

# CHILE

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The year started off on a note of optimism; metal prices for 2001 were expected to average anywhere up to US\$0.90/lb for copper, US\$270/oz for gold and US\$5/oz for silver. However, by the middle of the year copper price predictions were revised to below US\$0.78/lb and by November reduced metal production programmes were the main topic.

## Mine production (‘000 t except where stated)

	2000	2001
Copper	4,646	4,766
Molybdenum	34	33
Gold (t)	54	43
Silver (t)	1,242	1,349
Iron Ore	5,398	5,437
Nitrates	988	1,072
Iodine	10	11
Sodium Chloride	5,083	5,989
Lithium Carbonate	36	31
Lead	1	1
Zinc	31	33

*Source: Sernageomin*

Reflecting these trends, total GDP dropped 11% to US\$66.49 billion, and total exports dropped by US\$700 million, though their proportion of GDP for the year increased by 2% to 26.3%. The mining sector's proportion of exports, valued at US\$7.74 billion, dropped 2% to 44.4%, copper's share remaining at 87% of the mining total.

The continued economic slowdown had less drastic consequences for Chile than for some other countries, due in large part to firm economic management. Inflation was 2.6% and while the employable population increased by 89,950 to 5.9 million, or 1.5%, unemployment

increased by only 0.7% to 492,000, partly because of government efforts to promote short-term jobs. Unemployment overall, however, was still at a problematic 8.3%.

## Legislation and Politics

In December 2001, parliamentary elections were held to re-elect half of the Senate and all of the Deputies. Once again it was a close result, with the ruling centre-left coalition (Concertación) holding the lower house. This enables it to pass legislation requiring only a simple majority, but requiring opposition support for items that require progressively larger majorities. In the Senate there is a virtual tie, matched by the nominated senators - of their 12 seats, four are related directly to the Concertación, four are oriented to the right, two are reasonably independent, one is vacant and Senator Pinochet is still suspended. The legal status of the General, regarding the cases being processed against him, is that of temporary dismissal due to bad health; he is living at home under medical care, totally retired from public life.

There are a number of retired and active members of the armed forces under various degrees of legal process before the special judges assigned exclusively to the cases of the 'disappeared' during the period of military government; the Table of Dialogue in 2000 was able to locate a limited number of these people, though DNA testing and other up-to-date procedures are proving to be a lengthy process. However, the dialogue did manage to clear the air to an extent, and the cases continue.

Attention has refocused on other things, such as changes to the 1980 Constitution. This Constitution was prepared by a commission of lawyers, academics, past elected presidents and experts. One of the principal objectives was to create a system that avoided the traps that the Chilean democracy has fallen into in the past.

### Mining-Related Legislation

In February 2001, the Mining Integration and Complementation Treaty between Argentina and Chile was approved by the Chilean Congress. It was the final step towards creating the basic legal framework for mineral exploration and operations straddling the long border region. Some US\$20 billion and 370 potential mineral deposits are being broached. The treaty is a very large step in improving co-operation between the two countries; it creates the legal framework that permits protocol zones straddling the formal border to be defined for each particular project within which there would be freedom of movement. Both countries are actively working on the many regulations needed to make this treaty operable.

An unemployment insurance law was approved in May 2001, and will go into effect in October 2002. The funds will be administered by a private group, formed from retirement-fund companies that won a recent public bidding procedure (quoting an annual administration fee of 0.6% on the funds managed during the contracted ten years). The funds will be made up from individual employee accounts, financed by the employee (0.6% of taxable income) and the employer (1.6% of the individual taxable income); and a solidarity fund financed by the employers (0.8% of payroll taxable income) and the government 225,792 per year of Monthly Tax Units (essentially an inflation-adjusted unit and presently equivalent to some US\$10 million). The fund will be obligatory for new employees as of August 2002.

The law 'Rules to Combat Tax Evasion' was published in June 2001. The law tightens up on allowable deductions, and corporate tax has been increased from 15% to 16% this year, and to 17% in 2004. There are also various tax reliefs, amongst which charitable donations, educational projects, double international tax and some stock exchange transactions are included. Personal income tax is reduced and individual voluntary savings programmes are encouraged. Under a

different law, import duties are being reduced from 15% to 7% and eventually 6% in 2003; for export products, such as metals, the duties were, and still are, recoverable over time. While there is something of a fiscal balance, for companies there is a net increase in cost.

