

## MEXICO

*By Victor Flores*

**D**espite the significant rebound in commodity prices and an improved global economic outlook, Mexico's mining sector did not show measurable improvement in 2003, and the production of a number of key mineral products declined. Despite the improvement in the price of gold, output of this precious metal decreased by over 5%, although silver output grew by 2%, even though the price of the commodity did not rise appreciably until the end of the year.

The base-metals sector put in a mixed performance, with a 29% rise in lead production — albeit on the back of an equally dramatic decline in 2002 — and a slight improvement in zinc output (+5%). Copper production fell by almost 3%. The production of arsenic and bismuth declined, and cadmium, molybdenum and antimony production increased.

Production of non-metallic minerals was mixed, with increased output of barite (+93%), celestite (+16%), fluorspar (+13%), gypsum (+3%), and sulphur (+17%). Feldspar production declined by 3%, graphite production fell a further 44%, kaolin production plummeted by 46%, and phosphate production was virtually wiped out, declining by almost 99%.

The country's economy recovered during 2003, driven by the recovery in the US and Europe, although growth remained sluggish. The country's GDP is estimated to have grown by only 1.3% in 2003, an improvement over the 0.9% posted in 2002. A further improvement is expected for 2004, with GDP estimates of the order of 3.5%. Inflation remained broadly in check at 4.0%, compared with 5.7% in 2002, and is estimated by private economists to average some 4.2% in 2004. The government is estimating 3.0%, and a tightening bias from the central bank could see this goal achieved. The government's plan to maintain a small budget deficit in order to help the economy along was aided by higher oil prices, and the government is expected to have achieved a modest budget deficit (as a percentage of GDP) of 0.6% in 2003. The budget deficit is estimated at -0.4% of GDP in 2004, although this could come in at the lower end of estimates as a result of the rise in crude oil prices.

The peso/dollar exchange rate, which averaged 9.6 pesos to the dollar in 2002, averaged 10.8 in 2003, despite the weakness of the US dollar against other major currencies. The exchange rate at year-end 2003 was 11.23 to the US dollar. Despite the weak economic environment, foreign direct investment was estimated to have increased by 11% in 2002, to US\$13.6 billion. An average exchange rate of about 11.3 is estimated for 2004, with a year-end exchange rate around 11.7.



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\* See 2003 Annual Report and subsequent news releases for additional details

#### LA PITARRILLA, MEXICO

drilling of third silver zone to commence in January

#### MANANTIAL ESPEJO, ARGENTINA

core drilling continuing, feasibility underway

#### PIRQUITAS, ARGENTINA

100%-owned, feasibility update work underway

#### MAVERICK SPRINGS, NEVADA

2004 drilling completed, resource update pending

#### BERENGUELA, PERU

drilling completed, assays pending

#### BOWDENS, NSW, AUSTRALIA

updated resource calculation and feasibility work continuing



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Since his election, President Vicente Fox, who represents the National Action Party (Partido Acción Nacional), has had to contend with a global economic slowdown and a fractious relationship with the Congress. The latter has stalled several initiatives, among them labour and fiscal reforms. With the election of the country's first president from an opposition party, the industry has made a series of proposals with respect to mining taxation aimed at improving the country's competitive position vis-à-vis other mining countries. The proposals touch on areas such as accelerated depreciation, fiscal stability agreements, and tax credits for exploration. Electricity reform, however, is one of the initiatives that has been stalled in Congress.

Mexico's mining regulations have completely opened the mining sector to foreign and domestic investment. Exploration concessions are now granted for a period of six years, but may not be extended. Exploitation concessions are now good for 50 years and can be extended for a like period. In addition, the exploitation concession also confers the right to process and beneficiate any minerals recovered. Mining and exploration leases are now granted in less than six months, and leases are freely tradeable. The previous restriction on the exploration for, and development of, sulphur, phosphates, potash, iron ore and coal has been lifted, as have been the previous restrictions on exploration along the country's coastline and continental shelf, international borders, islands and reefs.

The Dirección de Minas, responsible for regulating the mining industry, is now part of the recently renamed Secretaría de Economía (formerly Secretaría de Comercio y Fomento Industrial, SECOFI). The Dirección General de Promoción Minera promotes the development of the mining industry by providing investors with general information about the country's mining industry, guidance for investors, and studies on the Mexican and international mining industry.

The Consejo de Recursos Minerales, or Mineral Resources Council (CRM), continues the process of transferring its leases to the private sector, as part of its goal of becoming purely a geological survey. The CRM has even set up a computer database that allows parties interested in mineral exploration to obtain information on potentially attractive properties. This database is managed by the Centro de Documentación Sobre los Recursos Minerales (Cedorem). The country's register of mining leases is also on a computerised database. The CRM continues to pursue an aggressive mapping programme designed to provide geological and geochemical information of the country's most prospective ground on a 1:50,000 scale. The Fideicomiso de Fomento Minero (Fifomi) provides financing for the small and medium-size mining companies. During 2002, Fifomi focused on restructuring its loan portfolio, which had a 32% non-performing loan ratio at the end of 2001.

The government continues to reduce the number of hectares of prospective exploration ground held within the National Mining Reserve system, aided by a new set of bidding procedures established by the Secretaria de Economica. During 2002, the government also proposed a further simplification of the

mining law, eliminating the distinction between exploration and exploitation concessions.

The Cámara Minera de México, Mexico's Chamber of Mines, represents the interests of Mexico's private mining sector. At present, one of the chamber's principal priorities is to work with the regulatory agencies to establish clear, fair environmental laws. The Chamber now sponsors symposia every two years on ecology and mining, and has concluded agreements with the National Environmental Institute (Instituto Nacional de Ecología) to implement measures to reduce lead emissions in accordance with guidelines issued by the OECD.

The chamber also participated in the discussions that led to the amendments to the country's environmental protection laws (Ley General del Equilibrio Ecológico y Protección al Ambiente—LGEEPA). The amendments require an environmental risk assessment and a programme to mitigate accidents, as well as increased penalties for violations of the LGEEPA. The chamber also contributed to the development of regulations concerning effluent standards and emissions of diesel-powered vehicles. The chamber continues to work with the authorities to develop standards for the siting, design, construction and operation of tailings dams, and the creation of specific environmental regulations for exploration projects.

