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MINERALS IN THE WORLD ECONOMY

U.S.
DEPARTMENT
OF THE
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BUREAU
OF
MINES

1991

UNITED STATES DEPARTMENT OF THE INTERIOR • Bruce Babbitt, Secretary

BUREAU OF MINES

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Preface

This edition of the Minerals Yearbook - International Review records the performance of the worldwide minerals industry during 1991 and provides background information to assist in interpreting that performance. Content of the individual Yearbook volumes follows:

Volume I, Metals and Minerals, contains chapters on virtually all metallic and industrial mineral commodities important to the U.S. economy. In addition, a chapter on survey methods used in data collection with a statistical summary of nonfuel minerals and a chapter on trends in mining and quarrying in the metals and industrial mineral industries are included.

Volume II, Area Reports: Domestic, contains chapters on the minerals industry of each of the 50 States and Puerto Rico, Northern Marianas, Island Possessions, and Trust Territory. This volume also has a chapter on survey methods used in data collection, including a statistical summary of domestic nonfuel minerals.

Volume III, International Review, contains the latest available mineral data on more than 150 foreign countries and discusses the importance of minerals to the economies of these nations. The 1991 review is presented as five area reports and one world overview: Mineral Industries of Africa, Mineral Industries of Asia and the Pacific, Mineral Industries of Latin America and Canada, Mineral Industries of Europe and the U.S.S.R., Mineral Industries of the Middle East, and Minerals in the World Economy.

The U.S. Bureau of Mines continually strives to improve the value of its publications to users. Constructive comments and suggestions by readers of the yearbook are welcomed.

Acknowledgments

The U.S. Bureau of Mines, in preparing these Minerals Yearbook—International Review reports, extensively utilized statistics and data on mineral production, consumption, and trade provided by various foreign Government minerals and statistical agencies through a variety of publications. The cooperation and assistance of these organizations is gratefully acknowledged. Statistical and informational material was also obtained from reports of the U.S. Department of State, from United Nations publications, and from the domestic and foreign technical and trade press. Preparation of this summary volume would not be possible without the contributions of the country specialists and the Branch Chiefs of the Division of International Minerals, the commodity specialists of the Division of Mineral Commodities, and the International Data Section of the Division of Statistics and Information Services, all components of the Information and Analysis Associate Directorate.

George J. Coakley
Chief, Division of International Minerals

Vitae

Charles L. Kimbell is a geologist and the Bureau's Senior Foreign Mineral Specialist. He is on the staff of the Chief of the Division of International Minerals and has more than 33 years of experience in the development and analysis of domestic and international mineral production and trade statistics for U.S. Bureau of Mines. He has been involved with the preparation of the international volume of the Minerals Yearbook beginning with its premier 1963 edition, serving as writer of country studies and as divisional technical reviewer from that year and as the only or senior author of this international review component since 1969.

For comments or further information, please contact

Division of International Minerals
U.S. Bureau of Mines
810 7th Street, NW, MS 5205
Washington, DC 20241
Telephone: (202) 501-9666
Fax: (202) 219-2489

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By Charles L. Kimbell

INTRODUCTION

This study is intended to serve three roles. First, it represents a global overview and summary to supplement and complement the five regional companion volumes of the 1991 edition of the Minerals Yearbook - International Review. In this regard, it also extends previous time series under this title that appeared as the introductory chapter to the international volume of the Minerals Yearbook from the inception of that volume in 1963 until it was subdivided into separate regional volumes in 1989. The basic statistical presentations herein generally contain data through and including that for 1991, although in a few instances the most recent statistics are those for earlier years because more recent, comprehensive global statistics simply are not yet available owing to delays in data collection and processing in some countries and continued governmental suppression of data in others.

The second role of this study is to provide an update to the coverage of events impacting the world's mineral industry that have occurred between the end of 1991 and the preparation of this study. Inclusion of this update is almost essential because of the potential effect of some of these events on global mineral industry activities.

Finally, this study, in parallel with the regional volumes that it summarizes and complements, includes limited materials on the short-term outlook for the world's mineral industry, at least as far as the impact of events covered in the update can be examined. To simplify the outline of this study, the update and outlook appear as a single section with regional subdivisions following the 1991 review. This arrangement was selected because most of the noteworthy events are regional in nature, and most seem destined to have their greatest impact on one specific region or on a selected group of regions rather than on the world as a whole.

1991 SUMMARY

In broadest overview, UN global industrial production indicators released and shown in table 2 suggest that the extractive sector of the world's mineral industry in aggregate registered a very slight upturn in 1991 relative to its 1990 performance. It also shows a continued rebound in the industry from the recessionary period of the mid- to late-1980's. These same indicators as calculated in late 1991, however, reflected a very minor downturn in extractive mineral industry operations between 1989 and 1990. This latter downturn represented a notable revision from the data reported in the immediate previous edition of this chapter, which suggested a tiny upturn.

The apparent slight 1991 upturn in extractive sector industrial output generally was not mirrored in the performance of the processing sectors of the global mineral industry. Although the aggregate index for the chemicals, petroleum, coal, and rubber products manufacturers (see table 3) showed a notable gain in 1991, similar indices for nonmetallic mineral products and for base metals registered declines between 1990 and 1991. Examination of regional performance indices shows that the difficulties experienced in 1990 in maintaining output levels within the countries that formerly constituted the CMEA were reinforced by trends toward reduced gains in output levels, if not actual reductions in output, in several other areas. Generally speaking, the traditional developed market economy countries recorded downswings in overall industrial activity in 1991, particularly after midyear, whereas developing market economy countries logged gains. The developed market economy country downturns, however, were not nearly as significant as were the downturns recorded for the former centrally planned economy states — those that before 1992 were either constituent Republics within the U.S.S.R. or the latter's CMEA partners.

Before detailing statistical assessments of global mineral industry performance, some attention must be given to other politicoeconomic events of 1991 that bore upon fuel and nonfuel mineral industry operations. Heading that list must be the events associated with the crisis over Kuwait. The United States led the UN Coalition action to forcibly evict Iraqi forces from the land area of Kuwait, under the military operation code-named "Desert Storm." The attendant destruction of Kuwaiti oil- and gas-producing and processing facilities was primarily the result of industrial sabotage by the Iraqis, but it also included some war damages resulting from Coalition efforts to oust the invaders, for example, the destruction of valve stations controlling the flow of crude oil to loading piers, from which the Iraqis were intentionally polluting the waters of the

Persian Gulf. There was also significant damage within Iraq, particularly to the national infrastructure, which is supportive of not only military but also of all industrial activities.

Embargoes established by the UN in 1990 were continued through 1991, and their significant impact on the global pattern of oil exports continued, restricting deliveries from Iraq and from Kuwait up until the expulsion of Iraqi forces from the latter, and thereafter restricting deliveries from Iraq only. Deliveries from Kuwait, however, also continued to be interdicted through much of 1991, not by politicolegal considerations but rather by physical difficulties related to facility destruction. Not only were supplies of oil from Kuwait and Iraq interdicted, but deliveries from other countries were increased to compensate for the restricted shipments from these two countries. The trade restrictions in this area affected not only oil exports but also exports of materials such as sulfur from Iraq and caused dislocation in trade patterns for mineral commodities and other materials in neighboring states, such as Jordan and Turkey.

Reestablishment of other mineral industry and nonmineral industry industrial and commercial facilities in Kuwait was well under way, but far from complete, at yearend. Within Iraq, recovery proceeded more slowly and was considerably hampered by the continuing embargoes that remained in force because of Iraq's failure to conform to UN resolutions.

Despite that the Iraqis had set afire about 700 of the 1,330 oil wells in Kuwait and the Neutral Zone, and that they had blown up an additional 100 or more wells that failed to catch fire, and despite predictions that 2 to 5 years would be required to subdue the flames, professional oil well firefighters from the United States and other nations snuffed out the last of the fires by early November 1991. This firefighting effort, the largest ever undertaken by the world's oil service industry, was accomplished despite inadequate equipment and supplies at the outset of operations at a cost of more than US$2 billion. Repair of other Kuwaiti oil and gas industry facilities—gathering stations, pipelines, crude oil and products loading installations, refineries, tank farms, and a host of ancilliary facilities—at a cost of additional billions of dollars was under way at yearend, but would not be completed even within 1992. The repair and replacement activities, particularly in light of the Iraqi looting of both installed and warehoused spare industry equipment before the fighting began, stimulated importation of petroleum industry equipment as well as mineral-based construction materials to repair and/or replace buildings, roads, bridges, airfields, and the like. The replacement of oil production and processing equipment with new units in Kuwait not only stimulated manufacture of such units in a time when the need for new equipment otherwise was checked by the glutted oil market, but it also potentially altered the competitive position of Kuwait in the post-Desert Storm market.

In the mineral-rich, technologically advanced Republic of South Africa, Government progress in ending apartheid laws offered some potential for possible reconciliation and renewed economic cooperation between that country and a number of other neighboring nations. U.S. economic sanctions imposed on South Africa under the Comprehensive Anti-Apartheid Act of 1986 were lifted in July 1991 as were trade embargoes by most other countries. Elsewhere in Africa, the aftermath of civil war in Liberia continued to have a distinctly adverse effect on the country's once-robust iron ore industry. Other African nations suffered from less marked internal strife as well as from international financial problems, with all such events serving as a deterrent to investment in and development of the mineral industry in this region.

Political and economic problems in Zaire contributed to a substantial cutback in copper and cobalt production.

In Africa's northeast, industrial development in Egypt made slow progress, but that country's Government, generally regarded as one of the most liberal among the Moslem states, faced Islamic-fundamentalist groups which threatened to set back what economic gains had been made by the country. Elsewhere in the area, sorely in need of viable economic activity, development prospects were even worse. In Somalia, civil disorder approached anarchy in the country's large southern area. In Ethiopia, Eritrean separatists continued aggressive efforts to achieve independence. In Sudan, the African continent's largest country, the northern regions fared reasonably well in 1991, but in the country's south, internal civil disorder was compounded by the influx of Ethiopian refugees.

China's potential, both as a source of raw materials and as a major world market, remained large. The growth in mineral output, particularly coal, to meet increases in domestic demand continued to be substantial. Elsewhere in Asia, Taiwan and the Republic of Korea continued to emerge as significant industrialized areas, with their import-based steel industries as major showpieces in the minerals industry area. Other states, notably Thailand, continued efforts to diversify and to increase industrial activity, particularly in downstream operations including ventures in minerals processing. Generally high levels of activity were noted in Australia, and mineral resource development was furthered in such widely scattered areas as Papua New Guinea and New Caledonia. On the negative side, widely touted plans for expansion of activities in North Korea were more propagandistic than engineering possibilities, particularly with the limited availability of capital to fund development. The unsettled political situation in the Philippines contributed to lackluster industrial performance as well as to a poor investment climate, not only for mineral industry ventures but for other economic endeavors. Political instability posed developmental problems for minerals ventures and other economic endeavors in Cambodia and Burma.

High environmental compliance costs and public land access problems in Canada and the United States saw the beginning of a significant shift in North

American exploration and investment dollars to Latin America. This was encouraged by the movement toward more progressive foreign investment laws in many Latin American countries.

In the Western Hemisphere, 1991 mineral industry operations in Canada, the United States, and the larger mineral-producing Latin American nations served to significantly counterbalance lower levels of performance in Eastern Europe and the former U.S.S.R. Among the Latin American states, inflation and international debt problems continued to mitigate against expansion of many major mineral industry operations. The Iraq-Kuwait crisis, which drove energy prices upward, was a temporary boon, at least to the major oil producers of Latin America, Mexico, Venezuela, Colombia, and Ecuador (listed in order of output), but the same crisis worked to the disadvantage of those countries like Brazil and Chile, which though well endowed with nonfuel mineral resources, and in possession of a considerable processing capability, remained substantial net importers of energy.

In Europe, 1991 was a year in which the countries of the EC seemed to grow closer, despite some complex problems, and as a more firmly linked group, they represent a formidable economic force. However, there were some signs that the degree of economic unity that was anticipated for 1992 by advocates of a strong EC might fall short of attainment. It became increasingly apparent that at least in the short term, German reunification brought more liabilities than assets to both unified Germany and to the EC as a whole. This merger without question provided certain advantages to those German states that previously constituted the former German Democratic Republic over other former CMEA member states, such as Bulgaria, Czechoslovakia, Hungary, Poland, and Romania. These advantages through linkage to the EC would at least to some extent make the economic rationalization of its mineral industry somewhat smoother.

As the nations of the EC edged haltingly toward closer linkages, there were clearcut moves toward disintegration of other nations in Europe—moves that could vastly complicate efforts at attaining economic viability within a market economy world. Estonia and Latvia in 1991 joined Lithuania in separating from the U.S.S.R., thereby completing the breakaway efforts of the Baltic States that had been under Soviet "protection" since the onset of World War II. Perhaps more significantly, as the year ended, a number of other former Soviet Republics chose not to formally associate themselves with Russia in the Commonwealth of Independent States (CIS). Armenia, Azerbaijan, Georgia, and Moldavia opted for a greater sense of independence, contributing further to the breakup of the former monolithic national mineral industry of the U.S.S.R. This left the CIS as a loose federation composed of the giant Russia and the smaller former Republics that became the newly independent states of Belarus, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan. Although the mineral industry of the former U.S.S.R. was far from having the sound central control that some ascribed to it, what evolved from it for CIS and the seven other separated states has proven almost chaotic, at least at the outset.

The year 1991 marked the beginning of the disunion of the several Republics that had comprised Yugoslavia since shortly after the end of World War I. Macedonia and Slovenia disassociated themselves from Yugoslavia with a providentially low level of civil strife before the end of 1991, but Croatia's similar 1991 separation was marred by internal warfare between ethnic Serbians and Croatians in the border areas of Croatia, and more complicated problems began to develop in Bosnia-Herzegovina between Serbians, Croatians, and Moslems, all groups indigenous to the state. The internecine warfare in former Yugoslavia, coupled with sanctions aimed at curtailing this warfare, effectively crippled the area's modest but diverse mineral industry, an industry that previously ranked as one of the soundest in all of the basically centrally planned economy states.

In Czechoslovakia, 1991 brought continued public debate by some for dissolving the link between the Czech and Slovak Republics. The Czech Republic possessed the greater proportion of technologically more sophisticated industries, such as steel and heavy producer durables. The Slovak Republic, on the other hand, was faced with a declining mining industry, with the aluminum sector holding out the only hope for the future.

A survey of global mining investment trends published by the *Engineering and Mining Journal* (January 1991) showed that 296 mining projects valued at $55.2 billion were on the drawing boards in 1991. For the first time in several years, new investment in base metal projects increased while gold investment remained high. Distribution of investment by region was as follows: South America and the Caribbean (25.0%), Asia (21.9%), North and Central America (20.8%), Africa (15.2%), Australia and Oceania (13.3%), and Europe (3.8%).
In the steel sector, the Latin American Iron and Steel Federation (ILAFA) recorded a significant upturn in the aggregate investment in steel facilities by the countries that it covers, but similar data for the members of the European Coal and Steel Community (ECSC) and for members of the OECD updating that which was included in previous editions of Minerals in the World Economy were not received in time for inclusion in table 13.

The unit prices paid for virtually all economically important metallic mineral commodities in 1991 were significantly lower than those of 1990. Among the nonferrous metals reviewed in the section of this study dealing with prices and in table 3, only cobalt advanced in terms of its annual average. Pressure on cobalt prices was attributed to supply problems in Zaire. The 1991 average prices, in fact, were lower than those recorded for a number of years, and it should be noted that the price declines were even more significant than is immediately apparent from examining the current dollar prices

published herein because of the effect of inflation.

The upturns in oil prices occasioned near midyear 1990 by the Iraqi invasion of Kuwait did not hold up, and virtually all recognized standard market economy world crude oil prices fell markedly between yearend 1990 and yearend 1991.

Value of World Crude Mineral Production

The estimated value of world crude mineral production in 1991 exceeded $1,584.0 billion in terms of current (1991) dollars, or almost $1,172.5 billion in terms of constant 1983 dollars. This latter figure was 1.2% above the 1990 level but was 2.9% below the record high to date of $1,207.1 billion 1983 dollars set in 1980. Table 1 provides the latest available revised time series of the estimated value of world crude mineral production both in terms of 1983 constant dollars and in terms of current dollars. The statistical base for this estimation is derived from the data on the value of production of a group of key commodities that was compiled for and published in the authoritative French language mineral industry periodical, Annales des Mines, for selected years up to 1983.

The aforementioned values and those presented in the tabulation are for crude minerals only and by no means reflect adequately the role of the entire mineral industry in the world economy. These figures represent only the value of mineral materials as they are mined or otherwise extracted from the Earth. They do not reflect the value added to these materials through downstream processing within the facilities commonly accepted as mineral industry plants. That is, value added through beneficiation of ores, smelting, refining, and similar processing is not included in these figures. Comprehensive world data on the value added by such processing are not available; however, a conservative estimate of the total value of processed output from mineral industry plants derived wholly from primary (newly mined) materials would be on the order of about $2,810 billion constant 1983 dollars or $3,800 billion in terms of 1991 dollars.

To evaluate fully the worth of the total output of mineral industry plants would require the addition of a substantial (as yet unestimated) increment for the output derived from secondary raw materials, such as scrap and other reclaimed substances. Such recovery for some mineral materials is virtually nonexistent or inconsequential (as in the cases of sand and gravel and fuels, for example), but for others it is very substantial. For example, in 1991, almost 30% of world steel production, 45% of world refined lead output, and more than 15% of world refined copper production were clearly identified as being derived from scrap. Similarly, for market economy countries (data on centrally planned economy countries are not available), about 25% of total aluminum output was from scrap.

It is also important to note that the overall impact of the mineral industry extends far beyond the worth of all its products as measured by their sale value, whether the product be of primary or secondary origin. Mineral products constitute the overwhelmingly dominant share of the total raw material supply for all manufacturing operations. This encompasses not only the traditional "smokestack" industry facilities that use steel and other metals in the production of industrial equipment and consumer durables and the construction industry that converts mineral products into a host of structural types, but also such industries as textile mills whose raw materials are increasingly synthetic fabrics. Also, many high technology and advanced materials depend entirely on mineral based materials from silicon chips and optical fibers to graphite composites and barium-lanthanide based superconducting ceramics. In the areas of agricultural and forestry industries, mineral fertilizers and other mineral-based soil treatment products are indispensable for maintaining high production and productivity. Mineral products are essential to the transportation industry as raw materials for roads, railroads, bridges, runways, and docking facilities as well as for conveyances that use them; in addition, the mineral industry is a major user of transportation networks. The mineral industry itself provides all but a small share of the total energy required for the mining and processing of other mineral commodities and of agricultural materials from crude forms to the manufactures derived therefrom, and it also provides the overwhelmingly dominant share of the energy required to transport all raw materials, products, and the world's population around this planet. Finally, all electrical energy--that derived from hydroelectric and geothermal sites as well as from nuclear and conventional thermal powerplants--could not be produced and distributed without equipment and transmission lines fabricated from mineral commodities.

Production Index Patterns

Table 2 summarizes the development pattern of the world's extractive mineral industry output over recent years, as reflected by the extractive industry components of the UN industrial production indices that appear quarterly in the UN Monthly Bulletin of Statistics. The table demonstrates the upturn in overall extractive industry productive operations during 1986-89, as well as the slight downturn in 1990 and the recovery in 1991. From the quarterly results, there was a general downturn from the first quarter of 1990 through the third quarter of that year, with a slight recovery in the fourth quarter, followed by a slump in the first quarter of 1991, an upturn in the second quarter, another slump in the third quarter, and a fairly significant upturn for the last quarter. Assuming that additional and/or revised data for individual countries that undoubtedly will be added over the next year to the data base from which these indices are computed do not alter the general pattern, the overall extractive industry production index provides a somewhat brighter picture of 1991 than some other gauges of industry behavior.

What this global summary fails to reveal is that the world area most significantly responsible for the slump

was the former U.S.S.R. and its former CMEA associates of Eastern Europe. Examination of detailed regional statistics in the source publication for these data demonstrates the impact of output cutbacks within this area on the global aggregate.

Another tool that is available to assess production performance of the extractive sector of the mineral industry is the series of individual country industrial production indices that are published in each issue of the UN Monthly Bulletin of Statistics. This series does not cover all countries, and for those that are included, not all have the minerals extractive sector broken out as a separate line item. Nonetheless, the extractive sector is reported separately for 46 of the 52 countries shown regularly in the source. Unfortunately, only 38 of the countries showing an extractive sector index in the most recent issue available for review for the preparation of this discussion included data up to and including 1991. These listed countries, however, included the world's two largest crude minerals producers—the former U.S.S.R. and the United States—and such other leading producers as the United Kingdom, Mexico, Canada, Venezuela, Australia, and the Republic of South Africa, listed in the order of their ranking among crude mineral producers in the Callot study of 1983. In that year, 67.2% of total global crude mineral production was credited to the 38 countries reporting extractive mineral industry production indices for 1991. The remaining eight countries listed in the source but without 1991 data accounted for an additional 3.1% of the total 1983 output value. Thus, the source of these indices provides no coverage for countries that in 1983 accounted for 29.6% of the value of total crude mineral production. Most conspicuously absent are Algeria, China, Iran, Iraq, Kuwait, Libya, Nigeria, Saudi Arabia, and the United Arab Emirates.

Of the countries reporting 1991 results, the former U.S.S.R., as well as Czechoslovakia, Hungary, and Poland, the only other former CMEA members detailed, all logged declines between 1990 and 1991. So too did the United States and EC members—Belgium, Denmark, Germany, Greece, Italy, and Spain. EC members reporting gains were Ireland, the Netherlands, and the United Kingdom (all apparently on the basis of their oil and gas production upturns resulting from the Iraq-Kuwait crisis) as well as Portugal (whose increase stemmed from continued growth of the giant Neves-Corvo copper operation). Luxembourg had reported no 1991 figure, and France, the remaining EC member, was one of two countries showing 1991 extractive industry output on a par with that of 1990.

Other countries reporting downturns included: Austria, Barbados, Cyprus, Finland, Morocco, Republic of Korea, Sweden, and Zambia. Others logging gains between 1990 and 1991 were Australia, Canada, Chile, Fiji, India, Israel, Japan, Malaysia, Mexico, Norway, Republic of South Africa, Turkey, and Zimbabwe; Brazil reported an unchanged level from that of 1990.