A labour reform law was published in October last year, and came into effect in December 2001. In general, regulations have been increased and flexibility in individual employment reduced. The Labour Authority has been given more powers to inspect and make immediate judgements, making it both judge and jury. Important for mining is that the 'exceptional work programme' practice - such as four days on, four days off during the 365 days of the year - is recognised, but it must be renegotiated every four years. Non-substitutive items, such as fixed rest days, overtime only for emergency situations, daily work hours, and the reduction of the standard work week from 48 to 45 hours as of 2005, complicate the present flexibility and future negotiations.

### Exploration

The registration of exploration claims maintained by the National Geology and Mining Service (Sernageomin), shows that the number of valid claims in 2001 dropped from 21,944 to 18,220. These claims have to be renewed every two years. The total spent on exploration during the year (defined as exploration prior to the feasibility study stage) is estimated to have been around US\$50 million - half the level of 2000.

The larger companies continued their search for new opportunities. The highlight of the year was at El Morro, in Region III, where Noranda closed the year by exercising its option with the owner, Metallica Resources of Denver, by purchasing US\$1 million of the latter's common stock. This was after establishing an inferred mineral resource of some 410 Mt at 0.61% Cu (principally sulphide copper) and 0.56 g/t Au, at a cut-off grade of 0.4% Cu. Noranda can earn a 70% interest in the property by spending US\$10 million on

exploration and development over six years from September 1999, as well as completing a feasibility study by 2007 and paying an additional US\$10 million to Metallica.

BHP Billiton agreed to finance exploration by Southern Rio Resources on the latter's Santa Tomas copper-molybdenum property in Region I, against the option to earn 70% in the property. After initial drilling the option was dropped. The company also withdrew from the Disputada copper property, Condell, in Region V.

Codelco's joint venture with AMP, an Australian institutional investor, was wound up after five years without identifying any potentially economic properties. Environmental approval for a three-year, US\$20 million surface and underground drilling programme at Mansa Mina adjoining Chuquicamata in Region II, was approved and the programme started. Codelco also has agreements with Industrias Peñoles for exploration ventures in northern Mexico, and with Barrick for projects in Brazil. Recently, Codelco has signed a memorandum of understanding with CVRD for a 50:50 copper alliance. Within two years, Codelco's foreign exploration could equal its domestic efforts.

Arizona Star Resources Corp., an affiliate of Bema Gold Corp., has formed a joint venture with Aur Resources to explore its Agua de la Piedra gold property in Region II. Aur is the operator of the project, with 51%; two drilling programmes totalling some 4,300 m tested the geometry of the deposit and are under evaluation. The Cerro Casale gold copper project in Region III (51% Placer Dome, 25% Arizona Star, 24% Bema Gold), has had its environmental impact study approved, but the project is on standby pending an improvement in metal prices.

Barrick Chile has let out its La Coipita copper prospect in Region IV to Codelco, which has an active drilling programme under way. In November, the company announced an agreement with Coeur d'Alene to explore the

latter's Puchuldiza gold prospect in Region I; Barrick can earn 75% in the property by spending US\$2.25 million over five years, or 85% for an additional US\$5.75 million. Coeur can regain its 25% interest by a payment of US\$2.16 million in cash.

Some half a dozen junior exploration companies, against over a dozen or so in better times, were active during the year. Medinah Minerals Inc. of California announced a substantial discovery at its Alto de Lipague gold/copper property in the Metropolitan Region, then reached an agreement with London-based Venture Capital Corp (VCC) for an investment of US\$5 million for which VCC would receive 25% of the property and revenues. In January this year, Medinah finalised preparations for a phase IV drilling programme.

Atna Resources Ltd of Vancouver entered into an agreement with the owners of the copper oxide-sulphide property, Barrial Seco, in Region III. By spending US\$250,000 within six months, and completing a prefeasibility study, Atna can exercise its option on a 50:50 JV agreement. If a production decision is made, Atna will acquire the owner's 50% share in five equal US\$1 million instalments. Based on drilling information, as well as metallurgical tests, the property has an indicated and inferred resource of 21.7 Mt averaging 0.6% Cu at a 0.3% cut-off. The project is on standby awaiting developments in the district.