With respect to taxation, the chamber continues to lobby for the elimination of the asset tax during the pre-production period. On the transportation and infrastructure front, the mining industry originally applauded the much awaited privatisation of Ferrocarriles Nacionales, the government railroad monopoly, but is now lobbying against what it claims are indiscriminate rate hikes. The chamber continues to fight against proposed changes to the rules governing the classification of roadways and the allowable weight of freight trucks. The chamber continues to work with the governmental entity responsible for regulating explosives in order to reduce the restrictions on the use of explosives in mining. The chamber recently successfully lobbied the government to renew the diesel tax credit for the mining sector (Impuesto Especial sobre Producción y Servicios). The industry also obtained a renewal of the favourable water use fees for the mining sector.

The chamber has also initiated a programme to work more closely with agrarian communities located in those areas where exploration and mining take place. The strong increase in exploration activity has led to instances of friction between owners of surface rights and the mining companies. Some of these conflicts are due to ambiguous interpretations between the Agrarian Law (Ley Agraria) and the country's mining law. This remains a priority issue for the mining sector.

Mexico's mining industry can be broadly divided into three categories, large domestic producers, small domestic producers, and foreign firms. A fourth category, state-owned mining companies, disappeared with the last of the privatisations in 1993.

There are four large domestic producers operating in Mexico – Industrias Peñoles, a diversified producer of precious and base metals and the world's largest producer of refined silver; Grupo México, also a diversified producer, responsible for over 90% of the country's copper production; Empresas Frisco, also a diversified producer of precious and base metals; and Luismin, the smallest of the four and devoted exclusively to precious metals.

Mexico is an important producer of a number of mineral products. It is ranked number one for the production of silver, bismuth and celestite, and is one of the world's top five producers of fluorspar, arsenic, cadmium, graphite and molybdenum. Mexico ranks among the world's top ten in the production of barite, manganese, salt, lead and zinc. Foreign direct investment (FDI) in the mining sector is estimated at only US\$23.5 million in 2003, compared with US\$203 million in 2002. In the past ten years, FDI in the mining sector has average US\$101 million per annum.

### **Copper**

Mexico's copper production declined in 2003, on the back of declines in both 2001 and 2002, with last year's output totalling 300,329 t, a decrease of 2.6%. The country's two largest producers, Cananea and La Caridad are located in the north of the state of Sonora. Both operations are part of Grupo México, which last year struggled to refinance its debt in the aftermath of its hostile take-over of US-based Asarco in 1999; a final debt restructuring agreement, however, was reached at the end of 2002. The company was unable to meet scheduled interest and principal repayments owing to the low price of copper. Despite this setback, production was largely unaffected.

With the completion of the smelter and refinery complex at the nearby La Caridad mine, production at Cananea improved by a further 10.2% in 2003, to 168,954 t. The orebody has a reserve estimated at 1,600 Mt averaging 0.61% Cu, plus an additional 1,550 Mt of leach material averaging 0.26% Cu. The project's SX/EW capacity is currently 35,000 t/y, but this is expected to increase to 85,000 t/y with the construction of additional capacity. Scheduled for completion by the end of the year 2000, delays pushed back the start-up to August 2001.

A strike at Cananea in late 1998 prompted the closure of the smelter, which was due to be closed as part of the environmental protocols that accompanied the signing of the North American Free Trade Agreement. After declining by 31% in 2002 as a result of strike action, production at La Caridad recovered by 15%, to 132,928 t, in 2003. The deposit has a reserve of 426 Mt averaging 0.52% Cu and leach ore totalling 187 Mt at 0.24% Cu. The concentrator has a capacity of about 170,000 t/y and the new SX/EW facility has the capacity to produce 22,000 t/y of copper cathode.

The smelter at La Caridad began to produce at its expanded capacity of 300,000 t/y at the beginning of 1997. The expansion included the construction of new sulphuric acid and oxygen plants. In addition to the expansion of La Caridad smelter, Grupo México completed work on the copper refinery, with

annual capacity of 300,000 t, and this reached full capacity in early 1999. The facility is adjacent to the smelting facilities at La Caridad and includes a gold and silver refinery, and a copper rod plant. Grupo México, through its IMMSA subsidiary, also operates a copper smelter in the city of San Luis Potosí.

The state of Zacatecas is also an important copper producer, boasting production from Industrial Minera México's polymetallic operation at Sombrerete, where copper production was largely flat, at 21,972 t, in 2003. In Chihuahua, production is centred at Santa Bárbara (6,058 t in 2003, a decrease of 19%), the polymetallic San Francisco del Oro deposit (which remained closed in 2003 because of low commodity prices) operated by Empresas Frisco, and Fresnillo's Naica operation in Saucillo (3.5% decline in production to 2,176 t). Output at Industrial Minera México's polymetallic operation at Charcas in San Luis Potosí declined by 4.7% to 15,749 t. Minor copper production was reported by the states of Durango, Hidalgo, Michoacán, the state of Mexico, and Sinaloa.

Grupo México owns El Arco, a deposit located in Baja California. The deposit possesses reserves of 1,000 Mt averaging 0.50% Cu and 0.2 g/t Au, containing both sulphide and oxide ores. The original development plans envisioned an operation treating 2.1 Mt/y to produce a sulphide concentrate. A development decision continues to be deferred as a result of low metals prices.

Peñoles continues to advance the Milpillas project in Sonora, which now has an indicated resource of 30 Mt averaging 0.25% Cu. The company has initiated project development, with a total capital commitment of US\$180 million and production of 60,000 t/y of cathode copper expected by 2005.

### **Gold and Silver**

A favourable investment climate, coupled with a favourable financing environment, has led to a boom in gold exploration in Mexico. However, although gold prices improved in 2003, production declined by over 5%, to 22.1 t (709,390 oz), owing to the ongoing closure of both mid-size and smaller mines. The Penmont joint venture, owned 56% by Peñoles and 44% by Newmont Mining, manages the country's largest producer, La Herradura near Puerto Peñasco on the Gulf of Cortez in the state of Sonora. This large, low-grade deposit has a proven and probable reserve of 65.9 Mt of ore at an average grade of 1.02 g/t (0.03 oz)/t Au. Production in 2003 totalled 154,000 oz at a cash cost of US\$162/oz.

At Peñoles' La Ciénega project, located in the state of Durango, production increased by about 11%, to 4.1 t in 2003. This project has a total reserve of 4.2 Mt at a grade of 5.85 g/t Au, 120 g/t Ag, 1% Pb and 0.8% Zn.

