

CHILE

By Simon Tarbutt

The gloom from low metal prices in 2002 continued into the early part of 2003 as more mining companies, in addition to Codelco and BHP Billiton, considered cutting production. However, optimism grew as the year progressed and market forecasts for 2004 improved appreciably. For copper, price forecasts ranged from US\$0.82/lb to as high as US\$1.20/lb. In addition, a number of mining projects previously on hold were dusted off. Chile's economic performance improved during 2003: GDP grew by 3.6% to some US\$69 billion and total exports increased by 16.4% to US\$21.4 billion. Mining accounted for US\$8.5 billion, with copper contributing US\$7.5 billion, 89% of mining exports and 35% of total exports. Inflation slowed to 1.1% and unemployment dropped slightly to 7.4% from 7.6%.

Legislation and politics

An underlying theme on the general political scene was that of bribery and corruption. It ranges from the awarding of contracts for vehicle-testing stations, through the payment of extra salaries to public works personnel, and consulting companies linked to state universities, to the disappearance of funds from social promotion agencies and the financing of political campaigns. All these matters are still being investigated in the courts, and some people have been held incommunicado for extended periods. On the positive side, a few corrective measures have been taken.

Duty on imports into Chile have been reduced from 7% to 6% for those products not covered in bilateral agreements. A number of products from the Mercosur countries have been given a 43% discount preference on duties, and the agreement with the European Union has meant that 91% of the imports from there carry no duty. Under a trade agreement with the US, approved in Congress in October 2003, 87% of Chilean exports to the US will not be liable for import duty, as of 2004. Against this, and "to compensate for the loss of income", VAT has been raised to 19%.

Despite an early proposal by the government to modify the labour reform law to make it more flexible, no agreement has been reached. The proposal was to make the working hours fit the needs of an individual company, but always restricting the maximum hours worked to 12 hours per day and between 2,100 and 2,200 hours per year.

Discussions on mining taxation continued throughout the year; these had started in 2001 and triggered by the sale by ExxonMobil of Disputada de Las Condes whose assets include Los Bronces, a 180,000 t/y open-pit copper mine, El Soldado, a 70,000 t/y open-pit/underground copper mine and Los Chagres, a 220,000 t/y smelter). Disputada was sold to Anglo American plc for US\$1.3 billion and had paid no income tax for 24 years, even though investments during the period had reduced costs by a third. Under DL600, the

1974 investment law applied to all investments, not just mining, tax stability is guaranteed for 20 years and accelerated depreciation is allowed; owing to the large investments in mining, these amortisation periods are relatively much longer than in other industries. These are now beginning to run out and it is forecast that mining companies will more than double their contributions in income tax over the next few years.

In spite of this, arguments are still flowing in all directions concerning the application of a royalty - changing the rules in mid flight, new forms of expropriation, the use of so-called tax dodges and even about whether a royalty is a tax or not. In April 2004, the government announced that it was sending a proposal to Congress to impose a royalty on the extraction of non-renewable resources, with effect from 2007. A charge of zero to 3% on gross sales is to be based on profits, the higher the operating margin the higher the charge; those companies with gross sales of less than 2,000 Annual Tax Units (US\$1.2 million) and those with less than 5% operating margin would be exempt. The proposal claims to be equitable and fair as it takes into account both the differences of investment and operating costs between properties, as well as the fluctuations in metal prices; also, the proceeds will go to a fund to finance innovation and mining technology initiatives in mining that will benefit future generations.

However, greater clarity and definition is required in the royalty proposal as regards "operating margin", "operational profit" and 2,000 UTA as the exemption limit. This will be for Congress to decide as the proposal will require a modification to the Mining Concessions Constitutional Law, and this needs a 4/7 majority vote by both senators and deputies. With the present balance in Congress it is likely to require at least partial support from opposition parties.

Production and development

The first part of the year weak markets saw copper inventories continue to grow despite production cuts by some producers. However, demand improved during the second half and by January this year, normal production had resumed at the large Escondida mine (BHP Billiton) where the 1.25 Mt/y capacity in 2003 had been reduced by 200,000 t. Also, Chile's biggest producer, Codelco, which had warehoused 200,000, indicated that it would begin releasing stocks when appropriate.