In the final quarter of 2001, Atna consolidated the ownership of the historical Chañarcillo silver district (which had been a major sustenance for Chile in the late 1800s), by entering into two agreements that include a cash payment of US\$168,000, a commitment of US\$800,000 on exploration or development over six years and a 2% net smelter royalty. The properties could be developed as a large-scale open pit or a smaller-scale underground silver/zinc operation. Atna has completed geochemical and geophysical programmes and is currently in talks with several companies regarding JV opportunities.

South American Gold and Copper Ltd (SAGC), while not neglecting the development of its 60% Cal Norte lime project, renewed its emphasis on exploration activities. A study was carried out on the Pimentón gold property in Region V, to put the existing pilot plant and the mine back into full operation. This would cost US\$1.25 million. The exploration of the Antena gold prospect in Region VI, though initially positive, has been suspended pending metal price improvements. SAGC is investigating Meseta, a highly favourable prospective area of copper mineralisation.

The Chilean subsidiary of Latin American Copper plc, a London-based company listed on the Ofex exchange, is exploring for oxide copper deposits in the Chilean coastal iron/copper/gold belt of Region III. The company maintains an active programme to generate new projects: it holds the Cerro Sur project in a joint venture with BHP Billiton, and a drilling programme is planned for 2002.

Silver Standard Resources ended the year by acquiring an option to purchase 100% of the Challacollo old silver operation and property in Region I. The total consideration is for US\$1.5 million in staged cash payments over two years. The property is subject to an existing 2% royalty as well as a further 2% royalty to the property vendors that can be purchased for US\$1.5 million at any time. The purchase price includes a finder's fee of up to 5%. The property has an indicated resource of 10.2 Moz. of silver.

### Development

Alliance Copper, the 50:50 JV between BHP Billiton and Codelco to test the former's BioCOP(tm) bioleach technology (to leach ores with high arsenic content), continued to run the test reactor installed in 2000. The favourable results led to the start of construction of a US\$60 million prototype plant at Chuquicamata for treating 20,000 t/y of concentrates. The plant is expected to be completed by the end of 2002. Codelco later announced a US\$1 million finance agreement between itself and state promotional

organisations, Corfo and Conityc, and said that it intends raising a total of US\$25 million for the investigation of sulphide ore leaching.

Minera Michilla in Region II, owned by Antofagasta Minerals, patented its Cuprochlor leaching process. Basically it uses sodium chloride and sea water, along with acid to leach mainly secondary sulphide ores. In a recent presentation, 90% recoveries were demonstrated.

Phelps Dodge and Placer Dome reached an agreement in the final quarter of the year to pool their efforts in the development and commercialisation of similar pressure leaching technologies for the treatment of concentrates to recover copper, gold, silver and by-products, from complex sulphide ores.

The first part of the year in Chile was marked by power cuts in the northern mining districts as a result of failures in the new gas pipeline from Argentina and hold-ups in getting the substitute coal-fired generators online. These problems have been solved, but the country-wide power systems are giving indications of further regulatory problems developing. There are two interconnected systems, the Central I.S. (SIC), which supplies power to some 90% of the population, and is 60% to 80% reliant on hydroelectric power, depending on the weather; and the Greater North IS (SING), which supplies most of the mining companies and is dependent on thermal power. The interconnection of the two systems is feasible and relatively simple; however it is not happening, owing to delays in regulatory and other corrective measures.

The sale of Disputada de las Condes became a central item in mid-2001 when ExxonMobil officially invited bids for the purchase of all its mining properties - the 180,000 t/y Los Bronces open-pit copper mine and plants in the Metropolitan Region, and the 70,000 t/y El Soldado open pit and underground copper mine with its associated plants, as well as Los Chagres smelter (143,800 t of anodes and blister in 2001) both in Region V. In early



January 2002, the local press reported five bids - from Anglo American, Antofagasta plc, Codelco, Copec and CVRD. Codelco later withdrew, and on May 2, 2002, it was announced that Anglo American had signed an agreement to purchase the assets for US\$1,300 million (in cash), subject to due diligence.