Comparison of the index levels and growth trends for the extractive mineral industry shown in table 2 with the index levels and growth trends provided by the same source and published in table 3 of this study demonstrates the lack of parallelism between raw mineral production and mineral processing. In the case of the processing industries, both nonmetallic mineral products and base metals registered declines between 1989 and 1990, with only chemicals, petroleum, coal, and rubber products logging growth between 1989 and 1990. On the other hand, reviewing quarterly returns, nonmetallic mineral products advanced rather sharply between the first and second quarters and then suffered drops through the third and fourth quarters, while chemicals, petroleum, coal, and rubber products showed a decline between the fourth quarter of 1989 and the first quarter of 1990, an upturn into the second quarter of 1990, a slump in the third quarter, and then a recovery in the fourth quarter. Different yet was the pattern for base metals, which logged an increase between the last quarter of 1989 and the first quarter of 1990, as well as continued gain into the second quarter, followed by a slump in 1990's third quarter and a modest recovery in the fourth quarter.

As was the case with the UN's extractive industry production indices reported here, what is not shown in table 3 is that the global mineral processing industry did not perform as a unified industry. As was the case with minerals extraction, shortfalls in processing of mineral raw materials in the former U.S.S.R. and other former CMEA states were the major contributors to the downturn in the indices. Generally, market economy mineral processors benefited from conditions in 1990, and their output edged upward. For those interested in regional comparatives, the source of tables 2 and 3 should be useful.

Although the country-by-country industrial production indices can be used to assess the performance of the extractive or mining sector of the total mineral industry of any of these countries, there is no comparable and consistent regularly published international reporting for the important processing sector of the mineral industry. That is, there are no indices in print covering exclusively operations of the smelters, refineries, cement and brick plants, and corresponding facilities that convert crude mineral materials into the essential materials for the industrialized society of today's world. Thus, the majority of total mineral industry activities in the countries of the EC and Japan and a very substantial component of the total activities of the mineral industries of developed countries such as the United States, the former U.S.S.R., the EC, Australia, Canada, Czechoslovakia, Poland, and the Republic of South Africa are not covered separately by UN indices. Of course, it may be assumed that in terms of the world as a whole, mining and other crude mineral extraction would not continue except to meet the raw material needs of the processing plants. Hence, any significant global change in raw material production will be matched by a corresponding change in the consumption of these materials and therefore by a corresponding growth or decline in production by the processing sector of the

mineral industry. Although this may be true for the world in total, it does not help in assessing the shifts in the relative roles of the various countries.

Quantitative Commodity Output

Of the 101 distinct mineral commodities and/or subdivisions of mineral commodities for which world mineral production as measured by the U.S. Bureau of Mines is presented in table 4 for 1987-91. Sand and gravel are added for the first time in this series. Only 25 registered increases in 1991 relative to their 1990 levels of production, 75 showed declines, and 1 registered an output level unchanged from that of 1990. These results were even poorer than those for 1990, when 38 commodities logged increases and 63 recorded declines, on the basis of revised data available to the U.S. Bureau of Mines. Without question, 1991 results were far less satisfactory than those of any previous year, 1986-90 inclusive, at least for the world as a whole. It is important, however, at this point, to reemphasize that the vastly larger parts of 1991 production declines were chiefly the result of shortfalls in the former U.S.S.R. and the former centrally planned economy nations of Eastern Europe. Space considerations preclude detailing the production statistics on a commodity-by-commodity and country-by-country basis in this text, but examination of the tables of leading producers that appear at the end of this study will demonstrate shortfalls for the major producers of selected important commodities within this geographic area.

Of the 53 metallic mineral commodities recorded separately in table 4, only 11 recorded production gains in 1991 and 42 showed declines. Of the 11 showing gains, only 3 reached new record production highs in 1991; these (in the order they appear in table 4) were mine copper, primary refined copper, and mine platinum-group metals. Others logging output gains in 1991 with respect to 1990 levels, but not achieving record output levels in 1991, together with the year in which they reached historic output highs, were unalloyed aluminum ingot (1989), smelter cadmium (1988), chromite (1989), columbium-tantalum concentrates (1988), manganese ore (1980), refinery selenium (1979), refinery tellurium (1985), and secondary smelter zinc (1982 and 1983).

Of the 11 metals for which production gains were recorded for 1991, mine copper and primary refined copper recorded gains for the ninth consecutive year; mine platinum group metals, refinery selenium and refined tellurium all logged increases for the second consecutive year; unalloyed aluminum ingot, chromite, and secondary smelter zinc each registered increases after downturns in 1990 from record to date highs achieved in 1989; manganese ore also gained in 1991 after a 1990 decline but fell substantially below its record high of more than a decade ago; and smelter cadmium and columbium-tantalum concentrates advanced in 1991 after declines in both 1989 and 1990 from record highs of 1988.

Of the 42 metallic commodities showing lower 1991 output levels than in 1990, beryl concentrate and mine uranium recorded output drops for the fifth straight year after having attained record production levels in 1961 and 1980, respectively; arsenic trioxide output fell for the fourth consecutive year, thus remaining below the record output level of 1985; and output of mine cobalt, primary smelter lead, mine mercury, and secondary smelter tin fell for the third straight year (peak levels, respectively, were 1986, 1985, and 1971 and 1985). Fifteen metallic commodities registered declines for the second consecutive year in 1991, after reaching historic peaks in 1989. These were primary smelter copper, secondary smelter copper, secondary refined copper, iron ore, pig iron, ferroalloys, crude steel, secondary smelter lead, secondary refined lead, mine molybdenum, mine nickel, plant nickel, titaniferous slag, mine vanadium, and primary smelter zinc. Six other metallic commodities registered declines for the second straight year in 1991 but had logged record production highs before 1989. These, and the years in which they registered record outputs parenthetically, were mine bismuth (1985), smelter bismuth (1986), primary refined lead (1985), monazite concentrate (1985), mine tin (1979), and ilmenite (1974). The remaining 14 metallic commodities recorded declines in 1991 after logging increases in 1990. Of the latter group, the following had set to-date record production highs in 1990: alumina, bauxite, mine gold, primary smelter magnesium, secondary smelter magnesium, mine silver, mine zinc, and zirconium concentrates. Others in this group showing declines in 1991 following increases in 1990, but that had attained record production highs before 1990, were as follows, with the year of record production provided parenthetically: mine antimony (1987), refined cobalt (1986), mine lead (1973), primary smelter tin (1980), rutile (1980), and mine tungsten (1980).

Of the 37 individual categories of nonmetallic minerals and their products listed in table 4 under the heading "industrial minerals," only 11 registered gains in 1991 compared with their 1990 output levels. Of those recording gains, eight attained new production highs in 1990. These, in the order they appear in the table, were boron materials, cement, fuller's earth, kaolin, gem diamond, industrial diamond, iodine, and strontium minerals. Other commodities in this group that logged output gains between 1990 and 1991, but with a 1991 output that fell short of their previous record highs, together with the year in which they reached record-to-date output, were pumice (1973), gypsum (1989), and salt (1989).

Of the 11 nonmetals registering gains, cement attained a 16th consecutive year of growth; kaolin registered an increase for the 9th consecutive year; gem diamond, industrial diamond, and iodine each logged their 5th consecutive year of growth; boron materials registered a gain for the 4th consecutive year; output of fuller's earth increased for the 3rd year in a row; gypsum, salt, and strontium minerals recorded gains after declines in 1990; and pumice logged an output gain after reductions in 1989 and 1990.

Of the 26 other commodities in the group of "industrial minerals" or nonmetals, guano recorded a total 1991 global output equal to that of 1990, after achieving a record high in 1989. The remaining 25 commodities in this group logged output declines between 1990 and 1991. Of these, barite, bentonite, feldspar, and soda ash achieved record production highs in 1990. Additionally, natural corundum logged a downturn in output between 1990 and 1991, had shown growth between 1989 and 1990, but did not reach a record high in 1990 (peak output was in 1980). Similarly, output of byproduct sulfur turned down in 1991 after logging an increase in 1990, but its record-to-date output was achieved in 1988. Bromine, fluorspar, industrial sand and gravel, and talc and related materials achieved record output levels in 1989 and registered declines in both 1990 and 1991. Other nonmetallic commodities logging downturns in both 1990 and 1991, but that had reached historic output highs before 1989, included natural graphite (peak in 1963), lime (peak in 1980), elemental sulfur (peak in 1974), and sulfur from pyrite (peak in 1971). Commodities in this group that registered peak levels of output in 1988 and that showed declines thereafter included diatomite, nitrogen, perlite, phosphate rock, and potash. Additionally, asbestos, magnesite, sodium sulfate, and Thomas slag registered declines in 1989, 1990, and 1991, but logged record production levels in 1976, 1986, 1979, and 1979, respectively. Mica and vermiculite recorded their fourth consecutive year of declines in 1991, but both had reached record output levels in 1978.

Of the 11 mineral fuel commodities listed in table 1, only 3 registered output gains between 1990 and 1991. Considering first the production of primary energy commodities, anthracite coal increased marginally in 1991 after a more significant decline between 1989 and 1990, and marketed natural gas output (gross production less that was flared, vented, and reinjected into reservoirs for pressure maintenance) increased for the ninth consecutive year reaching a new historic high in 1991 as increases from gasfields were augmented by increases in recovery from fields in which the gas occurs as a byproduct of oil. Other major primary mineral sources of commercial energy, however, logged declines in 1991. Bituminous coal registered a drop to a level below that of not only the to-date historic high of 1990 but below that of 1989 as well, ending a 9-year period of continuous growth. Lignitic coal output fell for a second consecutive year, after continuously recording growth for 21 years ending in 1989. The single most dominant primary energy source, crude oil, registered a significant 1991 downturn after 4 years of continuous growth.

The recovery of natural gas liquids, chiefly butane, propane, and natural gasoline, derived as a byproduct of natural gas, reached a new high in 1991, the fifth consecutive year of such growth.

Peat is listed among mineral fuels because of its origin and nature, both similar to those of low-rank coals. However, about 80% of total peat output is used as a soil conditioner and for other nonfuel purposes. Output in 1991 declined, hence the commodity registered 2 consecutive years of output decline, but revised figures for 1987-89 were sufficiently increased that 1989 became the record year of production to date. (It should be noted that U.S. Bureau of Mines-published figures for peat output in the late 1970's and early 1980's are even higher than the 195.7 million tons now reported for 1989, but these earlier figures included estimates for the former U.S.S.R. that subsequently were revised substantially downward.)

As for the four mineral fuel products listed in the table, refined oil decreased for the first time since 1984-85, after 5 previous years of growth. The record high refined oil output was that of 1979. Carbon black output declined slightly in 1991, after 4 consecutive years of growth. Output of both metallurgical and other cokes diminished again in 1991, following the pattern set in 1990, and chiefly reflecting cutbacks in the former U.S.S.R. and several East European states. The historic record high for metallurgical coke had been set in 1980 and that for other coke in 1979.

The overall performance of the nonfuel mineral industry can only be summarized in terms of the value of production, and for these nonfuel commodities, exactitudes on the relative role of each commodity in the aggregate are not available for any year subsequent to 1983 (see section on value of world mineral production). Among fuel commodities, however, the overall pattern of output level changes and their interrelationships can be demonstrated not only on the basis of value, but also by reporting each fuel in terms of a common unit measuring its energy content. This has been done in this chapter on the basis of standard coal equivalents (SCE), as reported by the UN. Table 5 summarizes world output of energy commodities for 1980-90 as reported by the UN, with estimates for 1991 by the Bureau of Mines.

Political and economic changes and problems that began to impact mineral industry activities in the former U.S.S.R. and Eastern Europe in 1989 continued to have adverse effects on mineral production and processing, including that of the fuel mineral commodities, in that area through 1991. These conditions, coupled with the Desert Storm warfare in the Near East, combined to restrain global energy production; available information suggests a 1991 decline of 1.7%, to an estimated 10,688 million metric tons of standard coal equivalent. Of the individual commodity group components, solid fuels output apparently declined about 3.6%, and liquid fuels (including natural gas liquids) decreased nearly 2.6%. In contrast, natural gas output increased by nearly 1.5%, reflecting continued worldwide efforts to reduce losses of that portion of the total gas output that is produced in association with crude oil, as well as a trend toward greater utilization of nonassociated gas resources. Generation of electric power by hydroelectric and geothermal plants collectively declined, but only very marginally. In contrast, nuclear power generation grew by an estimated 4.5%.

Although no update of UN statistical information included in tables 6 and 7 of

the 1990 edition of this chapter relating to power generation and powerplant capacities was available in time to be incorporated in this edition, estimates updating these data have been made based on other published data of the UN and the U.S. Department of Energy. The most notable statistical development between 1990 and 1991 was the increase in the quantity of power generated by nuclear plants and in the share of total power generated by these installations. Output in 1991 was nearly 2.6 times that of 1981 and represented 17.4% of all power generated in 1991, a share that was 1.8 times its 1981 share. This is significant to world mineral economics not only because the mineral industry is the source of raw materials for nuclear and thermal power, but also because the mineral industry is a significant user of electrical energy in the mining, processing, and transport of minerals and mineral products. Table 6 presents statistics on electric power generation subdivided by the type of plant for 1981 and 1987-91, and table 7 provides comparable statistics on capacity by plant type for the same years.

In the 11 years 1981-91, output by world nuclear powerplants increased 159%, including a 4.5% growth between 1990 and 1991. In 1991, electricity generated by nuclear plants was 17.4% of all power generated and 48.5% of all primary electricity, as shown in table 6. In contrast to the growth in nuclear power output, the growth trend in plant capacities was significant. There was only a 2.2% increase in global nuclear plant capacity between 1990 and 1991, a lower rate of growth than the 2.8% logged for total electric plant capacity. Thus, nuclear plant utilization registered an increase in 1991.

The indicated 1981-91 growth in geothermal power was 144%, but this included a small but evident downturn in 1991. Although this output was of some significance to a few of the geothermal power-producing countries such as the Philippines, it remained inconsequential in terms of total world energy output.

In the case of hydropower, there apparently was an almost imperceptible downturn in output in 1991, but with an estimated 2.2% growth in hydroplant capacity in 1991, industry performance was less satisfactory than in 1990.

Global production of thermal power apparently increased only 1.1% in 1991, a smaller growth than the 1.8% attained in 1990, and far less significant than the 4.8% increase in 1989. The output growth rate did not compare favorably with the 3.2% increase in thermal-generating capacity between 1990 and 1991.

In the 1989 edition of this study, it was noted that there was a continuing trend in the power generation area away from the so-called "captive plants or self-producers," that is, plants with capacities essentially dedicated to some specific industry or group of industries, and usually toward public utilities. Data for 1990, as well as revised data for earlier years, indicated that this trend reversed. Although the self-producers account for under 10% of total global power generation, they have increased their share of total power production very modestly since 1987. In that year, they accounted for 6.8% of total output, and their share increased to 6.9% in 1988, 7% in 1989, and 7.2% in 1990. Unfortunately, the data on self-producers versus public utilities could not be updated in time for analysis in this edition.

Generally speaking, output by both public utilities and self-producers increased for each source plant type (hydro, geothermal, nuclear, and thermal) between 1987 and 1990, the only departures from that trend of increase being those of self-producer nuclear plants between 1989 and 1990 and of public utility hydroelectric plants between 1988 and 1989. However, the rates of change varied considerably. Users of this study desiring details are referred to the UN 1990 Energy Statistics Yearbook, the source publication for this part of this study, and to more recent editions of this work as they become available. The 1990 UN volume also provides details on electric power generation and capacity on a country-by-country basis, detailing both self-producers and public utilities for the years 1987-90 inclusive, and may be useful in attempting to assess specific use of electric power for mineral ventures, at least for some countries.

Geographic Distribution of World Mineral Output Value

Available information is inadequate to extrapolate reliably to 1991 the 1983 data on country-by-country geographic distribution of world crude mineral output value that was published in the July-September 1985 edition of Annales des Mines and reproduced in summary form in the 1985 edition of U.S. Bureau of Mines Minerals Yearbook - Area Reports, International. These data for 1983 appear in the 1985 Minerals in the World Economy chapter (table 2) together with corresponding figures for 1950 and 1978 and with some textual comments on this material. The reader is referred to this publication, as well as to its original source, for further information.

VALUE AND TRENDS IN WORLD MINERAL TRADE

For 1991, the aggregate value of world international export trade in mineral commodities was roughly estimated at $685 billion in current 1991 dollars. The estimated level was about 6% higher than that for 1990, but still more than 3% below the record high set in 1980, and the year was the fifth in a row in which the value of exported minerals advanced. Table 8 provides a data series for the estimated value of world export trade in all mineral commodities from 1979 through 1991, as well as a breakdown of this total into fuel and nonfuel commodities. The data shown are based on the historically more traditional and realistic (from the viewpoint of data availability) practice of reporting trade values for the year before the year of review.

Despite the considerable increase in the dollar value of mineral commodity exports, their share of total export merchandise trade declined to 19.1% in 1990 from 19.7% in 1989. At 19.1%,

this share was very near the recent year record low of 19.0% reached in 1988. Comparable 1991 figures were not available in time for inclusion here, but it is expected that the mineral commodity share of the total will be little altered from that of 1990.

Having noted the upturn in the total value of export trade in mineral commodities in 1988-90, it appears important to reflect on the differences in performance between the country group including the former U.S.S.R. and the former centrally planned economy states of Eastern Europe and the groups that include other world areas. Although table 8 demonstrates the substantial growth in global export trade values from 1986 to 1991, it should be understood that the recorded growth rates are by no means universal. Between 1989 and 1990, for example, the global growth in the value of mineral commodity exports was 8.4%, but the former U.S.S.R. and the former centrally planned economy countries of Eastern Europe in aggregate showed a decline of more than 5.8%, while the rest of the world logged an increase of more than 10.3%. Between 1988 and 1989, an increase of 11.1% was recorded for global mineral exports, but the former U.S.S.R. and East European countries logged a decrease of almost 5.7%, while the rest of the world achieved an almost 13% increase. Similarly, between 1987 and 1988, a global increase of 7.5% was recorded. This was because the 9.4% growth in mineral commodities for the aggregate of market economy countries and the centrally planned economy states of Asia and the Western Hemisphere, outweighed the 3.4% decline for exports from the former U.S.S.R. and Eastern Europe. Between 1986 and 1987, the last set of years in which mineral commodity exports logged a gain in the former U.S.S.R. and Eastern Europe, that gain was only 2.8% compared with almost 10.5% for the rest of the world and 9.8% for the global aggregate.

The downturns in value of exports from the former U.S.S.R. and its former CMEA partners in Eastern Europe seemingly reflect not only reductions in output levels of materials destined for export markets that were occasioned by moves toward economic rationalization of industry in these countries, but they also mirror adjustments in monetary exchange rates from the artificially high levels employed for the currencies of these countries at the outset of this timespan to more realistic levels reflecting actual trading with market economy countries that were in effect by 1990. The Bureau's informal information for 1992, however, suggests that exports from Russia for a number of commodities have increased due to the disposal of surplus inventories formerly consumed by the downsized military-industrial complex .

The data presented in table 8 have been developed from UN export trade data presented in table 9 and derivatives thereof, relating to distribution of value of world export trade by major mineral commodity groups and growth of value of world export in major mineral commodities which appear in tables 10 and 11, respectively. These tables represent extensions of data series that have been included in the Minerals in the World Economy study for many years.

The impact of cutbacks in mineral industry activity in the former U.S.S.R. and the centrally planned economy countries of Eastern Europe on global mineral trade are immediately apparent when it is shown that of the total value of 1989 world major mineral commodity exports of $519,032 million (presented in table 9), almost 12.6%, or $65,371 million, came from these economies in transition. Yet in 1990, with the total value of world major mineral commodity exports rising more than 9.7% to $569,533 million, only slightly less than 10.9% or $61,994 million originated in these same countries. That is, in a time in which the value of major mineral commodity exports from all other countries aggregated increased by $53,878 million, the value of major mineral commodity exports from the former U.S.S.R. and its Eastern European neighbors declined by $3,377 million.

Examining these same results in terms of the five main commodity groups included, the country group including the former U.S.S.R. and the other centrally planned economy countries of Eastern Europe registered not only a lower share of the world total in 1990 than in 1989 in each of the five groups, but also a lower current dollar value for each group. Further, it is noteworthy that if the 1990 values were to be converted to 1989 dollars, the disparity would be even greater.

CONSUMPTION

Nonfuel Mineral Commodities

Available statistics on 1991 worldwide consumption of selected nonfuel mineral commodities shown in table 12 indicate downturns for all but 3 of the 15 listed commodities. It should be stressed that in most instances, the consumption declines were primarily the result of lower levels of use in the former U.S.S.R. and the former centrally planned economy nations of Eastern Europe. However, several commodities suffered use cutbacks in market economy countries. In the case of the nonferrous metals covered in the table, the differences in performance between market economy countries and the former centrally planned economy states are immediately evident from the table itself. Among these important commodities, refined lead, primary magnesium, and refined tin registered downturns for market economy countries as well as among the centrally planned economy countries. Also notably, cadmium use showed no significant change from 1990 levels in either group of countries.

Global consumption of iron ore fell by 3.4% or about 31 million tons, and this was a greater decline than that logged for production of marketable iron ore and related products, which was down by only 3.0% or almost 28.2 million tons. Thus, it would seem that for another year there was a net addition to stocks. The 1991 drop in iron and steel scrap use was about 5.5% or about 18 million tons, on the percentage basis somewhat greater than the 4.8% or 36.9 million ton drop in global steel production. Although

consumption of iron ore and iron and steel scrap are not broken down by region in table 12, it seems almost assured that the pattern of 1990 continued into 1991: drops in use in the former U.S.S.R. and Eastern Europe were the overwhelmingly dominant declines and accounted for much, although not all, of the global decline, whereas among market economy countries as a group, there were upturns for both materials. On a global basis, it would appear that the slight shift in the ratio of pig iron to scrap in steel furnace charges noted in 1990 continued into 1991, this shift being toward a slightly larger proportion of pig iron with a corresponding decline in the share accounted for by scrap.

Examination of table 12 shows that separate statistics have been provided for market economy countries and for centrally planned economy countries. This has been done for two reasons. First, from the historical perspective, the consumption trends from year to year for these two groups of countries differ because, in market economy countries, use trends are influenced to a significant extent by variations in the broader economies of the countries, whereas in centrally planned economy countries they at least heretofore were regulated by rigid central government economic planning. Second, the consumption figures provided for the centrally planned economy countries without exception are apparent consumption figures and the data bases from which they are calculated include a significant number of estimates. Apparent consumption is defined as the sum of production and imports, minus exports, plus or minus variations in stocks. For these countries, however, production data are still often estimated, both import and export data may be significantly incomplete, and data on stocks generally are not available. Under the definition of apparent consumption, any change in the level of component figures will result in a change in the calculated apparent consumption. Besides the lack of stock data and the questionable nature of the completeness of trade reporting, there is the problem of the estimates of production levels. For several commodities in this group, there are significant differences between production estimates by the U.S. Bureau of Mines and those of Metallgesellschaft AG, the source of these consumption figures. Hence, the consumption numbers provided here would differ if the Bureau's production numbers were substituted in the equations for those of Metallgesellschaft.