The sale of San Luis's mining interests in early 2002 for US\$90 million put these projects, held by mining subsidiary Luismin, into the hands of Canadian producer Wheaton River Minerals Ltd. The San Martín mine in the state of Querétaro, which came on stream in 1993, produced approximately 1.1 t last

year, and the company's La Guitarra mine in the state of Mexico – subsequently sold to Genco Resources of Canada – produced only minimal amounts. The San Dimas mine in the state of Durango produced 2.13 t in 2003.

Production from the state of Guanajuato has been traditionally centred around the Torres mine, operated by Minera Las Torres, a subsidiary of Peñoles. Owing to a declining reserve profile, production declined by 41% in 2003, to 1.4 t, and the mine has been closed down. In early 2004, El Cubo, another mine in the Guanajuato area, was sold to Mexgold Resources for US\$13.5 million in cash and the assumption of US\$7 million in debt.

Minas de Bacis, operator of mines at El Herrero in the Otáez district of Durango reported steady production of 780 kg, having declined by over 25% in 2002. The Guanaceví district in Durango reported 2003 production of 83 kg, a large improvement over 2002 (29 kg), and the Pánuco de Colorado district reported nil production. By-product gold from the copper porphyry at Cananea jumped by 34%, to 314 kg, and by-product gold from La Caridad also improved, rising to 204 kg. The Villa de la Paz district (SLP) reported production of 819 kg in 2003, a decline of 3% on the previous year.

Gold is also produced as a by-product or co-product at many mines throughout the country, including Fresnillo's operations in Zacatecas, which produced 796 kg in 2002, Santa Bárbara in Chihuahua (199 kg), and Real del Monte near Pachuca in the state of Hidalgo (80 kg). Other gold production is derived from smaller operations in Durango and San Luis Potosí, usually as a by-product of silver production.

During 2003, Glamis Gold Ltd began construction on El Sauzal, a gold project in southern Chihuahua. A reserve calculation completed by Glamis subsequent to the transaction indicates a proven and probable reserve of 2.0 Moz, based on an average grade of 3.37 g/t. Glamis estimates that the project, which has an estimated development cost of US\$100 million, will begin production of 1.7 Mt/y in late 2004, with an annual production of 170,000 oz at a cost of US\$115/oz.

Having completed a prefeasibility study on its Guadalupe de los Reyes gold property in Sinaloa, Northern Crown Resources sold the property to Meridian Gold Inc. Northern Crown had reported a resource of 5.8 Mt averaging 1.35 g/t Au, but Meridian will now pursue the project as a low-tonnage, high-grade target.

The Penmont joint venture between Peñoles and Newmont Mining has suspended work on the Bermejil deposit at its Mezcala project in the state of Guerrero. Located less than 500 m from the Nukay deposit at Los Filos (Teck Cominco Ltd), reserves at Bermejil total 62.5 Mt averaging 0.8 g/t Au.

Teck Cominco and Miranda Mining of Mexico City identified geological resources in excess of 2.27 Moz on their Los Filos JV in the state of

Guerrero, and an additional 2.69 Moz on the nearby El Limón project. In 2003, Wheaton River acquired Miranda Mining for US\$38.5 million and paid a further US\$49 million to Teck Cominco, giving Wheaton River a 100% interest in the Nukay mine and a 22% interest in El Limón. Feasibility work is ongoing to confirm the extent of the reserve and to establish conceptual project economics for Los Filos, a project that contains an indicated resource totalling 55.0 Mt averaging 1.25 g/t Au. The adjacent Nukay mine produced 16,300 oz in 2003 from the Nukay and La Agüita open pits.

Metallica Resources Inc recently completed the acquisition of an additional 50% interest in the Cerro San Pedro project, near the city of San Luis Potosí, from partner Glamis Gold for US\$18 million in phased payments. The project boasts a reserve of 61.1 Mt averaging 0.59 g/t Au and 24 g/t Ag. The feasibility study envisages a run-of-mine heap-leach operation with production of 118,800 oz of gold equivalent, cash costs of US\$129/oz gold equivalent and capital costs of US\$28 million. With the improvement in the gold price the company announced the commencement of construction in early 2004, but the company has found its attempts to begin construction blocked by legal opposition from some of the residents of the town.

Minefinders Corp continued the economic evaluation of the Dolores project in southwestern Chihuahua during 2003. The gold and silver mineralisation at Dolores is associated with a series of brecciated and stockwork veined felsic dykes, and recent work has identified a number of higher-grade feeder structures. An updated resource completed in mid-2003 confirmed a measured and indicated resources of 50.8 Mt averaging 1.26 g/t Au and 61.6 g/t Ag at a gold equivalent cut-off grade of 0.6 g/t.

Gammon Lake announced an updated resource for the company's 100%-owned Ocampo project in the state of Chihuahua. The main open-pit area has a measured and indicated resource totalling 16.6 Mt at 1.28 g/t Au and 60g/t Ag. The Northeast zone has an underground resource of 3.5 Mt averaging 5.86 g/t Au and 302 g/t Ag, as well as a small surface resource totalling 100,000 oz of gold and 4.2 Moz of silver.

Queenstake Resources Ltd, which began production at the Magistral project in Sinaloa in early 2003, sold the asset to Nevada Pacific Gold at the end of the year for US\$7 million in cash and 2 million shares. The four open pits have a total reserve of 7.0 Mt averaging 2.07 g/t Au, with additional material contained in tailings. Production in 2003 was approximately 23,000 oz.

The Mulatos project, located in the southeast corner of Sinaloa, was sold by JV partners Placer Dome Inc (70%) and Kennecott Exploration Co (30%) at the end of 2000, and is now owned by Alamos Gold Inc (itself the product of a merger between Alamos Minerals Ltd and National Gold Corp). The project has a measured and indicated resource of 62.2 Mt at 1.51 g/t Au, using a cut-off grade of 0.6 g/t. The company is completing a feasibility study, which envisages treating 10,000 t/d to produce some 150,000 oz/y of gold.

Although silver prices were stable throughout most of 2003, Mexico's silver production last year increased by 2% to 2,916 t (93.8 Moz), primarily as a result of increasing production at Sombrerete and Fresnillo. Peñoles' operations in Torreón account for some 1,500 t/y of refined silver.

