

MINERALS IN THE WORLD ECONOMY

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SUMMARY OF INTERNATIONAL EVENTS IMPACTING THE MINERALS ECONOMY IN 1993

Social and political movements that had been gathering momentum over several years continued in 1993 to dramatically affect and inspire uncertainty on the global mineral industry. Privatization of government-controlled mineral industries continued throughout the world, especially in Africa, Asia, Central Eurasia, Eastern Europe, Latin America, and Western Europe. The reasons for privatization varied among regions and countries, but the trend was universal and was not expected to end soon. Regional trade blocks were being developed and expanded. The European Union (EU), the North American Free Trade Area (NAFTA), the Association of Southeast Asian Nations (ASEAN), the Asia Pacific Economic Cooperation (APEC), and the Latin American Southern Cone Common Market (MERCOSUR) were expected to contribute to reduced internal tariffs and increased minerals trade. Minerals consumption within the politically unstable former Soviet Union (FSU) decreased significantly without a simultaneous cutback in production, while its exports flooded the world's mineral markets. These exports into Western Europe and Japan, still in economic recession, depressed minerals and metals prices worldwide, especially for aluminum, magnesium, nickel, and potash. Increasingly restrictive environmental laws and land-access limitations in Australia, Canada, Western Europe, and the United States tended to

discourage mineral resource development. However, the number of undeveloped countries in Latin America and Asia that encouraged exploration and development by revising mining and tax laws and regulations increased, thereby increasing investment opportunities for foreigners.

Africa

The African continent in 1993 produced a significant portion of total world output for a number of mineral commodities. The most significant national nonfuel mineral economies in Africa in terms of diversity and value of output, in decreasing order of importance, were South Africa, Zambia, Zaire, Morocco, Zimbabwe, Namibia, and Ghana. South Africa led world gold producers in 1993 with an annual production of over 600 metric tons (mt), and it ranked among the top five world producers in the value of nonfuel minerals, coal, and uranium. It was a major world producer of andalusite, chromite, ferroalloys, diamond, fluorspar, manganese, platinum-group metals, pyrophyllite, titanium, uranium, vanadium, vermiculite, and zircon. Among the most significant mineral commodities produced in Africa, ranked by proportion of world production in 1993, were diamonds, cobalt, chromite, gold, phosphate rock, manganese, uranium, and petroleum.

The African share of world mineral-commodity production showed little change from that of 1992, although output generally declined slightly. There were few significant production increases (gold, platinum-group metals, titanium), but there were significant decreases of cobalt and copper, because of political

instability and production problems in Zaire and production problems in Zambia. Significant declines occurred in the production of chromite in South Africa and Zimbabwe, and of phosphate rock by producers in general.

U.S. mineral imports in 1993 from African nations were mainly raw materials, and 10 of the countries were considered to be major import sources for the United States. Among these were South Africa for andalusite, antimony, asbestos, chromite, ferrochrome, diamond, fluorspar, gemstones, manganese, platinum-group metals, pyrophyllite, vanadium, and vermiculite; Zaire for cobalt, copper, and diamonds; Zimbabwe for ferrochromium and lithium; Gabon for manganese; Guinea for bauxite; Madagascar for graphite; Morocco for barite; Namibia for quartz crystal; Zambia for cobalt; and Mauritania for iron ore.

Most of Africa's labor force was unskilled or semiskilled, which was a significant factor in the slow pace of mineral industry development throughout much of Africa. Mining in Africa, in many cases, involved labor-intensive methods at ore bodies of low grade or small size that would not normally be economic in more developed regions. Even Africa's many modern mines tended to be labor-intensive because of the availability of low-wage workers. In South Africa, declining ore grades, rising costs, and low gold prices cost more than 100,000 workers their jobs during the past 3 years as the industry sought to improve productivity. In the absence of other viable economic activity for relatively unskilled people, and with very low labor costs and capital inputs, these following minerals were expected to

continue to be produced and marketed in small quantities from small mining operations: cassiterite (tin), columbite and tantalite, diamonds, gold, gemstones, natron, platinum, and salt. With few exceptions, such as South Africa and Morocco, the production of minerals was the dominant industrial activity in each country, and in several countries, one or two mineral commodities were dominant. Among the latter were petroleum and diamonds in Angola, diamonds in Botswana and Zaire, manganese and oil in Gabon, petroleum in Congo and Nigeria, gold in Ghana, bauxite in Guinea, uranium and diamonds in Namibia, uranium in Niger, phosphate in Senegal and Togo, and copper and cobalt in Zambia. In all cases, mineral exports were vital to foreign exchange earnings, and governments clearly saw the advantages of expanding both the variety and quantity of such exports for funding internal development. Unfortunately, falling prices for sub-Saharan African commodities drove per capita incomes there to below 1970 levels. In many cases, political instability, social conflicts, and poor infrastructure deterred expansion. Nevertheless, several African countries continued to develop as investment and mining laws were liberalized and foreign investment was attracted.

Privatization of state enterprises continued as part of economic restructuring programs in several countries. Many African governments adopted International Monetary Fund and World Bank structural adjustment programs to facilitate foreign investments, but these programs have been slow in enticing new foreign investment to the region. In 30 of the countries with continuing adjustment programs, only a handful showed signs of much progress. In Nigeria, the Government revised investment laws to attract new investors in the oil and gas sectors, allowing joint ventures between local and foreign participants. The foreign partners were permitted to have up to 70% equity. This and other policy changes led to an increase in the Nation's oil and natural gas reserves. Also, the

Nigerian government began rewriting its mining laws to attract foreign investors. Ghana's efforts to encourage foreign investment in the minerals sector were successful. Interest in gold exploration was significant in Ghana and nearby Mali, Guinea, and the Ivory Coast. Ghana privatized part of the state gold mining sector and was trying to reduce its interest in Ashanti Goldfields Corp., the country's main mineral export earner. Zambia was studying possible privatizing of its main source of export income, Zambia Consolidated Copper Mines. In South Africa, a new Minerals Mining and Exploration Act came into effect, which provided for a standard licensing regime with special provisions to promote investment by foreign and domestic enterprises in minerals exploration and extraction. The formal ending of apartheid laws and of economic sanctions against South Africa during the year opened the country for renewed foreign investment, but most investors awaited the outcome of elections in April 1994 and subsequent new policies that could affect mining investment.

Environmental issues were the focus of increasing attention in Africa. In Guinea and Tanzania, environmental impact statements were required to be included with requests for a mining license. The World Bank provided funding to Tunisia for abatement of pollution of the Mediterranean Sea from industry, ship ballast, and oil spills. Legislation was introduced in the South African Parliament to increase the responsibility of mine owners to rehabilitate environmental damage and to increase the environmental planning requirements of new mines.

Asia and the Pacific

The countries of Asia and the Pacific were important suppliers of a wide variety of minerals and mineral value-added products to both regional and world markets. Although the region had a large mineral resource base, it lacked large known resources of petroleum and associated products. Production of the latter was less than adequate for overall

regional consumption and will not satisfy the projected economic growth.

Australia, China, and India had the most important known mineral resources in the region. Australia had known reserves of bauxite, coal, copper, diamond, gold, iron ore, lead, manganese ore, mineral sands (titaniferous minerals, monazite, and zircon), nickel, salt, silver, tin, uranium, and zinc. China was the world leader in resources of antimony, barite, magnesite, rare earths, and tungsten. China also had large resources of ilmenite, molybdenum, low-grade iron ore, and coal. India had significant resources of barite, bauxite, coal, graphite, iron ore, and mineral sands. Significant resources and occurrences of minerals were also known in several other countries, as follows: bauxite, copper, gold, nickel, tin, and coal in Indonesia; tin and associated titanium in Malaysia; copper, fluor spar, lead-zinc, and coal in Mongolia; nickel in New Caledonia; gold and iron sands in New Zealand; magnesite and anthracite coal in North Korea; copper and gold in Papua New Guinea; copper, chromite, and gold in the Philippines; and gemstones in Sri Lanka. Potential is high for significant mineral resources in other countries, as follows: copper and gold in Burma (Myanmar), Cambodia, and Laos, and industrial minerals in Thailand, and magnesite and coal in Vietnam.

Although Japan, Hong Kong, South Korea, Singapore, and Taiwan had few domestic mineral resources and were dependent on imported raw materials, each country was a significant part of regional and international commerce, and each was advanced both technologically and economically. Hong Kong and Singapore were city-states and major free trade zones that relied on commerce and trade. Singapore was a financial and service center for petroleum and mining activities in Southeast Asia.

The countries of Asia and the Pacific produced more than 60% of the world's output of bauxite, fluor spar, graphite, ilmenite, refined tin, and tungsten. From 40% to 60% of the world's output of barite, cement, iodine, iron ore, pig iron, magnesite, manganese, and rutile was

produced in the area. In addition, the region accounted for 15% to 40% of world production of alumina and aluminum metal, mined and refined copper, gold, mined and refined lead, mercury, mined and refined nickel, salt, steel, and mined zinc. While Asia and the Pacific produced a substantial portion of mine output of many mineral commodities, its output of crude petroleum and natural gas was only about 10% of world production of each. However, the region was an important producer of coal, and its output of anthracite and bituminous coal was about 90% and 45%, respectively, of world production of these ranks of coal.

Countries in the region that were large net exporters of minerals and metals were Australia—alumina, coal, diamonds, ilmenite, refined lead, monazite, rutile, zinc, and zircon; Indonesia—bauxite, copper concentrate, nickel matte, liquid natural gas (LNG), and tin metal; Malaysia—bauxite, LNG, oil, and tin; Mongolia—copper and molybdenum concentrates and fluorspar; New Zealand—aluminum, iron sand, and steel semimanufactures; and the Philippines—chromite, copper concentrate, and nickel. China exported antimony, barite, refractory bauxite, fluorspar, magnesite, rare earths, talc, tin, tungsten, and petroleum refinery products. China's exports of tin and tungsten had a severe impact on markets and apparently influenced the decision of the Malaysia Mining Corp., once the world's biggest tin producer, to withdraw permanently from tin mining. Oil and gas occurrences were known throughout the region and commercial quantities were recovered in Brunei, one of the region's largest LNG producers, China, India, Indonesia, and Malaysia.

Consumption of mineral commodities was increasing in Australia, China, Japan, and the newly industrialized economies of India, Indonesia, Malaysia, South Korea, Taiwan, and Thailand. Japan was by far the largest single consumer of minerals (industrial minerals, metals, and energy) in the Asia and Pacific region. Most consumption in Japan, Korea, and Taiwan was for the

manufacture of finished goods for domestic consumption and for export.

In contrast to Japan, China's booming economy and major industrial expansion led to increased production and consumption of raw materials, primarily for production of goods for domestic use. Demand exceeded supply for several materials, and China continued to increase imports of these materials through early 1993, thereby affecting the world's mineral prices. China sharply curtailed copper imports in April 1993 and copper prices plummeted to 3-year lows. Iron ore imports continued to rise from the 1992 level of 25 million metric tons (Mmt), even though China was the world's biggest iron ore producer with annual production nearly 200 Mmt.

Because of the strength of the yen, Japan's purchases of foreign minerals, metals, and fuels continued to cause contraction of its relatively small domestic mining sector. Japan accelerated its overseas mineral exploration and development projects for copper, gold, lead, silver, and zinc since 1992. Significant joint exploration and development projects were undertaken in Australia, Chile, China, Mexico, Mongolia, South Africa, and the United States. In 1992, Japan successfully launched its first geological observation satellite with the world's most advanced sensor and radar equipment to aid in the search worldwide for natural resources of copper, gold, iron, lead, silver, zinc, and other metals. The satellite began transmitting data in 1993 covering 10 portions of the Earth's surface, including two targeted areas in the United States.

To promote economic cooperation, trade, and investment in the Pacific Basin, the member countries of the APEC met in 1993 to plan for economic development in the region. APEC was composed of Australia, Canada, China, Hong Kong, Japan, South Korea, New Zealand, Papua New Guinea, Taiwan, the United States, plus all the member nations of the ASEAN—Brunei, Indonesia, Malaysia, Philippines, Singapore, and Thailand. The collective population of APEC accounted for about one-half that of the world.

Interest in privatization of state-controlled mineral industries continued in the region as it had around the world.

