y León (the regional government) has continued to explore the Salomon gold property. This Carlin-type deposit was discovered some years ago and trial mining has now increased the reserves to 190,000 oz of gold contained in 600,000 t of ore at an average grade of 9.5 g/t Au. An agreement with Rio Narcea Gold Mines to increase the exploration is pending. Siemcalsa is also overseeing Los Santos, a tungsten (scheelite) concession in Salamanca, and is seeking partners to develop the deposit.

**Table 1. Production Energy Minerals**

	Unit	2000	2001	2002 <sup>P</sup>
Anthracite	'000 t	5,160	4,694	4,393
Coal	'000 t	6,173	5,798	5,358
Black lignite	'000 t	3,630	3,456	3,557
Brown lignite	'000 t	8,103	8,787	8,726
Oil	'000 t	227	388	324
Natural gas	Million m <sup>3</sup>	179	556	551
Uranium	t(U <sub>3</sub> O <sub>8</sub> )	348	42	54

<sup>P</sup> Provisional data. Source: Ministerio de Economía/Carbunión.

**Table 2. Production Metallic Minerals**

	Unit	2000	2001	2002 <sup>P</sup>
Copper	'000 t*	23.6	9.8	1.2
Zinc	'000 t*	200.2	165.6	69.9
Lead	'000 t*	51.7	35.6	6.2
Gold	kg*	4,317	5,922	5,512
Silver	t*	114	52	3
Mercury	t*	236	524	726
Tin	t*	1.1	0.5	0.3
Pyrite	'000 t	206	152	n/a

<sup>P</sup> provisional data

\* metal content

Source: Personal research/IGME/M<sup>o</sup> de Economía.**Table 3. Production Non-Metallic Minerals ('000 t)**

		2000	2001	2002 <sup>P</sup>
Fluorspar	CaF <sub>2</sub>	135	129	134
Potash	K <sub>2</sub> O	522	471	407
Salt		3,921	3,840	3,490
Quartz		1,961	2,000	2,000
Special clays		945	1,370	1,000
Magnesite	MgO	173	190	185
Barite	BaSO <sub>4</sub>	22	44	41
Magnetite		67	55	25
Talc		121	115	120
Lepidolite		7	7	6
Diatomite		68	70	50
Sodium sulphate	Na <sub>2</sub> SO <sub>4</sub>	1,000	1,065	910
Celestite	SrSO <sub>4</sub>	148	153	134
Kaolin (washed)		450	500	515
Feldspar		550	650	700
Calcium carbonate		2,000	2,200	1,800

Source: IGME /Personal research/ M. de Economía.