By the end of 2003, the Chilean Copper Commission (Cochilco) was predicting a deficit in the global copper market of 83,000 t in 2004, based on a 6.4% rise in projected demand, to 16.76 Mt, against an 8.3% increase in supply, to 16.67 Mt. The deficit forecast for 2003 was 346,000 t. Chile produced 4.91 Mt of copper in 2003 and the estimate for 2004 is 5.47 Mt.

During 2003, Los Pelambres (Antofagasta plc 60% and a Japanese smelter consortium 40%), completed the expansion of ore capacity to 120,000 t/d through general upgrading and the installation of an additional crusher. This year, the mine is expected to produce 338,000 t of copper in concentrate and 7,000 t of molybdenum. An EIS was presented for the extraction of additional

reserves that will allow the property to mine up to 2,100 Mt of ore at up to 175,000 t/d.

Escondida produced 847,121 t of copper in concentrates and 147,598 t of cathodes. A start was made in September on the next expansion phase, the US\$400 million Escondida Norte pit, with a 250 Mt stripping programme to be completed in September 2005. Meanwhile, the EIS was approved for the US\$1.13 billion project to leach low- grade sulphide dumps to produce, initially, 84,000 t/y of cathodes, and eventually 234,000 t/y. The project will involve new SX and EW facilities.

The US\$654 million expansion of Minera Doña Ines de Collahuasi (owned 44% by Falconbridge Ltd, 44% by Anglo American plc and 12% by a consortium of Japanese smelter companies led by Mitsui) is reported to be on schedule for completion by mid-2004. The Ujina concentrator will process 110,000 t/d of ore, with production transferring production from the Ujina to the Rosario open pit. Copper production for 2003 was close to 400,000 t, including some 60,000 t in cathodes from oxide ore extracted from the smaller Huiniquintipa pit. The expansion will increase total annual production to close to 500,000 t for a few years, before falling back to present levels.

The expansion at Codelco's El Teniente division, which is planned to increase copper production from 380,000 t/y to 450,000 t/y without any increase in personnel, saw a renewal of senior personnel at the start of 2004. The project involves the development of new underground mine areas, the expansion of concentrator capacity to 130,000 t/d, the expansion of the smelter and improved infrastructure. The work involved expenditure of some US\$220 million during the year and the project is now 89% complete. There have been some delays but these have been necessary in order to prevent disruption to ongoing operations. The whole project was due for completion by the end of 2005 and is expected to cost US\$736 million. When parallel environmental measures are included, the total investment will approach US\$1.1 billion. Copper production at El Teniente in 2003 was 339,440 t.

Codelco Norte (involving the integration of the Chuquicamata and Radomiro Tomic divisions) advanced on four main fronts: the crushing complex at Chuquicamata is being replaced by an in-pit system at a total estimated cost of US\$93 million and is now 73% complete; US\$95 million is being spent to raise concentrator capacity to 182,000 t/d and improve the recovery of copper and molybdenum (85% complete); US\$138 million is being committed to improving environmental standards at the smelter to reduce sulphur and arsenic emissions (82% complete), along with plant improvements to increase efficiency; at refinery N° 2 the conversion from electrofining to the permanent cathode process (59% complete), will increase production to 855,000 t/y of copper in 2005 and will cost a total of US\$165 million.

Codelco moved to dispose of some non-core assets during the year. It sold 60% of Soc Fundición Talleres SA to Elecmetal, a Chilean metals and mining services company and competitor of Talleres, for US\$9.23 million. Talleres, located in the city of Rancagua in Region VI, originally operated the

workshops for El Teniente, before being made a separate division in 1992 and a limited company in 2003. Also at El Teniente, the Coya (39.3 MW) and Pangall (37 MW) hydroelectric generating stations, were sold to Pacific Hydro of Australia, which paid US\$75.6 million and agreed a four-year total electricity supply contract to El Teniente at a pre-determined rate, renewable once.

Biosigma, a research project headed by Codelco and Nippon Mining & Metals of Japan, selected three proposals from 21 submitted from Chilean and Japanese universities for research into the bioleaching of low-grade copper oxide ores. Funding is from the Chilean State and the Inter-American Development Bank.