Of the eight nonferrous metals reported, all except cadmium logged declines in the centrally planned economy country group between 1990 and 1991, and cadmium was essentially unchanged. In contrast, among the market economy countries, lead, magnesium, and tin fell below 1990 levels, but aluminum, cadmium, copper, nickel, and zinc all logged increases. As a result, the global totals for all except cadmium and zinc were lower in 1991 than in 1990. In the case of aluminum, the 3.6% decline in consumption contrasted sharply with a 1.2% increase in production, suggesting significant additions to stocks. In the case of cadmium, global output also apparently slightly topped consumption, adding to inventories. For copper, the 0.7% drop in world consumption was only slightly greater than the 0.1% drop in output, and there was an indicated 200,000 ton net stock drawdown. In the case of refined lead, the global drop in consumption was again greater than the drop in production, providing for additions to stocks. Stocks of magnesium also presumably increased as the 1991 reduction in consumption was substantially larger than the 1991 drop in output. In the case of nickel, assuming consumption figures for 1991 to be reasonably complete, the 1991 decline of 4.6% in use was significantly more substantial than the 0.8% drop in production, apparently leading to inventory buildups—a reversal of the pattern between 1989 and 1990 when a 0.5% increase in consumption occurred despite a 5.4% drop in production. Tin stocks apparently declined as 1991 consumption fell by 5.2% while output was reduced by 8.5%. Finally, slab zinc use advanced by only 0.2% in 1991 while production increased 1.8%, suggesting measurable additions to stocks.

For the industrial minerals (traditionally termed nonmetals in previous U.S. Bureau of Mines reporting and in the present reporting of a number of other countries), it should be noted that cement again logged an increase in use in 1991, as it has for a number of years, despite market weaknesses for a number of other major mineral commodities. Each of the three fertilizer materials logged declines in 1991 as in 1990, and again decreased use in the former U.S.S.R. and other CMEA countries of Eastern Europe led to the most substantial declines, but there were shortfalls in some market economy countries as well. Sulfur, one of the most prominent chemical materials produced, more than reversed its 0.9% gain in use between 1989 and 1990, logging a 4.2% decline between 1990 and 1991. This decline was closely paralleled by a drop in output, although the precise level of both production and consumption may be in dispute. It should be noted here that the statistical series used in this study for sulfur consumption is from the journal, Sulphur, a source that records world sulfur production at a level larger than that reported by the Bureau of Mines. As a result, the figures provided for global consumption from this source exceed the Bureau's reported production in each year 1987-91. Although it is clear that there is a difference in opinion as to the actual levels of total production and consumption between the Bureau of Mines and the journal Sulphur it is nevertheless considered that both the Bureau of Mines production series and the Sulphur consumption series reflect with reasonable accuracy the year-to-year trends.

Mineral Fuel Commodities

Data on mineral fuel consumption in table 12 have been provided in terms of SCE to facilitate interfuel comparisons. The aggregate totaled 10,281 million tons SCE in 1991, only 4 million tons SCE below the 1990 level.

Considering the relative share of total energy consumption provided by each of the listed fuels, natural gas continued to gain in relative importance, reaching nearly 24.6% of the total. Primary electricity, nuclear, geothermal and hydropower, also showed a gain, together accounting for nearly 5.2% of the total. In contrast, solid fuel consumption dropped by more than 2.1% and liquid fuel use declined fractionally. Thus, natural gas and primary electricity carved slightly larger shares of total energy consumption in 1991, while solid fuels and liquid fuels accounted for slightly smaller shares.

INVESTMENT

Annual global steel industry investment is partly mirrored in the data for selected market economy countries that appear in table 13 for 1988-90. No reasonably comprehensive 1991 data were available for inclusion in this study, and the partial reporting available was so incomplete that it was impossible to demonstrate whether the level advanced or declined from the 1990 level of nearly $15.5 billion. Moreover, with the radical changes that are now being effected in the steel industries of the states that were the U.S.S.R. and its CMEA partners, it is most regrettable that comprehensive and comparable data, both current and historic, on investment in this area are not available.

Updated information on market economy country petroleum industry capital and exploration expenditures by geographic area has been included in table 14, and it is evident that there was a substantial upturn in investment in 1991. The level of almost $74.5 billion was 14.5% above the 1990 level and included gains in every topical category and geographic area. The source of information for this table has been changed to the Oil and Gas Journal Database from the previously used Chase-Manhattan Bank study of Capital Investments of the World Petroleum Industry, which has been discontinued. Because of this source change, it has been necessary to modify the structure of the table somewhat, but its total scope of coverage is regarded as basically unchanged. It should be noted that the grand total, as well as some of the detail appearing for 1987, corresponds precisely with those in the previous source.

Salient statistics on U.S. foreign investment in mineral industry activities (table 15) as reported by the U.S. Department of Commerce have been revised to show the latest information for the years 1987-91. Revisions include not only numeric changes but also certain format changes necessitated by changes in the reporting style of the source. From the table, it is evident that although there has been a continued growth in total U.S. foreign investment, this growth has by no means been evident in the various mineral industry sectors shown in the table. Thus, although there was a nearly 6.2% upturn in total foreign investment, there was only a 3% upturn in the total investment in the five individually listed mineral industry sectors. Of these, two, metals and nonmetallic minerals except fuels, registered declines between 1990 and 1991, the former of nearly 9.6%, the latter of almost 7.3%. The remaining three showed gains of 18.8% for coal, 3.8% for petroleum, and 0.7% for primary and fabricated metals.

TRANSPORTATION

Marine Transport

Bulk carriers, freighters, and tankers are the three classes of seagoing vessels engaged in transporting mineral commodities. However, vessels in these classes are not wholly devoted to mineral commodity transport, as seen in tables 16 through 22. Bulk carriers move considerable tonnages of agricultural products as well as crude minerals, their concentrates, mineral fertilizers, and the like. Freighters, owing to their great variety, can be devoted wholly to hauling mineral products or wholly to nonmineral goods, as well as carrying mixed mineral commodities and nonmineral commodities. They include general cargo ships, full container ships, partial container ships, roll-on/roll-off ships, and barge carriers. Tankers, although largely engaged in moving crude oil and refinery products, also transport liquid chemicals, molasses, wine, liquefied natural gas, and other fluids. Table 16 shows the distribution of the world's merchant fleet by vessel type in terms of the number of vessels, their gross tonnage, and their deadweight tonnage. The increase of nearly 1.5% in the number of vessels between 1990 and 1991 compared with a 2.7% growth in gross tonnage and a nearly 2.3% increase in deadweight tonnage points to an increase in the average size of vessels. Of the four categories of vessels reported, all showed increases in number and in deadweight tonnage between 1990 and 1991 except for "other," and on the gross tonnage basis, all groups registered increases.

Although physical characteristics of vessels such as size, draft, crew requirements, type of propulsion system, ratio of gross tonnage to cargo tonnage, and fuel costs have undeniable influences on shipping industry performance, problems of and changes in the quantity and types of materials moved also significantly affect the shipping sector of the world economy, and thus have a bearing on the minerals sector of that aggregate. Unfortunately, comprehensive global data reflecting changes in these critical variables are not published.

Bulk Carriers.—During 1991, the world's bulk carrier fleet increased by 27 vessels, compared with an increase of 111 vessels between 1989 and 1990, and 3 vessels between 1988 and 1989. During 1991, bulk carrier total deadweight tonnage increased 1.4% compared with nearly 4.8% between 1989 and 1990. The average deadweight tonnage of a bulk carrier in 1991 was 45,255 tons, up about 0.9% from the 1990 level of 44,850 tons. Table 17 shows the distribution of bulk carriers by flag of registry at yearend 1991. Comparison with similar data for 1990 reveals that most of the major countries listed varied little between the years, but there were a few changes worthy of note. First, Cyprus edged out Japan for 4th rank in 1991; second, the Bahamas

replaced the Republic of Korea in 10th rank in 1991; and, perhaps most significantly, the Soviet Union, 12th ranked in 1990, disappeared from the list of countries altogether but was not replaced anywhere in the list of the 26 leading countries by the CIS or any of its constituent republics, nor by any of the former Soviet Republics that opted for separate existence.

Freighters.—The world's freighter fleet increased in 1990 by 140 vessels, compared with an increase of 111 vessels in 1990 and a drop of 323 vessels in 1989. The total deadweight tonnage advanced 1.9% to more than 122.3 million tons, with the result that the average deadweight tonnage of a freighter in service in 1991 was 9,725 tons compared with 9,649 tons in 1990. Table 18 records the world's freighter fleet by flag of registry for 1991. Comparison of the information in this table with comparable 1990 figures shows the largest single departure to be the omission of the former U.S.S.R. from the roster, after ranking second only to Panama in 1990. Also missing is Yugoslavia, which ranked 17th in 1990. It would seem that most, if not all, of the vessels credited to these two flags in 1990 were added to the "Other" group for 1991. Despite a prolonged civil war and associated economic dislocations, Liberia has maintained its business as a major registry of convenience for the world's shipping industry.

Tankers.—The world tanker fleet increased by 181 vessels in 1991, compared with a 228 vessel increase in 1990 and a 117 vessel decline in 1989. In terms of deadweight tonnage, the growth in the total fleet was 3.2%, to almost 280.6 million tons, but the average deadweight tonnage of a tanker edged slightly downward from 50,689 tons to 50,626 tons. Table 19 records the world's tanker fleet as of yearend 1991 on the basis of number of vessels and deadweight tonnage, listed by flag of registry. As with the bulk carriers and freighters, the most conspicuous shift in the list of countries is the elimination of the former U.S.S.R., ranked 10th in 1990, from the roster of separately listed countries. Also perhaps of some significance was the shift in the U.S. position from fifth in 1990 to sixth in 1991.

Table 20 provides a summary of the world's vessels engaged in the haulage of liquefied natural gas and liquefied petroleum gases. These vessels are included in the totals given for the world's tanker fleet, but details on these highly specialized tankers seem appropriate when the growth of this element of the total tanker fleet is considered.

Panama and Suez Canals

Tables 21 and 22 provide the latest available information on the transit of mineral commodities through the Panama Canal, by number of vessels, direction, and the commodities transported. Both the number of vessels transiting the Panama Canal and the total amount of cargo moved through the waterway increased between 1990 and 1991. The number of transits rose by 5.9% but the total cargo moved grew by only 3.7%, and of that, mineral commodities increased only 0.7% and constituted only 45.2% of the total of cargo moved.

Information on commodity and vessel movements through the Suez Canal has not been available to the U.S. Bureau of Mines since 1987; therefore, no new information has been presented on this important international waterway for the past 3 years.

PRICES

The series summarizing the prices of the major nonferrous metals on the stock exchanges of the United States and the United Kingdom has been continued this year in tables 23 and 24. Time constraints have prohibited preparation of other price information that has appeared in this study in previous years. Users are urged to consult the 1993 USBM publication Metal Prices in the United States through 1991, which gives an analysis of historical price series and trends, or the 1993 edition of Mineral Commodity Summaries for current U.S. prices on nonfuel commodities, and to utilize U.S. Department of Energy sources for information on fuel material costs.

STATISTICAL SUMMARY OF WORLD PRODUCTION AND TRADE OF MAJOR MINERAL COMMODITIES FOR 1991

The final tables of this chapter, tables 25-50, extend and expand the statistical series on production that was started in the 1963 edition of the Area Reports: International Volume of the Minerals Yearbook and that was subsequently updated and expanded in the 1965 and 1967-90 editions. Continuing the practice started in 1989, a column has been included in each of these tables providing a 5-year average for 1987-91, inclusive. This should provide a clearer picture more rapidly of the role of each major producer over the 5-year period. The listing order of major producers, however, continued to be, as in past years, in descending order of rank in the year of review, 1991.

This group of tables now includes each of the crude minerals that ranked from 1st to 19th in 1983 terms of value of their output (as well as four others of lesser rank). These 23 crude mineral commodities accounted for 93% of the estimated value of world crude mineral production in 1983. In addition, world output of five key downstream products—aluminum, steel, cement, nitrogen in ammonia, and refined oil—is included because of their significance as products.

These 26 tables are primarily a supplement to other statistical data within this chapter but also summarize international production data for major mineral commodities covered in greater detail on a commodity basis in Volume I of the 1991 Minerals Yearbook and on a country basis in the regional reports of the Minerals Yearbook-International Review. In this 1991 edition, the data

presented in these tables, in most instances, correspond with the data in individual commodity world production tables appearing in Bureau of Mines Commodity Annual Reports but may differ somewhat from individual country data appearing in the component sections of Minerals Yearbook-International Review and/or from any total that might be obtained by adding figures presented for any single commodity in each of the country articles of the International Review due to the availability of reported data at the different times of writing.

The series on world trade in major mineral commodities that appeared in earlier editions of this chapter (tables 57-69 in the 1967 edition) could not be included because of scheduling problems.

UPDATE AND OUTLOOK

General Summary

While the statistical summary focuses on 1991 data, this update and outlook section draws on information available to the author as of the date of final preparation in early 1993.

For all the press notoriety associated with the shift in the Near East crisis from the defensive posture of Desert Shield to the restoration of Kuwaiti sovereignty through Desert Storm, this was not the dominant event governing global economic thinking in 1991 and the first half and more of 1992.

From the global perspective, the momentous political changes in the area that was the U.S.S.R. and in the smaller emerging transitional economy states of Eastern Europe will have even greater current and long-lasting effects on world mineral industry activities than the crisis in the Near East.

In overview it seems almost assured that the difficulties of the countries of Eastern Europe and the former U.S.S.R. with their economies in transition will be the most difficult of problems to resolve in the long run. As another year of economic transitions transpired, it appeared increasingly evident that the legacy of the half-century or more of economic central planning will be a decade or more of very difficult adjustments, and a number of these difficulties will greatly affect not only the mineral industry of these transition countries but also the rest of the world's mineral industry. Necessary changes within the countries with economies in transition will include not only technological improvements aimed at making individual ventures economically viable and environmentally acceptable in a market economy world, but also establishment of new governmental structures and corporate structures attuned to market economy operations and educating both management and labor into traditional market economy philosophies. Moreover, changes of all types within the mineral industry itself will both affect and effect matching changes within the related infrastructural component sectors of the economy, such as transportation, water supply, power supply, and communications.

A substantial share of the international alignments that have prevailed in the post cold war world were those stemming from the widely divergent patterns of performance in the various countries in prior years, and these in turn had resulted from the diverse preexisting conditions and problems facing the different countries and country groups.

The simple matter of the availability or lack of availability of hard currency remained a crucial factor in a number of instances. Those importers without sufficient hard currency were forced to a great extent to deal with other countries in a similar condition if they could arrange some type of barter trade with such a country, or to simply do without. Exporters with little hard currency were striving to maximize exports to hard currency countries to maximize their intake of such funds.

In the case of the former U.S.S.R. reports suggest that mineral exporters are circumventing both internal customs and legal systems and external market mechanisms. The resulting dumping of excess supplies of certain materials such as nickel, aluminum, chromium, and potash at below-market prices has been very disruptive to world commodity markets.

The post-1991 activities of the world's mineral industry will be summarized in a series of geographically oriented vignettes focusing on specific commodities and/or commodity groups in individual countries and/or country groups. These will generally be restricted to commodities of major economic significance and to countries that are either major mineral producers, major mineral processors, or major mineral consumers, with some special inclusions on commodities and countries that show marked changes from their 1991 situation. Because of the overriding importance of developments in Eastern Europe and the former U.S.S.R., this region will be examined first.

The Former U.S.S.R.—As 1992 began, dissolution of the U.S.S.R. was a reality, with the former highly centrally controlled Union replaced by the far weaker Commonwealth of Independent States (CIS) that linked Russia and seven other former Soviet Republics, and by the seven theoretically nonlinked independent states—Armenia, Azerbaijan, Estonia, Georgia, Latvia, Lithuania, and Moldavia. The CIS member states, in addition to Russia, were: Beylorus, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, the Ukraine, and Uzbekistan. The breakup of the U.S.S.R. added to the economic chaos already evident as the various individual industrial operations strove to move toward market-economy-style operations—activities driven by market conditions rather than mandates from a central planning body. Output of most major indicator commodities had fallen rather steadily across the months of 1991 except for expected seasonal upturns in energy production in the late fall. Although precise, complete, official statistical information on 1992 performance remained unavailable, general information suggested continued downturns in 1992 for most commodities, again with the possible exceptions of some energy materials for essential human needs. There was little to suggest any improvement of the situation in early 1993.

The following examples should illustrate the severity of output cutbacks. For 1991, Soviet steel output was less than 132.7 million tons, almost 14.1% below the 1990 level and more than 18.6% below the record high to date set in 1988. Output in 1991 fell from an average daily rate of almost 436,000 tons for January to only 312,000 tons for December. The downtrend, although not without minor fluctuations in the first half of the year, was steadily downward from August. Preliminary 1992 returns suggest an output of slightly under 117 million tons, including 67 million tons for Russia, almost 42 million tons for the Ukraine, about 4 million tons for Kazakhstan, and an estimated 4 million tons for the remaining former constituent Republics taken as a group. If these preliminary figures are not substantially altered, a 1992 decrease of 11.8% in steel output will be logged for the group of countries that formerly composed the U.S.S.R.

There had been an even greater reduction in Soviet iron ore output in 1991, with the tonnage produced dropping to less than 85% of the 1990 level. This decline reflected not only reduced demand by the former U.S.S.R.'s domestic steel industry, but also demonstrated the effects of reduced exports to such countries as Bulgaria, Czechoslovakia, Hungary, Poland, and the states of Germany that until October 1990 were the German Democratic Republic. Russia reportedly produced 97.3 million tons of iron ore in 1992, apparently logging an increase of about 8% over its 1991 level, but on the other hand, the Ukraine recorded an output of only 75.7 million tons, 11.5% below its 1991 level. Assuming that Azerbaijan and Kazakhstan, the other two former Soviet Republics that produced iron ore in 1991, approximately maintained their 1991 output levels, then total 1992 output by former Soviet Republics was probably only slightly smaller than that of 1991, or quite close to the 200-million-ton level of that year.

The former U.S.S.R.'s cement production had dropped to about 122 million tons in 1991, about 89% of the 1990 level and only 87% of the record high set in 1989. As with steel, there had been some departures from a constant downturn across the year 1991, but in the case of cement, the downturn was constant from September through December. Complete and comprehensive results for 1992 were not available, but available information suggested a level of about 115 million tons for the aggregate of former Soviet Republics.

Declines in the former U.S.S.R.'s output of most energy commodities in 1991 reflected the overall domestic industrial downturn, as well as reduced deliveries to both industrial economies of former CMEA partner states and to market economy nations. Production of anthracite, bituminous, and lignitic coal had fallen in 1991, and although precise accounting for each type of coal and for each of the Republics for 1992 was not yet available, further declines seemed assured for that year, although probably not so great as those of 1991.

Crude oil production presented the darkest outlook for any of the Soviet primary energy sources. The daily production rate had declined modestly in every month in 1991, resulting in an annual total that was only 91% of that of 1990 and marking the third consecutive year of lower levels. Incomplete returns suggested that a 1992 level about 13% below the 1991 level for the 15 former Soviet Republics would be the highest attainable level. Oil sales from countries that formerly composed the Soviet Union to all other countries fell from a daily average of more than 4 million barrels in 1988 and 1989 to a daily average of only 1.3 million barrels in 1992. On the other hand, the resource potential of Russian oilfields and the interest of Western oil companies in investing in the development hold great promise for the future economic growth of the Russian republic.

Marketed natural gas output in the former U.S.S.R. in 1991 did not decline in direct proportion to the drop in oil production. A drop of only 1.1% in 1991 was registered, and no consistent downturn was evident across the year. Moreover, the 1992 outlook was for stabilization near the 1991 level. This primarily reflected efforts to increase utilization of associated gas, which was being produced together with crude oil. However, additional nonassociated gas was evidently being produced as well.

One thing that became abundantly clear to market economy country oil industry agents who were examining former U.S.S.R. oil industry activities and facilities was that years of unsound technological management coupled with the use of inadequate equipment had severely damaged some, if not all, major oilfields. Indeed, in the case of some fields, it was questioned whether they would be possible to operate ever again at a profit because they had been so poorly managed. Even the popular press published reports outlining technological mishandling of Russia's Samotlor Lake oilfield in Siberia, the giant field that for a period of time was claimed to be the source of one-quarter of all oil produced in the area that formerly was the Soviet Union. At this field, it was reported in early 1993 that one in every four wells was then out of production, and that output has been declining at a rate of 13% to 14% per year since 1989. The Russians have been attempting to obtain foreign investment capital to finance recovery in the Samotlor oilfield area, but through early 1993, no major market economy producer had established working arrangements, although some smaller firms were involved in limited contractual arrangements with the Russians. The reluctance of major firms to establish working arrangements with the Russians apparently was chiefly because of the confused political situation, including the difficulties of determining just what certain Russian entities and individuals could do and could not do.

Other technological problems hampering development in the nations that once comprised the Soviet Union relate to their nuclear powerplants. A substantial number of all such facilities completed to date are regarded as substandard from the viewpoint of safety, even without consideration of their technologic and economic aspects. The

problem was pointed out in May 1993, with an explosion and fire at the Zaporizhia plant in the Ukraine. Although this accident apparently did not directly involve nuclear materials, and thus did not pose the long-term risks that 1986's Chernoble disaster caused, it did point to problems involving a different and newer class of plant from the Chernoble type that had already been labled dangerous by some observers.

Overall, for the mineral industries of the states that were formerly the U.S.S.R., the processes of economic and environmental rationalization, exacerbated by civil strife in some areas, presented a dim outlook for rapid recovery, and the highly confused and confusing political situation did not bode well for the prospects of international economic assistance, and prospects for investment and other involvement from abroad continued to be speculative.

Other Ex-CMEA Countries.—In Czechoslovakia, where 1991 had seen some expressions of discontent over continued linkage of the Czech Republic with Slovakia, and where efforts at industrial rationalization had led to 1991 drops in steel and cement output to about 80% of 1990 levels, 1992 saw the dissolution of the country into two separate states, as general industrial activity continued to slow under rationalization and restructuring.

The output of steel in the geographic area that was known as Czechoslovakia until late 1992 dropped by almost 8% from the 1991 level, demonstrating a weakness in the structure of what had been one of the country's most prominent industries since the early 20th century. In contrast, cement operations, clearly one of the area's economically more sound minerals industry components, apparently recovered somewhat in 1992, with an upturn of about 14% suggested. Another positive event of 1991 had been the upturn in aluminum output to about 49,387 tons. This was an output level change that definitely countered the general trend in the area and in its former CMEA neighbors and suggested a degree of viability for this import-based minerals industry operation. Preliminary estimates for 1992 suggest a drop in aluminum output of about 9%.