Peñoles remains the country's largest silver producer, and production at its Proaño operation near Fresnillo in the state of Zacatecas totalled 973 t in 2003 as a result of the project's expansion. Three vein systems – Santo Niño, San Ricardo, and San Mateo – are exploited by cut-and-fill methods, and the expansion from 0.9 Mt/y to 1.2 Mt was completed in 2001.

Of Peñoles' other silver operations, the US\$40 million Rey de Plata mine in the Taxco region, a joint venture with Dowa Mining of Japan, boasts reserves of 2.9 Mt averaging 239 g/t Ag and 8% Zn. Commercial production commenced at the end of 2000 at a rated capacity of 330,000 t/y of ore. The project was put on care and maintenance in December of 2001 as a result of low commodity prices and reported no production in 2003.

Las Torres, in the state of Guanajuato reported production of 109 t in 2003, a decline of over 29%, and output at Naica, in the state of Chihuahua, fell more modestly (-7%), to 147 t. In Hidalgo, the Zimapán mine was closed in March of last year and contributed only 5 t to Peñoles' silver output in 2003, as production at this operation declined by 85%. Production from the operations in the area of Cadereyta and Colón, both in the state of Queretaro, totalled 10 t.

Industrial Minera México is also an important producer of silver, although most of it is recovered as a by-product or co-product at its polymetallic operations. Production at the Charcas operation in the state of San Luis Potosí decreased to 50 t in 2003 (56 t in 2002), whilst at Taxco in Guerrero production also fell, to 42 t (63 t in 2002). Production at the operations in Chihuahua fell with respect to the previous year. Production at Santa Bárbara fell by 5% to 132 t, and San Francisco del Oro remains on care and maintenance.

IMMSA's San Martín operation, also in Zacatecas near Sombrerete, reported an increase in production of 11%, to 221 t.

Production at the historic Real del Monte mine in the state of Pachuca continued to decline, falling a further 38% in 2003, to 20 t. Project operator Real del Monte Mining, part of the GAN Group, has suffered from a lack of working capital and is unlikely to proceed with previously announced expansion plans.

Real de Angeles, part of Grupo Frisco, remained closed. Minas de Bacis, located in the state of Durango, produced 68 t, a 7% improvement in production with respect to 2002. By-product silver from Peñoles' La Ciénega mine totalled 61 t in 2003, a decline of 16% with respect to the prior year, and primarily a function of lower grade ores.

The San Dimas mine, now owned by Canada's Wheaton River Minerals Ltd, produced 168 t in 2003, a 38% improvement on the preceding year. Smaller mining operations, which once produced a significant amount of silver in the largely artisanal districts of Cuencamé, Guanaceví, and Panuco de Coronado, reported virtually no production during 2002.

Pan American Silver Corp of Vancouver continued to develop its La Colorada mine in the state of Zacatecas. The company reports vein-hosted reserves of 2.64 Mt averaging 455 g/t Ag, or 38.6 Moz of contained silver. Additional drilling has extended the deeper, replacement-style mineralisation, now totalling 5.0 Mt averaging 108 g/t Ag. The US\$20 million project, expected to be completed in July 2003 with annual production of 3.8 Moz/y of silver, fell behind schedule, and production in 2003 totalled only 992,142 oz. The company also acquired the Alamo Dorado project in Sonora (through the merger with Corner Bay Minerals), which contains a proven and probable reserve of 35.5 Mt at 68 g/t Ag, or 78 Moz. During 2003, Pan American advanced the feasibility study for an open-pit operation and expects to make a construction decision in mid-2004. A feasibility study conducted by Mintek on behalf of Corner Bay indicated a project capable of producing 6 Moz of silver over eight years at a capital cost of US\$45 million.

### **Lead and Zinc**

One of the world's most important producers of lead and zinc, Mexico benefited from the improvement in commodity prices during 2003. Year-on-year zinc production in 2003 increased by 4.5% to 409,500 t, steady production at Charcas and Bismark, and increased production at Francisco I Madero offsetting lower production at Sombrerete, Santa Bárbara, Naica and Tizapa.

The Charcas mine in the state of San Luis Potosí, produced 67,880 t, up from 67,843 t in 2002. The San Martín mine in Zacatecas reported slightly lower production in 2003 of 50,654 t. The Tizapa operation in the state of Mexico, a joint venture between Peñoles (51%) and Dowa Mining (49%), came on stream at the end of 1994 and has reserves of 3.2 Mt averaging 250 g/t Ag, 8.5% Zn and 1.3% Pb, plus minor amounts of gold. This underground operation produced 20,671 t of zinc in 2003, a 32% decline with respect to 2002.

Chihuahua remains the country's largest zinc-producing state. Peñoles' Bismark underground mine is the state's largest producer, and reported production of 44,745 t in 2003 (compared with 46,123 t in 2002). This polymetallic skarn deposit has reserves of 3.75 Mt at an average grade of 6.7% Zn, 0.42% Pb, 0.39% Cu, and 40 g/t Ag. Cut-and-fill mining is employed to feed a 2,400 t/d concentrator. The Santa Bárbara mine also delivered lower production, falling to 33,229 t in 2003 (37,050 t in 2002). At Naica, in the Saucillo district of Chihuahua, zinc production in 2003 declined by 2.5%, to 37,157 t, but this follows a major expansion in 2002. Grupo México's Santa Eulalia mine remained on care and maintenance as a result of low prices, despite the benefits of a previously announced expansion.

Also in Chihuahua, San Francisco del Oro (1,608 t in 2001 and 0 t in 2002) remained closed, pending a recovery in metals prices.

The country's newest zinc producer, the Francisco I Madero mine in Zacatecas, started up on schedule in July, 2001. The orebody has reserves of 30 Mt averaging 5.2% Zn and 1.10% Pb and at full capacity the mine will process some 3 Mt/y of ore for the production of 110,000 t/y of zinc. During 2003 the mine produced approximately 96,179 t, an increase of almost 15% with respect to 2002, and could achieve its rated production during 2004. The project was brought on stream at a total capital cost of US\$125.8 million, slightly below budget.

Mexico's lead production is estimated at 145,296 t in 2003, a year-on-year increase of 29.4%. The bulk of the country's lead is produced in the northern state of Chihuahua.

Production at Fresnillo's Naica unit in Saucillo decreased by over 3% in 2003, to 47,250 t (2002: 48,931 t), and output at Santa Bárbara fell by 14% to 15,885 t (2002: 18,475 t). As mentioned previously, San Francisco del Oro did not report any production, as operations at the mine were suspended. The same occurred at Santa Eulalia, which was closed. The Real de Angeles mine in Zacatecas also remained closed during 2002, having last been in operation in 1998.