During the year, Amerigo Resources Ltd of Vancouver acquired Minera Valle Central, which processes 90,000 t/d of tailings from El Teniente and produces some 13,000 t/y of copper in concentrate. The purchase price was US\$20 million, with US\$16.6 million paid on closure and the remaining US\$3.4 million payable within three to five years depending on the price of copper. Amerigo is studying an expansion to 120,000 t/d and a further increase of 10,000 t/d fed from old tailings from El Teniente's nearby Colihue dam.

In Region III, a decline was begun from the Candelaria open-pit mine (Phelps Dodge Corp 80% and Sumitomo Metal Mining Co 20%) and development started for underground extraction at the Candelaria Norte deposit where resources amount to 10.9 Mt at 2.15% Cu. Production is forecast to begin in the fourth quarter of 2004, and should maintain copper output at present levels. In 2003, Candelaria produced 212,700 t Cu in concentrates in 2003.

The Refugio gold mine, operated Compañía Minera Maricunga, owned equally by Bema Gold Corp of Vancouver and Kinross Gold Corp of Toronto, is forecast to restart production in the fourth quarter of 2004. Recent exploration drilling has expanded reserves to justify increased capacity and extension of mine life. A US\$71 million investment programme is estimated for plant modifications and upgrades, a modest pre-stripping programme and a 110 km power line to connect to the main grid, which will replace the previous diesel generated power. A new mining fleet is also contemplated, possible under a lease capital arrangement.

Minera Cerro Dominador, owner of a copper concentrating plant in Region II, has reached an agreement with the Codelco Norte group to process 1,200 t/d of 3.8% ore from the Mansa Mina prospect some 85 km distant near Chuquicamata, and return the 40-45% concentrate to Chuquicamata for smelting and refining; Mansa Mina is not in commercial production as yet. Near the end of the year the company also presented an EIS to reopen and expand its 5,700 t/y cathode copper SX-EW plant, in the same location, to 10,000 t/y; feed would be 3 Mt/y of ore averaging 0.92% Cu from Chuquicamata. Also, agreements will be sought with local small-scale oxide miners who have the potential to provide up to 10 Mt at 1.55% Cu.

Sociedad Punta del Cobre SA (Pucobre) in Region III obtained approval for its US\$6.3 million EIS to develop the Venado Sur deposit as an open pit. This will entail mining 100,000 t/mth of oxide ore at a 1:1 stripping ratio, and shipping the ore 35 km to the existing plant. The company owns the Socavón Rampa/Socavón Trinidad/Abundancia underground mines, the Biocobre plant and the San José concentrator. In 2003 the company produced 45,906 t of copper, 72% from the concentrator.

State-owned Enami's debts have increased to some US\$485 million, the two principal items being US\$240 million for environmental measures taken at the smelters a few years ago financed by commercial loans, and US\$164 million of 'advance profits' taken a few years ago, to repay Treasury-supplied mining promotion funds. Part of the solution is to sell the Ventanas copper smelter and refinery (323,00 t/y of cathode) to Codelco which needs additional capacity. In mid-year, the proposal was presented to Congress, a legal requirement for both state companies, with Ventanas valued at US\$373 million. The proposal has recently received consent from the House of Deputies, along with a recommendation that the state would become the guarantor for the remaining debt.

One of Enami's principal functions is to promote mining, and it received a further boost during the year when a decree was signed committing the government to annual funding of US\$8 million to assist the some 12,000 small- and medium-scale copper and gold miners. This will provide a floor to guarantee services and technological promotion, even in low price periods.

In line with the improvement in metal prices, the number of small-scale copper, gold and silver miners in Chile last year increased from 463 to 489.

Soc Química y Minera de Chile SA (SQM), which produces fertiliser minerals, iodine and lithium from a number of operations in Regions I & II, had an active year apart from production. A contract to supply 150,000 t of potassium chloride was signed with PCS Yumbes, a new nitrate mine and fertiliser plant in Region II, and SQM has since taken up an option to acquire PCS Yumbes for US\$35 million. SQM also purchased the new La Coruña iodine property of Falcon de Chile SCM for US\$13 million. Falcon was majority-owned by the Marshall group of South Africa. There are no immediate plans to develop the reported 37,000 t of contained iodine reserves. On the lithium front, an EIS was approved for construction of a US\$14.9 million lithium hydroxide processing plant, to produce initially 4,000 t/y of lithium carbonate, with a possible expansion to 6,000 t/y, depending on demand.