The 1991 reductions in output of major nonfuel mineral products in the former Czechoslovakia had been mirrored, to a significant extent, in 1991 output cutbacks for both bituminous coal and lignite-brown coal. For 1992, a very modest recovery from 1991 levels seemed likely, however, recovery to pretransition levels was out of the question.

In Poland, the effects of industrial rationalization had led to a 1991 drop in steel output to about 10.4 million tons, and a further 6% reduction seemed likely for 1992, to a level of about 9.8 million tons. Poland's cement output had registered only a 4% drop between 1990 and 1991 to a level slightly above 12 million tons, and data for the first 9 months of 1992 suggested that a very slight recovery may have been logged in that year.

Poland's coal industry, long a reliable export source of quality bituminous coal, had recorded a downturn of only 5% in output in 1991 to slightly more than 140 million tons, apparently in response to the decline in Poland's own industrial needs. However, results for the first 9 months of 1992 suggested a decline of more than 13% in bituminous coal output for the year, a drop somewhat greater than the 10% shortfall that had been anticipated, and evidently reflective of drops in the export market as well as in domestic requirements. Counter to the trend in most of Eastern Europe, Polish output of brown coal and lignite had edged up 2.6% in 1991 to more than 69.3 million tons. However, this trend did not continue in 1992, and a decline of nearly 8.5% was expected for the year on the basis of operating results for 9 months. Thus, it appeared that the environmental problems of these low-rank coals were finally being felt, as demonstrated by Polish output reductions.

Copper and sulfur remained Poland's other major mineral commodity export industries, and efforts have continued to maximize output within limits of sound economic practice, to keep foreign exchange earnings as high as possible. Mine copper output had suffered a sharp downturn between 1988 and 1991, with production in the latter year totaling only 73% of the 1988 level, but in 1992, a recovery to about 387,000 tons represented a 21% growth with respect to the 1991 level. In comparison, output of refined copper had declined only 13.6% between 1988 and 1990 and turned upward in 1991 with an 8.9% growth, with a further 2.7% increase logged for 1992. One of the results of these readjustments in copper production levels was that mine and refined output were brought into line in 1992, with no additional quantity of copper in concentrate being produced for smelting and refining elsewhere. It is further notable that the quantity of Polish refined copper exports moving into traditional market economy countries has increased sharply. In 1988, it totaled only 105,600 metric tons, dropped to 90,900 metric tons in 1989, but then increased to 115,900 metric tons in 1990, 157,600 metric tons in 1991, and 205,600 metric tons in 1992.

In the case of sulfur, 1991 had been a second consecutive year of output decline in Poland, and partial year 1992 results suggested the likelihood of a further modest decline for the year as a whole. Output at the Grzybow and Machow operations was reportedly slowly being phased out, but the opening of the new Osiek Mine, once slated for 1990 and seen by management as a replacement for Grzybow, apparently had been postponed until at least 1993. It was noteworthy, however, that to keep output up to the maximum possible level, efforts were made to develop new markets, and the success of these efforts was reflected in significant alterations in export destinations in trade statistics. For example, in 1992, sales to Tunisia were sharply higher, and Egypt became a significant new customer, whereas deliveries to Brazil and India were far lower than in 1991, and total deliveries to West European countries were more than one-quarter lower in the first 9 months of 1992. Privatization of Siarkopol, the Polish governmental sulfur producer, was postponed at least beyond yearend 1992.

The sharp 1991 drops in Czech and Polish steel output had parallels or near-parallels in Bulgaria, Hungary, and Romania, and further steel industry output declines were noted for these countries in 1992. Bulgaria's 1992 production fell by more than 26% below the 1991 level, that of Hungary declined by 19%, and that of Romania fell by nearly 25% from the 1991 levels. Production in 1992 totaled about 1.6 million tons each for Bulgaria and Hungary and slightly under 5.4 million tons for Romania. These levels were far below the record-to-date highs of 3 million tons set by Bulgaria in 1987, almost 3.8 million tons by Hungary in 1984, and almost 15.0 million tons by Romania for 1985.

Downturns in output of brown coal and lignite occurred in 1991 for Bulgaria (10.2%), Hungary (3.6%), and Romania (16.5%), and although final results were not available at this writing, declines of approximately 11.5% and 7.1% were in order for Bulgaria and Hungary, while Romania apparently logged a surprising 22% growth in output.

Yugoslavia.—Through 1992 and 1993, the geographic area that had been the Republic of Yugoslavia through 1990 was the scene of almost constant intense civil disorder that at times escalated to open warfare. The ultimate outcome could not be foreseen through the clouds of war and the intense animosities that had either grown or surfaced after years of suppression between the several ethnic factions, but at the time of this manuscript's preparation, the former Yugoslavian states of Slovenia, Croatia, and Macedonia had achieved independence, and the state of Bosnia-Herzegovina was striving for this goal but was enmeshed in conflict in a tripartite internal conflict between parts of the Serbian, Croatian, and Moslem elements of its population, each receiving support from outside the state. Thus, the area that continued to lay claim to the title Yugoslavia was at this writing reduced to an amalgamation of the former Yugoslav states of Serbia (with its regions of Kosovo and Voivodina) and Montenegro (Crna Gora). Regardless of the ultimate political outcome, however, it was evident that both 1992 and 1993 would be logged as years of generally low levels of industrial output for the region as a whole. Although, through this writing, open combat in both 1992 and 1993 had been confined chiefly to Bosnia-Herzegovina and Croatia (the latter to a substantially lesser extent), economic activity in all component states suffered to a greater or lesser degree as a result of the strife. Destruction of industrial facilities, transport and communications dislocations, energy shortages, and the loss of trained factory workers and staff from industrial and infrastructural jobs as a result of deaths, injuries, or prolonged militia service by these individuals combined with the open warfare to reduce both industrial and agricultural production levels sharply. The overall impact of these conditions, coupled with the effect of trade sanctions imposed by the UN in an effort to bring the open warfare to a stop, was felt heavily in the minerals sector. Post-1991, reliable and comprehensive statistical assessment of mineral industry operations for one-time Yugoslavia as a whole was unavailable at this writing, but the downtrends were clear; it only remained to accurately assess the extent of the various downturns. Estimates of 1991 production by region in the former Yugoslavia are available in the companion regional report in this series on the Minerals Industries of Europe and Central Eurasia.

The European Community Countries.—Through 1992 and into 1993, German reunification, no matter how desirable it may have been to the partitioned Germanies from the psychological viewpoint, and no matter what long-term benefits may result for the two former Germanies and/or for the EC, brought major problems to both formerly separate states as well as to the EC as a whole, including some relating to the mineral industries of both parts of the reunited country.

Although the technology available to the former German Democratic Republic was among the best, if not the best, in all of the centrally planned economy states, it was assuredly not up to average developed market economy country standards, much less the standards of the EC member countries, whether seen from the viewpoint of economic or environmental considerations. The difficulties of maintaining reasonably full employment while economically integrating and rationalizing both the resources and the processing facilities that the former Eastern states brought to the unified country, and at the same time addressing the inherited environmental problems of the former East German installations, have proven formidable, and they have not yet been resolved.

The effects of the integration and rationalization processes on a few key industries are evident in production statistics. In the case of steel, in August 1990, the last month before unification for which separate statistics were published, Germany produced a total of 3,518,000 tons of crude steel, of which 3,144,000 tons was from the Western states (then the Federal Republic of Germany), and 374,000 tons was from the Eastern states (then the German Democratic Republic), whereas in October, the month that unification actually occurred, the monthly total for both areas was only 3,421,000 tons. In terms of annual output, the effect is even more striking; crude steel output of the two areas totaled 48.9 million tons in 1989, the last full year before reunification, including 7.8 million tons produced in the area now termed the Eastern states; in 1991, the first full year after reunification, the national total was down to 42.2 million tons, reflecting reductions in both groups of states, and in 1992 it fell further to only 39.7 million tons.

The potash industry, in which the two separate areas had ranked as the world's third and fourth leading producers in 1989 (with the German Democratic Republic holding third rank), showed a decline from a total of 6 million tons in that year (3.8 million from the Eastern states and 2.2 million from the Western states) to 4.9 million tons in 1990 (2.7 million from the Eastern states and 2.2

million from the Western states), to a unified undistributed total of only 3.9 million tons in 1991 and an estimated 1992 total of only 3.4 million tons.

In the case of brown coal and lignite, total German output in 1989 aggregated 411 million tons, including 301 million tons from the Eastern states and 110 million tons from the Western states, but this was reduced to 388 million tons in 1990, including 280 million tons from the Eastern states and 108 million tons from the Western states, with a further reduction to an unseparated aggregate of 279 million tons in 1991 and to an estimated 238 million tons in 1992.

As events unfolded in the unified Germany through 1992 and beyond, it was evident that problems of the labor force were to be prominent. The first labor strike in the Eastern states in 60 years was authorized by an overwhelming majority in a vote by metal workers in late April 1993. At the crux of the problem was a decision by employers to unilaterally revoke a 1991 accord with the metal workers' union that had called for a 20% raise for the Eastern metal workers in 1993 and for equality in their pay with that of workers in the West by 1994. The employers argued that deterioration in the German steel industry and the overall economy made the previously promised raises unrealistic and instead offered a 9% increase, a rate that worker representatives regarded as no more than a counterbalance to inflation in the Eastern states. It was suggested that the higher pay increases, if granted, might serve to discourage some crucially needed foreign investment in metals industry plants in the Eastern states. Indeed, some observers suggested that the strike could well be the end of the steel industry in the Eastern states. Steel markets in Germany have been glutted with cheap steel from the economy-in-transition states of Eastern Europe, and the existence of such steel could minimize pressure to negotiate any strike settlement with steelworkers in the states that formerly constituted the German Democratic Republic.

Another significant development in the EC in 1993 that provided a guide to possible economic development trends that could affect long-term mineral industry development was the approval of the Danish electorate of the Maastricht Treaty. Although Denmark represents only a small part of the total EC, it was a part that through much of 1991 was regarded as having some reservations on the wisdom of increasing EC powers vis-a-vis individual country powers. Although this vote alone could not be regarded as an assurance that the EC countries would shift more to the "United Europe" concept, it certainly pointed in that direction.

The Near East.—Probably the most significant mineral industry developments in the Near East since the end of 1991 have been the continuation of restoration of facilities and activities in the areas that had been heavily affected by the Iraqis' invasion of Kuwait and the subsequent Desert Shield and Desert Storm operations. The other most notable post-1991 situation influencing the whole region's mineral industry operations is the continued lack of regional stability, owing to a number of major international tensions as well as to internal problems in several countries. The resolution of regional water management and distribution issues is still pending. The outcome of these water issues will have a major impact on industrial development in the region.

In broadest terms, mineral industry facilities in Kuwait and the adjoining Neutral Zone, although suffering far more than those in Iraq, have been restored more effectively than those of the latter. However, Kuwait's 1992 production activities remained considerably below those of 1989, the last year before the Iraqi aggression. For example, Kuwait's crude oil output, including its share of output from the Neutral Zone, totaled almost 651 million barrels in 1989, dropped to almost 429 million barrels in 1990 (with virtually all the production occurring before the Iraqi invasion), declined to only 68 million barrels in 1991 (virtually all that in the last third of the year), and then increased to more than 374 million barrels in 1992. Thus, 1992's output was up 450% from that of 1991 and was at a level of about 57% of that of 1989. For Iraq, however, 1989 output had been 1,057 million barrels, 1990 production dropped to almost 745 million barrels as exports were largely blocked after the invasion of Kuwait, 1991 production totaled just under 109 million barrels, and 1992 output was estimated at only 146 million barrels, 34% above that of 1991 but less than 14% of the 1989 level. Similarly, production in fertilizer plants in both countries remained at levels reduced from those of 1989, but again, recovery in Kuwait was to a higher level than in Iraq. In terms of nitrogen content of ammonia produced, Kuwait had manufactured 665,000 metric tons in 1989, 292,000 metric tons in 1990, was nil in 1991, and totaled 140,000 metric tons in 1992. In Iraq, 1989 output was 474,000 metric tons, dropped to an estimated 330,000 metric tons in 1990 and further to an estimated 50,000 metric tons in 1991, and recovered only marginally in 1992 to an estimated 70,000 metric tons.

North America.—Probably the most significant event of 1992 in the northern Western Hemisphere for its possible future impact on the mineral industries of the region's countries was the initialling, by the chiefs of state of Canada, Mexico, and the United States, of the initially agreed draft of the North American Free Trade Agreement (NAFTA). At this writing, the agreement still required final approval of the legislative branch of Government in each of the countries to become effective, and such approval was by no means assured, at least without resolution of supplemental negotiations on related labor and enviornmental issues. A finalized NAFTA could lead to a rationalization or restructuring of certain industries in the three countries but in the long term should add to economic efficiencies and productivity in the region. Canada's Parliament voted favorably on a preliminary version in early 1993, but neither the Mexican Senate nor the United States Senate had taken the agreement under consideration at this writing.

Insofar as post-1991 mineral industry performance is concerned, that of the United States was mixed and overall somewhat lackluster. Output of anthracite, bituminous, and lignitic coal fell slightly in 1992, that of crude oil was off almost 3.6%, but natural gas production was essentially unchanged from that of 1991. In contrast, steel production advanced 5.7%, refined aluminum output advanced nearly 4.4%, refined copper logged a growth of nearly 7.9%, and slab zinc output increased 4.4%, but refined lead production dropped 3.6%. Among the industrial minerals and their products, U.S. cement production registered a 7.3% gain but failed to fully recover from the downturn experienced between 1990 and 1991. Chemical raw materials, salt and sulfur, suffered slight downturns, as did phosphate rock, but the other two mineral fertilizer commodities registered slight gains.

In Canada, the overall value of 1992 mineral production was reportedly about 0.6% higher than that of 1991, but this was a lesser increase than the 1991-92 inflation rate. Quantitatively, among the fuels, output of crude oil, natural gas, and natural gas liquids advanced, but that of coal fell. Iron ore production fell almost 7.5% to just under 32.8 million tons, but steel output was up by 7.6%, and that of refined aluminum, copper, lead, and zinc all advanced. Cement output fell for another year, dropping by nearly 9.5% to slightly under 8.5 million tons.

Mexico's oil and gas industry in effect held its ground in 1992, with output reaching levels that were marginally below those of 1991. The country's steel industry experienced a 5.9% growth in output, and output levels of its nonferrous metals industry sector also were generally up: mine output of copper, lead, silver, and zinc was higher than the 1991 levels, as was production of refined copper and lead, while that of slab zinc was only slightly below the 1991 level.

South and Central America.—Brazil, the dominant single diversified mineral industry country of South America, in 1992 registered production gains at both the mining and smelter/refinery levels for most major metals, including aluminum, copper, iron, and zinc. The country also apparently logged growths in production of a number of the industrial and construction nonmetallics, despite internal political problems that threatened impeachment of the President and some general continuing hyperinflation and other economic woes, including an investment climate plagued with balance of payments problems.

Chile continued as the continent's second most significant nonfuel minerals producer/processor, and here, where the copper industry remained the dominant element of the overall economy as well as the mineral industry, both mine and refinery copper output advanced again in 1992. These upturns, coupled with growths in production of iron ore, iron and steel, and copper byproducts, provided a relatively optimistic outlook for 1993.

The northern tier South American oil producers—Colombia, Ecuador, and Venezuela—not only benefited from the interdiction of Iraqi and Kuwaiti oil from midyear 1990 through yearend 1991, but the first two listed registered further output gains in 1992, and Venezuela logged only a 1.2% drop in crude production for that year relative to the 1991 level. Peru, the continent's other significant nonferrous metal producer, continued to suffer from the internal strife generated by the "Shining Path" revolutionary movement in both 1991 and 1992 that led to the dissolution of a constitutional government and the establishment of autocratic rule by the Fujuira President. These problems did not prevent appreciable upturns in output of copper, lead, and zinc and a more modest increase in silver in 1991, nor were they regarded as the primary force behind 1992 output drops for each of these metals. Nonetheless, they had a definite negative effect on mineral operations as well as the country's overall economy. Foreign investment was given a boost by the acquisition of Empresa Minera Hiero Peru by the Chinese Government.

Among the bauxite-producing states of the Caribbean and South America, the Dominican Republic had terminated mining in early 1991 and did not reestablish such production through early 1993. Of the others, only Brazil (as already noted) logged an output gain in 1992; production in Guyana and Suriname was estimated to have been about on par with that of 1991, and Jamaica and Suriname logged reductions in output. After a $350 million expansion of faciliities at its only bauxite mine al Los Pijiguaos, Venezuela produced almost 2 million tons of bauxite in 1991. Expectations for achieving a production rate of 3.5 to 4.0 Mmt/a by mid-1992 were dashed by price consequences of the dumping of aluminum on world markets by the former Soviet Union. Nonetheless, projections of 6.0 to 8.0 Mmt/a were being made for Venezuelan bauxite production in the period after 1993.

Cuba, with global mineral significance only because of its very large world-class lateritic nickel deposits, continued to experience economic difficulties through 1992 and into 1993. These were largely the result of the breakdown of Cuba's previous close links to the former U.S.S.R. and its difficulty in replacing these connections with links to market economy countries, although in one instance the Sherritt Gordon Company of Canada replaced Russia as a major purchaser and refiner of Cuban nickel. Available indicators suggest that the country's entire mineral industry was experiencing difficulties with development projects as well as with maintaining output from existing facilities. The country's own forecasts of increases in nickel output for 1992 seemingly were overly optimistic, although the long-term production potential is clearly there.

Africa.—For the dominant mineral producer and most highly industrialized country on the continent, the Republic of South Africa, production of most mineral commodities declined in 1991. Gold production fell slightly to 601 tons. Diamond production decreased by 3.3%. Coal production increased by 1.9%.

Among metallic commodities only chrome ore, copper, lead, and silver achieved higher production levels in 1991 than in 1990. Nonmetallic commodities that had higher production in 1991 were asbestos, barite, feldspar, gypsum, silica, and sillimanite.

The increasing costs of production, particularly from the deep mines, continued to negatively impact the industry, while productivity increases have not kept pace with these costs. In June 1991, a wage settlement between the National Union of Mineworkers (NUM) and the Chamber of Mines resulted in an increase in wages at gold mines of an average of 6%, the lowest wage increase in recent years, and less than one-half the inflation rate.

With the end of apartheid laws in South Africa and the end of trade embargoes on the country by most of the major industrialized countries, South Africa was able to begin regaining lost export markets. However, continuing political uncertainty in the country was a disincentive to new foreign investment.

The U.S. sanctions imposed under Title III of the Comprehensive Anti-Apartheid Act of 1986 (CAAA) and the Rangel double-taxation amendment were lifted on July 10, 1991. As of that date, U.S. companies and citizens were no longer prohibited by the CAAA from making new investments in South Africa. However, other U.S. sanctions remained. The 1985 Gramm Amendment prohibits U.S. support for new International Monetary Fund funding for South Africa. Although Americans are no longer prohibited by Federal laws from investing in South Africa, a number of sanctions imposed by State and local authorities hinder companies from doing so.

Preliminary reports on the overall economy showed no growth in the GDP between 1991 and 1992. At best, 1992 mineral industry performance would be described as lackluster—modest gains for some commodities, modest losses for others. Gold mine output advanced to 608.5 metric tons, but this level was still short of the high in 1988. Production of aluminum and zinc edged upward, but output of copper and lead, at both the mine and refined metal stages of production, declined from 1991 levels. Crude steel output definitely slumped in 1992, and partial year results suggested a similar drop in cement production. Preliminary returns also suggested slight 1992 downturns for output of both iron ore and coal.

Zambia and Zaire remained the African continent's dominant copper and cobalt resource holders but showed sharply different performance results in 1992. The former exceeded the increases logged by most market economy world producers, increasing mine output by 4.9% and refined production by 8.2%, compared with increases of 1.2% and 3.8%, respectively, for the total of market economy countries. Zambian copper output, although improved from that of 1991, still fell considerably short of the peak production activity of 1980. Zaire, suffering major political and economic disruptions, registered a cutback in mine output of almost 51% and in refined copper of 59%. Although the drop in Zairian cobalt production was not as pronounced, continued production uncertainties had an upward impact on world cobalt prices.

Elsewhere on the continent, mineral industry operations in a number of countries continued to be influenced to a greater extent by problems that afflicted the general economic and political climate than they were by problems that were mineral industry specific. The percent of the work force infected by AIDS were economically significant in countries like Malawi, Uganda, and Zaire. This and other medical problems, including malaria and simple malnutrition, indeed impacted mineral industry operations and economics as well as other economic endeavors in a number of countries.

A number of countries suffered from internal strife and political instability. In Liberia, a continuing civil war had a major impact on its iron ore industry, a significant supplier to European steel mills. Foreign exchange problems were endemic, even in several countries with relatively stable Governments. The combinations of medical, political, and economic conditions, coupled with competition for limited foreign investment monies by East European countries undergoing economic transition, served to dim the outlook for significant economic progress. For example, little progress in mineral industry development could be seen in the sub-Saharan northeast—Sudan, Somalia, and Ethiopia. Nonetheless, a number of international mining companies showed interest in selected mineral industry projects, especially for gold elsewhere on the African continent. Ghana, having successfully turned its economy around with the help of a World Bank Structural Adjustment Loan, attracted substantial new foreign investment to revitalize its gold industry. Production in Ghana is expected to reach a record of 1 million troy ounces of gold per year in the near future.

China.—In China, the country's mineral industry continued to demonstrate activity that led to quantitative upturns in almost all of the limited number of officially reported major commodities. The 1992 output of coal was slightly more than in 1991, and crude oil output increased again by about 1.2%, while natural gas production dropped a modest 0.5%. For iron ore, a 1992 production increase of nearly 9.9% was indicated by 11 months of data, a 12.7% growth was reported for crude steel, and a 21% growth in cement output, was estimated based on data supplied to the UN for the months of January, March, April, June, July, September, and October 1992. Although no 1993 results were available at the time of this writing, there seemed no outward indications of any causes that would retard continued upturns in output, for most of these seemed driven by internal economic growth and associated consumption requirements.

Japan.—In Japan, with its mineral industry oriented to an almost total dependence on imported raw materials to make possible the country's huge mineral processing and downstream manufacturing activities, there was a very significant downturn in crude steel output in 1992. The production, at 98.1 million

tons, was lower than that of any year since 1983, and represented a second consecutive year of decline. Japan's copper refiners increased output, but national production of metallic lead, nickel, and zinc all declined, and monthly results on cement production through August suggested a drop of about 5% in output of that key commodity.