Two other important lead producers are Zimapán in the state of Hidalgo and San Martín in the state of Zacatecas. Zimapán reported production of only 889 t (2002: 5,388 t), as Peñoles took the decision to close down the operation effective March 1, 2003. With reserves largely exhausted, the company was unable to justify mining marginal material. Production at San Martín actually rose by 6% to 9,962 t. The Francisco I Madero zinc mine also contributed 8,457 t as the operation ramped up towards full production. The Charcas project in San Luis Potosí contributed an additional 4,008 t in 2003, a 7% decline with respect to the prior year.

Peñoles is also Mexico's largest producer of refined lead and zinc. The company operates a refinery in Torreón, in Coahuila, which includes a silver-lead refinery with annual capacity of 150,000 t and an electrolytic zinc refinery that can produce 220,000 t/y of zinc. This facility also recovers cadmium, bismuth, antimony, ammonium sulphate, sulphur dioxide, and sulphuric acid. The company completed a US\$130 million expansion of the refinery at the end of 2000, which has lifted annual capacity to 220,000 t. The facility has been under scrutiny by the environmental authorities as a result of elevated levels of lead in the surrounding communities.

Industrial Minera México operates a zinc refinery in San Luis Potosí with the capacity to produce 100,000 t/y of high-grade zinc, as well as sulphuric acid and refined cadmium. The facility was the subject of a brief strike during 2002. The company's 85,000 t/y capacity lead refinery at Monterrey, in the state of Nuevo León, has been converted into a facility to recover gold and silver from anode slimes.

Teck Cominco has put the development of the San Nicolás project in the state of Zacatecas on hold because of the low prevailing zinc price. During 2001, the company had completed a feasibility study indicating a total capital cost of US\$246 million, which prompted the company to defer a production decision until commodity prices improved. The most recent resource includes 1.88 Mt in the measured category averaging 3.76% Zn and 0.73% Cu, 78 Mt in the indicated category at 1.8% Zn and 0.9% Cu, and a further inferred resource of 7 Mt at 1.4% Zn and 0.14% Cu.

Western Silver has reported an updated resource for the Chile Colorado zone on its Peñasquito property in Zacatecas, totalling 148.7 Mt averaging 34.3 g/t Ag and 0.34 g/t Au, with minor amounts of lead and zinc. A feasibility study concludes that the project could produce at a rate of 20,000 t from an open pit at a development cost of US\$164 million.

At the Campo Morado project in the state of Guerrero, work by Farallon Resources Ltd on the precious metals-rich massive sulphide deposits remains suspended pending the resolution of an ongoing ownership dispute.

### **Iron and Steel**

Despite the financial problems experienced by the country's principal iron and steel producer, Mineral del Norte (Minosa), the steel tariffs imposed by the US (which exclude Mexico due to its NAFTA status), helped both the iron ore and steel industries. Mexico's iron-ore production increased to 6.8 Mt in 2003, from 5.75 Mt in 2002. Mexico's largest reserves of iron ore are found at Hércules (168 Mt) and Peña Colorada (131 Mt) and the latter has been the subject of a border dispute between the states of Colima and Jalisco. (Jalisco claims that the deposit falls within its state boundary but appears to have lost the dispute because even production from Las Encinas is now reported under Colima in the official statistics.)

The Peña Colorada mine in Colima has an annual capacity of 3.5 Mt of concentrates, with an expansion to 4.0 Mt/y to be completed by the end of 2004. Concentrates are pelletised at the company's facilities at the nearby port of Manzanillo. Output at the pelletising plant totalled 2.35 Mt in 2003, an increase of 9% from the previous year. Las Truchas in the state of Michoacán, operated by a subsidiary of Villacero, reported production of 1.13 Mt, an increase of 37% with respect to 2002. The operation largely managed to overcome the effects of a strike and a subsequent explosion in one of the converters at the steel plant during 2002, although production still fell short of capacity of 1.3 Mt.

The Hércules mine in the state of Coahuila produced 2.58 Mt in 2003, an increase of over 32%. The development of a tailings retreatment project has allowed the mine to maintain an annual capacity of around 2 Mt/y, and the discovery of the Ulises deposit will extend the life of the project by over 20 years.

Minosa, which had put the operations at the Cerro de Mercado mine in the state of Durango on care and maintenance during 2001 and 2002, reported production of 538,234 t in 2003. The project has an annual capacity of 3.0 Mt and last produced 400,000 t during 2000. Minosa also owns La Perla, a mine in Chihuahua, and this operation also resumed production in 2003, with total output of 571,503 t. Las Encinas, in the state of Jalisco, which produced 0.78 Mt in 2002, was closed in 2003. Reserves at Las Encinas have been increased to 157 Mt following the discovery of 24.3 Mt of additional mineralisation at Cerro Nahuatl.

Mexico's steel production increased in 2003 to 15.2 Mt, an increase of 7.8% with respect to 2002. The tariffs on steel passed by the Bush Administration helped the Mexican steel industry, which was exempted from the Section 201 tariffs as a result of its NAFTA status. Mexican steel producers have also argued that Asian and Eastern European steel producers have been 'dumping' steel on the Mexican market. In early 2002 the government announced that it would be raising tariffs by 35% on steel imports from several Asian and European countries with which Mexico does not have trade agreements. The industry's competitiveness, however, has been affected by higher fuel costs and shipping rates.

The privatisation of the steel industry has resulted in the formation of five large steel producers and a handful of mini mill producers. Grupo Acerero del Norte (GAN) controls Altos Hornos de México (AHMSA) and Fundidora de Monterrey. The company's principal product is sheet steel, production of which fell to 2.5 Mt in 2002. Production of raw steel was slightly greater than 2.9 Mt and accounted for 23% of national raw steel output. The start-up of a third blast furnace should see production increase during 2003. AHMSA's restructuring was bogged down when the talks between the company and its creditors broke down, although the company's operations have been largely unaffected.

In 1995, GAN purchased Aceros Nacionales (ANSA), the largest and most modern producer of steel wire in the Mexico City area, but this facility was sold to Grupo De Acero for US\$68 million during 1998. In May 1999, GAN and AHMSA declared bankruptcy and were awarded protection from creditors whilst a financial rescue package was implemented. Spanish steel producer Aceralia was interested in entering into a deal with AHMSA, but withdrew upon closer examination of the company's financial status.