Exploration

The number of exploration claims on the register maintained by the National Geology and Mining Service (Sernageomin) increased from 19,215 to 24,615 in 2003, covering a total area of 81,000 km².

Region 1: Silver Standard Resources Inc made the final payment of US\$600,000, for a total of US\$1.5 million to acquire 100% of the Challacollo silver project. This was after completing half of a 3,000 m in-fill drilling

programme to up date previous indicated resource estimates of 10.2 Moz of silver and 36.9 Moz in the inferred category. The agreement also involves NSR royalties totalling 4%.

In the far north at Choquelimpie, Minera Can Can of the Copec group, completed the decline into the gold orebody beneath the old open pit. Exploration drilling and metallurgical tests on the oxide and sulphide ores are continuing to determine reserves and the scale of the future operation.

Region II: Towards the end of the year, Nittetsu received approval for its US\$3.6 million environmental impact statement (EIS) for copper exploration. The programme includes 18,000 m of drilling in 30 holes.

Expatriate Resources Ltd of Vancouver, through its Chilean subsidiary Compañía Minera Ltda, carried out 4,488 m of reverse circulation (RC) drilling on its Isleña property. Various intercepts were made of copper-silver mineralisation in the vicinity of the small-scale Union mine, which produced 84,097 t at 2.5% Cu and 287 g/r Ag over a period of some 16 years to 1982. Minera acquired a 414 ha option on the Mina Union and Ana-Estero claims to round out the 1,600 ha wholly-owned holding. No active exploration was carried out on the large combined 5,000 ha Chug Chug and adjacent Gabriela copper-gold properties, nor on the Lucy copper-silver project.

Codelco continued the exploration of the Toki cluster, consolidating inferred resources of 11.2 Mt at Toki, 3.8 Mt at Quetena, and 2.0 Mt at Genoveva, for a total of 17 Mt of contained copper.

The updating of studies of the Spence copper project owned by Riochilex, a subsidiary of BHP Billiton, continued through the year. Production is now predicted for 2007 at 200,000 t/y of cathode copper for an investment of US\$800 million.

Region III: Exploration during 2003 was most active in this region. A new gold discovery was made by Codelco in conjunction with Compañía Minera Mantos de Oro (Placer Dome Inc), named Purén Norte. There are plans to complete a feasibility study by the end of 2004 and to recover the gold at the nearby plant of La Coipa (Mantos de Oro).

Latin American Copper plc, quoted on the London AIM exchange, signed an agreement with Phelps Dodge Corp to examine the latter's information available on Chile's iron oxide-copper-gold (IOCG) area. The second stage would be funded by Phelps Dodge's local subsidiary Ojos del Salado, and would involve US\$150,000 of drilling per target. Further stages would continue on a mutual option basis.

Also in the IOCG belt, field crews of Far West Mining Ltd have examined anomalies identified by BHP Billiton using the latter's patented Falcon airborne gradiometer, and 27 targets have been identified; three of these have been picked for an initial 5,000 m of drilling. Far West has raised funding on the Canadian Exchange to enable it to secure a 70% earn-in share. For

one area, identified as 4c, BHP Billiton has decided to exercise its option on any second-phase exploration, which will increase its participation from 30% to 51%.

Minera IPBX Ltda, a subsidiary of International PBX Ventures Ltd of Vancouver, now has a significant stable of prospects. During the year Hornitos (Cu, Au) 3,100 ha, and San Pedro (Ti, Au.Cu) 1,000 ha were acquired. These are in addition to Tierra de Oro (Au, Ag, Co, Cu) 3,056 ha, Las Lomitas (Cu, Au, Ag) 1,000 ha, Sierra Pintada (Cu, Au, Ag) 3,300 ha, Tabaco (Cu, Au, Ag) 393 ha, Zulema (Cu, Au) 3,600 ha, and La Totora (Cu, Au, Ag, Co) 1,600 ha. Exploration drilling was carried out on Tabaco, confirming historic drilling, and an IP survey was carried out by the company. At Tierra de Oro, detailed surface mapping and sampling revealed gold-bearing structural zones. In a JV 70% earn-in agreement, Pathfinder Resources Ltd of Vancouver carried out initial drilling on Zulema and encountered a large mineralised system geologically resembling the Candelaria (Phelps Dodge) orebody, some 20 km to the east.