Australia.—Australia, another world-class mineral producer of crude minerals in the Asia-Pacific area and also a mineral processor of considerable consequence, registered an upturn in crude steel output in 1992, reaching a new record high after a disappointing 1991, but the country's cement output turned downward for a second year. Among nonferrous metals, bauxite and aluminum logged declines, as did lead at both the mine and refined stages along with mine nickel and mine zinc. In contrast, output of mine and refined copper increased in 1992, as did plant nickel, mine silver, and slab zinc. Preliminary returns on iron ore suggested a 5% to 6% decline in output on a gross weight basis in response to a drop in export market demand, because Australian steel output was up by 11%. Preliminary production data on energy materials—bituminous coal, brown coal and lignite, crude oil, and natural gas—suggest an overall modest decline in most categories of from 1% to 3% in 1992 from 1991.

India.—Asia's other large raw material source, and at least theoretically a potential giant market, seemed to be successfully, if slowly, edging forward through a multitude of problems in the post-1991 world, but once again slow reporting made assessments of 1992 performance difficult. Output of coal, apparently up by about 4% for 1991, presumably made additional gains in 1992. Iron ore output, which had increased by about 5.6% in 1991, apparently edged slightly higher, chiefly to meet increased domestic needs, for Indian steel output increased 5.9% from that of 1991. Cement production, which had increased about 2% in 1991, also presumably increased again in 1992, but data were sufficiently incomplete and the percentage growth could not be estimated. Following the 8.4% drop in bauxite output in 1991, India's industry recovered and set a new record high in 1992, mining more than 5.5 million tons. In contrast, the country's aluminum production was about 1.5% below the record-to-date level of 1991. Copper production levels at both the mine and the refinery dropped slightly in 1992.

Other Asian and Pacific Countries.—The Republic of Korea and Taiwan continued to be significant processors of imported mineral materials, mirroring the practices of Japan, in the post-1991 period. The former logged an 8% increase in output of both crude steel and hydraulic cement and a 6% upturn in refined copper production, whereas Taiwan apparently only kept its mineral product output about on par with its 1991 levels.

Asia's traditional major market economy tin producers, Indonesia, Malaysia, and Thailand, all registered drops in mine tin production in 1992. However, Malaysia sharply increased refined tin production as tin refineries remained closed in the Netherlands and the United Kingdom, and plants in Brazil, Indonesia, Thailand, and elsewhere further reduced output levels.

Most of the Asia/Pacific area's prominent nickel producers also logged mine output cutbacks in 1992. Australia, Indonesia, and the Philippines registered production declines, with only New Caledonia maintaining its 1991 level. Nickel plant output for the region as a whole edged down, with declines logged for Japan, the Republic of Korea, New Caledonia, and Taiwan, and with very small, less than compensating gains registered for Australia and Indonesia. Most nickel production declines were attributed to declining prices and market disruptions caused by the large exports of Russian nickel to the West.

Continued North Korean claims of growth and development that included mineral industry operations seemed probably exaggerated in the light of evidenced capital availability and potential foreign markets for products.

In the other Pacific Islands, Papua New Guinea's copper industry registered a setback in output in 1992 to a level about 5% below that of 1991. Papua New Guinea is also in the midst of a gold boom that could lead to the production of more than 2 million ounces per year within the next few years, although Government re-negotiation of equity interests in certain new gold properties may delay the development timetable.

AVAILABILITY OF DATA

The concept of data availability must be addressed, because there are perceptible changes from year to year, and the availability of accurately reported, precisely defined statistics and nonstatistical information provides the only sound basis for analytical studies required for government policy planning or industry market analysis.

As the countries of Eastern Europe and the former U.S.S.R. undergo the transition from centrally planned economies to market economies, there has been a perceptible increase in information availability for rather obvious reasons. Any industrial operation seeking economic assistance from Government and/or private sources outside the country in which the facility is sited must provide some appraisal of its operations at the time it seeks assistance, as well as some information on previous performance to serve as tools in evaluating its potential under the proposed development scheme for which it seeks financial assistance. Additionally, there was growing governmental recognition that concealment of much of the national mineral production, trade, and consumption data for purposes of national military and/or economic security probably never was very successful, never was really necessary for most commodities, and certainly proved unnecessary with the end of the so-called cold war. Indeed, the long-term unwillingness to publish uniform statistical series of reliable,

comprehensive industrial operating results may well have contributed to problems of ineffective, inefficient industry performance. Recognition of the needs of potential investors for information together with recognition of the folly of treating much industrial data as state secrets has led to the publication of increasing amounts of both statistical and nonstatistical information in those countries undergoing economic transition.

Virtually complete openness was clearly essential for the German Democratic Republic as it reunited with the Federal Republic of Germany, thereby becoming a part of a member of the EC. Progress in increasing minerals industry reporting in other Eastern European nations was evident in 1990 and beyond, but there were doubts as to whether the recent reporting was definitionally equivalent to the limited previously published historical reporting. Care must be exercised in the use of such data to ensure definitional comparability across time.

At the time of the preparation of this study, it remained unclear as to what would ultimately transpire regarding the reporting of trade for the states formerly comprising the U.S.S.R. For years the Soviets published a trade book, which, albeit incomplete, was of considerable use as a tool in the assessment of mineral industry activity in the country. How the member states of the CIS and the other fully independent former Soviet Republics will take up the task of annually documenting their foreign trade remains to be seen. There have been some encouraging signs that trade reporting may become more complete than in the past, or at least the recent past, based on at least some increase in the reporting of nonferrous metals trade, but whether this will continue on a regular basis and whether it will be extended to cover other previously confidential commodities remains to be seen.

Despite reporting improvements in some topical and geographical areas, there remain some substantial information gaps for these countries with economies in transition in addition to the just-mentioned problem of trade data. Moreover, additional data gaps clearly have developed, stemming from civil strife and dissolvement of existing reporting entities. The area that formerly was Yugoslavia is undoubtedly the best case in point, but the 1992 dissolution of Czechoslovakia raises questions as to when (or if) the emerging independent states will assume the responsibility previously carried out by the central government. Indeed, it may prove that this is not a question of unwillingness but a question of financial inability to produce comparable statistics to those previously provided by the central governments.

Even as the global mineral industry is presented with increasing reporting from states that were secretive, there are some decidedly negative trends relative to information availability in some major and some minor countries that in prior years have provided production, trade, and consumption information rather freely. Although a part of the overall problem relates to the disintegration of countries such as Yugoslavia, there are other causes as well.

One of the outcomes of military conflicts such as occurred in the Middle East is a disruption of production and trade activities and either the means or willingness to publish national statistics.

Similar concern continues regarding reporting on the mineral industry of Australia, another major traditional supplier of mineral materials among market economy nations. There have been marked reductions in frequency and detail of the reporting of production and consumption of mineral commodities in Australia, albeit due to budget cuts and government organizational restructuring. Moreover, reporting of trade in mineral commodities, long provided on the basis of a July 1 fiscal year, has been cut back, particularly for the declared destinations of some key exports, to the extent that analysts around the globe are frustrated in attempts to analyze comprehensive trade flow.

Similarly, difficulties have been encountered in assessing the performance of India's mineral industry. Reporting of production ultimately has proven generally adequate, but complete final reporting has been slow, and reporting of consumption has been even more significantly delayed, although ultimately seeming to be sufficiently comprehensive. The reporting of both export and import trade for this important raw materials source and significant mineral consumer has never been ideal, being based on the country's unusual April 1-starting "trade year," and in later years has been even more deficient because of growing delays in the timely availability of published results.

A different type of problem exists in production reporting, for which Canada, by virtue of its importance as a supplier and consumer, may serve as the best example. Here, the general practice essentially is to report shipments as a measure of production. (Some other countries, particularly those with no substantial domestic processing industry, record exports as production.) The problem with this practice is that it does not reflect the buildup or drawdown of producers' stocks, figures that may serve to significantly affect market prices for certain commodities. Information on shipments is important—it is often a crucial figure—but actual production is an important statistical fact, distinct and apart from data on shipments and/or exports. Again, it should be stressed that although Canada was specifically cited as a country following this practice, others routinely do so, and unlike Canada, which provides actual production statistics for concerned researchers, a number of countries simply do not do so.

There has also been a reduction in production data from the viewpoint of the commodity scope of coverage for a number of countries in recent years. Many of such cutbacks in data have resulted from mergers among producers and closures of other producers which have so reduced the number of producing firms in some countries that publishing a national total would reveal company proprietary data. This problem has forced some countries to cease publishing total national output of several commodities over the past 10 years.

As this study goes to press, there still remains the threat of the loss of separate trade reporting for the 12 countries of the EC. It appears that plans call for a fairly prompt reporting of EC trade with extra-EC countries but a delayed reporting of intra-EC country trade. This would appear to be undesirable from the viewpoint of any single member country in the EC, for it would eliminate key statistics in assessing the effects of membership in the EC on any single member state. On the other hand, it must be recognized that a considerable cost accrues as a result of maintaining reliable intra-EC trade data, and there will be no tariffs or other charges being paid that could be regarded as offsetting income. Hence, it becomes questionable as to whether the need for information of this type justifies the cost of obtaining it to those countries that must pay the bill. Clearly, if we are to continue to treat the EC countries as 12 separate entities, we will be unable to assess the minerals industry importance of each country's minerals industry unless we can measure the trade between them.

ACKNOWLEDGMENTS AND SOURCES

For a study such as this, which summarizes and amalgamates much information collected, compiled, and utilized by the numerous U.S. Bureau of Mines country specialists and branch chiefs for inclusion in the country and regional reports that comprise the five other sections of 1991 Minerals Yearbook-International Review, it is clearly impossible to cite all sources of information used in its presentation, but some recognition is due.

Generally speaking, this study and its related detailed studies on countries and areas would be much more difficult, if not impossible, without the efforts of the personnel of national mining and geological agencies throughout the world. Information that they collect, compile, and then publish, either in their own volumes or those of central statistical agencies in their countries, are the foundations on which this work rests. Thus, appreciation is expressed to the multitude of persons employed by these agencies.

At this point, it is appropriate to recognize some of the employees of the Department of State Regional Resource Officers, and others who have ensured that publications and other informational materials from the countries for which they are responsible flow into the U.S. Bureau of Mines.

Next, acknowledgment must be given to Bureau country- and commodity-specialist colleagues in the Division of International Minerals and the Division of Mineral Commodities, respectively, who regularly process vast volumes of material to glean from it the information aggregated herein. Special recognition must also be given to the personnel of the International Data Section of the Division of Statistics and Information Services who have painstakingly compiled foreign trade information and coordinated the assembly of world production data on the various commodities developed by the country specialists in consultation with the Bureau's commodity specialists.

The work of the staffs of the Statistical Office of the UN as well as similar offices in the OECD and the EC is acknowledged. These organizations provide certain statistical aggregates that are beyond the financial and staff capabilities of the U.S. Bureau of Mines.

Particular appreciation is due to the mineral statistics personnel of the International Lead and Zinc Study Group; the International Nickel Study Group; the French-based firm Metaleurop S.A.; the German-based firm Metallgesellschaft AG; the Italian-based firm Nuova Samim; and the World Bureau of Metal Statistics in the United Kingdom.

Similarly, for their cooperative consultations relating to many mineral commodities not only in their own countries but in other world areas as well, special individual acknowledgement must be given to the internationally oriented personnel of the British Geological Survey and to Canada's Ministry of Energy, Mines, and Resources Canada.

The cooperative (collegial) sharing of information by the Metal Mining Agency of Japan, the Federal Institute of Geosciences and Natural Resources of Germany, and the Bureau of Geological and Mining Research of France is also gratefully acknowledged.

TABLE 1

ESTIMATED VALUE OF WORLD CRUDE MINERAL PRODUCTION

Year	Value of 53[1] major crude mineral commodities[2]		Value of all crude mineral commodities[3]	
	Billion current dollars	Billion 1983 constant dollars	Billion current dollars	Billion 1983 constant dollars
1950	25.9	103.5	29.5	117.9
1953	37.0	135.1	42.5	155.3
1958	50.0	173.5	60.1	208.5
1963	59.0	192.0	72.3	235.3
1968	77.9	222.3	9.45	269.8
1973	159.2	357.3	191.6	430.0
1978	477.0	728.5	539.6	824.1
1979	656.5	901.2	733.2	1,006.5
1980	902.9	1,094.6	995.7	1,207.1
1981	912.0	1,008.1	993.2	1,097.9
1982	902.9	938.1	971.2	1,009.1
1983	930.4	930.4	988.7	988.7
1984	r1,010.5	r968.3	r1,073.8	r1,029.0
1985	r1,032.6	r953.8	r1,097.3	r1,013.6
1986	r1,093.3	r983.9	r1,161.9	r1,045.6
1987	r1,142.3	r996.1	r1,213.9	r1,058.5
1988	1,248.1	1,047.5	1,326.3	1,113.1
1989	r1,362.0	1,094.6	r1,447.3	1,163.2
1990	r1,415.3	r1,090.2	r1,503.9	r1,158.5
1991	1,490.5	1,103.3	1,584.0	1,172.5

rRevised.

[1]The list of commodities included has been varied slightly by the authors of the basic source article over the years, and the number 53 may be regarded as debatable. Forty-eight commodities were included in every study, 1950-83 inclusive, and are included in a listing in table 3 of the 1985 edition of this chapter; this list of 52 entries also includes columbium-tantalum (as a single entry), kyanite, uranium (each of which has been included in the study from 1958-83 inclusive), and beryl (which was included in the study from 1950-68 inclusive). Additionally, a generic group (natural abrasives), perlite, and vermiculite were incorporated into the 1950 study but dropped thereafter; lithium was included in 1958 only; and asphaltic limestone was included from 1950-68 inclusive. The alterations in the number of commodities had little, if any, significant effect on the totals, with the possible exception of uranium's omission in 1950 and 1953.

[2]Data for 1950, 1953, 1958, 1963, 1968, 1973, 1978, and 1983 are as reported in Annales des Mines, July-Aug.-Sept. 1985, p. 9. Data in constant dollars for 1979-82 and 1984-91 inclusive are extrapolated from the 1983 Annales des Mines figures on the basis of the UN index of extractive mineral industry production in the UN Monthly Bulletin of Statistics, November 1992, p. 238. Data in current dollars for 1979-82 and 1984-91 inclusive are derived from the constant dollar estimates using reciprocals of the most recent available U.S. price deflators.

[3]Data extrapolated from values for 53 commodities to compensate for other (additional) mineral commodities. For details on the basis for this extrapolation, see accompanying text under "Value of World Mineral Production."

TABLE 2

INDEX NUMBERS OF WORLD MINERAL INDUSTRY EXTRACTIVE PRODUCTION

(1980=100)

Year	Coal	Crude petroleum and natural gas	Metals	Extractive industry total
Annual averages:				
1978	93.8	104.4	98.2	102.0
1983	101.3	79.5	r97.8	r85.0
1984	100.7	82.6	r104.3	r88.2
1985	105.5	79.7	r108.5	87.1
1986	107.1	82.7	r109.5	r89.9
1987	107.0	83.2	r112.6	r91.0
1988	r107.6	87.9	r122.4	r95.7
1989	r107.3	92.6	12.9	r100.0
1990r	r99.1	r92.7	r134.7	r99.6
1991	98.8	93.2	143.4	100.8
Quarterly results:				
1990:				
1st quarter	r100.5	96.4	130.7	r101.9
2d quarterr	99.6	95.3	132.9	101.5
3d quarterr	97.0	87.9	135.4	96.0
4th quarterr	99.3	91.3	139.8	r99.0
1991:				
1st quarter	r102.1	89.5	r136.8	97.5
2d quarter	97.9	97.3	137.8	103.1
3d quarter	93.5	91.9	142.0	99.2
4th quarter	101.6	94.3	157.0	103.2

rRevised.

Source: 1978 only—United Nations. Monthly Bulletin of Statistics, v. 45, No. 2, Feb. 1991, p. 236; all other data—United Nations. Monthly Bulletin of Statistics, v. 46, No. 11, Nov. 1992, p. 238.

TABLE 3
INDEX NUMBERS OF MINERAL-RELATED INDUSTRY PRODUCTION

(1980=100)

Year	Non-metallic mineral products	Chemicals, petroleum, coal, rubber products	Base metals
Annual averages:			
1978	96.7	95.8	100.4
1983	96.7	r104.5	91.8
1984	100.7	r110.9	r99.1
1985	101.7	r114.6	r100.3
1986	104.7	r119.1	r99.0
1987	108.2	r125.7	r103.0
1988r	11.4	r133.8	r110.5
1989	118.1	r138.5	r112.9
1990	r117.3	138.9	r111.4
1991	115.3	142.3	110.0
Quarterly results:			
1990:			
1st quarterr	114.9	138.1	112.2
2d quarterr	120.3	139.6	113.4
3d quarterr	117.2	137.3	109.4
4th quarterr	116.6	140.7	110.7
1991:			
1st quarter	110.6	138.1	111.4
2d quarter	119.6	144.0	113.4
3d quarter	116.6	140.7	106.7
4th quarter	117.1	141.1	111.1

rRevised.

Source: 1978 only—United Nations. Monthly Bulletin of Statistics, v. 45, No. 2, Feb. 1991, p. 237; all other data—United Nations. Monthly Bulletin of Statistics, v. 46, No. 11, Nov. 1992, p. 238.

TABLE 4
WORLD PRODUCTION OF MAJOR MINERAL COMMODITIES[1]

Commodity		1987	1988	1989	1990	1991e
METALS						
Aluminum:						
Bauxite, gross weight[2]	thousand metric tons	r92,726	r98,071	r105,218	r110,696	110,263
Alumina, gross weight	do.	r34,893	r36,826	r39,345	r40,101	39,827
Unalloyed ingot metal	do.	r16,514	r17,548	r18,199	r17,977	18,194
Antimony, mine output, Sb content	metric tons	69,955	r70,607	r65,297	r66,846	64,730
Arsenic, trioxide[3]	do.	r62,387	r60,288	r57,907	r53,976	47,084
Beryl concentrate, gross weight[4]	do.	8,632	8,302	7,532	r7,119	6,607
Bismuth:[4]						
Mine output, Bi content	do.	3,173	3,220	r3,649	r3,359	3,301
Smelter	do.	4,078	r4,099	r4,194	r4,060	4,038
Cadmium, smelter	do.	r19,169	r21,761	r21,325	r20,493	20,673
Chromite, gross weight[3]	thousand metric tons	r11,920	r12,890	r14,179	r12,848	13,237
Cobalt:						
Mine output, Co content	metric tons	r41,245	r43,819	r36,000	r35,709	26,583
Metal, refined	do.	r27,995	r26,407	r25,181	r25,316	23,922

See footnotes at end of table.

TABLE 4—Continued

WORLD PRODUCTION OF MAJOR MINERAL COMMODITIES[1]

Commodity		1987	1988	1989	1990	1991[e]
METALS—Continued						
Columbium-tantalum concentrate, gross weight[3 5]	metric tons	22,596	r40,342	r34,021	r32,103	32,593
Copper:						
Mine output, Cu content	thousand metric tons	r8,243	r8,323	r8,667	r8,693	8,820
Metal:						
Smelter:						
Primary[6]	do.	r7,962	r8,090	r8,279	r8,025	8,008
Secondary[7]	do.	r975	r1,101	r1,135	r1,062	1,044
Refined:						
Primary[6]	do.	r8,233	r8,472	r8,693	r8,710	8,988
Secondary[7]	do.	r1,493	r1,748	r1,850	r1,836	1,495
Gold, mine output, Au content	kilograms	r1,660,535	r1,848,448	r2,023,050	r2,127,398	2,111,522
Iron and steel:						
Iron ore, iron ore concentrates, iron ore agglomerates, gross weight	thousand metric tons	r902,737	r926,047	r953,294	r929,023	900,840
Metal:						
Pig iron	do.	r522,720	r553,888	r562,947	r550,973	528,485
Ferroalloys	do.	r15,969	r17,767	r18,118	r17,474	16,629
Steel, crude	do.	r734,319	r779,782	r786,219	r770,638	733,673
Lead:						
Mine output, Pb content	do.	r3,352	r3,359	r3,285	r3,390	3,318
Metal:						
Smelter:						
Primary	do.	r3,241	r3,259	r3,235	r3,130	3,016
Secondary	do.	r2,415	r2,516	r2,670	r2,563	2,457
Refined:						
Primary	do.	r3,193	r3,220	r3,265	r3,130	3,029
Secondary	do.	r2,529	r2,596	r2,707	r2,701	2,613
Magnesium metal, smelter:						
Primary	metric tons	323,930	334,348	r344,448	r353,512	339,269
Secondary	do.	r65,665	r75,825	r81,970	r87,937	79,671
Manganese ore, gross weight	thousand metric tons	r23,931	r25,023	r26,575	r25,441	25,526
Mercury, mine output, Hg content	metric tons	5,534	r6,835	r6,749	r5,061	4,536
Molybdenum, mine output, Mo content	do.	r99,471	r107,360	r130,299	r122,232	112,224
Monazite concentrate (source of rare-earth metals and thorium)[4]	do.	26,008	23,767	r e24,354	r21,841	15,920
Nickel:						
Mine output, Ni content	do.	r890,539	r917,717	r970,493	r937,173	922,944
Metal, plant output	do.	r857,103	r929,631	r933,730	r883,015	875,636
Platinum-group metals, mine output, metals content	kilograms	r270,281	r280,160	r279,726	r288,502	291,678
Selenium, refinery[3 5]	metric tons	r1,421	r1,685	r1,604	r1,794	1,809
Silver, mine output, Ag content	do.	r14,019	r14,517	r15,057	r15,122	14,723
Tellurium, refinery[3 4 5]	do.	74	r69	r67	r71	79
Tin:						
Mine output, Sn content	do.	r179,902	r204,816	r233,607	r218,518	196,695
Metal, smelter:						
Primary	do.	r188,156	r214,058	r218,868	r222,737	204,758
Secondary	do.	r16,204	r19,482	r19,133	r18,150	15,606

See footnotes at end of table.