Ispat Mexicana, also known as Imexsa, was established when Indian interests purchased Siderúrgica del Balsas, part of the facilities that comprised the Siderúrgica Lázaro Cárdenas (Sicartsa II) complex. Ispat's main facilities include a 4 Mt/y pellet plant and two DRI plants with annual capacities of 2.4 Mt and 1.7 Mt, respectively. The company's furnaces have the capacity to produce 5.3 Mt/y of liquid steel. The pellet plant produced 2.3 Mt in 2003, and the combined output of the two DRI plants totalled 3.5 Mt. Steel shipments totalled 3.75 Mt in 2003.

The company will be investing US\$13.5 million in 2004 to enable the company to produce ultra-low carbon steel for the automotive industry.

Industrias Monterrey (IMSA) completed the expansion of its hot-rolled steel facility from 1.2 Mt/y to 2.2 Mt/y in August of 2003, and expects to be at capacity during 2004.

Grupo Villacero, the largest rebar producer in North America, operates the Sicartsa I unit, producing primarily rebar, which is then processed further by the company's plants in Monterrey (Simisa), Guanajuato (Sibasa), Mexico City (Camsa), Veracruz (Metaver) and El Paso, Texas (Border Steel). Production in 2002 was affected by an explosion in one of the converters early in the year and by a strike in the fourth quarter. Overall, Villacero operated at 40% of capacity in 2002. The company's other production subsidiaries include Tubería Nacional (steel tubing), Cintacero (steel belts) and Zincacero (galvanised steel). Speciality products, primarily steel mesh, are produced by two subsidiaries, Viga Trefilados in Michoacán and Temple in Veracruz.

Hylsa, the steel making subsidiary of Grupo Alfa, produces hot and cold-rolled sheet, galvanised steel, steel rod and rebar. The company's direct reduction plant in Monterrey, completed during 1998 at a cost of US\$400 million, has an annual capacity of 700,000 t. The company also completed the expansion of its mini mill that will have an annual capacity of 1.5 Mt. Shipments of Hylsa's finished products increased in 2003 to 2.9 Mt, compared with 2.78 Mt in 2002. As a result of improved demand the company restarted an additional furnace with annual capacity of 600,000 t/y of pig iron and a hot-rolled sheet facility with annual capacity of 350,000 t. In early 2004, the company announced that its parent, Grupo Alfa, would be distributing its shares in Hylsa as part of a plan to create eventually a stand-alone, publicly listed steel business.

Tubos de Acero de México (Tamsa) is Mexico's only producer of seamless steel pipe, used primarily in the petroleum industry. In 1995, Argentine seamless pipe producer Siderca acquired a 37% interest in Tamsa and took over management control, creating the world's second-largest producer of seamless drilling pipe. In 2002 Tamsa was taken over by Tenaris, a Luxembourg-based seamless company created by Techint of Argentina to house its seamless pipe holdings, including Tamsa, Siderca and Dalmine of Italy, and renamed TenarisTamsa. The company produced 608,000 t in 2003 as demand improved due to higher drilling activity in North America and Mexico.

Several mini-mill firms are also producing a variety of steel products. Industrias Campos Hermanos (ICH) is a producer of speciality steels, steel alloys and welded pipe. The company's 120,000 t/y capacity mini-mill has been operating below capacity, as has the acquired 185,000 t/y welded pipe facility at Monclova, Nuevo León.

ICH completed the acquisition of an 82% stake in Grupo Simec for US\$285 million during the first quarter of 2001. Grupo Simec, a division of Grupo Sidek, produces both steel and aluminium products. The company has a total capacity of 840,000 t/y at its plants in Guadalajara, state of Jalisco, and Mexicali, state of Baja California Norte. Production in 2002 totalled 609,202 t. The company's principal products are steel bars and rebar. Following the acquisition, ICH announced that it intends to invest US\$190 million in the company.

### **Manganese**

Minera Autlán is Mexico's primary manganese producer. Having been a state-owned enterprise, the company was privatised in 1993. The purchaser, Grupo Ferrominero, invested US\$66 million in the operation over the next five years as part of the purchase package. Improved demand from the steel sector led to a significant turnaround. Production in 2003 increased by 70%, to 111,641 t, and the industry posted its best year since 2000, when production totalled 157,547 t. Autlán continued its financial restructuring process during 2003.

The company's principal operations are located in the state of Hidalgo. The underground Molango operation is based on a manganiferous limestone deposit averaging approximately 27% Mn; the processing facilities produce manganese nodules. The nearby Nonoalco facility produces natural manganese dioxide.

Elsewhere, the deposits in the Tetzintla area occur as manganese oxides and average 38% Mn. The company's mine at Terrenates, in the state of Chihuahua, produces ore with a high Mn:Fe ratio. The company produces ferroalloys at three different plants. The Tamós plant in the state of Veracruz produces silicomanganese and ferromanganese, as does the Gómez Palacio plant in Durango. The former benefited from a US\$8 million investment to boost production by 18,000 t/y, but was shut down as a result of high fuel prices. The Tezuitlán plant in the state of Puebla, which produces silicomanganese, was reopened in mid-2002 as a result of improving market conditions. In September 2003, in response to a complaint filed by the company, the Secretaría de Economía imposed revised anti-dumping tariffs on silicomanganese imports from the Ukraine and ferromanganese imports from China.

### **Molybdenum**

The majority of Mexico's molybdenum is produced as a by-product of copper production at La Caridad in Sonora. Molybdenum concentrates are exported to the US, the UK, the Netherlands and Germany.

Output in 2003 is estimated at 3,523 t, a 2.8% increase with respect to 2002. The country's molybdenum production had been growing since 1997 as a result of the expansion of the molybdenum plant at La Caridad, prompted by an increase in the molybdenum grades being mined. The country's second producer is Molymex, located in the Cumpas district of Sonora, which produces molybdenum tri-oxide.

During 2002, Molymex completed the installation of an acid plant with an annual capacity of 23,000 t as part of a long-term plan to reduce the emission of pollutants.

### **Antimony**

Antimony production surged in 2003, rising by 109% (having risen by 127% in 2002) to 434 t, but still a fraction of the 1,800 t produced in 1995. Mexico's primary producer is Minera y Refinadora Mexicana, which mines stibnite ores in the Real de Catorce district in the state of San Luis Potosí. Antimony is also produced in the Tejocotes region of Oaxaca, and resources of this metal are known to occur in the states of Puebla, Sonora, and Zacatecas. Antimony trioxide is produced at Peñoles' facility in Bermejillo, Durango, and at Industrial Minera México's refinery in Monterrey. Production is exported primarily to the US.