Adjacent to the Zulema property, Solomon Resources Ltd of Vancouver completed 125 line-km of detailed magnetics, IP and a 300-station gravity survey on its Annie and Santa Candelaria concessions. Combined with previous mapping and sampling, this confirmed Candelaria-type geology and mineralisation.

In the first half of the year, Samex Mining Corp acquired the Zorrosa claim area of 1,475 ha for US\$50,000. Los Zorros, covers an area of many abandoned small-scale gold operations and the owners have maintained a back-in option if Samex discovers a 2 Mt contained equivalent copper deposit on, or within 500 m, of the property. Samex raised US\$371,000 on the Canadian exchange to start exploration. Later in the year, an additional 209 ha were acquired for US\$230,000 in staged payments and NSR royalties on gold, silver and copper; the first payment of US\$30,000 has been made.

Mandalay Resources Corp made substantial progress at its 100 km² La Quebrada property; with mapping, sampling, geophysics and some drilling, has confirmed near-surface copper sulphide and stratabound silver mineralisation.

Lumina Copper Corp of Vancouver acquired the Regalito copper prospect in October for C\$900,000 to be paid over eight years, with a minimum of C\$200,000 in a year when the average copper price exceeds US\$1.00/lb; similarly, after year eight, US\$200,000 will be paid until commercial production starts, after which a 1 to 3% NSR royalty will be paid from which a portion of the initial payments will be recovered. An earlier unqualified resource estimate for the property was 200 M t at 0.50% Cu at a 0.3% Cu cut-off.

Region V: Lumina Copper reached agreement with General Minerals Corp of Denver to acquire the Vizcachitas property where previous scoping studies and some prefeasibility detail have been carried out on a preliminary resource

of 645 Mt averaging 0.45% Cu and 0.014% Mo, at a 0.3% Cu cut-off grade. The terms of the deal were that Lumina issued 500,000 common shares and 500,000 common share purchase warrants to General Minerals. In the event that the combined value does not exceed C\$5 million during the 48 months period from the closing date, then on the expiry thereof, Lumina will pay the difference between the combined value at that time and C\$5 million.

Elsewhere in the region, South American Gold & Copper focused attention on its Pimentón gold property, and a due diligence study was carried out by Pincock Allen & Holt on behalf of the Overseas Private Investment Corp (OPIC) of the US. OPIC was reviewing a US\$2.8 million loan application as part of the US\$4 million required to reopen the mine at 100 t/d to produce 19,600 oz/y, expected for the middle of 2004. This would contribute to continued exploration on the property. During 2003, exploration identified a tourmaline breccia pipe, lending credence to the belief that the geology is similar to the Andina (Codelco) and Disputada (Anglo American) copper properties to the south and Pelambres (Antofagasta) to the north; four holes were drilled with positive results.

Region XI: In June, Patagonia Gold plc of the UK (formerly HPD Exploration of the UK) in partnership with Minera Puerto Madryn of Argentina, purchased WestMag's 75% interest in the Coyhaique gold project. It is located 15 km east of the city of Coyhaique and covers 20,800 ha. After resubmitting an environmental impact statement, a 10,000 m drilling programme was started in late November.

Region XII: In the far south of Chile, an exploration programme at the Estancia Invierno coal prospect on the Isla Riesco, was prepared to determine reserves for open-pit mining. Previous resource evaluation has identified 670 Mt of sub-bituminous (4,300 to 5,500 kcal/kg) coal. The prospect was awarded to Minera Otway in 2002, a company jointly owned by Ingeniería del Sur (related to the coal producer Carbonífera Catamutún) and Ingeniería Civil Vicente.

Sustainable development

In a study of the income, education, assets and location of the 4 million homes in Chile by the consultancy Adimark, Antofagasta was specifically cited as the number two city after Santiago. The survey noted that all the major mining-related towns occupy top positions in Chile's social development. This has arisen not only because of the relatively higher salaries paid in mining, but because of the continuous effort of mining companies to relate and participate with local communities.