TABLE 4—Continued

WORLD PRODUCTION OF MAJOR MINERAL COMMODITIES[1]

Commodity		1987	1988	1989	1990	1991[e]
METALS—Continued						
Titanium concentrate, gross weight:						
Ilmenite[4 8]	thousand metric tons	r3,925	r4,021	r4,254	r3,933	3,468
Rutile[3 4]	do.	439	434	r455	r475	450
Titaniferous slag	do.	1,575	1,725	1,765	r1,600	1,500
Tungsten, mine output, W content	metric tons	42,474	r51,224	r51,609	r51,918	42,960
Uranium, mine output, U_3O_8 content[3 5]	do.	r43,409	r43,187	r40,034	r31,698	29,613
Vanadium, mine output, V content	do.	r33,045	r35,409	r35,945	r33,803	29,574
Zinc:						
Mine output, Zn content	thousand metric tons	r7,188	r6,980	r7,100	r7,320	7,282
Metal, smelter:						
Primary[6]	do.	r6,707	r6,825	r6,831	r6,712	6,711
Secondary[7]	do.	314	r338	r346	r341	370
Zirconium concentrate	do.	753	929	r979	r852	796
INDUSTRIAL MINERALS						
Asbestos	do.	r4,237	r4,318	r4,238	r3,919	3,490
Barite	do.	r4,607	r5,466	r5,574	r5,595	5,271
Boron materials	do.	r2,685	r2,926	r2,936	r2,966	2,988
Bromine[3]	do.	391	411	442	r416	401
Cement, hydraulic	do.	r1,054,839	r1,119,113	r1,147,918	r1,152,490	1,190,519
Clays:[3]						
Bentonite	do.	r9,269	r9,049	r9,592	r9,733	9,264
Fuller's earth[5]	do.	r3,082	r3,006	r3,010	r3,480	4,012
Kaolin	do.	r21,021	r22,806	r23,259	r23,672	24,733
Corundum, natural	metric tons	9,241	9,411	8,994	9,000	8,900
Diamond, natural:						
Gem[e]	thousand carats	r41,024	r45,269	r45,902	r47,401	48,462
Industrial[e]	do.	r50,464	r51,202	r51,560	r54,165	55,924
Total	do.	r91,488	r96,471	r97,462	r101,566	104,386
Diatomite[3]	thousand metric tons	r1,611	r1,672	r1,660	r1,629	1,556
Feldspar[3]	do.	r4,383	r4,843	r5,181	r5,269	5,167
Fluorspar	do.	r4,600	r5,086	r5,529	r5,025	4,354
Graphite	metric tons	r643,156	r650,168	r652,332	r644,379	628,894
Gypsum	thousand metric tons	r93,165	r98,152	r98,615	r94,970	80,014
Iodine	metric tons	r12,671	r14,607	r15,977	r16,114	16,159
Lime	thousand metric tons	r126,875	r134,122	r138,656	r135,219	133,962
Magnesite[4]	do.	r11,988	r11,991	r11,796	r11,117	10,944
Mica[3]	do.	r278	r251	r229	r211	198
Nitrogen: N content of ammonia	do.	r95,104	r99,275	r99,051	r97,545	93,712
Perlite[3]	do.	r1,787	r1,849	r1,852	r1,836	1,714
Phosphate, gross weight:						
Phosphate rock	thousand metric tons	r150,157	r161,208	r160,032	r154,356	146,859
Thomas slag	do.	1,793	1,867	r1,754	r1,568	1,468
Guano	do.	12	10	56	r8	8
Potash, marketable, K_2O equivalent	do.	r30,456	r31,836	r29,580	r27,685	25,548
Pumice[3 5]	do.	r11,835	r11,946	r11,045	r10,739	10,802
Salt	do.	r178,759	r182,822	r190,477	r182,780	183,659
Sand and gravel, industrial	do.	r113,429	r119,110	r120,278	r117,451	110,418

See footnotes at end of table.

TABLE 4—Continued

WORLD PRODUCTION OF MAJOR MINERAL COMMODITIES[1]

Commodity		1987	1988	1989	1990	1991e
INDUSTRIAL MINERALS—Continued:						
Sodium compounds, n.e.s.:[3]						
Soda ash	thousand metric tons	30,203	r31,261	r32,030	r32,273	31,344
Sulfate	do.	r4,895	r4,943	r4,931	r4,870	4,837
Strontium materials[3 5]	metric tons	r182,667	r224,133	r251,941	r233,527	240,356
Sulfur, elemental basis:						
Elemental[9]	thousand metric tons	r14,622	r14,699	r15,102	r14,052	12,136
From pyrites	do.	r9,998	r10,446	r10,555	r9,998	9,796
Byproduct[10]	do.	r32,347	r33,971	r33,814	r34,103	33,660
Total	do.	r56,967	r59,116	r59,471	r58,153	55,592
Talc, steatite, pyrophyllite, and unspecified	do.	r8,498	r8,853	r9,359	r9,084	8,848
Vermiculite[3 5]	metric tons	r658,164	r643,282	r614,225	r578,548	354,134
MINERAL FUELS AND RELATED MATERIALS						
Carbon black[3 5]	thousand metric tons	4,548	4,760	r4,852	4,872	4,750
Coal:						
Anthracite	million metric tons	r345	r357	r365	r340	342
Bituminous	do.	r3,126	r3,189	r3,285	r3,305	3,229
Lignite	do.	r1,204	r1,225	r1,233	r1,173	1,075
Total	do.	r4,675	r4,771	r4,883	r4,818	4,646
Coke:[12]						
Metallurgical	thousand metric tons	334,744	346,416	346,962	332,511	323,160
Other	do.	16,473	14,582	14,767	12,669	11,800
Gas, natural, marketed	billion cubic meters	r1,875	r1,945	r2,000	r2,044	2,074
Natural gas liquids[3]	million 42-gallon barrels	r1,633	r1,672	r1,691	r1,731	1,781
Peat	thousand metric tons	r185,504	r193,422	r195,736	r177,318	166,240
Petroleum:						
Crude	million 42-gallon barrels	r20,809	r21,678	r22,063	r22,620	21,945
Refined	do.	r21,999	r22,567	r22,837	r22,807	22,245

eEstimated. rRevised.

[1]Figures generally conform to those published in appropriate commodity chapters of volume I of the Minerals Yearbook, 1991 edition.

[2]Includes bauxite equivalent of nepheline syenite concentrate and alunite ore produced in the former U.S.S.R., the only producer on record of such materials as a source of aluminum metal.

[3]Excludes data for China (no adequate basis for estimation available).

[4]Excludes data for the United States (withheld to avoid disclosing company proprietary data).

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

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

[7]Includes 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).

[8]Includes leucoxene.

[9]Comprises sulfur produced by the Frasch process plus sulfur mined in the elemental state from ores.

[10]Comprises 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.

[11]Data may not add to total shown due to independent rounding.

[12]Production of coke other than metallurgical by China and the former U.S.S.R. is included with "Coke: Metallurgical."

TABLE 5
WORLD PRIMARY ENERGY PRODUCTION

(Million metric tons of standard coal equivalent)

Year	Coal	Crude petroleum and natural gas liquids	Natural gas	Primary electricity		Total
				Hydro and geothermal	Nuclear	
1980	2,623	4,422	1,482	216	83	9,187
1981	2,635	4,250	1,859	220	99	9,063
1982	2,712	4,027	1,844	226	107	8,916
1983	2,719	3,982	1,856	237	124	[1]8,917
1984	2,851	4,032	2,022	245	150	9,300
1985	3,062	3,985	2,081	249	178	9,555
1986	3,075	4,178	2,124	253	190	9,821
1987	3,202	4,198	2,227	r256	r210	[1]10,092
1988	3,281	4,386	2,329	r265	226	[1]10,486
1989	3,335	4,452	2,416	r261	235	[1]10,699
1990	3,317	4,551	2,494	271	243	10,876
1991e	3,199	4,434	2,531	270	254	10,688

eEstimated. rRevised.

[1]Data do not add to total shown because of independent rounding.

Sources: 1980, 1985, and 1987-90—United Nations. 1990 Energy Statistics Yearbook, New York, 1992, 2,428; pp. 1981—United Nations. 1984 Energy Statistics Yearbook, New York, 1986, 2,691; pp. 1982—United Nations. 1985 Energy Statistics Yearbook, New York, 1987, 2,380; pp. 1983—United Nations. 1986 Energy Statistics Yearbook, New York, 1988, 2,378; pp. 1984—United Nations. 1987 Energy Statistics Yearbook, New York, 1989, 2,392; pp. 1986—1989 Energy Statistics Yearbook, New York, 1991, 2,386; pp. 1991—U.S. Bureau of Mines estimates.

TABLE 6

WORLD ELECTRIC POWER PRODUCTION BY GENERATING PLANT TYPE

Source plant type	1981		1987		1988	
	Production (billion kilowatt hours)	Share of total (percent)	Production (billion kilowatt hours)	Share of total (percent)	Production (billion kilowatt hours)	Share of total (percent)
Primary electricity:						
Hydroelectric	1,776	21.2	2,041	19.3	2,112	19.1
Geothermal	16	.2	36	.3	36	.3
Nuclear	801	9.6	1,075	16.1	1,837	16.6
Subtotal	[1]2,592	[1]30.9	3,782	35.7	3,986	36.0
Secondary electricity:						
Thermal	5,792	69.1	6,805	64.3	7,073	64.0
Total	8,384	100.0	10,587	100.0	11,059	100.0

Source plant type	1989		1990		1991e	
	Production (billion kilowatt hours)	Share of total (percent)	Production (billion kilowatt hours)	Share of total (percent)	Production (billion kilowatt hours)	Share of total (percent)
Primary electricity:						
Hydroelectric	2,095	18.3	2,162	18.4	2,158	18.2
Geothermal	39	.3	40	.3	39	.3
Nuclear	1,903	16.6	1,982	16.9	2,072	17.4
Subtotal	[1]4,036	35.2	[1]4,183	35.6	4,269	35.9
Secondary electricity:						
Thermal	7,414	64.8	7,551	64.4	7,635	64.1
Total	11,450	100.0	11,734	100.0	11,904	100.0

[r]Revised.

[1]Data do not add to total shown because of independent rounding.

Source: 1981—United Nations. 1984 Energy Statistics Yearbook, New York, 1986, p. 384; 1987-90—United Nations. 1990 Energy Statistics Yearbook, New York, 1992, p. 428; 1991—estimated by U.S. Bureau of Mines based on Department of Energy and UN data.

TABLE 7
WORLD ELECTRIC POWERPLANT CAPACITY BY GENERATING PLANT TYPE

Plant type	1981		1987		1988	
	Capacity (million kilowatts)	Share of total (percent)	Capacity (million kilowatts)	Share of total (percent)	Capacity (million kilowatts)	Share of total (percent)
Primary plants:						
Hydroelectric	488	23.1	596	22.9	609	23.0
Geothermal	3	.1	8	.3	8	.3
Nuclear	161	7.6	306	11.8	317	12.0
Subtotal	652	30.8	910	35.0	934	35.3
Secondary plants:						
Thermal	1,462	69.2	1,691	65.0	1,710	64.7
Total	2,114	100.0	[1]2,600	100.0	2,645	100.0

Plant type	1989		1990		1991e	
	Capacity (million kilowatts)	Share of total (percent)	Capacity (million kilowatts)	Share of total (percent)	Capacity (million kilowatts)	Share of total (percent)
Primary plants:						
Hydroelectric	622	23.0	628	22.9	642	22.7
Geothermal	9	.3	9	.3	9	.3
Nuclear	330	12.2	337	12.3	344	12.2
Subtotal	961	35.5	974	35.5	995	35.2
Secondary plants:						
Thermal	1,743	64.5	1,772	64.5	1,829	64.8
Total	2,704	100.0	2,746	100.0	2,824	100.0

eEstimated.
[1]Data do not add to total shown because of independent rounding.

Sources: 1981—United Nations. 1984 Energy Statistics Yearbook, New York, 1986. p. 328; 1987-90—United Nations. 1990 Energy Statistics Yearbook, New York, 1992, p. 372; 1991—estimates by U.S. Bureau of Mines based on Department of Energy and UN data.

TABLE 8
VALUE OF WORLD MINERAL COMMODITY EXPORT TRADE AND ITS ROLE IN WORLD TRADE

Year	Value of mineral commodity export trade (million current dollars)			Change in total from previous year (percent)	Mineral commodities' share of all commodities exported (percent)
	Mineral fuels	Nonfuel minerals[1]	Total		
1979	333,031	188,416	521,447	41.3	31.9
1980	480,789	226,761	707,550	3.6	35.4
1981	474,266	199,328	673,594	(.5)	34.3
1982	430,384	180,950	611,334	(9.2)	33.1
1983	384,188	174,724	558,912	(8.6)	30.8
1984	378,398	184,701	563,099	.7	29.5
1985	361,646	188,673	550,319	(2.3)	28.5
1986	260,126	194,258	454,384	(1.7)	2.2
1987	280,401	218,346	498,747	9.8	20.1
1988	262,984	273,328	536,312	7.5	19.0
1989	292,150	303,840	595,990	11.1	19.7
1990	343,414	302,819	646,233	8.4	19.1
1991e	365,000	320,000	685,000	6.0	NA

eEstimated. NA Not available.
[1]In part estimated, based on data for major commodity groups presented in table 9 of this chapter.

TABLE 9
VALUE OF EXPORT TRADE IN MAJOR MINERAL COMMODITY GROUPS[1]

(Million U.S. dollars)

Commodity group	1984	1985	1986	1987	1988	1989	1990
Metals:							
All ores, concentrates, scrap	25,753	24,943	23,879	26,440	31,812	37,787	36,271
Iron and steel	66,126	70,318	74,025	80,850	98,626	107,590	107,326
Nonferrous metals	36,185	35,656	36,617	44,567	60,727	67,860	68,922
Total	128,064	130,917	134,521	151,857	191,165	213,237	212,519
Nonmetals, crude only	9,855	9,963	10,534	11,185	12,993	13,645	13,600
Mineral fuels	378,398	361,646	260,126	280,401	262,984	292,150	343,414
Grand total	516,317	502,526	405,181	443,443	467,142	519,032	569,533
All commodities	1,909,303	1,933,434	2,104,252	2,477,240	2,819,131	3,024,779	3,391,752

[1]Data presented are for selected major commodity groups of the Standard International Trade Classification, Revision 2 (SITC-R2) and as such exclude some mineral commodities classified in that data array together with other (nonmineral) commodities. SITC-R2 categories included are as follows: All ores, concentrates, scrap-Div. 28; iron and steel-Div. 67; nonferrous metals-Div. 68; nonmetals (crude only)-Div. 27; and mineral fuels-Div. 3. Major items not included are the metals, metalloids, and metal oxides of Group 513; mineral tar and other coal-, petroleum-, and gas-derived crude chemicals of Div. 52; manufactured fertilizers of Div. 56; and nonmetallic mineral manufactures of Groups 661, 662, 663, and 667. Data include special category exports, ship stores and bunkers, and other exports of minor importance, and exclude the trade between the Federal Republic of Germany and the German Democratic Republic. Data for centrally planned economy countries of Asia are based on imports of China.

Sources: 1987-90 data: United Nations. Monthly Bulletin of Statistics, v. 46, May 1992, pp. 262-305; 1986 data: United Nations. Monthly Bulletin of Statistics, v. 45, May 1991, pp. 260-303; 1985 data: United Nations. Monthly Bulletin of Statistics, v. 44, May 1990, pp. 260-303; 1984 data: United Nations. Monthly Bulletin of Statistics, v. 43, May 1989, pp. 250-293.

TABLE 10
DISTRIBUTION OF VALUE OF WORLD EXPORT TRADE IN MAJOR MINERAL COMMODITY GROUPS[1]

(Percent)

Commodity group	1984	1985	1986	1987	1988	1989	1990
Metals:							
All ores, concentrates, scrap	5.0	5.0	5.9	6.0	6.8	7.3	6.4
Iron and steel	12.8	14.0	18.3	18.2	21.1	20.7	18.8
Nonferrous metals	7.0	7.0	9.0	10.1	13.0	13.1	12.1
Total	24.8	26.0	33.2	34.3	40.9	41.1	37.3
Nonmetals, crude only	1.9	2.0	2.6	2.5	2.8	2.6	2.4
Mineral fuels	73.3	7.20	64.2	63.2	56.3	56.3	60.3

[1]For detailed definition of groups, see footnote 1, table 9.

TABLE 11
GROWTH OF VALUE OF WORLD EXPORT TRADE IN MAJOR MINERAL COMMODITY GROUPS[1]

(Percent change from that of previous year)

Commodity group	1984	1985	1986	1987	1988	1989	1990
Metals:							
All ores, concentrates, scrap	+10.8	(3.2)	(4.3)	+10.7	+20.3	+18.8	(4.0)
Iron and steel	+7.8	+6.3	+5.3	+9.2	+22.0	+9.1	(.2)
Nonferrous metals	(1.1)	(1.5)	+2.7	+21.7	+36.3	+11.7	+1.2
All metals	+5.7	+2.2	+2.8	+12.9	+25.9	+11.5	(.3)
Nonmetals, crude only	+5.7	+1.1	+5.7	+6.2	+16.2	+5.0	(.3)
Mineral fuels	(1.5)	(4.4)	(28.1)	+7.8	(6.2)	+11.1	+17.5
All major mineral commodity groups	+.3	(2.7)	(19.4)	+9.4	+5.3	+11.1	+9.7
All commodities	+5.3	+1.3	+8.8	+17.7	+13.8	+7.3	+12.1

[1]For detailed definition of groups, see footnote 1, table 9.

TABLE 12

WORLD CONSUMPTION OF SELECTED MINERAL COMMODITIES

(Thousand metric tons unless otherwise specified)

Commodity		1987	1988	1989	1990	1991
Ferrous metals: World:						
Iron ore, gross weight[e]	million metric tons	884	897	923	911	880
Iron and steel scrap, gross weight	do.	324	344	341	328	310
Nonferrous metals:						
Market economy countries:						
Aluminum, refined		13,652	14,364	r14,676	14,891	14,948
Cadmium		15	16	r17	16	17
Copper, refined		r8,007	r8,190	r8,636	r8,761	8,969
Lead, refined		r4,215	r4,298	r4,536	r4,384	4,332
Magnesium, primary		r215	r232	r232	r235	220
Nickel[1]		r638	r661	664	r676	677
Tin, refined		172	179	180	183	181
Zinc, slab		4,972	5,270	5,215	r,233	5,464
Centrally planned economy countries:						
Aluminum, refined		r3,403	3,391	r3,427	r2,950	2,246
Cadmium		4	4	3	3	3
Copper, refined		r2,407	2,340	r2,352	r2,033	1,745
Lead, refined		r1,461	r1,431	r1,325	1,189	1,010
Magnesium, primary		108	111	109	98	89
Nickel[1]		200	196	r187	r180	140
Tin, refined		r57	r55	r54	r47	37
Zinc, slab		1,916	1,924	r1,851	r1,746	1,529
World total:						
Aluminum, refined		r17,055	17,755	18,103	17,841	17,194
Cadmium		19	20	20	19	20
Copper, refined		10,414	10,530	10,988	10,794	10,714
Lead, refined		5,676	5,729	5,861	5,573	5,342
Magnesium, primary		323	343	341	333	309
Nickel[1]		838	857	r852	856	817
Tin, refined		229	234	234	230	218
Zinc, slab		6,888	7,194	7,066	6,979	6,993
Industrial minerals: World:						
Cement	million metric tons	1,049	1,112	1,135	1,151	1,186
Fertilizers:[2]						
Nitrogenous, contained N		93,965	97,510	99,636	95,927	93,985
Phosphatic, contained P_2O_5		34,758	36,385	37,619	37,061	34,823
Potassic, K_2O equivalent		26,02	27,126	27,852	26,683	25,070
Sulfur, elemental S equivalent		58,945	63,065	61,106	r61,670	59,060
Mineral fuels: World:						
Solid fuels	million metric tons of standard coal equivalent	3,218	3,313	r3,386	r3,327	3,256
Liquid fuels	do.	3,786	3,933	3,985	3,979	3,963
Natural gas	do.	2,207	2,313	2,403	2,463	2,528

See footnotes at end of table.

TABLE 12—Continued

WORLD CONSUMPTION OF SELECTED MINERAL COMMODITIES

(Thousand metric tons unless otherwise specified)

Commodity	1987	1988	1989	1990	1991
Mineral fuels: World—Continued:					
Primary electricity:					
Hydro and geothermal million metric tons of standard coal equivalent	256	265	263	272	280
Nuclear do.	210	226	235	244	254
Total[3] do.	9,677	10,050	10,272	10,285	10,281

eEstimated. rRevised.

[1]Nickel content of refined nickel, ferronickel, and nickel oxide.

[2]Data are for years ending June 30 of that stated.

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

Sources: Based on data provided by the World Bureau of Metal Statistics (market economy countries, nonferrous metals except magnesium); Metallgesellschaft AG (centrally planned economy countries, nonferrous metals and all magnesium consumption); European Cement Association (Cembureau). World Statistical Review Nos. 13A and 13B/Special Edition, and World Cement Market in Figures 1913/1990, Brussels 1992, 237 pp.; British Sulphur Corp. Ltd. (fertilizer materials and sulfur); and 1990 United Nations Energy Statistics Yearbook (all mineral fuels for 1986-90). Data on iron ore and iron and steel scrap for all years and on mineral fuels for 1991 are compiled from a variety of sources by the U.S. Bureau of Mines.

TABLE 13

ANNUAL INVESTMENT IN THE STEEL INDUSTRY FOR SELECTED COUNTRIES

(Million dollars)

Country or country group	1988	1989	1990
Organization for Economic Cooperation and Development (OECD):			
European Communities:			
Belgium	r370	432	576
France	r427	516	793
Germany	r785	788	1,566
Greece	6	11	NA
Ireland and Denmark	7	8	16
Italy	575	675	NA
Luxembourg	r80	67	95
Netherlands	r203	197	NA
Portugal	r11	28	103
Spain	r475	401	438
United Kingdom	r545	583	NA
Subtotal	r3,484	3,706	r3,587
EFTA[2]	r1,229	1,041	989
Other:[3]			
Australia	e650	NA	NA
Canada	478	500	575
Japan	r4,168	5,299	6,773
Turkey	120	NA	NA
United States	r1,838	2,273	2,500
Subtotal	r7,254	r8,072	r9,848
Total OECD[4]	r11,967	r12,819	r14,424
Latin America:[5]			
Argentina	202	74	61
Brazil	394	362	501
Chile	22	112	43
Colombia	25	47	25
Ecuador	NA	NA	NA

See footnotes at end of table.

TABLE 13—Continued

ANNUAL INVESTMENT IN THE STEEL INDUSTRY FOR SELECTED COUNTRIES

(Million dollars)

Country or country group	1988	1989	1990
Latin America—Continued:[5]			
Mexico	324	495	185
Paraguay	—	—	(6)
Peru	2	6	6
Uruguay	(6)	1	(6)
Venezuela	123	214	209
Central America	9	6	41
Total	1,101	1,317	[7]1,071
Grand total	[r]13,068	[1]14,136	[1]15,495

[e]Estimated. [r]Revised. NA Not available.

[1]Incomplete total; does not include Countries indicated as "NA."

[2]European Free Trade Association (EFTA) figures exclude data for Switzerland.

[3]Data for New Zealand have not been available since 1979. Estimates for Australia for 1987-88 by the U.S. Bureau of Mines.