### **Other metals**

Mexico is an important producer of a number of other ferrous and base metals. Arsenic production decreased by 11% to 1,729 t in 2003, from 1,945 t in 2002 and 2,381 t in 2001. Output remains depressed, having reached a peak of 4,450 t in 1993. Arsenic is recovered from the refining of base metals at the Met-Mex refinery of Peñoles in Torreón and at Industrial Minera México's refinery in San Luis Potosí.

Mexico remains the world's largest producer of bismuth, even though production has been erratic in recent years. Bismuth is recovered from the processing of base and precious metals at the Met-Mex refinery in Torreón and by Industrial Minera México. From an output level of over 1,600 t in 1997, production in 1999 plunged to 560 t, then recovered to 1,080 t in 2000, and grew further to 1,391 t in 2001. Production in 2003 stabilised somewhat, falling 5.5% to 1,064 t. As Mexico's consumption of bismuth is only around 50 t/y, the rest is exported, primarily to the US and Belgium.

Cadmium production rose by 14.8% in 2003 to 1,606 t, but is still well below the 1,891 t recorded in 1997. The Charcas mine in the state of San Luis Potosí, and the San Martín mine in the state of Zacatecas account for the bulk of Mexico's production. Refined metal, meanwhile, is recovered at the Met-Mex refinery in Torreón and at Electrolítica de Zinc's refinery in San Luis Potosí. Cadmium oxide, once produced at Industrial Minera México's now-idled Chihuahua base metals refinery, is now recovered at Peñoles' facility at Bermejillo, in the state of Durango. Mexico consumes about 180 t/y of cadmium and exports the remainder.

Mexican tin production, which has declined dramatically in the past decade, remains at depressed levels. Having once produced 600 t/y, production in 2003 was only 22 t. Tin is recovered as cassiterite from small alluvial operations.

Mexico's tungsten production has plummeted. Having produced 173 t in 1997, no production has been reported since 1999.

### **Barite and Celestite**

Mexico's production of barite, which fell in each of the years 2001 and 2002, rose dramatically in 2003, to 255,961 t, a gain of almost 93%. The largest consumer of Mexican barite continues to be the state-owned oil company, Petróleos Mexicanos; national capacity, at 400,000 t, was developed solely to satisfy Pemex's ambitious oil exploration and development plans. As a result of the rebound in the oil price and Pemex's much improved finances, barite demand has improved.

Baramín produced 198,887 t at its facilities in Galeana in the state of Nuevo León, a 77.9% increase with respect to 2002. The remaining producers are Barita de Santa Rosa and Barita de Parral, in Coahuila, all of which had improved output during 2003. The operations of Barita de Sonora, one of the country's primary producers, has been suspended since 1998.

After two years of consecutive declines, celestite production posted an increase as a result of improved demand from the electronics sector and an improved competitive position due to the devaluation of the currency. Mexico is the world's largest producer of celestite, accounting for some 25% of global production. Output in 2003 totalled 126,747 t, an increase of almost 16%. Celestite is produced by Estroncio de México at its Cuatrociénegas facility and by Minas de Estroncio at its Coahuila unit, both in the state of Coahuila.

Production of strontium carbonate for export takes place at a facility in the city of Reynosa along the border with the US. This operation has a capacity of over 22,000 t/y. Minera La Valenciana, in the state of Coahuila, is the country's primary producer of this strontium mineral, which is refined to strontium carbonate at the company's facilities in Torreón.

### **Fluorspar**

Mexico's production of fluorspar grew by 12.5% to 749,842 t in 2003. Although still well below the country's peak output of nearly 1.0 Mt/y during the 1980s, the strength in worldwide demand for acid-grade fluorspar for the production of the new generation of refrigerants, as well as higher prices, has helped improve Mexico's competitive position. The two principal producers in San Luis Potosí are Minera Las Cuevas and Fluorita de Río Verde, with combined production of 607,629 t in 2003, an increase of 17.5% over 2002.

Minera Las Cuevas, Mexico's largest producer of fluorspar, exploits a high-grade deposit with a capacity of 430,000 t/y. In response to demand for higher quality concentrates, the company has invested US\$25 million in a new calcine plant.

Fluorita de Río Verde, meanwhile, also located in San Luis Potosí, has an annual capacity of 160,000 t. Fluorita de México produces fluorite from its underground operations at Muzquiz, Coahuila, where mining is carried out by room-and-pillar methods. The project produced 94,219 t in 2003. The Acuña district contributed an additional 36,726 t.

### **Graphite**

Graphite production in 2003 fell to 8,898 t, a 44.2% decrease with respect to the previous year, and following a 26% decline in the prior year. The country still ranks as one of the world's top five graphite producers, but its resource base of 3.1 Mt places it second in the world. Virtually all of the country's production is centred near the city of Hermosillo in the state of Sonora. Mexico's principal producer is Grafitos Mexicanos, which accounts for about 45% of the country's output. Another important producer in Sonora is Minera Internacional Midas. About 95% of the country's production is in the form of amorphous graphite. An additional 5,000 t of crystalline graphite is produced by Grafito de México in the San Francisco Telixtlahuaca region in the state of Oaxaca.

### **Salt**

Mexico's production of salt is estimated at 8.02 Mt in 2003, a slight decline with respect to 2002. Most of Mexico's salt production comes from the Guerrero Negro Complex, located on the Pacific coast in the state of Baja California Sur. Exportadora de Sal, operator of Guerrero Negro, is a joint venture between the Mexican Government (51%) and Mitsubishi (49%). The proposed US\$120 million Salitales de San Ignacio expansion project remains on hold as a result of strong environmental opposition, although the government continues to study the potential environmental impact of the project. Production includes several grades of salt, including table salt, industrial salt and salt for de-icing. Approximately 99% of the production is destined for the export market, primarily to Japan, South Korea, New Zealand, Canada and the US. The country's remaining production can be attributed to Salinera de Yucatán, Azufrera Panamericana, and a handful of small producers.