In this regard, the Mining Council of Chile (Consejo Minero), whose members include the countries 17 largest mining companies, has published a report entitled 'Social Responsibility in Large-Scale Mining'. The report notes that where mines are remote, personnel (an increasing number are female, 1,535 in 2002, against a decreasing employee rotation rate reaching 2.2% in the same year) are accommodated in bachelor camps and families are encouraged to settle in the nearest cities, with various schemes available to

help them become home owners through loans, subsidies or direct bonuses for rent or mortgage payments.

For schooling, there has been support not only in the construction, equipping and installation of primary and secondary school infrastructure, but also in teacher training and the establishment of technical colleges related to the universities in the Regional capitals. There is also provision for further education of employees and their families (in 2002 the employees of the member companies had an average of 12 years of studies against the national average of nine years). As well, universities are seeing the financing of faculty seats and support for research by their students, some of whom benefit from scholarships or indirectly through employee bonuses.

The development of smaller-scale commerce, and larger-scale supply companies in the regions is being encouraged, as is the recognition of indigenous history, and the care and promotion of the environment. There are many other aspects of regional community development benefiting from mining, and the total annual investment by the mining industry is probably running in excess of US\$260 million.

Separately, steps have been taken to consolidate an Integrated Territorial Programme, or business cluster, in Antofagasta. The intention is to supply the mining industry with goods and services and, importantly, to develop critical mass, knowledge and access to markets for continued business once the mines close. Escondida (BHP Billiton) in conjunction with the state Business Development Corp (Corfo) has launched a pilot project for an e-catalogue for smaller local businesses. This was strengthened in the middle of 2003 by the formal launch of the cluster programme by the regional government, and further enhanced towards the end of the year when Codelco and BHP Billiton agreed to cooperate and encourage the development of conditions for Region II to become a global centre for services and supplies.

The small-scale mining sector has also been assisted. Collaborative efforts between Sonami, the National Mining Society, and Sernageomin have sought to train small-scale miners in environmental matters, including pilot tests in the field to demonstrate the advantages of jigs and gravity separation to recover gold against the use of mercury. Also, small-scale copper electrowinning in the field has been tested but the results have yet to be evaluated.

On the regulatory side, Sernageomin has published guidelines for hydrometallurgical processes, the handling and loading of ores and minerals at ports and mine closure. A country-wide survey of abandoned mines and infrastructure, has been completed for Regions V and VI, and Metropolitan Santiago, with assistance from the Japan International Cooperation Agency (JICA). The Federal Institute for Geosciences and Natural Resources of Germany (BGR) has participated in seeking possible solutions to various other problems.

Tables next page.

Table 1: Mine production ('000 t except where stated)

	2002	2003
Copper	4,620	4,909
Molybdenum	29	33
Gold (t)	39	39
Silver (t)	1,210	1,313
Iron Ore	7,269	8,011
Nitrates	1,174	1,134
Iodine	12	16
Sodium Chloride	3,503	6,213
Lithium Carbonate	35	42
Lead	3	2
Zinc	36	33

Source: Sernageomin

Table 2: Mine production

Mines	Copper (t)		Gold (kg)		Silver (kg)	
	2002	2003	2002	2003	2002	2003
Copper						
Large scale	4,225,840	4,437,442	12,181	13,105	556,929	583,043
Medium scale	353,913	424,959	2,204	2,141	27,626	55,281
Small scale	34,652	46,066	350	421	7,344	15,143
Gold						
Large scale	4,726	-	6,762	6,219	230,739	252,614
Medium scale	28	73	16,253	14,230	382,149	398,509
Small scale	628	637	879	2,799	1,937	4,612
Silver						
Large scale	-	-	-	-	-	-
Medium scale	-	-	-	-	-	-
Small scale	-	1	7	5	796	424
Zinc/lead						
Large scale	-	-	-	-	-	-
Medium scale	-	-	52	34	2,952	3,163
Small scale	-	-	-	-	-	-
TOTAL	4,619,787	4,909,178	38,688	38,954	1,210,473	1,312,789

Source: Sernageomin