[4]Sources for OECD: The Iron and Steel Industry in 1989. Paris, 1991, p. 34; The Iron and Steel Industry in 1990. Paris, 1992, p. 36. Source for Canada for 1988 data: Canadian Minerals Yearbook, 1989.

[5]Source for Latin America: Instituto Latinoamericano del Fierro y el Acero. Statistical Yearbook of Steelmaking and Iron Ore Mining in Latin America 1991. Santiago, p. 199.

[6]Less than 1/2 unit.

[7]Data do not add to total shown because of independent rounding.

TABLE 14

MARKET ECONOMY COUNTRY PETROLEUM INDUSTRY CAPITAL SPENDING BY GEOGRAPHIC AREA

(Million dollars)

Area and type of expenditure	1987	1988	1989	1990	1991
United States and Canada:					
Crude oil and natural gas	23,940	28,320	24,920	26,650	31,300
Natural gas liquids plants	740	790	840	870	900
Refineries	3,050	3,490	3,690	4,900	6,370
Total	27,730	32,600	29,450	32,420	38,570
Mexico, Central and South America:					
Crude oil and natural gas	6,180	6,125	4,695	4,510	4,900
Refineries	1,580	1,500	1,500	1,700	1,900
Total	7,760	7,625	6,195	6,210	6,800
Western Europe:					
Crude oil and natural gas	12,030	13,115	11,540	11,900	13,500
Refineries	2,730	2,500	2,700	2,700	2,750
Total	14,760	15,615	14,240	14,600	16,250
Africa and Middle East:					
Crude oil and natural gas	2,770	2,915	2,790	2,970	3,000
Refineries	1,020	1,000	1,000	1,000	1,200
Total	3,790	3,915	3,790	3,970	4,200
Asia and Pacific:					
Crude oil and natural gas	2,100	2,295	2,305	2,330	2,500
Refineries	2,040	2,000	2,050	2,100	2,150
Liquefied natural gas plants	1,380	1,300	1,300	1,400	1,500
Total	5,520	5,595	5,655	5,830	6,150
Tankers (all areas)	1,510	1,500	1,700	2,000	2,500
Grand total	61,070	66,850	61,030	65,030	74,470
Of which:					
Crude oil and natural gas	47,020	52,770	46,250	48,360	55,200
Natural gas liquids plants	740	790	840	870	900
Refineries	10,420	10,490	10,940	12,400	14,370
Liquefied natural gas plants	1,380	1,300	1,300	1,400	1,500
Tankers	1,510	1,500	1,700	2,000	2,500

Source: Oil & Gas Journal.

TABLE 15

SALIENT STATISTICS ON U.S. FOREIGN INVESTMENT IN MINERAL INDUSTRY ACTIVITIES

(Million dollars; inflows [-])

	1987	1988	1989	1990	1991
Direct foreign investment: Total	314,307	335,893	r372,419	r424,086	450,196
Of which:					
Mining:					
Metals	2,753	3,008	2,552	3,105	2,808
Nonmetallic minerals, except fuels	343	452	354	358	332
Coal	1,649	1,390	1,330	1,190	1,414
Primary and fabricated metals	r6,279	7,939	r8,510	r10,410	10,481
Petroleum	59,774	57,807	r51,393	r56,957	59,160
Reinvested earnings of foreign affiliates:					
Total	19,714	13,327	r15,950	r20,886	18,949
Of which:[1]					
Primary and fabricated metals	572	1,176	r1,107	r628	r278
Petroleum	189	-1,112	r-829	r2,834	2,652
Equity and intercompany account flows:					
Total	11,331	11,767	r28,412	r41,566	39,847
Of which:[1]					
Primary and fabricated metals	-275	1,105	r-108	r1,722	-1,146
Petroleum	2,009	-1,768	r-11,949	r4,542	3,050
Income: Total	r38,523	r50,429	r53,800	r55,117	48,970
Of which:					
Mining:					
Metals	263	388	683	458	446
Nonmetallic minerals, except fuels	46	59	W	28	57
Coal	-86	-101	W	19	-19
Primary and fabricated metals	r956	r1,573	r1,569	r1,031	540
Petroleum	r7,317	r7,727	r6,640	r10,230	10,055

rRevised. W Withheld to avoid disclosing company proprietary data.
[1]Mining data not available.

Source: U.S. Department of Commerce. Survey of Current Business, v. 72, No. 8, Aug. 1992.

TABLE 16

WORLD MERCHANT FLEET DISTRIBUTION, BY TYPE[1]

		1987	1988	1989	1990	1991
Number of vessels:						
Bulk carriers		5,302	5,332	5,335	5,446	5,473
Freighters[2]		12,572	12,518	12,195	12,441	12,581
Tankers		5,090	5,250	5,133	5,361	5,542
Other[3]		343	368	320	348	347
Total		23,307	23,468	22,983	23,596	23,943
Gross tonnage:						
Bulk carriers	thousand long tons	128,468	130,225	131,135	137,154	139,295
Freighters[2]	do.	93,966	95,932	94,780	97,296	99,931
Tankers	do.	135,010	140,833	137,129	147,815	153,309
Other[3]	do.	3,688	4,367	3,720	4,471	4,690
Total	do.	361,132	371,357	366,764	386,736	397,225
Deadweight tonnage:						
Bulk carriers	do.	224,309	227,515	233,139	244,253	247,679
Freighters[2]	do.	116,937	118,077	118,060	120,037	122,349
Tankers	do.	245,906	254,796	251,923	271,749	280,572
Other[3]	do.	1,405	1,531	1,367	1,454	1,425
Total	do.	588,557	601,919	604,489	637,493	652,025

[1]Maritime Administration classification. Tankers include whaling tankers. Vessels shown here as "Other" include combination passenger and cargo and combination passenger and refrigerated cargo. Data are as of Dec. 31 of the year indicated.
[2]Includes refrigerated freighters.
[3]Excludes refrigerated freighters.

Source: U.S. Department of Transportation, Maritime Administration. Merchant Fleets of the World.

TABLE 17

WORLD BULK CARRIER FLEET, BY DEADWEIGHT TONNAGE OF COUNTRY OF REGISTRY AS OF DECEMBER 31, 1991

Country of registry	Number of vessels	Deadweight tonnage (thousand long tons)
Liberia	553	30,885
Panama	711	28,003
Greece	449	21,347
Cyprus	469	18,950
Japan	266	16,948
Norway (NIS)	236	12,439
Philippines	250	10,924
British Dependencies	192	10,587
China	278	9,035
Bahamas	175	8,493
Korea, Republic of	150	8,122
Malta	196	6,957
Taiwan	65	5,287
India	121	5,256
Brazil	89	5,027
Turkey	94	4,674
Italy	61	4,318
Singapore	78	4,022
Romania	63	2,784
Poland	88	2,672
Vanuatu	46	1,759
Iran	49	1,751
Australia	30	1,702
Luxembourg	17	1,630
Spain	43	1,386
Yugoslavia	31	1,382
Other	673	21,339
Total	5,473	247,679

TABLE 18

WORLD FREIGHTER FLEET, BY DEADWEIGHT TONNAGE OF COUNTRY OF REGISTRY AS OF DECEMBER 31, 1991

Country of registry	Number of vessels	Deadweight tonnage (thousand long tons)
Panama	1,662	15,961
China	880	8,647
United States	359	7,155
Liberia	380	6,344
Cyprus	599	5,762
Germany[1]	396	4,623
British Dependencies	393	3,996
Japan	382	3,364
Singapore	238	3,208
Bahamas	302	3,093
Malta	303	2,769
Taiwan	127	2,542
Denmark (DIS)	171	2,406
Greece	216	2,390
Netherlands	281	2,261
Korea, Republic of	233	2,191
Norway (NIS)	198	1,975
Philippines	236	1,785
Romania	202	1,605
Italy	189	1,480
India	99	1,436
Indonesia	267	1,365
Poland	134	1,306
United Kingdom	68	1,199
Turkey	200	1,083
France	48	1,040
Other	4,018	31,363
Total	12,581	122,349

[1]A unified Germany was established in 1991.

TABLE 19

WORLD TANKER FLEET, BY DEADWEIGHT TONNAGE OF COUNTRY OF REGISTRY AS OF DECEMBER 31, 1991

Country of registry	Number of vessels	Deadweight tonnage (thousand long tons)
Liberia	597	53,170
Panama	637	30,808
Norway (NIS)	323	23,540
Greece	223	19,357
Bahamas	233	18,771
United States	226	14,993
Japan	281	13,006
Cyprus	136	11,017
British Dependencies	121	9,032
Singapore	161	6,813
Iran	37	5,948
Malta	136	5,218
Italy	226	4,444
Denmark (DIS)	83	4,230
Brazil	85	3,777
France	42	3,295
India	70	3,249
Spain	68	3,109
China	183	2,790
Kuwait	23	2,120
Marshall Islands[1]	7	2,097
Sweden	64	1,812
Isle of Man	40	1,802
United Kingdom	63	1,706
Turkey	50	1,473
Iraq	19	1,352
Taiwan	19	1,323
Australia	21	1,305
Netherlands	61	1,214
Romania	17	1,165
Korea, Republic of	62	1,123
Libya	12	1,099
Mexico	39	1,097
Other	1,177	23,317
Total	5,542	280,572

[1]Marshall Islands was established in 1991.

TABLE 20
WORLD LIQUID GAS CARRIER FLEET BY NUMBER AND CAPACITY

	1990		1991	
	Number of vessels	Capacity thousand m^3	Number of vessels	Capacity thousand m^3
World:				
Liquefied natural gas	77	7,287	78	7,414
Liquefied petroleum gas	716	8,828	771	9,754
Total	793	16,115	849	17,168
Of which OPEC:				
Liquefied natural gas	6	678	6	678
Liquefied petroleum gas	20	437	24	457
Total	26	1,115	30	1,135
Percent of OPEC of world:				
Liquefied natural gas	7.8	9.3	7.7	9.1
Liquefied petroleum gas	r2.8	5.0	3.1	4.7
Total	r3.3	6.9	3.5	6.6
Percent of world tanker fleet:				
Liquefied natural gas	1.4	NA	1.4	NA
Liquefied petroleum gas	13.4	NA	13.9	NA
Total	14.8	NA	15.3	NA

rRevised. NA Not available.

Source: OPEC Statistical Bulletins, 1990 and 1991, Vienna.

TABLE 21
PANAMA CANAL: TRANSITS AND COMMODITY MOVEMENTS

	Fiscal year[1]				
	1987	1988	1989	1990	1991
Number of transits:					
Commercial ocean traffic	12,230	12,234	11,989	11,941	12,572
Other traffic	1,214	1,207	1,400	1,384	1,536
Total	13,444	13,441	13,389	13,325	14,108
Cargo moved (thousand metric tons):					
Commercial ocean traffic:					
Mineral commodities	68,890	69,586	69,461	74,491	74,989
Other commodities	82,187	89,408	84,609	85,103	90,318
Subtotal	151,077	158,994	154,070	159,594	165,307
Other traffic	212	303	236	254	525
Total	151,289	159,297	154,306	159,848	165,832

[1]Year ending Sept. 30 of that stated.

TABLE 22

MOVEMENT OF MINERAL COMMODITIES THROUGH THE PANAMA CANAL[1]

(Thousand metric tons)

	1989			1990			1991		
	Atlantic to Pacific	Pacific to Atlantic	Total	Atlantic to Pacific	Pacific to Atlantic	Total	Atlantic to Pacific	Pacific to Atlantic	Total
METALS									
Ore and concentrate									
Bauxite and alumina	137	2,286	2,423	233	3,089	3,322	165	1,733	1,898
Chromite	31	67	98	6	47	53	74	19	93
Copper	49	579	628	68	479	547	26	496	522
Iron	119	287	406	185	420	605	164	300	464
Lead	—	225	225	8	228	236	15	247	262
Manganese	99	286	385	87	318	405	93	175	268
Tin	—	31	31	—	12	12	—	4	4
Zinc	38	549	587	30	775	805	24	942	966
Other and unspecified	275	1,885	2,160	192	2,162	2,354	238	2,561	2,799
Subtotal	748	6,195	6,943	809	7,530	8,339	799	6,477	7,276
Ingots and semimanufactures:									
Aluminum	288	14	302	416	13	429	511	12	523
Copper	2	886	888	8	906	914	3	994	997
Iron and steel[2 3]	6,439	3,686	10,125	6,833	3,040	9,873	7,865	2,872	10,737
Lead	—	68	68	15	81	96	1	106	107
Tin[2]	22	7	29	11	11	22	12	8	20
Zinc	25	166	191	7	224	231	8	181	189
Other	53	59	112	49	19	68	42	41	83
Subtotal	6,829	4,886	11,715	7, 339	4,294	11,633	8,442	4,214	12,656
Total	7,577	11,081	18,658	8,148	11,824	19,972	9,241	10,691	19,932
INDUSTRIAL MINERALS									
Borax	1	399	400	3	431	434	1	404	405
Cement	238	4	242	552	5	557	963	5	968
Clays, fire and china	562	40	602	633	88	721	719	21	740
Fertilizer materials	11,890	2,542	14,432	11,901	2,112	14,013	13,367	1,587	14,954
Salt	21	718	739	34	1,396	1,430	29	1,157	1,186
Sulfur	7	2,189	2,196	66	2,753	2,819	—	3,001	3,001
Other[4]	283	130	413	334	271	605	446	337	783
Total	13,002	6,022	19,024	13,523	7,056	20,579	15,525	6,512	22,037
MINERAL FUELS									
Carbon black	78	2	80	28	1	29	82	11	93
Coal and coke	5,386	3,692	9,078	5,146	3,100	8,246	4,710	3,816	8,526
Petroleum:									
Crude	2,123	5,877	8,000	2,730	6,681	9,411	3,267	5,105	8,372
Refined	7,891	6,730	14,621	9,183	7,071	16,254	9,982	6,047	16,029
Subtotal	10,014	12,607	22,621	11,913	13,752	25,665	13,249	11,152	24,401
Total	15,478	16,301	31,779	17,087	16,853	33,940	18,041	14,979	33,020
Grand total	36,057	33,404	69,461	38,758	35,733	74,491	42,807	32,182	74,989

[1]Fiscal year ended Sept. 30, 1991.

[2]Tinplate is included under "Tin" as in the source publication rather than under "Iron and Steel."

[3]Includes a category identified simply as "Scrap" in source publication, which may include scrap other than iron and steel scrap.

[4]Comprises asbestos, bricks and tile, clinkers, diatomite, dross, marble, and other stone, slag, and soda and other sodium compounds.

Source: Panama Canal Commission Annual Report 1991.

TABLE 23
NONFERROUS METAL PRICES IN THE UNITED STATES

(Average cents per pound unless otherwise specified)

Year and month	Aluminum[1]	Cadmium[2]	Cobalt[3]	Copper[4]	Lead[5]	Nickel[6]	Silver[7]	Tin[8]	Zinc[9]
1987	72.295	1.988	6.56	81.096	35.943	2.277	7.009	3.156	41.923
1988	110.087	7.598	7.09	119.107	37.140	6.091	6.535	3.310	60.197
1989	87.843	6.278	r7.64	129.534	39.350	5.982	5.499	3.973	82.019
1990	74.040	3.378	10.09	121.764	46.022	4.074	4.820	2.876	74.593
1991:									
January	68.571	2.905	15.69	113.214	34.521	3.936	4.028	2.593	58.083
February	68.132	2.589	14.91	113.612	33.231	4.065	3.723	2.574	55.931
March	68.310	2.031	13.99	112.553	33.336	4.046	3.969	2.553	56.109
April	63.875	1.955	14.11	111.727	33.303	4.233	3.971	2.590	57.628
May	59.318	2.000	14.33	104.174	32.595	4.012	4.041	2.638	49.837
June	57.750	1.750	13.50	102.477	32.033	3.930	4.389	2.653	48.397
July	58.955	1.518	13.11	102.944	32.792	3.960	4.304	2.624	48.669
August	57.659	1.607	13.58	104.569	32.858	3.785	3.938	2.607	48.357
September	55.753	2.005	15.33	109.709	33.386	3.511	4.036	2.572	49.773
October	52.461	1.948	18.09	109.936	34.624	3.436	4.102	2.561	48.555
November	52.408	1.900	25.20	108.634	34.475	3.358	4.061	2.538	54.635
December	52.345	1.900	31.31	101.572	34.649	3.281	3.909	2.553	57.294
Average	59.461	2.009	16.92	107.927	33.484	3.796	4.039	2.588	52.772

rRevised.
[1]Metals Week U.S. market price.
[2]U.S. dollars per pound: 1987-89—producer; 1989-91—New York dealer market price.
[3]U.S. dollars per pound, average annual spot for cathodes.
[4]Electrolytic, f.o.b. refinery, producer.
[5]Refined lead, North America producer price.
[6]U.S. dollars per pound, New York dealers, cathode.
[7]U.S. dollars per troy ounce, 0.999 fine, New York.
[8]U.S. dollars per pound, New York dealer.
[9]United States high-grade.

Source: American Bureau of Metal Statistics Inc., except cobalt, which is compiled by the U.S. Bureau of Mines.

TABLE 24
NONFERROUS METAL PRICES IN THE UNITED KINGDOM[1]

(Average cents per pound unless otherwise specified)

Year and month	Aluminum[2]	Copper[3]	Gold[4]	Lead[5]	Silver[6]	Tin[7]	Zinc[8]
1987	71.004	80.847	446.470	27.041	7.024	3.035	36.197
1988	117.334	118.010	437.047	29.727	6.531	3.199	56.262
1989	88.508	129.201	381.431	30.513	5.507	3.871	75.124
1990	74.364	120.723	383.466	36.717	4.832	2.760	69.850
1991:							
January	68.728	111.063	383.639	27.203	4.050	2.514	54.714
February	68.248	111.102	363.830	26.896	3.738	2.501	53.892
March	67.857	109.299	363.335	27.322	3.948	2.463	54.366
April	63.134	112.130	358.379	27.224	3.982	2.472	56.891
May	58.788	104.593	356.945	25.155	4.048	2.525	49.482
June	57.840	100.665	366.718	24.898	4.393	2.531	48.152
July	58.821	101.436	367.685	24.841	4.348	2.516	48.221
August	56.992	101.296	356.305	24.486	3.958	2.498	47.460
September	54.967	105.441	348.738	24.465	4.037	2.471	46.413
October	52.165	107.213	358.687	23.673	4.117	2.457	44.983

See footnotes at end of table.

TABLE 24—Continued

NONFERROUS METAL PRICES IN THE UNITED KINGDOM[1]

(Average cents per pound unless otherwise specified)

Year and month	Aluminum[2]	Copper[3]	Gold[4]	Lead[5]	Silver[6]	Tin[7]	Zinc[8]
1991—Continued:							
November	51.474	107.948	360.167	22.945	4.078	2.436	49.591
December	49.784	100.840	361.725	24.117	3.958	2.428	53.885
Average	59.067	106.086	362.179	25.269	4.055	2.484	50.671

[1]London Metal Exchange.
[2]Unalloyed ingot, 99.5%.
[3]Grade A settlement price.
[4]U.S. dollars per troy ounce, final price.
[5]Refined lead, monthly average cash price.
[6]U.S. dollars per troy ounce, 0.999 fine, spot price.
[7]U.S. dollars per pound, for 1987 Straits tin; beginning 1988 Kuala Lumpur tin market price. (1987 average price the same on both markets.)
[8]Monthly average cash price, high-grade.

Source: American Bureau of Metal Statistics Inc.

TABLE 25

LEADING WORLD PRODUCERS OF BAUXITE[1]

(Thousand metric tons)

Country	1987	1988	1989	1990	1991[p]	Average 1987-91
Australia	34,102	36,192	38,583	r41,391	40,503	38,154
Guinea	13,500	15,619	16,523	r17,524	17,054	16,044
Jamaica	7,802	7,305	9,601	10,921	11,552	9,436
Brazil	6,567	8,083	8,665	r9,678	10,310	8,661
India	2,779	3,961	4,768	r4,852	4,835	4,239
U.S.S.R.e[2]	r5,726	r5,714	r5,737	5,295	4,795	5,453
Suriname	2,522	3,434	3,530	3,267	3,198	3,190
Yugoslavia	3,394	3,034	3,252	2,952	e2,700	3,066
Chinae	r2,200	r2,300	r2,388	r2,400	2,600	2,378
Guyana	2,785	1,774	1,321	1,424	2,204	1,902
Greece	r2,467	r2,433	r2,602	r2,504	2,130	2,427
Hungary	3,101	2,593	2,644	2,559	2,037	2,587
Venezuela	245	522	702	771	1,992	846
Sierra Leone	1,390	1,379	1,562	r1,430	1,288	1,410
Total	[3]88,579	r94,343	r101,878	r106,968	[3]107,199	99,793
Other	r4,148	r3,728	r3,340	r3,728	3,064	3,602
Grand total	r [3]92,726	r98,071	r105,218	r110,696	110,263	103,395

eEstimated. pPreliminary. rRevised.
[1]Table includes data available through June 16, 1992.
[2]Includes bauxite equivalent of nepheline syenite concentrate and alunite ore, which are produced in the U.S.S.R. only.
[3]Data do not add to total shown due to independent rounding.

TABLE 26
LEADING WORLD PRODUCERS OF ALUMINUM[1]

(Thousand metric tons)

Country	1987	1988	1989	1990	1991[p]	Average 1987-91
United States	3,343	3,944	4,030	4,048	4,121	3,897
U.S.S.R.[e]	2,400	2,400	2,400	2,200	2,000	2,280
Canada	1,540	1,534	1,555	[r]1,567	[e]1,830	1,605
Australia	1,004	1,150	1,244	1,234	1,235	1,173
Brazil	843	874	890	931	1,140	935
China[e]	615	710	[r]850	850	860	777
Norway	853	864	863	845	833	852
Germany[e]	[r]861	[r]814	[r]788	[r]736	690	778
Venezuela	428	437	540	[r]590	[e]600	519
India	265	375	423	433	[e]440	387
Spain	341	323	352	355	355	345
Yugoslavia	[e]244	260	[r]331	[r]349	[e]315	300
United Kingdom	294	300	297	290	294	295
France	323	328	335	326	286	319
Netherlands	276	278	279	[r]270	264	273
New Zealand	252	264	258	260	259	259
United Arab Emirates: Dubai	155	162	168	[r]174	239	180
Italy	233	[r]226	219	232	218	226
Total[2]	[r]14,270	[r]15,243	[r]15,822	[r]15,691	15,977	15,401
Other	[r]2,245	[r]2,305	[r]2,376	[r]2,287	2,216	2,285
Grand total[2]	[r]16,514	[r]17,548	[r]18,199	[r]17,977	18,194	17,686

[e]Estimated. [p]Preliminary. [r]Revised.