An important Roundtable Conference on Regulations for Foreign Investment in the Mineral Industry, organized by the Ministry of Geology and Mineral Resources, was held in Beijing in May 1993. The Conference provided an opportunity for representatives of international companies to comment on the proposed regulations on foreign investment and enter into discussions with high-level Government officials. India issued a new National Mineral Policy (NMP) in March 1993. The NMP repealed the ban on foreign and private investment in the mining of 13 mineral commodities—chromium, copper, diamond, gold, iron, lead, manganese, molybdenum, nickel, platinum-group metals, sulfur, tungsten, and zinc. The NMP allowed foreign equity up to 50% in mining joint-venture projects promoted by Indian companies. Enhanced equity holdings above 50% would be considered on a case-by-case basis. Since India had considerable mineral development potential, one of the objectives of the NMP was to attract foreign investment for mineral exploration. In Pakistan, a program of privatization and trade liberalization had endured during six governments in 5 years. Generous investment rules permitted total ownership of companies by foreign firms, tax holidays from 3 to 8 years, a 5-year capital gains tax exemption continued to attract significant foreign investment.

Mineral development in Asia and the Pacific was expected to increase with changes in investment climate in Burma, Mongolia, and Vietnam. There was potential for an increase in metal mining in Australia, Burma, China, India, Indonesia, Mongolia, Papua New Guinea, Thailand, and Vietnam, and for petroleum and natural gas finds in coastal Asia, particularly in the South China Sea adjacent to Burma, China, and Vietnam.

The mining and mineral processing industries of the region were sizable, especially in China and Japan. Moreover, the consumption of minerals and fuels for the manufacture of value-

added goods for both domestic and foreign markets was expected to expand in India, South Korea, Mongolia, and the countries of IndoChina and ASEAN. Taiwan was expected to continue to seek overseas processing facilities to meet the needs of its economy. Although environmental constraints to development were increasing in the region and some civil unrest continued locally, growth and trade were vibrant, and the countries of Asia and the Pacific were expected to play an important role in the world economy in the foreseeable future.

Europe and Central Eurasia

Western Europe was the single largest trading area and consumer of raw materials in the world and the single most important determinant of global raw materials production. The region relied on North and South America, Africa, and Australia as sources of raw materials for its significant metals processing industry. Central Eurasian mineral production was dominated by Russia, Kazakhstan, and Ukraine. Russia and Kazakhstan were major international minerals producers of a large variety of minerals. Ukraine was a major producer of coal, ferrous products, iron ore, and manganese.

The breakup of the world's most prolific minerals producer, the FSU, and the economic collapse and contraction of its defense industries, drastically reduced domestic demand for raw materials, increased mineral products available for export, and rearranged trade patterns of some of the newly independent states (NIS). Russia exported a far higher amount of aluminum, magnesium, nickel, potash, titanium, and other minerals to Western Europe and the United States than it did prior to the breakup. As a consequence, exports contributed to major supply and demand imbalances and declining commodity prices on global markets, and many Western mines closed or reduced production to balance the markets. For example, lead and zinc production declined 11% and 9%, respectively, during the first 10 months of 1993. Inco, the biggest Western nickel producer announced a 16%

decrease in production to reduce the nickel surplus. The major factor holding down prices of ferrochromium were exports from Kazakhstan to the United States. This was due to reduced internal consumption in the NIS and to the inability of both domestic and former East European customers to pay hard currency for these raw materials.

Export of the substantial surplus of mineral commodities was a means of securing vital foreign exchange needed for industrial modernization necessary in the competitive world market. Coming in the wake of recessions in Western Europe and Japan these increased exports caused disruptions in international consumption patterns, helped reduce worldwide minerals prices, and, in general, helped perpetuate the general international economic recession. For example, aluminum exports outside of former Council for Mutual Economic Assistance (CMEA) countries increased five-fold in the last few years to an estimated 1.3 Mmt in 1993. In response, the EU established a limit on Russian exports to EU countries of 60,000 mt during a 4-month period. This caused a strong reaction from U.S. aluminum producers who had sought to minimize the effects of extra Russian material by cutting back on production. As a result, meetings were held between the United States, the EU, Russia, and other major producers of aluminum in an attempt to minimize some of these disruptions.

The trend towards privatization continued throughout Europe and the transitioning economies of the FSU. On December 31, 1992, trade barriers between the 12 EU nations were eliminated and 1993 saw a continuation of the rationalization, mergers, privatization, and acquisitions that began several years ago. The United Kingdom's (UK) commitment to rationalization of its coal industry was demonstrated by the fact that, at yearend 1993, only 22 underground coal mines were in operation in the UK, compared with 50 in 1992, and overall productivity in British coal mines was reportedly 17% higher than in 1990. Germany and France also continued to close down their less

efficient coal mines, but with less vigor that displayed by the British. Germany continued to spend in the order of \$100 billion per year to modernize and integrate the eastern German states into a greater Germany. In the process, much of the minerals and metals production in the former Eastern Germany, which went, in part, to supply former CMEA needs, had been cut back significantly. In particular, the steel works at Brandenburg, and the potash and lignite mines have been greatly affected. Two of Germany's largest steel companies and engineering firms, Hoesch AG and Friedrich Krupp AG, merged.

In 1993, France announced a privatization program involving 21 large state-controlled companies. Among these were Elf Aquitaine, the oil group, which was France's largest industrial concern; Rhone-Poulenc, the chemical group; Pechiney's packaging division; and Usinor Sacilor, the world's second largest steel company after Nippon Steel. Italy also planned to privatize several state-controlled companies, including Ente Nazionale Idrocarburi (ENI), the state petroleum company that included Agip, the country's largest oil and gas group; Snam, which operated Italy's distribution of natural gas; and Nuova Samim, the metallurgical group. Ilva S.p.A., Italy's fourth largest manufacturing company, and Europe's third largest steel producer, continued its efforts at rationalization through restructuring and cutbacks and was continuing to seek foreign investors to assist in privatization efforts. In Spain, ERCROS, the country's largest chemical, fertilizer, mining, and explosives company was in the process of being privatized. Only Greece, in the EU, was showing a reversal in efforts to denationalize its industrial sector.

Restructuring and modernization of existing facilities continued throughout Central Europe and Central Eurasia, funded through several sources, including foreign partners, local and foreign banks, the World Bank, and the European Bank for Reconstruction and Development. The Czech Republic, Hungary, and especially Poland, have attracted a number of foreign investors in the metals

and minerals sector. Central Eurasia also was seeking to adapt to market economy structures, but because of a lack of experience with modern market practices, financial support was more difficult to obtain. Nevertheless, some nations were able to restructure economies to attract foreign investors and banks. A number of successful contractual agreements were made involving toll refining of a variety of ores in Kazakhstan, Russia, and Uzbekistan. Western companies, such as Newmont Mining Corp. and Chevron Corp., have shown interest in opportunities for gold-tailings reprocessing and refining and petroleum extraction.

Efforts increased at controlling environmental pollution and seeking to reverse some of the environmental destruction that had gone unabated for centuries. Environmental damage resulting from lignite and uranium mining in East Germany and metal mining and smelting operations in the FSU was severe, but given the depressed economic conditions in these areas, cleanup of only extreme cases was attempted. Many operations were closed due to marginal economics and polluting obsolete technology.

Almost every Central European country had new environmental laws prepared and, of far greater importance, was seeking to enforce these laws. In Poland, most operations at the Huta Bobrek steel mill were closed in 1993, reportedly for environmental reasons. Central European nations, which had come to rely on low-priced Russian energy and, to varying degrees, on its own high-sulfur lignite reserves to fill a significant part of energy needs during the last 50 years, were now coming under increasing pressure to install expensive coal-cleaning processes to control sulfur emissions. The World Bank and the European Bank for Reconstruction and Development continued to be active in supporting environmental programs in many of the Central Eurasian countries. Surrounding countries concerned about environmental pollution from nuclear reactors and metal-processing facilities in

Central Eurasia offered to fund some of the cleanup.

Latin America and Canada

The United States depended significantly on Canada and Latin America for mineral imports. Total trade between the United States and Canada exceeded that of any other two countries in the world, increasing from \$183.7 billion in 1992 to over \$235.5 billion in 1993, with further growth expected. The value of Canadian exports of nonfuel minerals and coal was estimated at \$19.4 million for the first 9 months of 1993, an increase of about 5% compared with the corresponding period in 1992. The United States continued to be Canada's best mineral-exports customer in 1993, absorbing 66% of the total, including coal, but excluding crude oil and natural gas. The EU and Japan received 11.1% and 8.4%, respectively, of Canada's exports.

Canada's main nonfuel mineral exports to the United States were as follows: iron ore, potash, and sulfur, and smelted and refined aluminum, copper, gold, iron and steel, nickel, silver, and zinc. Japan received aluminum, copper concentrates, gold, and most of Canada's coal exports. Copper, nickel, iron ore, and zinc concentrates went to the EU.

The United States was Mexico's leading trading partner in 1993. Seventy-six percent of Mexico's total exports was to the United States, while 63% of its total imports came from the United States. In the minerals sector, approximately two-thirds of Mexico's mineral exports went to the United States, while more than 60% of its mineral imports was from the United States. The total value of Mexican hydrocarbon exports, including refinery products, was about 14% of total exports. Mexico exported 891,000 barrels per day (bbl/d) of crude oil to the United States, or about 67% of its total crude oil exports. Mexico was a major exporter to world buyer of cement, copper, fluorspar, graphite, gypsum, lead, manganese, salt, silver, sodium sulfate, sulfur, and zinc, and it remained a leading source of

fluorspar, graphite, and strontium for the United States.

Throughout 1993, negotiations continued on NAFTA and supplemental agreements concerning the environment, labor, and the ability to deal with unforeseen import surges. NAFTA was ratified by the legislative bodies of Canada, Mexico, and the United States at yearend. This agreement created the largest and richest trading bloc in the world, including 370 million consumers and an annual combined gross domestic output approximating \$7 trillion. NAFTA automatically replaced the Free Trade Agreement between the United States and Canada after 5 years of generally successful operation. The excellent infrastructural connections between Canada, Mexico, and the United States, including railroads, highways, and pipelines, were expected to continue to be a significant factor in the intra-regional marketing of mineral commodities. The phased reduction of tariffs under NAFTA was expected to increase and strengthen the diverse trade in mineral raw materials and mineral-derived materials between the United States and both Canada and Mexico.

Of special importance to the mining industry were liberalized investment rules in NAFTA as applied to foreign investors. The new rules included the following: Foreign investors from Canada, Mexico, and the United States must be treated as equal to nationals of member countries with respect to the establishment, acquisition, expansion, management, operation, and disposition of investments; no member country may limit foreign investment in an enterprise to a maximum level of equity; and no performance requirements on an enterprise may be imposed. There also were rules against expropriation and nationalization. Because most mineral commodities from Mexico were already entering the United States market duty free or at preferential rates, NAFTA was expected to help increase United States mineral exports to Mexico, where the average tariff was less than 10%.

NAFTA was expected to mark the high point of Mexico's trade liberalization

program, begun in 1986 when Mexico joined the General Agreement on Tariffs and Trade (GATT). In Mexico, NAFTA was expected to effect a significant increase in mineral development activity, so that by 1999, 100% foreign ownership of mineral resources will be possible. In 1993, more than 100 foreign mining companies were actively exploring in Mexico, mainly for gold. From the Canadian perspective of NAFTA, the Economic Council of Canada forecast that by 1998, free trade would bring a net gain of 250,000 jobs to Canada, thereby increasing employment by almost 2% and Canada's gross national product by 2.5%.

Prior to NAFTA and during the past 30 years or more, other Latin American countries have entered trade agreements between themselves, such as MERCOSUR including Argentina, Brazil, Paraguay, and Uruguay; Chile's bilateral Free Trade Agreement with Mexico; the Venezuela and Colombia agreement with the Central American Common Market; Venezuela's agreement with Chile to begin phasing out tariffs over a 6-year period; and a free-trade pact between Colombia, Mexico, and Venezuela to phase out tariffs. During MERCOSUR negotiations, Brazil discussed measures to lower its average tariff to approximately 14% and abolish the 40% ceiling on foreign investor stockholdings in privatized companies. Brazil also signed an agreement with Peru to reduce tariffs on bilateral trade by 50%. Chile signed an agreement with Colombia to eliminate tariffs entirely by 1999. In 1993, Argentina signed a bilateral investment treaty with the United States guaranteeing U.S. investors the best of national or most favored nation treatment, free transfer of profits, and access to international arbitration. Also in 1993, Suriname became the 31st Latin American country to sign a trade framework agreement with the United States. The framework agreements created Trade and Investment Councils to discuss bilateral easing of barriers to trade and investment.