At the start of the year, Noranda and Falconbridge announced their intention to purchase the SX-EW 60,000 t/y Lomas Bayas copper mine in Region II from Boliden. However, by mid-2001, they had agreed that Falconbridge would make the acquisition alone. The acquisition cost US\$175 million plus US\$2.1 million cash, less debts of US\$112.7 million; there will be a further US\$15 million if Falconbridge exercises its right to retain the neighbouring prospect Fortuna de Cobre, within five years.

Small-scale mining operations, bucking the trend, have increased in number from 396 in 1999 to 479 at present, thanks to their own efforts at raising productivity, with counselling from Enami and Sonami (National Mining Society). On the other hand, however, Enami (which operates two custom smelters with the basic aim of providing in-country market facilities for the medium- and small-scale miners) has accumulated debts of US\$480 million in spite of showing operating profits. Some US\$240 million of this sum relates to environmental measures at the smelters which have been financed by commercial loans on the instructions of Enami's owner, the State. A further US\$164 million relates to 'advance profits' withdrawn by the State to repay Treasury-supplied mining promotion funds (part of Enami's fundamental function). Since metal prices have not come up to expectations, further commercial loans have had to be taken. Annual interest payments amount to some US\$28 million.

Expanding Enami's Ventanas smelter in region V has been the subject of talks for some time. Another State organisation, Codelco, is planning the expansion of its Andina mine, less than 200 km inland from

Ventanas, and needs smelting capacity near at hand. At present, on a custom smelting basis, it utilises some 40% of the Ventanas capacity. A law would be needed to allow Enami to bring in any JV partner.

At the beginning of the year, Aur Resources announced, a restructuring after its purchase of Quebrada Blanca from Teck Cominco; Aur's South America Division, based in Santiago, will be responsible for the operation of the Andacollo copper mine in Region III, Quebrada Blanca in Region I and business development activities throughout South America.

BHP and Billiton announced their willingness to merge in March 2001, and the operation was approved by share holders in May. In Chile, the merger brings the Escondida and Cerro Colorado copper mines under one roof.

The friendly merger between Barrick Gold and Homestake Mining was finalised at the end of the year and brings the Veladero gold project under the control of Barrick (formerly Homestake 60% and Barrick 40%). Located in Argentina, the property is adjacent to Barrick's Pascua Lama project. Barrick also acquires 51% of the Agua de la Falda gold mine (Codelco 49%) in Region III. Further geological investigation and initial engineering are under way at Veladero.

The 18,000 t/y Cascada copper mine was sold by Asset Chile (representing the Cruzat group which is concentrating on other businesses) to Chilean entrepreneurs Sergio Cardone (real estate) and Anselmo Palma (packaging). Details of the operation have not been revealed, but the mine was in bankruptcy protection with debts of US\$35 million. There is a US\$20 million project to convert it to an SX-EW operation.

As part of its commitment to double its commercial value by 2005, Codelco made an announcement early in 2002. The Chuquicamata and Radomiro Tomic mines, and eventually the Mansa Mina, Gaby and Toqui prospects, are being formed into a

Northern Division. There will be a new shared-service group and an, as yet undefined, head office.

Codelco's El Teniente division awarded an industrial waste project to KDM (a local subsidiary of the Spanish firm Urbaser) in late 2000, and saw the start of construction in October. The US\$4.2 million operation will have a capacity of 20,000 t/y to handle tyres, timber and other scrap (El Teniente generates some 13,500 t/y).

Codelco's Chuquicamata division reached an agreement with the mayor of the nearby town of Calama to finance US\$1 million worth of security and recreational facilities in the town. This is part of a project, costing US\$200 million, to move some 3,000 employees to the town during 2002, to make way for mine expansion.

## Production

All metal production increased in Chile during 2001, except for gold; the latter's shortfall being due to the continued suspension or closure processes at Guanaco and Refugio (Kinross), as well as Tambo and El Indio (Barrick). Copper mine production increased by 120,000 t to 4.77 Mt, in spite of falling head grades and heavy maintenance programmes. The increase was due mainly to El Tesoro coming on stream in April, various circuit improvements at Pelambres (both operated by Antofagasta Minerals), as well as to similar modifications at other companies.