### **Other Non-Metallic minerals**

Mexico's gypsum production, which reached a high of 4.2 Mt in 1997 as a result of healthy growth in the US construction sector, improved by 2.7% in 2003, to 3.21 Mt. The country's principal producer is Yeso San Marcos, with annual capacity of 2.0 Mt. Minera Caopas recovers gypsum from its facilities at Santa Rosalía in the state of Baja California Sur. The project has reserves of around 150 Mt and an annual capacity of 1.0 Mt. The completion of a 4 km conveyor and a 1,250 t/h loading facility will enable Caopas to increase its production to 2.0 Mt/y. Yeso Mexicano produces approximately 175,000 t/y, with the balance of the country's production coming from small producers.

The production of phosphates plunged by 99% in 2003 to less than 5,000 t. Production had reached record levels in the previous year after the country's largest producer, Roca Fosfórica Mexicana, was successfully privatised. The operation, however, was devastated by a hurricane and the operations remain closed while the company attempts to obtain a US\$80 million insurance settlement (which apparently was paid by re-insurers but embezzled by employees of the principal insurance company). Roca Fosfórica has traditionally accounted for about 75% of the country's phosphate production.

Mexico's sulphur production grew by 16.8% in 2003 to 1,034,402 t. The country's two producers, Azufrera Panamericana and Compañía Exportadora del Istmo, shut down their Frasch sulphur facilities at the end of 1993 and these operations, remain in government hands (technically, they are owned by state-owned oil monopoly, Pemex) after a failed privatisation effort in 1994. The country's primary source of production is the recovery of sulphur from oil and gas production. The majority of the country's production comes from the southern states of Tabasco and Chiapas, which contributed 425,003 t and 307,226 t, respectively, in 2003. Sulphur production was also reported from the states of Veracruz, Oaxaca, Guanajuato, Nuevo León and Tamaulipas. Pemex announced in 2002 a US\$30 million investment in a new sulphur production facility in the state of Veracruz.

Mexico's kaolin production is in the hands of a number of small producers scattered throughout the states of Guanajuato and Jalisco. Mexico's production, which rose sharply in 2001 (99,410 t) and 2002 (89,883 t), fell by 46% in 2003 to 48,464 t, the worst year since 2000 (21,069 t).

Mexico's production of feldspar fell slightly to 338,469 t in 2003. The country's principal producer is Materias Primas y Minería, a unit of Vitro, and accounts for about 65% of the country's production.

### **Coal**

Mexico's total steam coal production rose by 6.7%, to 6.53 Mt, in 2003, primarily as a result of improved prices and the re-opening of operations closed during 2002 because of safety concerns. The country's largest producers are Minera Carbonífera Río Escondido (Micare) and Minerales Monclova (Mimosa), both subsidiaries of Mexican steel producer Grupo Acerero del Norte. These two companies were formed when government-owned Micare was privatised in 1992.

Micare produces the bulk of the country's steam coal from the Sabinas and Fuentes-Río Escondido basins in the state of Coahuila, and consists of two open-pit and three underground operations with reserves totalling 208.6 Mt. As a result of GAN's financial troubles, Micare has been put on the auction block.

Mimosa produces coking coal and operates five underground mines in the Sabinas region. In early 2000 it opened its Mina V coal mine, also in Coahuila, in order to supply the Federal Electricity Commission (CFE). Development work has also commenced on Mina VI, which has a reserve of 27 Mt. The company's contracts with CFE were curtailed because of questions about the tendering process, and a portion of the contracts awarded to foreign producers.

Mexico's production of coke, on the other hand, declined by 11.7% in 2003, to 1.46 Mt. Production is centred around the coking-coal facilities at Monclova in the state of Coahuila and at the Lázaro Cárdenas-Las Truchas metallurgical complex in Michoacán. Coking coal is produced primarily in the state of Coahuila.

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Industrial Minera México produces approximately 250,000 t/y of coking coal at its Nueva Rosita complex in Coahuila, and production is primarily destined for the company's smelters. Production fell in 2002 as a result of a sympathy strike with other Grupo México operations.

Carbonífera de San Patricio, another important producer of coking coal, operates three underground mines and is developing a fourth, all located in the state of Coahuila. La Luz and El Gavilán mines are located in the Saltillo Basin and have a capacity of 360,000 t/y and 90,000 t/y, respectively. The company's '4-1/2' mine is located in the Esperanza Basin and has a capacity of 24,000 t/y. The development of La Caballada will increase the production from the Esperanza Basin to 96,000 t/y. The company's washing plant feeds a coking facility at Cloete, Coahuila, with an annual capacity of 96,000 t, and which produced 84,936 t in 2002.

Last year, Grupo Acerero del Norte shut down the coking plant at the Las Truchas steel complex in the state of Michoacán.

Table following page.

<b>Mexico Mineral Production</b>			
	<b>2001</b>	<b>2002</b>	<b>change</b>
<b>Precious Metals</b>			
Gold (kg)	23,254	22,065	-5.1%
Silver (kg)	2,852,138	2,916,273	2.2%
Gold (oz)	747,616	709,390	-5.1%
Silver (oz)	91,696,237	93,758,177	2.2%
<b>Base Metals (t)</b>			
Antimony	208	434	108.7%
Arsenic	1,945	1,729	-11.1%
Bismuth	1,126	1,064	-5.5%
Cadmium	1,399	1,606	14.8%
Copper	308,388	300,329	-2.6%
Lead	112,244	145,296	29.4%
Molybdenum	3,428	3,523	2.8%
Tin	12	22	83.3%
Zinc	391,711	409,500	4.5%
<b>Ferrous Metals and Coal (t)</b>			
Coal	6,116,270	6,529,003	6.7%
Coke	1,656,437	1,462,106	-11.7%
Iron	5,750,563	6,797,555	18.2%
Manganese	65,483	111,641	70.5%
<b>Industrial Minerals (t)</b>			
Barite	132,836	255,961	92.7%
Celestite	109,314	126,747	15.9%
Dolomite	518,412	409,363	-21.0%
Feldspar	348,670	338,469	-2.9%
Fluorite	666,379	749,842	12.5%
Graphite	15,956	8,898	-44.2%
Gypsum	3,125,755	3,208,780	2.7%
Kaolin	89,883	48,464	-46.1%
Phosphate	458,710	4,981	-98.9%
Salt	8,575,896	8,020,667	-6.5%
Silica	1,826,665	1,689,435	-7.5%
Sulphur	885,492	1,034,402	16.8%
Wollastonite	28,259	50,422	78.4%