A large number of countries in Latin America were in the process of reducing the role of governments in the economy,

including the mining industry, through privatization of business operations. Apparently, they recognized that privatization of ownership and acceptance of foreign investment fosters vigorous growth, not least in the mining industry, leading to enhanced revenues and expanded overall economic strength in labor and wages. Especially notable was the action taken by Argentina to sell control of its state oil company, Yacimientos Petroliferos Fiscales (YPF), to local and foreign investors. YPF shares were made available to the New York Stock Exchange in the form of American Repository Receipts. The northern Mexican coal producer Minera Cabonifera Rio Escondido, S.A. (MICARE) was sold in October 1992 for \$30 million plus the assumption of \$100 million of debt to a joint venture comprising Grupo Acerero del Norte (51%) and Mission Energy of the United States (49%). In July 1993, the Mexican manganese producer, Minera Autlan was sold for \$23 million to Grupo Ferrominero. Other mining properties in Mexico were offered for sale during the year. The lure of rights to private ownership in Latin countries such as Argentina, Bolivia, Chile, Colombia, Cuba, Ecuador, Guyana, Mexico, Peru, and Venezuela, attracted great interest in terms of the mineral endowment of those countries. Chile's state-owned Comision Chilena del Cobre (CODELCO) opened negotiations on a joint venture with the U.S. company Cyprus Amax Mineral Co. on the El Abra copper project and was looking into other privatization possibilities to generate additional capital. The Peruvian Government negotiated the sale of its Cerro Verde copper project to the U.S. company Cyprus Mines, and began negotiation of the sale of the Tintaya copper mine to another U.S. company, Magma Copper. The Corporacion Minera de Bolivia (COMIBOL), once the leading mineral producer in Bolivia, began seeking private partners to operate its existing mines under joint venture or other contracts.

Foreign investment in Latin America had been stimulated by more open

economies, less intervention by governments, and by liberalized investment and mining laws offering incentives and equal treatment to the foreign investor. In some countries, such as Mexico, incentives included a reduction in corporate taxes. Venezuela courted foreign exploration for metals, particularly gold, and encouraged joint efforts in petroleum operations. Even Cuba, in need of hard currency for its economy, changed its Constitution to make private and foreign investment legal and to open the country to foreign trade. Foreign investment became permitted in selected state enterprises, export or import of goods without central government permission, and recognition of foreign ownership of property in joint-venture deals. Cuba began accepting exploration efforts by foreign companies for metals and petroleum, while entering negotiations to formalize its long-term processing of nickel matte in Canada. Increased investment opportunities in the Cuban mining sector were still blocked to U.S. investors due to ongoing U.S. economic sanctions against Cuba.

Chile, Bolivia, and Mexico have been particular beneficiaries of increased foreign investment. Foreign investors targeted precious metals in exploration and development projects. Large investments by U.S. and Canadian mining companies in Chile enabled that country to obtain record-high gold and copper production and become the largest world producer and exporter of copper. Increased gold output in Bolivia, Uruguay, and Venezuela was also the result of foreign investment. Changes in the petroleum laws of Argentina, Bolivia, Chile, and Peru also increased interest and exploration by foreign oil companies. The overall change in investment climate and the issuance of new liberalized mining laws and regulations led to an increase in mineral exploration in Latin America, especially Mexico. It had been estimated that, since 1990, there had been an influx of over 100 U.S. and Canadian exploration companies into Mexico; most of which have set up offices in Hermosillo, Sonora. In 1993, over 50 active exploration and development

programs, mostly for copper and gold, were ongoing in Chile.

Concern for protection of the environment during mineral development activities continued through much of America. Cuba drafted a new mining act, based on those of other Latin American countries, that addressed environmental issues. Environmental protection laws and regulations had been in effect in Mexico since 1946, but the strongest expression of this commitment to environmental protection was the General Law of Ecological Balance and Environment Protection (LGEEPA) of 1992. The two agencies having primary jurisdiction in this area were the Ministry of Social Development (SEDESOL) and the Ministry of Agriculture and Water Resources (SARH). Permits and authorizations were required for exploration activities. Permits required for mining and plant operation include the following: water discharge, operating, land-use, explosives, water-well usage, and hazardous-materials handling. Also in effect were regulations concerning noise, gas and dust emission, dumps and tailings, oil and fuel storage, and electrical transformers. The National Water Law of 1992 and the Federal Law Concerning Water Rights of 1992 were also concerned with water discharge, and the Consejo Nacional de Agua (CONAGUA) set minimum water quality standards.

Canada saw increasing environmental challenges to property development, mining, and closure or abandonment. The industry strived to respond to responsible criticism by way of adopting environmentally acceptable methods of operation. However, some companies chose to shift its interest elsewhere, particularly to Latin American countries. The Environmental Assessment Act, designed to replace the guidelines of the Environmental Assessment and Review Process of 1984, was approved in 1992, but the Canadian federal government was slow to produce regulations to implement this legislation. The government proposed allowing tax deductions for funds set aside for eventual cleanup of closed mines. During late 1992, an

agreement was ratified at the Canadian Mines Ministers' annual meeting to extend the Mine Environmental Neutral Drainage (MEND) program from 1993 to 1997 and to increase its funding from \$10.4 million to about \$15 million. The British Columbia government became sensitive to the withdrawal of international mining investment from Canada, and responded by establishing a tax incentive for capital spending on mines and a 3-year exploration grant program. In contrast to this effort to attract mineral development, British Columbia blocked development of the large Windy Craggy copper-gold-cobalt deposit in favor of a new national park.

The North American Agreement on Environmental Cooperation (NAFTA Environmental Side Agreement) became effective at the same time as NAFTA. This agreement was expected to influence environmental practices or policies in member countries who were committed to ensuring that laws and regulations provide for unspecified high levels of environmental protection.

Groups of Canadian citizens representing all views produced a preliminary, but comprehensive, statement attempting to reconcile conflicting interests between preservation and development. Called the *Whitehorse Initiative*, this effort brought together a coalition of Federal and local governments, native peoples, industry, labor unions, and nongovernmental organizations to formulate a common policy integrating public land use, resource development, and the environmental and economic concerns of the nations people. Some progress was evident by the end of 1993, but much work remained.

The Middle East

Production and processing of crude petroleum and natural gas were the dominant economic sectors of the Middle East. About 66% of total world crude petroleum reserves and 31% of total world natural gas reserves were in the Middle East. In 1993, 15 countries of the region accounted for 29% of world

crude petroleum production, 19% of world natural-gas-plant liquid production, and 6% of world dry-natural-gas production. Only Cyprus and Lebanon were not crude petroleum producers. Oil and gas provided more than 80% of the Middle East's foreign exchange. Although energy resources and production overshadowed those of metals and industrial minerals, the latter was important, both locally and in international trade. Nonfuel resources exploited included barite, borax, chromite, copper, gold, gypsum, iron, lead, phosphate, salt, and zinc.

Total crude petroleum production declined during 1993 by over 100 million barrels (Mbbls) as a result of declining demand in the major industrial countries. The region consumed about 5% of the world's total production of petroleum products and about 6% of the world's total production of natural gas.

Most mineral commodity production facilities, including hydrocarbons, were still under government control through various state-owned companies, even though most of the governments continued to promote privatization of the sector. Export sales, primarily of oil and gas, provided funding for diversification of the mineral industry and of the national economies in general. Emphasis was on expanding value-added downstream facilities for petroleum and natural gas, including refineries, petrochemical and fertilizer plants, and energy-intensive industries, such as aluminum. Petroleum industry earnings were also spent by several governments on mineral industry projects in Africa, the newly independent republics of the FSU and elsewhere. These investments were channeled through the Islamic Development Bank and the Arab Bank for Economic Development in Africa, and through bilateral agreements. Governments, increasingly sensitive to local and worldwide environmental concerns, continued to improve environmental standards for mineral production and processing operations. Bahrain provided funding for the aluminum smelter industry to install additional environmental safeguards. Even in Iraq,

where all mineral commodity production facilities were owned by the government, except for some small local construction material operations, some attempts at privatization were reported in 1993. The Iraqi government offered a limited number of shares in a cement plant at Samaah and a brick plant in Diwaniyah. Production sharing agreements with foreign petroleum companies for direct participation in expansion of the oil sector were reportedly being considered by the Government during the year. Previous foreign company participation was limited to service contracts. In September 1993, a decree issued by the Iraqi Revolutionary Command Council authorized partial privatization, by formation of stock companies, of the state-owned enterprises under control of the Ministry of Industry and Minerals. Oil and gas production not under that Ministry's control were not affected.

Energy products were the primary mineral-based materials imported by the United States from the Middle East. Nonfuel minerals, for which the Middle East was a significant supplier to the United States, were bromine, cut gemstones, and potash from Israel, and chromite and ferrochromium from Turkey.

The dissolution of the FSU opened up vast opportunities for Iran, Saudi Arabia, and Turkey to advance their influence in the newly independent Islamic republics. Private companies in Turkey and the Turkish state oil company, Türkiye Petrolleri Anonim Ortaklığı signed agreements to help develop some of the enormous oil and gas resources in this region. Turkish interests also negotiated access to gold and other minerals as well, while Iranian and Saudi Arabian interests continued to express interest in hydrocarbons and other minerals in the newly independent states of the FSU.

Iraqi mineral production facilities damaged during the Gulf War in late 1990 and early 1991 was reported to have been restored to at least 50% of prewar capacity in crude oil and natural gas and even more in petroleum and petrochemical products, phosphate, sulfur, cement, and construction

materials. However, consumption was limited to what was produced internally because of the United Nation trade embargo.

SUMMARY OF MAJOR MINERAL COMMODITIES AND LEADING PRODUCERS FOR 1993

Bauxite

Bauxite resources were primarily in Africa, Asia, Oceania, and South America. Only five countries combined, Australia, Brazil, Guinea, India, and Jamaica, contained most of the total world reserves available for extraction under current economic conditions and accounted for nearly 80% of world production of bauxite. World bauxite and alumina production declined and prices for smelter-grade alumina remained below the \$200/mt level during 1993 because of growing aluminum inventories on international markets and declining worldwide demand. The United States imported bauxite primarily from Australia, Brazil, Guinea, and Jamaica. U.S. alumina plant capacity remained essentially unchanged throughout 1993, but apparent capacity utilization decreased by the close of 1993.

Chromium

Most of the world's known resources and reserves of chromite are located in India, Kazakhstan, South Africa, and Zimbabwe. India, Kazakhstan, and South Africa accounted for 73% of world production of chromite. The two largest producers of chromite, Kazakhstan and South Africa, were in the process of major economic and political change during 1993. South Africa's production and exports of chromite continued to fall during 1993, because of weak international demand and a flood of cheap metal from the former U.S.S.R. and China into world markets. Despite a significant increase in production, South Africa's ferrochrome producers continued to operate below capacity in 1993. Prior

to the dissolution of the U.S.S.R., Kazakhstan was a major internal supplier of chromite ore to the U.S.S.R. consumer, but subsequent decline in demand led to a downward trend of chromite production in Kazakhstan and increasing exports to Europe during 1992 and 1993. The United States consumed about 10% of world chromite ore production in various forms of imported materials. The United States imported nearly one-half of its required chromium contained in chromite ore and chromium ferroalloys and metal from South Africa; the remainder was from the minor producers Turkey, Yugoslavia, Zimbabwe, and others.

Copper

Copper was produced during 1993 at numerous locations throughout the world. Among the leading producers of copper ore, in decreasing order of importance, were Chile, the United States, Canada, Russia, Zambia, and Peru. Chile and the United States together contain about 40% of world copper reserves. World production remained at about the same level as in 1992, and while world refined production and capacity increased slightly, world consumption of refined copper declined. Demand in Japan for refined copper was weak, while in Western Europe demand was especially poor, falling almost 10%, owing to weakening economies and increasing usage of substitutes such as aluminum titanium, steel, optical silica fiber, and plastics. Even though demand for refined copper in the United States and Canada ran counter to the world trend, it was not enough to offset falling demand elsewhere, and a global surplus led to the near doubling of inventories on the London Metal Exchange. The United States imported copper primarily from Canada, Chile, and Mexico.