During November, with the continuing low copper prices and predictions for 2002 of US\$0.65 to 0.73/lb. BHP Billiton led the field by cutting production at Escondida during 2002 by 80,000 t/y by selectively mining lower

## Chile Mine Production

Mines	Copper (t)		Gold (kg)		Silver (kg)	
	2000	2001	2000	2001	2000	2001
<b>COPPER</b>						
Large scale	4,326,940	4,409,929	11,964	10,923	635,258	653,509
Medium scale	246,500	292,218	2,171	1,898	29,856	25,652
Small scale	44,280	39,974	512	403	8,976	8,534
<b>GOLD</b>						
Large scale	27,698	22,534	15,493	9,119	377,217	398,896
Medium scale	594	706	20,948	18,065	184,412	255,453
Small scale	322	701	2,966	2,168	4,339	2,576
<b>SILVER</b>						
Large scale	-	-	-	-	-	-
Medium scale	-	-	-	-	-	-
Small scale	1	-	6	6	350	584
<b>ZINC/LEAD</b>						
Large scale	-	-	-	-	-	-
Medium scale	-	-	83	91	1,786	3,463
Small scale	-	-	-	-	-	-
<b>TOTAL</b>	<b>4,646,335</b>	<b>4,766,062</b>	<b>54,143</b>	<b>42,673</b>	<b>1,242,194</b>	<b>1,348,667</b>

Source: Sernageomin

grade sulphide ore, the first low-cost producer to do so. Codelco was the only other company, announcing a 2.7% cut in production to 1.53 Mt, to be shared by its five operating divisions. Chuquicamata will make the largest cut, whilst Codelco's newest and lowest-cost operation, Radomiro Tomic, will not be affected. Antofagasta Minerals is expecting a 40,000 t reduction in output at Pelambres during 2002 although this will be as a result of an anticipated natural decline in head grade.

Other companies adopted more conventional measures to reduce output; Phelps Dodge, for example, closed its higher-cost operations in the US, and its operations in Chile were unaffected. Asarco (part of Grupo Mexico) and Noranda made similar announcements.

Codelco revised its long-term price forecast down from US\$0.97/lb to US\$0.92/lb. Reflecting this, most copper producers continued with their planned expansions at existing operations, albeit at a slower pace.

At Escondida (57.5% BHP Billiton) the construction of the US\$1.05 billion Phase IV expansion was 77% completed by May 2002, and is proceeding at a steady pace for completion in September. Full production is expected by the second quarter of 2004. The project includes a new concentrator to increase treatment capacity by 85% to 237,500 t/d. This will compensate for falling grades, and, for the first five years, copper production will increase by 400,000 t to 1.2 Mt. The prefeasibility study for the US\$535 million Escondida Norte open pit, 5 km to the north, is complete; the objective is to feed the existing plant via conveyor belt. A prefeasibility study for the low-grade sulphide dump leaching project, valued at US\$435 million, has also been completed.

The feasibility study for the Spence property, acquired by BHP Billiton through its merger in 2000 with Rio Algom, has also been completed. The project, located near Calama in Region II, would involve an investment of US\$800 million to construct a mine and

processing facilities producing 200,000 t/y of copper from oxide and sulphide ores, based on a reserve of 300 Mt averaging 1.16% Cu.

Codelco's Andina division presented an environmental impact study for a US\$650 million expansion from 64,000 t to 135,000 t/d of ore. Basic engineering was estimated for completion by the end of 2001, covering expansion of both the open pit and underground mine, and the associated ore-processing facilities. Production at the expanded rate is expected to begin in 2005.

The US\$736 million expansion at El Teniente, which is due to increase production from 380,000 t to 500,000 t/y in 2005, is proceeding on schedule, with US\$488 million having been approved by the end of the year. With parallel environmental projects, the total expenditure will approach US\$1.1 billion.