Diamond

Over 80% of the world's natural diamond reserves were in Botswana, South Africa, Western Australia, and Zaire, while 93% of world production was in these countries and Russia. Exploration expenditures continued to increase in Canada, primarily in Northwest Territories, where the leading explorer, BHP, spent about \$11 million on kimberlite pipes in the Lac de Gras area, the only area of known economic importance. Most of the world's reserves and production of gem diamond were in southern Africa, Russia, and Western Australia. The year 1993 was another robust year for the world industrial diamond industry, and consumption in the United States and the world increased. Competing with the natural diamond industry were domestic and foreign companies synthesizing diamond stones, powder, dust, and grit for industrial use. Companies in Ireland, South Africa, Sweden, and the United States increased production capacity for synthetic industrial diamond during 1993. Increased pressure also came from producers of alternative materials, such as synthetic cubic boron nitride, fused aluminum oxide, silicon carbide and natural garnet, emery, and corundum. The United States imported about 75% of its industrial diamonds from Ireland, the United Kingdom, and Zaire, while about 60% of its gem diamond imports were from Belgium, India, and Israel.

Gold

During 1993, an abundant number of countries produced gold, but only six accounted for about 70% of total world gold production. In declining order of importance, these countries were South Africa, the United States, Australia, China, Canada, and Russia. About 40% of the world's known reserves of gold was concentrated in South Africa, while the Australia, Canada, Russia, and the United States accounted for nearly 30% of world gold reserves. South Africa had about one-half of world resources, and Brazil and the United States had about

12% each. Domestic gold mines continued to produce at record levels, but the trend in domestic exploration activity, which apparently peaked about 1988, continued to decline in 1993 as North American exploration companies sought both unexplored territory and improved business and regulatory climates elsewhere. Latin America became the center of attention where favorable geology, liberalized mining policies, and improved business conditions reduced risk to investors. Environmental pollution abatement and reclamation of mined land increased in importance at both domestic and foreign operations.

Iron Ore

Iron ore and iron ore agglomerates were produced at many locations throughout the world, but the leading producers, China, Brazil, and Australia accounted for about one-half of world production. Together, these three countries contained about one-quarter of the world's iron reserves. The year 1993 was a year of recovery for the domestic iron ore industry as demand increased slightly owing to higher levels of steel production. In the rest of the world, weak demand in Europe and Japan was offset by increased consumption in other countries, particularly China. China experienced substantial growth in iron ore consumption as its industrial base struggled to keep pace with its economic base. Australia and Brazil were, by far, the largest exporters of iron ore, with a combined 60% of world trade. The United States, Europe, and Japan were the leading consumers of iron ore. Eastern Asia, particularly China and South Korea, were expected to be leaders in the growth of iron ore demand. Iron ore resources throughout the world were adequate to meet demand for at least 100 years at current rates of consumption.

Lead

Lead concentrates and primary refined lead were produced at a number of locations throughout the world. The top producers of lead concentrate in the

world were, in declining order of importance, Australia, China, the United States, Peru, and Canada, accounting for about 56% of world production. These countries likewise contained about 56% of the world reserves of lead. Major producers of refined lead from primary sources were China, the United States, Canada, Australia, and the United Kingdom, accounting for about 44% of world production. Eastern European countries continued as significant contributors in the world market. Refined lead produced from secondary sources, mainly obsolete lead-acid battery components, accounted for nearly 45% of the total world production from combined primary and secondary sources. Stagnant consumption and rising commercial stocks, indicative of the continuing world recession, resulted in steadily declining prices through a significant portion of 1993. The United States remained the principal consumer of refined lead, representing approximately 25% of world consumption, followed by Europe, 43%, and Asia, 20%.

Manganese

China, South Africa, and Ukraine together produced about 60% of the world's mined manganese in 1993. South Africa and the former U.S.S.R., as constituted before December 1991, including Ukraine, held nearly 85% of world manganese reserves, and South Africa alone contained nearly 85% of the world manganese reserve base. Australia, Brazil, Gabon, and South Africa supplied international trade with about 80% of its manganese. Supply of manganese ore and ferroalloys exceeded world steel industry demand by as much as 30% worldwide, and the price of metallurgical ore declined for the third successive year. Ore production in and export from the FSU declined due to economic turmoil, while China's exports were limited as increasing production was absorbed by domestic demand for steel. Mines were under development or came on-stream in Brazil, Burkina Faso, and the Philippines. In Western Europe, two of the three operations regularly

producing ferromanganese using blast furnaces were closed. Germany's Thyssen Stahl AG closed its Hamborn plant, and England's British Steel Plc closed the Cleveland Iron component of its Teesside Works near Middlesbrough. U.S. capacity for electrolytic manganese dioxide was expanded appreciably to meet growing demand from the battery industry.

Nickel

Russia and Canada accounted for nearly one-half of the world production of nickel in 1993. Significant reserves were, in declining order of importance, Cuba, Russia, Canada, New Caledonia, Indonesia, South Africa, and Australia. Cuba had about three times the reserves of Russia. Identified world resources in deposits averaging 1% nickel or greater contained a total of 130 Mmt of nickel. Additional world resources of nickel were very large and extensive low-grade deposits in crusts and nodules on the deep-sea floor. The American and global

economic slowdown and a leveling off of demand for austenitic stainless steel caused nickel prices to decline to a 6-year low. Superalloy producers were especially hard hit by cutbacks in aircraft manufacturing, reduced defense spending, and the financial difficulties of the airlines. Worsening the situation were large exports of cathode and powder from Russia to the West and record-high stocks on the London Metal Exchange. Nevertheless, one new mine opened and several others were being developed in Western Australia. Smelter capacity was being expanded in Australia, Finland, and Indonesia.

Zinc

Only five countries, in descending order of importance, produced about 57% of the world's mined zinc: Canada, Australia, China, Peru, and the United States. These countries held about 47% of world zinc reserves. World mine production decreased 5% in 1993 owing to mine closures and cutbacks in the major

producing countries that were caused by low metal prices and high stocks of concentrates. Eight mines in Canada and 14 mines in Europe closed in 1993. World metal production increased slightly, with decreased production rates in Australia, Canada, Europe, and Japan offset by increases in Mexico and Peru. Zinc stocks rose throughout the year and London Metal Exchange stocks nearly doubled from yearend 1993 to a record 907,000 mt. Exports from China and the FSU and weak demand in Europe and Japan were a major factor in world stock increases and declining prices throughout the year. World consumption increased slightly with decreased demand in Europe and Japan offset by increases in North America and other countries in Asia. Galvanizing, representing 48% of consumption in 1993, was the fastest growing use of zinc during the past 5 years, resulting mainly from the increased use of dual-sided galvanized steel in the car industry.

TABLE 1
WORLD PRODUCTION OF MAJOR MINERAL COMMODITIES¹

Commodity	1989	1990	1991	1992	1993*
METALS					
Aluminum:					
Bauxite, gross weight ^{2 3} thousand metric tons	'103,722	'109,042	'107,916	'101,145	105,550
Alumina, gross weight	'41,461	'42,535	'42,354	'41,567	42,951
Unalloyed ingot metal do.	'19,010	'19,299	'19,575	'19,467	19,816
Antimony, mine output, Sb content ³ metric tons	'105,239	'94,407	'92,448	'75,011	73,288
Arsenic, trioxide do.	'61,026	'53,375	'45,960	'48,197	47,740
Beryl concentrate, gross weight ⁴ do.	'7,533	'7,096	'6,567	'6,952	6,766
Bismuth:³					
Mine output, Bi content do.	'3,750	'3,375	'3,451	'3,164	3,351
Smelter do.	'3,970	'3,882	'3,914	'3,767	3,762
Cadmium, smelter do.	'20,873	'19,953	'20,463	'20,201	18,913
Chromite, gross weight thousand metric tons	'14,006	'12,959	'13,320	'10,993	9,301
Cobalt:					
Mine output, Co content metric tons	'42,873	'42,420	'32,906	'27,131	22,224
Metal, refined do.	'26,407	'27,297	'24,761	'21,901	16,893
Columbium-tantalum concentrate, gross weight ^{4 5} do.	'34,060	'36,993	'38,368	'37,118	30,513
Copper:					
Mine output, Cu content thousand metric tons	'9,090	'9,078	'9,281	'9,453	9,352
Metal:					
Smelter:					
Primary do.	'8,663	'8,594	'8,469	'8,924	8,797
Secondary do.	'1,078	'1,051	'1,033	'1,033	1,060
Refined:					
Primary ⁶ do.	'9,149	'9,060	'8,947	'9,373	9,539
Secondary ⁷ do.	'1,771	'1,745	'1,690	'1,790	1,837
Gold, mine output, Au content kilograms	'2,013,913	'2,182,307	'2,187,462	'2,298,809	2,330,321
Iron and steel:					
Iron ore, iron ore concentrates, iron ore agglomerates, gross weight thousand metric tons	'1,013,383	'984,048	'955,552	'963,159	988,797
Metal:					
Pig iron do.	'561,762	'550,077	'525,741	'517,278	527,907
Ferroalloys do.	'19,940	'18,807	'17,658	'16,615	15,877
Steel, crude do.	'784,092	'771,373	'736,424	'722,384	725,129
Lead:					
Mine output, Pb content do.	'3,287	'3,352	'3,314	'3,109	2,926
Metal, refined:					
Primary do.	'3,240	'3,094	'3,095	'3,041	2,993
Secondary do.	'2,837	'2,813	'2,686	'2,476	2,427
Magnesium metal, smelter:					
Primary metric tons	'344,447	'355,237	'341,000	'306,381	283,944
Secondary do.	81,970	'88,116	'77,101	'78,923	80,205
Manganese ore, gross weight thousand metric tons	'26,260	'26,108	'22,937	'21,608	21,757
Mercury, mine output, Hg content metric tons	'5,464	'4,098	'2,542	'2,108	'2,563
Molybdenum, mine output, Mo content do.	'136,494	'127,028	'115,459	'107,610	95,286
Monazite concentrate (source of rare-earth metals and thorium) ³ do.	26,739	24,879	'17,494	'16,616	19,770

See footnotes at end of table.

TABLE 1—Continued
WORLD PRODUCTION OF MAJOR MINERAL COMMODITIES¹

Commodity		1989	1990	1991	1992	1993*
Nickel:						
Mine output, Ni content	metric tons	'986,655	'968,622	'985,361	'974,342	899,149
Metal, plant output	do.	'936,947	'901,831	'916,067	'885,322	806,972
Platinum-group metals, mine output, metals content	kilograms	281,629	291,015	'288,343	'281,438	250,718
Selenium, refinery ⁴ ⁵	metric tons	'1,635	'1,786	'1,631	'1,732	1,710
Silver, mine output, Ag content	do.	'16,425	'16,489	'15,672	'14,737	14,089
Tellurium, refinery ³ ⁵	do.	67	67	83	'98	87
Tin:						
Mine output, Sn content	do.	'232,857	'218,057	'196,272	'178,365	178,207
Metal, smelter:						
Primary ⁶	do.	'225,465	'228,140	'191,829	'189,305	185,057
Secondary ⁷	do.	'20,259	'17,983	'13,211	'8,710	7,935
Titanium concentrate, gross weight:						
Ilmenite ³ ⁸	thousand metric tons	4,353	4,072	3,411	'3,384	3,579
Rutile ³ ⁴	do.	459	481	458	'453	464
Titaniferous slag	do.	1,765	1,886	1,509	1,637	1,545
Tungsten, mine output, W content ³	metric tons	'51,038	'51,805	'48,567	'37,452	29,509
Uranium, mine output, U ₃ O ₈ content ⁴	do.	'45,983	'37,709	31,275	'33,431	29,478
Vanadium, mine output, V content	do.	'36,224	'33,914	'31,301	'28,150	28,937
Zinc:						
Mine output, Zn content	thousand metric tons	'6,825	'7,158	'7,258	'7,227	6,895
Metal, smelter:						
Primary ⁶	do.	'6,838	'6,784	'6,935	'6,777	6,825
Secondary ⁷	do.	'406	'395	'376	'359	352
Zirconium concentrate	do.	979	'852	795	'774	'787
INDUSTRIAL MINERALS						
Asbestos	do.	'4,290	'4,014	'3,488	'3,271	2,775
Barite	do.	'5,740	'5,763	'5,712	'5,118	4,890
Boron materials	do.	'2,993	'2,886	'2,865	'2,660	2,178
Bromine	do.	'409	'390	'392	'393	393
Cement, hydraulic	do.	'1,148,912	'1,149,369	'1,184,530	'1,241,217	1,303,360
Clays:⁴						
Bentonite	do.	'9,962	'9,645	'9,416	'8,292	7,949
Fuller's earth ⁵	do.	3,010	'3,480	'3,945	'3,572	3,613
Kaolin	do.	'23,230	'24,078	'24,130	'22,726	24,568
Corundum, natural (abrasive grade)	metric tons	9,001	8,457	7,111	'6,000	—
Diamond, natural:						
Gem ⁹	thousand carats	'50,665	'52,459	'51,090	'56,757	57,205
Industrial ⁹	do.	'55,562	'58,452	'54,737	'48,773	50,390
Total ⁹	do.	106,242	110,919	'105,832	'105,521	107,620
Diatomite	thousand metric tons	'1,656	'1,684	'1,607	'1,506	1,463
Feldspar	do.	'5,346	'5,481	'5,613	'6,035	6,009
Fluorspar	do.	'5,557	'5,124	'4,222	'4,054	4,031
Graphite	metric tons	'1,005,417	'945,462	'771,189	'755,905	741,040
Gypsum	thousand metric tons	'104,216	'104,271	'100,141	'101,671	103,203
Iodine	metric tons	'16,259	'17,113	'17,448	'16,581	16,625
Lime	thousand metric tons	'139,946	'135,592	'131,598	'125,955	124,395
Magnesite ³	do.	'11,953	'10,481	'9,813	'10,501	10,136
Mica ⁴	do.	'228	'214	'207	'200	190

See footnotes at end of table.