Codelco's El Salvador division, with cash operating costs of US\$0.66/lb, came under scrutiny, and the possibility of closure was mentioned during the third quarter. In November 2001, a US\$400 million programme was announced to increase the open pit (Damiana) portion of the production, and possibly to increase the Potrerillos smelter/refinery output from 137,000 t to 200,000 t/y of copper. However, no timetable was set out, but closure was shelved as being too expensive. As part of the Salvador programme, the railroad operation and equipment was outsourced to Ferronor via a US\$69 million, 15-year agreement; Ferronor is 55%-owned by RailAmerica and operates 2,330 km of railway in northern Chile, with a link to Argentina.

At the end of 2001, the natural gas distributor Distrinor won a contract to supply Chuquicamata and neighbouring Radomiro Tomic. The gas will be shipped from Argentina via the Norandina pipeline under a contract said to be worth US\$35 million over 10 to 15 years. Both Distrinor and Norandina are subsidiaries of Electroandina, controlled by Codelco and Belgium's Tractebel.

Antofagasta Minerals produced the first SX-EW cathode copper in April from its 60%-owned El Tesoro mine (Equatorial Mining of Australia owns the remaining 40%). The 75,000 t/y, US\$290 million operation was inaugurated on November 7 by President Lagos. Antofagasta's oldest mine, Michilla, was under serious review for most of the year. Eventually, in December, with cash costs down to US\$0.59/lb, an environmental declaration was presented for a US\$51.4 million project to maintain cathode production at 50,000 t/y by increasing ore throughput from 3.5 to 5.3 Mt/y. At Pelambres, after a US\$24 million minor expansion of the crushing/grinding system, an expansion from 105,000 t to 165,000 t/y is under review.

Minera Nittetsu Chile Ltda, a subsidiary of Nittetsu Mining Co. of Japan, in conjunction with the Chilean mining company, Cominor (40%), is constructing the Atacama Kozan copper project in Region III. The project comprises an underground mine and concentrator, and production is forecast to begin in November this year at 90,000 t/y of concentrate (containing 28% Cu).

Aur Resources announced in October that the SX-EW Quebrada Blanca operation would receive an investment of US\$28 million during 2002 as part of the continuing programme to expand production from 75,000 to 80,000 t/y, link up to the SING power grid and reduce cash costs to less than US\$0.50/lb.

The US\$600 million expansion project at Collahuasi (Falconbridge 44%, Anglo America 44%, and a Japanese consortium 12%) was under review for most of the year. The project consists of switching mining from the Ujina to the Rosario deposit and expanding concentrator capacity from 60,000 t to 110,000 t/d. This should result in a 17% rise in annual copper production to 410,000 t, and is anticipated to come on line in 2004. In July it was announced that the US\$200 million switch of open-pit mining would go ahead for completion by 2004 but

in December, the concentrator expansion was formally postponed until market conditions improve.

During the first half of 2001, Coeur d'Alene Mines, was offering its assets in Chile for sale, including the closed gold/silver mining operations at Fachinal in Region XI and Petorca in Region V, as well as the Cerro Bayo and Furioso gold prospects in Region XI. This was part of a corporate plan to concentrate on silver mining. In August 2001, however, the company announced that Cerro Bayo was being brought into production and by year end Coeur had presented a three-year underground mine plan to produce 70,000 oz/y of gold at a total cash cost of US\$195/oz. Reserves amount to 217,000 oz gold equivalent, and the company is seeking to increase them to 1 Moz. The properties are still on the market for a "significant offer".

In November, Falconbridge announced a plan for the Lomas Bayas SX-EW property in Region II. The company is to invest US\$50 million to maintain production at 60,000 t/y of copper. The investment would raise ore production by 15% to 10,000 t/d by mid-2003.

In the non-metallic sector, SQM, the world's largest producer of specialty fertilisers, iodine and lithium, continued its expansion of commercial facilities abroad and lithium investment within Chile. There was speculation concerning the acquisition of an 18% stake in SQM by Potash Corp. of Saskatchewan, the world's largest fertiliser enterprise, which operates the Yolanda nitrate mine in Region II.

Two newcomers made an appearance in the iodine sector: Atacama Minerals of Vancouver (in a 50% JV with ACF Minera of Chile), brought the Aguas Blancas property, Region II, into production, reaching its full 720 t/y rated capacity in November; in October, the Dutch firm DSM presented a US\$4 million environmental impact statement for its project to build an iodine plant in Region I.