TABLE 1—Continued
WORLD PRODUCTION OF MAJOR MINERAL COMMODITIES¹

Commodity		1989	1990	1991	1992	1993*
Nitrogen: N content of ammonia	thousands metric tons	¹ 99,331	¹ 97,160	¹ 94,472	¹ 93,253	91,497
Perlite ⁴	do.	¹ 1,547	¹ 1,579	¹ 1,442	¹ 1,538	1,585
Phosphate, gross weight:						
Phosphate rock	do.	¹ 165,788	¹ 161,554	¹ 149,494	¹ 146,004	131,641
Thomas slag	do.	1,503	1,227	¹ 1,224	¹ 1,003	978
Guano	do.	51	²	13	¹ 10	10
Potash, marketable, K ₂ O equivalent	do.	² 29,276	² 27,493	² 26,136	² 24,044	20,864
Pumice ^{4, 5}	do.	¹ 11,794	¹ 11,555	¹ 10,821	¹ 10,758	10,735
Salt	do.	¹ 191,660	¹ 182,445	¹ 188,265	¹ 181,270	186,190
Sand and gravel, industrial ^{4, 5}	do.	¹ 117,539	¹ 109,206	¹ 106,349	¹ 108,305	108,053
Sodium compounds, n.e.s.:						
Soda ash	do.	³ 31,543	³ 32,029	³ 31,312	³ 31,712	31,136
Sulfate	do.	⁴ 4,868	⁵ 5,057	⁴ 4,742	⁴ 4,405	4,356
Strontium materials ^{4, 5}	metric tons	² 271,639	² 240,229	¹ 198,752	¹ 139,223	145,828
Sulfur, elemental basis:						
Elemental ¹⁰	thousand metric tons	¹ 15,107	¹ 14,054	¹ 11,216	⁸ 8,671	6,361
From pyrites	do.	¹ 10,590	¹ 10,135	⁹ 9,734	⁷ 7,337	7,531
Byproduct ¹¹	do.	³ 33,227	³ 33,837	³ 33,917	³ 33,479	35,319
Total	do.	⁵ 58,924	⁵ 58,026	⁵ 54,867	⁴ 49,487	49,211
Talc, steatite, pyrophyllite, and unspecified	do.	⁹ 9,238	⁹ 9,368	¹² 9,069	¹² 8,756	¹² 8,696
Vermiculite ⁴	metric tons	⁶ 613,696	⁵ 570,569	⁵ 528,611	⁴ 470,075	489,334
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Anthracite and bituminous	million metric tons	³ 3,652	³ 3,713	³ 3,550	³ 3,636	3,561
Lignite	do.	¹ 1,286	¹ 1,187	¹ 1,121	⁹ 946	914
Total ⁹	do.	⁴ 4,938	⁴ 4,811	⁴ 4,671	⁴ 4,583	4,475
Coke:						
Metallurgical ¹³	thousand metric tons	³ 333,867	³ 331,443	³ 303,259	² 258,553	237,272
Other	do.	¹ 11,416	⁸ 8,288	⁴ 4,757	⁴ 4,065	5,295
Gas, natural, marketed	billion cubic meters	² 2,213	² 2,260	² 2,288	² 2,303	2,309
Natural gas liquids ⁴	million 42-gallon barrels	¹ 1,710	¹ 1,741	¹ 1,781	¹ 1,822	1,846
Peat	thousand metric tons	¹ 197,115	¹ 179,942	¹ 164,742	¹ 153,798	140,288
Petroleum:						
Crude	million 42-gallon barrels	² 21,997	² 22,258	² 22,000	² 22,372	21,975
Refined	do.	² 23,308	² 23,339	² 23,130	² 23,166	23,078

*Estimated. ¹Revised.

¹Figures generally conform to those published in appropriate commodity chapters of V. I of the Minerals Yearbook, 1992 edition.

²Includes bauxite equivalent of nepheline syenite concentrate and alunite ore produced in Russia and Azerbaijan, the only producers on record of such materials as a source of aluminum metal.

³Excludes data for the United States (withheld to avoid disclosing company proprietary data).

⁴Excludes data for China (no adequate basis for estimation available).

⁵Excludes data for the former U.S.S.R. (no adequate basis for estimation available).

⁶Includes all metal clearly identified as primary as well as all metal that cannot be subdivided clearly between primary and secondary (see footnote 7).

⁷Includes only that metal that is clearly identified as secondary. Some countries do not distinguish between primary and secondary, and for some of these, no basis is available for estimating the breakdown of total production. For such countries, the total has been included under primary (see footnote 6).

⁸Includes leucocene.

⁹Data may not add to totals shown because of independent rounding.

¹⁰Comprises sulfur produced by the Frasch process plus sulfur mined in the elemental state from ores.

¹¹Comprises sulfur recovered from coal gasification, metallurgical operations (except pyrite processing), natural gas, petroleum, tar sands, spent oxides, and gypsum, whether recovered in the elemental state or as a sulfur compound.

¹²Excludes pyrophyllite production for the United States (withheld to avoid disclosing company proprietary data).

¹³Includes production of nonmetallurgical coke by China and the U.S.S.R.

TABLE 2
LEADING WORLD PRODUCERS OF BAUXITE¹

(Thousand metric tons)

Country	1989	1990	1991	1992	1993*
Australia	¹ 38,584	41,391	40,503	² 39,746	² 41,900
Guinea	¹ 15,792	¹ 15,772	¹ 15,466	¹ 13,773	14,100
Jamaica	9,601	¹ 10,921	11,552	11,302	11,307
Brazil	8,665	¹ 9,678	10,414	¹ 9,366	9,357
India	¹ 4,471	4,852	¹ 4,735	¹ 4,898	² 5,223
Russia*	—	—	—	4,000	4,000
U.S.S.R.* ³	5,500	5,500	5,000	—	—
Total	¹ 82,613	¹ 88,114	¹ 87,670	¹ 83,085	85,887
Other	¹ 21,109	¹ 20,928	¹ 20,246	¹ 18,060	19,663
Grand total	¹ 103,722	¹ 109,042	¹ 107,916	¹ 101,145	105,550

*Estimated. ¹Revised.

¹Table includes data available through July 20, 1994.

²Reported figure.

³Dissolved in Dec. 1991.

TABLE 3
LEADING WORLD PRODUCERS OF PRIMARY ALUMINUM¹

(Thousand metric tons)

Country	1989	1990	1991	1992	1993*
United States	4,030	4,048	4,121	4,042	² 3,695
Russia	—	—	—	2,700	2,900
Canada	1,555	1,567	1,822	¹ 1,972	² 2,308
Australia	1,244	1,234	¹ 1,228	¹ 1,236	² 1,345
China*	¹ 750	850	¹ 963	¹ 1,100	1,220
Brazil	890	931	1,140	¹ 1,200	1,200
Norway	863	845	833	813	² 814
Venezuela	540	590	601	¹ 561	570
Germany	¹ 796	¹ 740	690	¹ 603	² 552
France	335	326	286	¹ 418	458
Bahrain	187	213	227	¹ 292	450
India	423	433	¹ 504	¹ 490	435
Spain	352	¹ 353	355	¹ 359	355
Tajikistan	—	—	—	¹ 400	300
U.S.S.R.* ³	¹ 3,300	3,523	3,251	—	—
Total	¹ 15,265	¹ 15,653	16,021	¹ 16,186	16,602
Other	¹ 3,745	¹ 3,646	¹ 3,554	¹ 3,281	3,214
Grand total	¹ 19,010	¹ 19,299	¹ 19,575	¹ 19,467	19,816

*Estimated. ¹Revised.

¹Table includes data available through June 16, 1994.

²Reported figure.

³Dissolved in Dec. 1991.

TABLE 4
LEADING WORLD PRODUCERS OF CHROMITE¹

(Thousand metric tons, gross weight)

Country	1989	1990	1991	1992	1993*
Kazakhstan	—	—	—	3,600	2,900
South Africa, Republic of ²	4,951	4,618	⁵ 5,100	³ 3,363	2,840
India	1,003	939	¹ 1,087	¹ 1,312	1,070
Finland*	⁵ 513	⁵ 504	⁴ 473	⁴ 499	500
Turkey	¹ 1,077	⁸ 836	⁴ 940	⁵ 531	490
U.S.S.R. ³	3,800	3,800	³ 3,800	—	—
Total	¹ 11,344	¹ 10,697	¹ 11,400	⁹ 9,305	7,800
Other	² 2,662	² 2,262	¹ 1,920	¹ 1,688	1,501
Grand total	¹ 14,006	¹ 12,959	¹ 13,320	¹ 10,993	9,301

*Estimated. ²Revised.

¹Table includes data through June 14, 1994.

²Includes production by Bophuthatswana.

³Dissolved in Dec. 1991.

TABLE 5
LEADING WORLD PRODUCERS OF MINE COPPER¹

(Thousand metric tons)

Country	1989	1990	1991	1992	1993*
Chile ²	1,609	1,588	1,814	¹ 1,933	² 2,050
United States ⁴	1,498	1,588	1,631	¹ 1,765	¹ 1,801
Canada	723	794	811	⁷ 769	734
Russia	—	—	—	^{**} 590	540
Zambia	466	436	410	⁴ 464	417
Peru	388	334	400	³ 388	389
Poland	⁴ 401	³ 370	³ 359	^{**} 360	350
Mexico	^{**} 260	³ 334	³ 331	³ 306	³ 341
China*	276	² 285	³ 304	³ 334	340
Australia	² 295	³ 327	³ 320	³ 378	³ 337
Indonesia	144	164	212	² 281	299
Kazakhstan	—	—	—	^{**} 230	210
Papua New Guinea	204	170	205	193	201
U.S.S.R.* ³	1,000	950	900	—	—
Total	⁷ 7,264	⁷ 7,340	⁷ 7,366	⁷ 7,991	8,009
Other	¹ 1,826	¹ 1,738	¹ 1,915	¹ 1,462	1,343
Grand total	⁹ 9,090	⁹ 9,078	⁹ 9,281	⁹ 9,453	9,352

*Estimated. ²Revised.

¹Data represent copper content by analysis of concentrates produced and, where applicable, copper electrowon from leach solutions except where otherwise noted. Table includes data available through Aug. 10, 1994.

²Includes recoverable copper content of nonduplicative mine and metal products provided from domestic ores and concentrates, and electrowon leach production.

³Reported figure.

⁴Recoverable content.

⁵Dissolved in Dec. 1991.

TABLE 6
LEADING WORLD PRODUCERS OF MINE GOLD¹

(Kilograms)

Country	1989	1990	1991	1992	1993*
South Africa, Republic of	607,460	605,100	¹ 601,110	¹ 614,071	² 619,201
United States	265,731	294,189	² 294,062	³ 330,212	² 331,013
Australia	203,563	244,137	234,218	¹ *243,400	247,196
China*	90,000	100,000	120,000	140,000	160,000
Canada	¹ 159,527	¹ 169,412	176,552	¹ 161,402	² 152,299
Russia	—	—	—	¹ 146,000	149,500
Brazil	¹ 52,527	¹ 101,913	¹ 89,369	¹ 85,862	85,000
Uzbekistan	—	—	—	¹ 80,000	80,000
Papua New Guinea	27,538	31,938	60,780	¹ 71,190	² 60,587
Indonesia	6,155	11,158	16,879	37,983	² 42,097
Ghana	13,358	16,840	² 26,311	³ 31,032	² 39,235
U.S.S.R. ³	304,000	302,000	260,000	—	—
Total	¹ 1,729,859	¹ 1,876,687	¹ 1,879,281	¹ 1,941,152	1,966,758
Other	² 284,054	³ 305,620	³ 308,181	³ 357,657	363,563
Grand total	² 2,013,913	² 2,182,307	² 2,187,462	² 2,298,809	2,330,321

*Estimated. ¹Revised.

¹Table contains data available through Aug. 9, 1994.

²Reported figure.

³Dissolved in Dec. 1991.

TABLE 7
LEADING WORLD PRODUCERS OF IRON ORE, IRON ORE
CONCENTRATES, AND IRON ORE AGGLOMERATES¹

(Thousand metric tons, gross weight)

Country	1989	1990	1991	1992	1993*
China	¹ 171,850	¹ 168,300	¹ 176,070	¹ 197,600	234,660
Brazil	157,900	152,300	¹ 150,500	¹ *151,000	151,000
Australia	¹ 105,810	¹ 110,508	¹ 117,134	¹ 117,170	² 120,534
Russia	—	—	—	¹ 86,700	75,000
Ukraine	—	—	—	75,700	70,000
India	53,418	54,579	57,638	¹ 54,000	61,000
United States	59,032	56,408	56,596	55,593	² 55,651
Canada	¹ 40,509	¹ 34,855	36,383	¹ 32,697	30,568
South Africa, Republic of	29,958	30,291	28,958	28,226	² 29,385
U.S.S.R. ³	241,348	236,000	199,000	—	—
Total	¹ 859,825	¹ 843,241	¹ 822,279	¹ 798,686	827,798
Other	¹ 153,558	¹ 140,807	¹ 133,273	¹ 164,473	160,999
Grand total	¹ 1,013,383	¹ 984,048	¹ 955,552	¹ 963,159	988,797

*Estimated. ¹Revised.

¹Table includes data available through Aug. 8, 1994.

²Reported figure.

³Dissolved in Dec. 1991.

TABLE 8
LEADING WORLD PRODUCERS OF CRUDE STEEL¹

(Thousand metric tons)

Country	1989	1990	1991	1992	1993*
Japan	¹ 107,909	110,339	109,649	98,131	99,600
United States	88,852	89,726	79,738	84,322	² 88,793
China*	61,200	66,100	70,570	80,000	88,680
Russia	—	—	—	67,000	58,000
Germany	48,902	43,981	42,169	¹ 39,711	² 37,600
Korea, Republic of	21,873	23,125	26,001	28,054	33,000
Ukraine	—	—	—	¹ 41,700	30,500
Italy	25,213	25,439	25,046	24,904	² 25,701
Brazil	25,055	20,567	¹ 22,616	² 24,000	25,000
India ³	¹ 12,782	¹ 15,313	¹ 17,500	¹ 18,450	18,500
France	19,335	¹ 19,015	¹ 18,434	17,961	² 17,179
United Kingdom	18,813	17,908	¹ 16,474	16,050	16,000
Canada	15,458	12,281	12,987	13,924	² 14,387
Spain	¹ 12,765	¹ 12,718	12,933	12,295	12,800
Taiwan	9,047	9,747	10,957	¹ 10,705	12,038
Turkey	7,934	¹ 9,322	¹ 9,335	¹ 10,253	² 11,436
Belgium	10,952	11,419	¹ 11,335	¹ 10,334	10,300
U.S.S.R. ⁴	160,096	154,414	132,666	—	—
Total	¹ 646,186	¹ 641,414	¹ 618,410	¹ 597,794	599,514
Other	¹ 137,906	¹ 129,959	¹ 118,014	¹ 124,590	125,615
Grand total	¹ 784,092	¹ 771,373	¹ 736,424	¹ 722,384	725,129

*Estimated. ¹Revised.

¹Table includes data available through July 21, 1994.

²Reported figure.

³Data are for years ending June 30 of year stated.

⁴Dissolved in Dec. 1991.

TABLE 9
LEADING WORLD PRODUCERS OF MINE LEAD¹

(Thousand metric tons, Pb content of concentrates)

Country	1989	1990	1991	1992	1993*
Australia	495	¹ 570	¹ 579	¹ 572	505
China*	308	¹ 315	¹ 352	¹ 330	405
United States	420	497	477	¹ 407	² 362
Peru	192	188	200	¹ 194	194
Canada	² 276	² 241	² 277	¹ 344	² 184
Kazakhstan	—	—	—	¹ 170	160
Mexico	¹ 170	¹ 187	¹ 168	¹ 170	² 158
Sweden	89	98	91	106	² 113
South Africa, Republic of	78	69	76	¹ 76	99
Korea, North*	80	80	80	75	80
Morocco	67	69	74	77	76
Poland	66	61	64	63	63
U.S.S.R. ³	440	420	380	—	—
Total	² 2,681	² 2,795	² 2,818	² 2,584	2,399
Other	¹ 606	¹ 557	¹ 496	¹ 525	527
Grand total	² 3,287	² 3,352	² 3,314	² 3,109	2,926

*Estimated. ¹Revised.

¹Table includes data available through Aug. 4, 1994.

²Reported figure.

³Dissolved in Dec. 1991.

TABLE 10
LEADING WORLD PRODUCERS OF MANGANESE ORE

(Thousand metric tons, Mn content)

Country	1989	1990	1991	1992	1993*
Ukraine	—	—	—	¹ 1,700	1,500
China*	¹ 640	¹ 816	¹ 1,030	¹ 1,060	1,080
South Africa, Republic of	2,044	1,911	1,369	1,077	1,076
Australia	¹ 1,011	909	701	570	865
Brazil	724	874	¹ 760	¹ 647	722
Gabon	1,197	1,118	748	718	674
U.S.S.R. ²	² 2,740	2,500	2,150	—	—
Total	² 9,249	² 9,058	² 7,621	² 7,012	7,234

*Estimated. ¹Revised.

¹Table includes data available through July 28, 1994.

²Dissolved in Dec. 1991.

³Reported figure.

TABLE 11
LEADING WORLD PRODUCERS OF MINE NICKEL¹

(Thousand metric tons, Ni content)

Country	1989	1990	1991	1992	1993*
Russia	—	—	—	¹ 280	243
Canada	201	196	192	¹ 186	² 188
New Caledonia	96	85	114	113	98
Indonesia	63	68	72	78	66
Australia	¹ 65	67	69	¹ 58	² 65
China*	34	33	¹ 30	¹ 33	33
Cuba*	46	41	33	32	² 30
South Africa, Republic of	29	29	28	28	29
U.S.S.R.* ³	280	280	¹ 280	—	—
Total	¹ 814	¹ 799	¹ 818	¹ 808	752
Other	¹ 173	¹ 170	¹ 167	¹ 166	147
Grand total	¹ 987	¹ 969	¹ 985	¹ 974	899

*Estimated. ¹Revised.

²Table includes data available through Aug. 1, 1994.

³Reported figure.

⁴Dissolved in Dec. 1991.

TABLE 12
LEADING WORLD PRODUCERS OF MINE SILVER¹

(Metric tons)

Country	1989	1990	1991	1992	1993*
Mexico	¹ 2,400	² 2,424	² 2,295	² 2,098	² 2,128
United States	2,008	2,121	1,855	1,804	² 1,645
Peru	1,840	1,762	1,770	¹ 1,573	1,573
Australia	1,075	¹ 1,173	1,180	¹ 1,248	1,100
Chile	545	655	¹ 678	¹ 1,029	940
Canada (shipments)	¹ 1,371	¹ 1,501	¹ 1,339	¹ 1,220	896
Kazakhstan* ³	—	—	—	900	900
Poland	1,003	832	¹ 899	¹ 798	800
Russia* ³	—	—	—	800	800
Korea, Republic of ⁴	239	238	265	¹ 333	330
Bolivia	267	311	376	¹ 282	300
Sweden	228	243	239	¹ 281	280
Morocco	237	241	296	¹ 213	212
China*	125	¹ 130	150	170	200
U.S.S.R.* ^{3 4}	2,500	2,500	2,200	—	—
Total	¹ 13,838	¹ 14,131	¹ 13,542	¹ 12,748	12,104
Other	² 2,587	² 2,358	² 2,130	¹ 1,995	1,980
Grand total	¹ 16,425	¹ 16,489	¹ 15,672	¹ 14,743	14,084

*Estimated. ¹Revised.

²Recoverable content of ores and concentrates produced unless otherwise specified. Table includes data available through July 1, 1994.

³Reported figure.

⁴Smelter and/or refinery production.

⁵Dissolved in Dec. 1991.

TABLE 13
LEADING WORLD PRODUCERS OF MINE TIN¹

(Metric tons, Sn content)

Country	1989	1990	1991	1992	1993*
China*	40,000	42,000	¹ 42,100	43,000	46,000
Indonesia	31,263	30,200	30,061	² 29,400	29,000
Brazil	50,232	³ 39,149	29,253	² 27,500	25,900
Bolivia	15,849	17,249	16,830	¹ 16,516	² 18,634
Peru	5,082	5,134	6,559	¹ 10,195	13,700
Malaysia	32,034	28,468	20,710	14,339	² 10,384
Total	¹ 174,460	¹ 162,200	¹ 145,513	¹ 140,950	143,618
Other	¹ 58,397	¹ 55,857	¹ 50,759	¹ 37,415	34,589
Grand total	² 232,857	² 218,057	¹ 196,272	¹ 178,365	178,207

*Estimated. ¹Revised.

¹Table includes data available through July 19, 1994.

²Reported figure.

TABLE 14
LEADING WORLD PRODUCERS OF MINE URANIUM¹

(Metric tons, U₃O₈ content)

Country	1989	1990	1991	1992	1993*
Canada	13,475	10,324	9,624	¹ 10,965	² 10,876
Niger	3,013	3,161	3,330	2,970	2,900
Kazakhstan*	—	—	—	3,000	2,700
Australia	3,656	3,529	3,776	¹ *4,000	² 2,256
South Africa, Republic of	3,456	2,875	2,039	2,222	2,000
France	¹ 3,218	² 2,816	² 2,486	² 2,119	² 1,774
Namibia	¹ 3,631	¹ 3,786	2,889	1,986	² 1,966
Total	¹ 30,449	² 26,509	² 24,144	² 27,262	24,472
Other	¹ 15,533	¹ 11,196	¹ 7,317	¹ 6,208	4,714
Grand total	¹ 45,982	² 37,705	¹ 31,461	¹ 33,470	29,186

*Estimated. ¹Revised.

¹Table includes data available through Apr. 13, 1995.

²Reported figure.

TABLE 15
LEADING WORLD PRODUCERS OF MINE ZINC¹

(Thousand metric tons, Zn content of direct shipping ore and concentrate)

Country	1989	1990	1991	1992	1993 [*]
Canada	1,216	1,203	1,157	¹ 1,325	² 1,007
Australia	803	² 940	¹ 1,024	¹ 1,008	945
China [*]	538	619	² 750	² 800	900
Peru	597	584	628	² 603	603
United States	288	543	547	552	² 513
Mexico	² 300	² 307	² 317	² 294	² 370
Kazakhstan	—	—	—	² 250	250
Ireland	¹ 168	167	188	¹ 199	210
Korea, North [*]	230	230	200	200	210
Sweden	174	164	161	¹ 164	² 173
Poland	² 204	¹ 178	¹ 172	² 170	170
Russia	—	—	—	¹ 150	170
Spain	267	² 258	² 261	202	160
Brazil	178	158	130	¹ 140	140
U.S.S.R. ^{*,3}	550	550	475	—	—
Total	² 5,513	² 5,901	² 6,010	² 6,057	5,821
Other	¹ 1,312	¹ 1,257	¹ 1,248	¹ 1,170	1,074
Grand total	² 6,825	² 7,158	² 7,258	² 7,227	6,895

^{*}Estimated. ¹Revised.

¹Table includes data available through July 28, 1994.

²Reported figure.

³Dissolved in Dec. 1991.

TABLE 16
LEADING WORLD PRODUCERS OF HYDRAULIC CEMENT¹

(Thousand metric tons)

Country	1989	1990	1991	1992	1993*
China*	207,000	203,000	² 252,610	304,000	² 356,000
Japan	79,717	84,445	² 89,564	² 88,253	87,000
United States (including Puerto Rico)	71,268	71,407	66,753	71,426	² 75,117
Russia*	—	—	—	² 64,000	60,000
India	46,000	49,000	51,000	² 50,000	52,000
Korea, Republic of	30,474	33,600	² 34,999	² 42,650	47,000
Italy	39,385	² 39,975	² 40,806	41,347	42,000
Germany	40,763	37,684	34,396	² 37,529	37,000
Turkey	23,796	24,416	² 26,091	28,607	30,000
Brazil	25,926	25,848	27,490	² 24,920	28,000
Mexico	22,766	23,824	25,100	26,900	27,100
Spain (including Canary Islands)	27,374	28,092	² 28,008	² 25,067	26,000
Taiwan	18,043	18,459	19,389	² 21,464	23,971
Thailand	15,024	18,054	18,054	² 21,832	23,000
France	26,835	26,388	26,507	² 21,165	22,000
Iran*	12,500	13,000	15,000	18,000	20,000
Indonesia	14,099	13,762	16,153	17,280	18,000
Egypt	12,480	14,111	16,427	² 17,000	17,000
Korea, North*	16,000	16,000	16,000	17,000	17,000
Ukraine	—	—	—	² 20,000	17,000
Saudi Arabia	11,442	² 11,983	² 11,371	² 15,300	15,300
Greece	12,535	13,561	13,580	² 13,620	13,500
Poland	17,125	² 12,518	² 12,012	² 11,908	² 12,228
United Kingdom	16,849	² 14,000	11,662	10,720	10,000
Iraq*	12,500	10,000	5,000	10,000	10,000
U.S.S.R. ³	140,436	137,322	² 127,000	—	—
Total	² 940,875	² 941,068	² 985,722	² 1,019,988	1,086,216
Other	² 208,037	² 208,301	² 198,808	² 211,299	217,144
Grand total	² 1,148,912	² 1,149,369	² 1,184,530	² 1,241,217	1,303,360

*Estimated. ²Revised.

¹Table includes data available through Sept. 2, 1994.

²Reported figure.

³Dissolved in Dec. 1991.

TABLE 17
LEADING WORLD PRODUCERS OF NATURAL DIAMOND¹

(Thousand carats)

Country	1989	1990	1991	1992	1993*
Australia	35,080	34,662	35,956	¹ 40,000	42,200
Botswana	15,252	17,352	16,506	¹ 15,946	17,000
Russia*	—	—	—	18,000	16,000
Zaire	17,755	19,427	17,814	¹ 13,501	15,000
U.S.S.R.* ²	23,000	24,000	20,000	—	—
Total	¹ 91,087	¹ 95,441	¹ 90,276	¹ 87,447	90,200
Other	¹ 15,155	¹ 15,478	¹ 15,556	¹ 18,074	17,420
Grand total	<u>106,242</u>	<u>110,919</u>	<u>105,832</u>	<u>105,521</u>	<u>107,620</u>

*Estimated. ¹Revised.

¹Table includes data available through June 8, 1994.

²Dissolved in Dec. 1991.

TABLE 18
LEADING WORLD PRODUCERS OF NITROGEN IN AMMONIA¹

(Thousand metric tons of contained nitrogen)

Country	1989	1990	1991	1992	1993*
China*	17,000	17,500	18,000	18,000	19,000
United States	12,280	12,680	¹ 12,803	¹ 13,643	² 12,865
Russia	—	—	—	8,786	² 8,138
India ³	6,661	¹ 7,010	¹ 7,132	¹ 7,038	² 7,124
Canada	3,339	3,054	3,016	3,104	² 3,410
Ukraine	—	—	—	¹ 3,908	² 3,242
Indonesia	2,526	² 2,789	2,706	² 2,688	² 2,888
Netherlands	2,901	3,188	3,033	² 2,588	2,500
Germany	² 2,932	2,371	2,123	² 2,113	2,000
France	1,476	1,586	1,604	¹ 1,848	1,800
Mexico	2,100	2,164	2,221	² 2,203	² 1,758
Poland	2,360	¹ 1,962	¹ 1,531	¹ 1,490	1,500
Trinidad and Tobago	¹ 1,550	1,520	1,524	1,568	² 1,462
Japan	1,539	1,531	1,553	1,602	² 1,447
Pakistan	¹ 1,175	¹ 1,214	¹ 1,154	¹ 1,144	² 1,446
Uzbekistan	—	—	—	1,309	² 1,105
Romania	2,736	1,785	¹ 1,800	¹ 1,100	1,100
Saudi Arabia	863	¹ 942	827	904	² 1,097
U.S.S.R.* ⁴	19,400	18,200	17,100	—	—
Total	¹ 80,838	¹ 79,496	¹ 78,127	¹ 75,036	73,882
Other	¹ 18,493	¹ 17,664	¹ 16,345	¹ 18,217	17,615
Grand total	<u>¹99,331</u>	<u>¹97,160</u>	<u>¹94,472</u>	<u>¹93,253</u>	<u>91,497</u>

*Estimated. ¹Revised.

¹Table includes data available through June 3, 1994.

²Reported figure.

³Data are for years beginning Apr. 1 of that stated.

⁴Dissolved in Dec. 1991.

TABLE 19
LEADING WORLD PRODUCERS OF PHOSPHATE ROCK¹

(Thousand metric tons, gross weight)

Country	1989	1990	1991	1992	1993*
United States	49,817	46,343	48,096	46,965	² 35,494
China*	20,000	21,550	22,000	23,000	24,000
Morocco ³	18,067	21,396	17,900	¹ 19,145	² 18,305
Russia*	—	—	—	¹ 11,500	10,400
Kazakhstan*	—	—	—	¹ 12,000	10,000
Tunisia	6,610	6,258	⁶ 6,352	6,400	6,400
Jordan	6,900	6,082	4,433	4,296	4,200
Israel	3,922	3,516	³ 3,370	3,595	3,590
U.S.S.R.* ⁴	37,500	36,800	28,400	—	—
Total	¹ 142,816	¹ 141,945	¹ 130,551	¹ 126,901	112,389
Other	² 22,972	¹ 19,609	¹ 18,943	¹ 19,103	19,252
Grand total	¹ 165,788	¹ 161,554	¹ 149,494	¹ 146,004	131,641

*Estimated. ¹Revised.

¹Data for major phosphate rock-producing countries derived in part from the International Fertilizer Industry Association; other figures are from official country sources where available. Table includes data available through May 13, 1994.

²Reported figure.

³Production from Western Sahara area is included.

⁴Dissolved in Dec. 1991.

TABLE 20
LEADING WORLD PRODUCERS OF MARKETABLE POTASH¹

(Thousand metric tons of K₂O equivalent)

Country	1989	1990	1991	1992	1993*
Canada	¹ 7,333	⁶ 6,989	7,406	¹ 7,270	² 6,841
Germany	⁵ 5,388	⁴ 4,960	³ 3,855	³ 3,473	3,250
Russia	—	—	—	³ 3,454	² 2,597
Belarus	—	—	—	³ 3,311	1,947
United States	1,595	1,713	1,749	1,705	¹ 1,506
Israel	1,273	1,311	1,320	¹ 1,320	1,300
U.S.S.R. ³	10,200	9,000	⁸ 8,560	—	—
Total	² 25,789	² 23,973	² 22,890	² 20,533	17,441
Other	³ 3,487	³ 3,520	³ 3,246	³ 3,511	3,423
Grand total	² 29,276	² 27,493	² 26,136	² 24,044	20,864

*Estimated. ¹Revised.

¹Table includes data available through May 4, 1994.

²Reported figure.

³Dissolved in Dec. 1991.

TABLE 21
LEADING WORLD PRODUCERS OF SALT¹

(Thousand metric tons)

Country	1989	1990	1991	1992	1993 [*]
United States including Puerto Rico	[†] 35,292	36,959	35,943	[†] 34,829	[‡] 38,710
China [*]	28,000	20,000	24,100	[†] 28,100	[‡] 29,953
Germany	[†] 17,129	[†] 15,719	[†] 14,979	[†] 13,095	12,607
Canada	[†] 11,021	[†] 11,261	11,993	[†] 11,171	11,169
India [*]	9,603	9,503	9,503	9,503	9,502
Australia	7,069	7,227	7,791	[*] 8,000	9,000
Brazil	3,653	5,203	8,213	[*] 8,200	8,200
Mexico	[†] 6,703	7,135	[†] 7,533	[†] 7,395	7,240
United Kingdom	[†] 6,720	6,434	6,828	[†] 6,101	6,200
France	[†] 8,267	[†] 6,605	[†] 6,500	[†] 6,116	6,100
Poland	4,670	4,055	[†] 3,840	[†] 3,887	4,000
Ukraine	—	—	—	[*] 4,400	4,000
Italy	[†] 4,186	[†] 4,432	[†] 3,954	[†] 3,711	3,700
Spain	3,090	3,377	[†] 3,400	[†] 3,770	3,700
U.S.S.R. [‡]	15,000	14,700	[*] 14,000	—	—
Total	[†] 160,403	[†] 152,610	[†] 158,577	[†] 148,278	153,658
Other	[†] 31,257	[†] 29,835	[†] 29,688	[†] 32,992	32,532
Grand total	[†] 191,660	[†] 182,445	[†] 188,265	[†] 181,270	186,190

^{*}Estimated. [†]Revised.

[†]Table includes data available through June 20, 1994.

[‡]Reported figure.

[‡]Dissolved in Dec. 1991.

TABLE 22
LEADING WORLD PRODUCERS OF ELEMENTAL SULFUR¹

(Thousand metric tons)

Country	1989				1990*			
	Frasch and native	From pyrites	Byproducts and other	Total	Frasch and native	From pyrites	Byproducts and other	Total
United States	3,888	W	7,704	11,592	3,726	W	7,834	11,560
Canada*	—	—	¹ 6,600	¹ 6,600	—	—	¹ 6,790	¹ 6,790
China*	300	4,270	600	5,170	320	4,400	650	5,370
Japan	—	62	2,497	2,559	—	53	2,604	2,657
Poland*	² 4,864	—	² 73	¹ 5,137	² 4,664	—	² 238	¹ 4,902
Russia*	—	—	—	—	—	—	—	—
Mexico*	¹ 21,531	—	841	² 2,372	² 1,441	—	¹ 972	² 2,413
Saudi Arabia	—	—	1,423	1,423	—	—	1,435	1,435
Germany*	—	¹ 214	¹ 1,487	¹ 1,701	—	¹ 150	¹ 21,400	¹ 1,550
France*	—	—	1,036	1,036	—	—	1,049	1,049
Ukraine	—	—	—	—	—	—	—	—
Iran*	—	—	500	500	—	—	680	680
Iraq*	960	—	370	1,330	800	—	380	1,180
Spain*	—	¹ 2894	¹ 317	¹ 1,211	—	² 748	¹ 399	1,147
South Africa, Republic of ²	—	461	² 220	682	—	452	¹ 230	¹ 683
Finland*	—	² 306	² 221	527	—	² 357	279	636
Romania*	—	¹ 350	375	¹ 725	—	¹ 350	¹ 310	¹ 660
U.S.S.R.* ⁴	3,450	2,150	4,300	9,900	3,000	1,900	4,125	9,025
Total ³	¹ 14,993	¹ 8,707	² 28,764	¹ 52,465	¹ 13,951	¹ 8,410	² 29,375	¹ 51,737
Others ³	¹ 114	¹ 1,883	¹ 4,463	¹ 6,459	¹ 103	¹ 1,725	¹ 4,462	¹ 6,289
Grand total	¹ 15,107	¹ 10,590	² 33,227	¹ 58,924	¹ 14,054	¹ 10,135	² 33,837	¹ 58,026

Country	1991				1992			
	Frasch and native	From pyrites	Byproducts and other	Total	Frasch and native	From pyrites	Byproducts and other	Total
United States	2,869	W	7,951	10,820	2,320	W	8,343	10,663
Canada*	—	—	¹ 7,130	¹ 7,130	—	—	¹ 7,487	¹ 7,487
China*	320	¹ 4,940	650	¹ 5,910	320	¹ 4,500	650	¹ 5,470
Japan	—	30	² 2,626	² 2,656	—	¹ 31	2,600	² 2,631
Poland*	² 3,935	—	² 238	¹ 4,173	¹ 22,917	—	² 235	¹ 3,152
Russia*	—	—	—	—	100	—	2,050	2,150
Mexico*	² 1,040	—	1,034	2,074	¹ 2710	—	¹ 1,592	² 2,302
Saudi Arabia	—	—	2,000	2,000	—	—	¹ 1,630	¹ 1,630
Germany*	—	¹ 95	¹ 21,187	¹ 1,282	—	¹ 25	¹ 21,139	¹ 1,164
France*	—	—	1,199	1,199	—	—	¹ 1,150	¹ 1,150
Ukraine	—	—	—	—	¹ 1,200	—	—	¹ 1,200
Iran*	—	—	700	700	—	—	750	750
Iraq*	250	—	50	300	500	—	¹ 100	¹ 600
Spain*	—	¹ 2546	¹ 359	¹ 905	—	¹ 2510	¹ 350	¹ 860
South Africa, Republic of ²	—	293	¹ 225	¹ 517	—	384	² 220	¹ 603
Finland*	—	² 369	267	636	—	¹ 2350	² 257	¹ 607
Romania*	—	¹ 350	² 250	¹ 600	—	¹ 385	² 200	¹ 585
U.S.S.R.* ⁴	2,700	1,700	3,700	8,100	—	—	—	—
Total ³	¹ 11,114	¹ 8,323	² 29,566	¹ 49,002	¹ 8,067	¹ 6,185	² 28,753	¹ 43,004
Other ³	¹ 102	¹ 1,411	¹ 4,351	¹ 5,865	¹ 604	¹ 1,152	¹ 4,726	¹ 6,483
Grand total	¹ 11,216	¹ 9,734	² 33,917	¹ 54,867	¹ 8,671	¹ 7,337	² 33,479	¹ 49,487

See footnotes at end of table.

TABLE 22—Continued
LEADING WORLD PRODUCERS OF ELEMENTAL SULFUR¹

(Thousand metric tons)

Country	1993 ^a			Total
	Frasch and native	From pyrites	Byproducts and other	
United States	1,904	W	9,055	10,959
Canada ^a	—	—	8,247	8,247
China ^a	330	5,000	700	6,030
Japan	—	29	2,640	2,669
Poland ^a	1,900	—	235	2,135
Russia ^a	100	—	2,000	2,100
Mexico ^a	² 102	—	1,533	1,635
Saudi Arabia	—	—	1,600	1,600
Germany ^a	—	—	1,100	1,100
France ^a	—	—	1,050	1,050
Ukraine	1,000	—	—	1,000
Iran ^a	—	—	800	800
Iraq ^a	600	—	200	800
Spain ^a	—	327	360	687
South Africa, Republic of ^a	—	375	260	635
Finland ^a	—	350	257	607
Romania ^a	—	380	200	580
U.S.S.R. ^{a, 4}	—	—	—	—
Total ³	5,936	6,461	30,237	42,634
Other ³	425	1,070	5,082	6,577
Grand total	6,361	7,531	35,319	49,211

^aEstimated. ²Revised. W Withheld to avoid disclosing company proprietary data; included with "byproduct."

¹Sources listed include the following: (1) Frasch recovery; (2) native, comprising all production of elemental sulfur by traditional mining methods (thereby excluding Frasch); (3) pyrites (whether or not the sulfur is recovered in the elemental form or as acid); (4) byproduct recovery, either as elemental sulfur or as sulfur compounds from coal gasification, metallurgical operations including associated coal processing, crude oil and natural gas extraction, petroleum refining, tar sand cleaning, and processing of spent oxide from stack-gas scrubbers; and (5) recovery from the processing of mined gypsum. Recovery of sulfur in the form of sulfuric acid from artificial gypsum produced as a byproduct of phosphatic fertilizer production is excluded because to include it would result in double counting. It should be noted that production of Frasch sulfur, other native sulfur, pyrites-derived sulfur, mined gypsum-derived sulfur, byproduct sulfur from extraction of crude oil and natural gas, and recovery from tar sands are all credited to the country of origin of the extracted raw material; in contrast, byproduct recovery from metallurgical operations, petroleum refineries, and spent oxides are credited to the nation where the recovery takes place, which in some instances is not the original source country of the crude product from which the sulfur is extracted. Table includes data available through July 26, 1994.

²Reported figure.

³Data may not add to totals shown because of independent rounding.

⁴Dissolved in Dec. 1991.

TABLE 23
LEADING WORLD PRODUCERS OF COAL (ALL GRADES)¹

(Million metric tons)

Country	1989			1990		
	Lignite and brown	Anthracite and bituminous	Total	Lignite and brown	Anthracite and bituminous	Total
China*	'42	'998	1,040	'42	'1,011	1,053
United States	78	'811	'889	80	'854	'934
Russia*	—	—	—	—	—	—
Germany ²	411	71	482	357	70	427
Australia	48	190	238	48	199	247
India	13	201	214	14	212	226
Poland ²	72	178	249	68	148	'215
South Africa, Republic of	—	176	176	—	175	175
Ukraine*	—	—	—	—	—	—
Kazakhstan*	—	—	—	—	—	—
U.S.S.R.* ³	'4172	'4599	'4771	160	543	703
Total ²	'836	'3,224	'4,059	'769	'3,212	'3,980
Other ²	'450	'428	'879	'418	'501	'831
Grand total ²	'1,286	'3,652	'4,938	'1,187	'3,713	'4,811

Country	1991			1992		
	Lignite and brown	Anthracite and bituminous	Total	Lignite and brown	Anthracite and bituminous	Total
China*	'44	'1,046	1,090	'44	'1,066	1,110
United States	78	'825	'903	82	'823	'905
Russia*	—	—	—	60	'270	'330
Germany ²	279	66	'346	242	66	308
Australia	'52	'206	'258	50	'224	'274
India	16	229	245	'15	'210	'225
Poland ²	69	140	'210	67	132	'198
South Africa, Republic of	—	178	178	—	174	174
Ukraine*	—	—	—	'—	'134	134
Kazakhstan*	—	—	—	—	127	127
U.S.S.R.* ³	180	449	629	—	—	—
Total ²	'718	'3,139	'3,859	'560	'3,226	'3,785
Other ²	'403	'411	'812	'386	'410	'798
Grand total ²	'1,121	'3,550	'4,671	'946	'3,636	'4,583

See footnotes at end of table.

TABLE 23—Continued
LEADING WORLD PRODUCERS OF COAL (ALL GRADES)¹

(Million metric tons)

Country	1993 ^a		Total
	Lignite and brown	Anthracite and bituminous	
China ^a	^a 46	^a 1,094	1,140
United States	^a 81	^a 777	^a 858
Russia ^a	50	250	300
Germany ²	^a 222	^a 60	^a 282
Australia	^a 49	^a 224	^a 273
India	15	220	235
Poland ²	^a 68	^a 131	^a 199
South Africa, Republic of	—	179	179
Ukraine ^a	—	116	116
Kazakhstan ^a	—	112	112
U.S.S.R. ^{a, 3}	—	—	—
Total ²	531	3,163	3,694
Other ²	383	398	781
Grand total ²	914	3,561	4,475

^aEstimated. ^aRevised

¹Table includes data available through Apr. 5, 1995.

²Data may not add to totals shown because of independent rounding.

³Dissolved in Dec. 1991.

^aReported figure.

TABLE 24
LEADING WORLD PRODUCERS OF MARKETING NATURAL GAS¹

(Billion cubic meters)

Country	1989	1990	1991	1992	1993*
Russia*	—	—	—	640	² 617
United States	¹ 493	¹ 507	¹ 504	¹ 508	524
Turkey	174	212	203	198	190
Canada	93	99	105	119	120
Netherlands	72	72	82	82	83
Turkmenistan*	—	—	—	68	70
United Kingdom	41	46	55	¹ 50	60
Algeria	48	49	55	56	56
Indonesia*	² 40	42	40	45	45
Uzbekistan*	—	—	—	¹ 40	40
Saudi Arabia	30	31	32	¹ 34	36
Mexico	30	34	34	33	² 33
Israel*	44	40	32	32	32
Iran	22	24	29	32	² 32
U.S.S.R. ³	796	815	810	—	—
Total	¹ 1,883	¹ 1,971	¹ 1,981	¹ 1,937	1,938
Other	¹ 330	¹ 289	¹ 307	¹ 366	371
Grand total	¹ 2,213	¹ 2,260	¹ 2,288	¹ 2,303	2,309

*Estimated. *Revised.

¹This is not gross production. Marketed production is defined as gross production less these amounts: flared, vented to the atmosphere without flaring, used expansively to drive turbines, and then flared or vented, and/or reinjected to reservoirs to maintain pressure. Table includes data available through Apr. 5, 1995.

²Reported figure.

³Dissolved in Dec. 1991.

TABLE 25
LEADING WORLD PRODUCERS OF NATURAL GAS PLANT LIQUIDS¹

(Million 42-gallon barrels)

Country	1989	1990	1991	1992	1993*
United States	564	569	606	621	² 634
Saudi Arabia	154	195	¹ 208	¹ 217	² 217
Mexico	139	156	165	165	170
Canada	151	151	158	166	165
Russia*	—	—	—	¹ 114	110
United Kingdom	51	42	51	¹ 58	60
United Arab Emirates*	47	58	60	60	60
Algeria	56	56	55	53	53
U.S.S.R.* ³	250	250	250	—	—
Total	¹ 1,412	¹ 1,477	¹ 1,553	¹ 1,454	1,469
Other	¹ 298	¹ 264	¹ 228	¹ 368	377
Grand total	¹ 1,710	¹ 1,741	¹ 1,781	¹ 1,822	1,846

*Estimated. *Revised.

¹Table includes data available through Apr. 5, 1995.

²Reported figure.

³Dissolved in Dec. 1991.

TABLE 26
LEADING WORLD PRODUCERS OF CRUDE PETROLEUM¹

(Million 42-gallon barrels)

Country	1989	1990	1991	1992	1993*
Saudi Arabia	1,849	2,354	2,963	3,075	² 2,992
Russia*	—	—	—	2,900	2,600
United States	2,779	2,685	² 2,707	2,625	2,499
Iran	1,026	1,127	1,217	1,300	² 1,095
China	1,004	1,008	1,015	1,050	1,058
Mexico	² 920	930	² 978	978	974
Venezuela	696	770	872	907	² 894
Norway	560	609	679	794	² 856
United Arab Emirates	715	773	890	² 836	800
United Kingdom	656	687	684	² 707	749
Nigeria	626	660	² 689	² 715	715
Kuwait	658	428	68	380	683
Canada	584	567	564	585	² 615
Indonesia	514	534	581	551	558
Libya	412	502	551	545	² 500
U.S.S.R. ³	4,460	4,190	3,785	—	—
Total	² 17,459	² 17,824	² 18,243	² 17,948	17,588
Other	² 4,538	² 4,434	² 3,757	² 4,424	4,387
Grand total	² 21,997	² 22,258	² 22,000	² 22,372	21,975

*Estimated. ²Revised.

¹Includes data available through Apr. 5, 1995.

²Reported figure.

³Dissolved in Dec. 1991.

TABLE 27
LEADING WORLD PRODUCERS OF REFINED PETROLEUM¹

(Million 42-gallon barrels)

Country	1989	1990	1991	1992	1993*
United States	6,125	6,173	6,207	6,304	² 6,489
Japan*	1,340	¹ 1,472	1,561	¹ 1,643	1,677
Russia*	—	—	—	¹ 1,778	1,600
Germany*	¹ 795	¹ 825	¹ 802	¹ 834	878
China*	725	730	800	830	860
United Kingdom*	663	676	709	¹ 707	710
Italy	671	689	680	¹ 680	678
Canada	639	637	618	¹ 604	605
Saudi Arabia	488	¹ 561	¹ 517	¹ 585	² 586
Mexico	540	¹ 572	582	¹ 578	585
France*	542	¹ 563	561	552	553
Brazil	532	527	¹ 527	527	527
Netherlands	520	501	¹ 509	¹ 519	514
Korea, Republic of*	257	269	353	360	447
Venezuela	353	388	390	¹ 379	406
Spain*	400	419	418	408	397
Iran	248	318	¹ 325	¹ 360	360
India*	350	345	345	345	345
Indonesia	247	271	278	293	293
Australia	227	23	243	243	² 250
Ukraine*	—	—	—	249	236
Belgium*	202	199	218	209	202
U.S.S.R. ³	3,000	2,790	2,535	—	—
Total	¹ 18,864	¹ 18,948	¹ 19,178	¹ 18,987	19,198
Other	¹ 4,444	¹ 4,391	¹ 3,952	¹ 4,179	3,880
Grand Total	¹ 23,308	¹ 23,339	¹ 23,130	¹ 23,166	23,078

*Estimated. Revised.

¹Table includes data available through Apr. 5, 1995.

²Reported figure.

³Dissolved in Dec. 1991.

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