[1]Table includes information available through May 27, 1992.

[2]Data may not add to totals shown due to independent rounding.

TABLE 27
LEADING WORLD PRODUCERS OF CHROMITE[1]

(Thousand metric tons, gross weight)

Country	1987	1988	1989	1990	1991[e]	Average 1987-91
South Africa, Republic of[2]	3,789	[r]4,245	4,951	[r]4,618	[3]5,078	4,536
U.S.S.R.	3,570	3,700	3,800	3,800	3,800	3,734
India	624	821	1,003	[r]939	900	857
Albania	[r]1,075	[r]1,109	[r e]1,200	[r]910	800	1,019
Turkey	762	851	[r e]1,000	[r e]730	800	829
Zimbabwe	570	[r]562	627	[r]573	600	586
Finland[e]	[3]543	700	498	[r]489	475	541
Brazil	338	410	476	[r]267	275	[r]353
Philippines	188	[r]124	[r]217	[r]183	200	182
Total[4]	[r]11,458	[r]12,522	[r]13,771	[r]12,510	12,928	12,638
Other	[r]461	[r]368	[r]407	[r]338	309	377
Grand total[4]	[r]11,920	[r]12,890	[r]14,179	[r]12,848	13,237	13,015

[e]Estimated. [r]Revised.

[1]Table includes data through May 14, 1992.

[2]Includes production by Bophuthatswana which was as follows, in metric tons: 1987—522,900; 1988—536,500; 1989—676,154; 1990—468,262; and 1991—500,000 (estimated).

[3]Reported figure.

[4]Data may not add to totals shown due to independent rounding.

TABLE 28

LEADING WORLD PRODUCERS OF MINE COPPER[1]

(Thousand metric tons, Cu content of ore)

Country	1987	1988	1989	1990	1991e	Average 1987-91
Chile	r1,418	r1,451	r1,609	r1,588	2,814	1,576
United States[3]	1,244	1,420	1,498	1,588	1,631	1,476
Canada	802	777	723	802	777	776
U.S.S.R.e[3]	630	640	640	600	550	612
Zambia	463	432	r451	r405	400	430
Peru[3]	418	323	373	334	399	369
Poland	438	437	384	r370	390	404
Australia	233	238	296	r330	2311	282
Chinae	250	r282	r276	r300	300	282
Mexico	r253	r285	r264	r321	297	284
Zaire[3]	516	495	467	370	250	419
Papua New Guinea	218	219	204	170	2205	203
Indonesia[3]	102	122	144	178	200	149
South Africa, Republic of[5]	188	169	r182	r179	2193	182
Portugal[3]	1	r4	104	r163	165	87
Philippines	216	218	r193	r182	150	192
Total[4]	r7,389	r7,510	r7,807	r7,879	8,032	7,723
Other	r854	r814	r860	r814	788	826
Grand total[4]	r8,243	r8,323	r8,667	r8,693	8,820	8,549

eEstimated. rRevised.

[1]Table includes data available through June 30, 1992.

[2]Reported figure.

[3]Recoverable content.

[4]Data may not add to totals shown due to independent rounding.

TABLE 29

LEADING WORLD PRODUCERS OF MINE GOLD[1]

(Kilograms)

Country	1987	1988	1989	1990	1991e	Average 1987-91
South Africa, Republic of	r607,000	r621,000	607,460	r605,400	2601,013	608,375
United States	153,870	200,914	r265,731	r294,527	2289,885	240,985
U.S.S.R.e	r260,000	r277,600	r304,000	r302,000	240,000	276,720
Australia	110,696	156,950	203,563	r244,137	2234,218	189,913
Canada	115,818	134,813	159,494	r167,373	2172,708	150,041
Chinae	72,000	78,000	r90,000	100,000	120,000	92,000
Brazile	83,700	100,200	r103,000	r85,000	80,000	90,380
Papua New Guinea	33,250	38,129	27,538	31,035	260,780	38,146
Colombia	r26,546	r29,014	r29,506	r29,352	30,000	28,884
Chile	17,035	20,614	22,559	r27,503	28,000	23,142
Ghana	10,201	11,601	13,358	16,840	226,310	15,662
Philippines	32,599	r30,482	r29,992	r24,591	r24,938	28,520
Korea, Republic of	7,600	11,121	14,270	20,760	21,000	14,950
Indonesia	3,643	4,738	6,155	11,158	216,879	8,515
Zimbabwe	14,710	14,191	16,000	16,900	16,000	15,560
Ecuador	9,500	8,050	13,000	10,000	12,000	10,510
Total	r1,558,168	r1,737,417	r1,905,626	r1,986,576	1,973,731	1,832,304
Other	r102,367	r111,031	r117,424	r140,822	137,791	121,887
Grand total	r1,660,535	r1,848,448	r2,023,050	r2,127,398	2,111,522	1,954,191

eEstimated. rRevised.
[1]Table includes data available through June 22, 1992.
[2]Reported figure.

TABLE 30

LEADING WORLD PRODUCERS OF IRON ORE, IRON ORE CONCENTRATES, AND IRON ORE AGGLOMERATES[1]

(Thousand metric tons, gross weight)

Country	1987	1988	1989	1990	1991e	Average 1987-91
U.S.S.R.	250,874	249,754	241,348	r236,000	200,000	235,595
Brazil	134,497	146,008	r157,900	r155,200	155,000	149,721
Chinae	r113,000	r117,000	r122,000	r117,000	119,000	117,600
Australia[2]	101,748	96,084	105,810	r110,508	3117,134	106,257
India	51,018	49,961	51,434	r54,579	357,638	52,926
United States	47,648	57,515	59,032	56,408	56,596	55,440
Canada	37,702	39,934	39,445	r35,670	35,961	37,742
South Africa, Republic of	22,008	25,248	29,958	r30,291	329,069	27,315
Venezuela	17,782	18,932	18,390	20,365	321,222	19,338
Sweden	19,636	20,440	21,763	19,877	20,000	20,343
Mauritania	9,002	9,780	12,114	11,420	11,000	10,663
Korea, Northe	8,500	9,000	9,500	9,500	10,000	9,300
Mexico	7,523	8,431	8,141	8,073	9,634	8,360
Chile	6,637	7,710	8,761	8,248	38,414	7,954
France	11,267	9,872	9,319	r8,729	37,472	9,332
Turkey	5,366	5,481	r4,518	r5,050	35,400	5,163

See footnotes at end of table.

TABLE 30—Continued

LEADING WORLD PRODUCERS OF IRON ORE, IRON ORE CONCENTRATES, AND IRON ORE AGGLOMERATES[1]

(Thousand metric tons, gross weight)

Country	1987	1988	1989	1990	1991e	Average 1987-91
Iran[4]	1,692	2,005	2,296	r3,240	3,4,890	2,825
Spain	4,492	4,212	4,566	3,030	3,900	4,040
Total	r850,392	r877,367	r906,295	r893,188	872,330	879,914
Other	r52,345	r48,680	r46,999	r35,835	28,510	42,474
Grand total	r902,737	r926,047	r953,294	r929,023	900,840	922,388

eEstimated. rRevised.
[1]Table includes data available through July 9, 1992.
[2]Dry weight.
[3]Reported figure.
[4]Data are for year beginning Mar. 21 of that stated.

TABLE 31

LEADING WORLD PRODUCERS OF CRUDE STEEL[1]

(Thousand metric tons)

Country	1987	1988	1989	1990	1991p	Average 1987-91
U.S.S.R.	161,887	163,037	r160,096	r154,414	e132,666	154,420
Japan	98,513	105,681	107,908	110,339	109,649	106,418
United States	80,877	90,650	88,852	89,726	79,738	85,969
China	r56,280	r59,430	61,200	r66,100	70,570	62,716
Germany[2]	44,491	49,154	48,902	44,022	42,169	45,748
Korea, Republic of	16,782	19,117	21,873	23,125	e26,001	21,380
Italy	22,859	23,760	25,213	25,439	25,007	24,456
Brazil	22,231	24,536	25,018	20,572	e22,617	22,995
France	r17,693	r19,122	r19,335	r19,032	18,437	18,724
United Kingdom	17,425	19,013	18,813	17,908	16,511	17,934
India	r13,121	r14,309	r14,608	r14,963	e16,394	14,679
Canada	r14,737	r14,866	r15,458	r12,281	12,987	14,066
Spain	11,691	11,685	12,684	12,705	e12,700	12,293
Czechoslovakia	15,356	15,319	15,465	r14,877	12,133	14,630
Belgium	9,787	11,222	10,948	11,426	11,332	10,943
Taiwan	5,949	8,313	9,047	r9,747	10,957	8,803
Poland	17,148	16,873	15,094	r13,625	10,439	14,636
South Africa, Republic of	8,991	8,837	r9,337	8,691	9,358	9,043
Turkey	7,044	7,982	7,934	r9,462	9,336	8,352
Korea, North e	6,500	8,000	8,000	8,000	8,000	7,700
Mexico	7,642	7,779	r7,851	r8,726	7,883	7,976
Romania	13,885	r14,496	14,415	r9,787	e7,000	11,917
Total	r670,889	r713,181	r718,051	r704,967	671,884	695,794
Other	r63,430	r66,601	r68,168	r65,671	61,789	65,132
Grand total	r734,319	r779,782	r786,219	r770,638	733,673	760,926

eEstimated. pPreliminary. rRevised.
[1]Steel ingots and casings. Table includes data available through June 29, 1992.
[2]Includes both Eastern and Western states.

TABLE 32
LEADING WORLD PRODUCERS OF MINE LEAD[1]

(Thousand metric tons, Pb content of ore)

Country	1987	1988	1989	1990	1991e	Average 1987-91
Australia	489	466	495	r565	2571	517
United States[3]	319	394	420	r497	2477	421
U.S.S.R.	r440	r440	r440	r420	400	428
China e	267	312	r308	r364	380	326
Canada	414	368	275	r232	235	305
Peru	204	149	192	189	203	187
Mexico	177	171	163	180	2158	170
Korea, North e	110	110	120	120	120	116
Yugoslavia	r107	r103	r107	r99	90	101
Sweden	90	92	89	r84	79	87
South Africa, Republic of	94	90	78	69	276	82
Total[4]	r2,710	r2,695	r2,688	r2,819	2,789	2,740
Other	r642	r663	r598	r571	529	601
Grand total[4]	r3,352	r3,359	r3,285	r3,390	3,318	3,341

eEstimated. rRevised.
[1]Table includes data available through June 16, 1992.
[2]Reported figure.
[3]Recoverable.
[4]Data may not add to totals shown due to independent rounding.

TABLE 33
LEADING WORLD PRODUCERS OF MANGANESE ORE[1]

(Thousand metric tons gross weight)

Country	1987	1988	1989	1990	1991e	Average 1987-91
U.S.S.R.	r9,356	r9,108	r9,141	r e8,500	8,000	8,821
China	2,610	3,212	r3,331	r e3,300	3,400	3,171
South Africa, Republic of	r3,294	r4,023	r4,884	r4,402	23,144	3,949
Brazil	2,067	1,991	2,080	r e2,500	2,200	2,168
Gabon	2,403	2,254	2,592	r2,423	2,125	2,360
Australia	1,853	1,985	2,124	r1,920	21,482	1,873
India	1,302	1,333	1,334	r1,363	1,300	1,326
Ghana	274	260	279	r247	270	266
Mexico e	385	444	394	r e365	182	354
Hungary	78	81	84	r60	65	74
Iran	63	75	81	54	65	68
Morocco	42	30	32	49	59	43
Romania e	65	65	60	55	50	59
Total[3]	r23,794	r24,860	r26,417	r25,239	22,342	24,530
Other	r137	r163	r158	r202	184	169
Grand total	r23,931	r25,023	r26,575	r25,441	22,526	24,699

eEstimated. rRevised.
[1]Table includes data available through May 11, 1992.
[2]Reported figure.
[3]Data may not add to totals shown due to independent rounding.

TABLE 34
LEADING WORLD PRODUCERS OF MINE NICKEL[1]

(Thousand metric tons, Ni content)

Country	1987	1988	1989	1990	1991e	Average 1987-91
U.S.S.R.e	r270	280	280	260	250	268
Canada	189	199	r201	r199	2193	196
New Caledoniae	57	68	99	r89	92	81
Australia	75	62	67	r67	269	68
Indonesia	58	58	63	r68	69	63
Cuba	34	42	44	re40	35	39
South Africa, Republic of	34	35	r34	r30	30	33
Chinae	25	25	25	27	28	26
Dominican Republice	233	29	r31	r29	25	29
Total[3]	r774	r798	r844	r809	790	803
Other	r117	r120	r127	r128	133	125
Grand total[3]	r891	r918	r970	r937	923	928

eEstimated. rRevised.
[1]Table includes data available through May 29, 1992.
[2]Reported figure.
[3]Data may not add to totals shown due to independent rounding.

TABLE 35
LEADING WORLD PRODUCERS OF MINE SILVER[1]

(Metric tons, Ag content)

Country	1987	1988	1989	1990	1991e	Average 1987-91
Mexico	2,415	2,359	2,306	2,346	22,196	2,324
United States	1,241	1,661	2,007	r2,125	21,848	1,777
Peru	2,054	1,552	e1,840	1,725	21,770	1,788
Canada (shipments)	1,375	1,443	1,262	r1,400	1,400	1,376
U.S.S.R.e (refinery)	1,510	1,520	1,520	1,400	1,300	1,450
Australia	1,119	1,118	1,075	r1,138	21,180	1,126
Poland	831	1,063	1,003	r832	870	920
Chile	500	507	545	r655	660	573
Spain	350	353	re530	500	500	447
Bolivia	142	232	267	311	2337	258
Korea, Republic of (refinery)	209	227	239	238	235	230
Brazil	110	124	172	223	225	171
Sweden	254	208	228	r243	225	231
Morocco	e44	226	237	r241	2200	190
Italy (refinery)	82	92	96	103	2178	110
South Africa, Republic of	208	200	r180	r181	2172	188
Japan	281	252	156	150	2171	202
Chinae	100	110	125	125	150	122
Papua New Guinea	61	70	94	e130	2125	96
Yugoslavia (refinery)	165	139	r127	105	94	126
Namibia	103	117	108	e93	89	102
Total[3]	r13,156	r13,571	r14,118	r14,264	13,924	13,806
Other	r863	r946	r939	r858	799	881
Grand total	r14,019	r14,517	r15,057	r15,122	14,723	14,687

eEstimated. rRevised.
[1]Table includes data available through June 23, 1992.
[2]Reported figure.
[3]Data may not add to totals shown due to independent rounding.

TABLE 36
LEADING WORLD PRODUCERS OF MINE TIN[1]

(Metric tons, Sn content of ore)

Country	1987	1988	1989	1990	1991[p]	Average 1987-91
China[e]	20,000	29,500	40,000	42,000	43,000	34,900
Indonesia	26,093	29,590	31,263	30,200	30,061	29,441
Brazil	30,405	44,102	50,232	39,149	[e]29,300	38,638
Malaysia	30,388	28,866	32,034	28,468	20,710	28,093
Bolivia	8,128	10,504	15,849	17,249	16,863	13,719
Thailand	14,852	14,225	14,922	14,635	14,937	14,714
U.S.S.R.[e]	16,000	16,000	16,000	15,000	13,500	15,300
Peru	5,263	4,181	5,053	5,134	6,559	5,238
Australia	7,691	7,009	7,709	[r]7,425	5,630	7,093
Portugal	64	81	63	1,404	3,100	942
Canada	[r]2,779	[r]3,591	[r]2,790	[r]2,828	[e]2,700	2,938
Zaire	2,378	[r]2,771	2,346	[r]2,221	[e]1,800	2,303
Zimbabwe[e]	1,410	1,140	1,300	1,300	1,200	1,270
United Kingdom	4,003	3,454	3,846	[r]3,400	[e]1,100	3,161
Total	[r]169,454	[r]195,014	[r]223,407	[r]210,413	190,460	197,750
Other	[r]10,448	[r]9,802	[r]10,200	[r]8,105	6,235	8,958
Grand total	[r]179,902	[r]204,816	[r]233,607	[r]218,518	196,695	206,708

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through June 30, 1992.

TABLE 37
LEADING WORLD PRODUCERS OF MINE URANIUM[1]

(Metric tons, U_3O_8 content)

Country[2]	1987	1988	1989	1990	1991[p]	Average 1987-91
Canada	14,666	14,695	13,475	[r]10,342	9,124	12,460
Australia	4,458	4,165	4,311	4,162	4,453	4,310
United States	5,893	5,956	6,276	[r]2,658	3,585	4,874
Niger	3,501	3,496	[r]3,013	[r]3,161	3,300	3,294
France	3,981	4,033	3,795	3,321	2,907	3,607
Nambia	4,175	4,139	3,629	[r]3,656	2,889	3,698
South Africa, Republic of	4,735	4,583	3,456	2,875	1,974	3,525
Gabon	934	1,094	1,047	828	[e]800	941
Total	42,343	42,161	[r]39,002	[r]31,003	29,032	36,708
Others	[r]1,066	[r]1,026	1,032	[r]695	581	880
Grand total	[r]43,409	[r]43,187	[r]40,034	[r]31,698	29,613	37,588

[e] Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through Oct. 31, 1992.
[2]Output of known market economy producing countries; that of centrally planned economy countries excluded.

TABLE 38

LEADING WORLD PRODUCERS OF MINE ZINC[1]

(Thousand metric tons, Zn content of ore)

Country	1987	1988	1989	1990	1991e	Average 1987-91
Canada	1,482	1,370	r1,216	r1,203	2,1,148	1,284
Australia	778	759	803	re933	2,1,048	864
U.S.S.R.e	810	810	810	750	650	766
Chinae	458	r528	r538	619	650	559
Peru	613	485	597	577	623	579
United States	233	256	288	543	2,547	373
Mexico	272	262	284	322	2,301	288
Spain	273	275	282	re258	260	269
Korea, Northe	220	225	230	230	200	221
Ireland	177	173	169	166	188	175
Sweden	219	189	174	157	155	179
Poland	184	e184	r179	r178	144	174
Brazil	133	156	r178	r138	135	148
Japan	166	147	132	127	2,133	141
Bolivia	39	57	75	104	2,129	81
Total[3]	r6,056	r5,877	r5,955	r6,307	6,311	6,101
Other	r1,132	r1,103	r1,145	r1,013	971	1,073
Grand total	r7,188	r6,980	r7,100	r7,320	7,282	7,174

eEstimated. rRevised.

[1]Table includes data available through July 1, 1992.

[2]Reported figure.

[3]Data may not add to totals shown due to independent rounding.

TABLE 39

LEADING WORLD PRODUCERS OF HYDRAULIC CEMENT[1]

(Thousand metric tons)

Country	1987	1988	1989	1990	1991e	Average 1987-91
China[e]	180,000	r210,000	207,000	203,000	248,000	209,600
U.S.S.R.	137,404	139,499	140,436	r137,322	127,000	136,332
Japan	71,551	77,554	79,717	r84,445	2 89,200	80,493
United States (including Puerto Rico)	72,122	70,989	71,268	71,310	69,853	71,108
India	36,980	40,700	r46,000	r49,000	50,000	44,536
Germany[3]	37,698	38,725	40,763	40,456	42,000	39,928
Italy	37,257	r37,884	r39,385	r e39,500	40,000	38,805
Korea, Republic of	25,662	28,995	30,474	33,600	34,000	30,546
Spain (including Canary Islands)[e]	23,400	24,000	r27,374	r28,092	2 27,576	26,088
Mexico	22,347	22,513	22,766	r23,900	26,700	23,645
Turkey	21,980	22,675	23,800	r24,408	2 26,028	23,778
France	23,560	25,300	r26,835	r26,388	26,000	25,617
Brazil	25,470	25,328	25,883	r25,900	26,000	25,716
Taiwan	15,663	17,281	18,043	r18,459	2 19,389	17,767
Thailand	9,850	11,514	15,024	18,054	18,054	14,499
Indonesia	11,844	12,472	14,099	13,762	2 16,153	13,666
Korea, North[e]	9,000	12,000	16,000	16,000	16,000	13,800
Iran	12,729	12,202	e12,500	r e13,000	15,000	13,086
Egypt	8,746	9,787	9,507	15,299	15,000	11,668
Greece	13,168	13,053	12,535	r13,944	13,500	13,240
Romania[e]	14,300	14,000	14,000	13,000	13,000	13,660
Poland	r16,090	r16,984	r17,125	r12,600	12,031	14,966
United Kingdom	14,311	16,506	r16,849	r14,000	12,000	14,733
Saudi Arabia	8,595	10,951	11,442	e12,000	12,000	10,998
Canada	r12,590	r12,036	r11,832	r11,600	11,000	11,812
Total	r862,317	4 r922,949	r950,657	r959,039	1,005,484	940,089
Other	r192,522	r196,164	r197,261	r193,451	185,035	192,887
Grand total	r1,054,839	r1,119,113	r1,147,918	r1,152,490	1,190,519	1,132,976

[e]Estimated. [r]Revised.

[1]Table includes data available through June 28, 1992.

[2]Reported figure.

[3]Includes both Eastern and Western states.

[4]Data do not add to total shown due to independent rounding.

TABLE 40
LEADING WORLD PRODUCERS OF NATURAL DIAMOND[1]

(Thousand carats)

Country	1987	1988	1989	1990	1991e	Average 1987-91
Australia	30,333	34,826	35,080	34,662	[2]35,956	34,171
Zaire	19,425	18,163	17,755	r19,427	20,000	18,954
Botswana	13,208	15,229	15,252	17,352	18,000	15,808
U.S.S.R.e	14,800	15,000	15,000	15,000	15,000	14,960
South Africa, Republic of	9,053	8,504	9,116	r8,708	8,412	8,759
Brazil	500	533	500	r1,500	1,500	907
Angolae	190	1,000	1,245	r1,300	1,300	1,007
Namibia	1,021	938	927	r761	[2]1,194	968
Chinae	1,000	1,000	1,000	1,000	1,000	1,000
Ghana	465	259	287	637	700	470
Total	r89,995	r95,452	r96,162	r100,347	103,062	97,004
Other	r1,493	r1,019	r1,300	r1,219	1,324	1,271
Grand total	r91,488	r96,471	r97,462	r101,566	104,386	98,275

eEstimated. rRevised.
[1]Gem and industrial grades undifferentiated. Table includes data available through May 19, 1992.
[2]Reported figure.

TABLE 41
LEADING WORLD PRODUCERS OF NITROGEN IN AMMONIA[1]

(Thousand metric tons, N content)

Country	1987	1988	1989	1990	1991e	Average 1987-91
Chinae	r16,000	r16,500	17,000	r17,500	18,000	17,000
U.S.S.R.	20,000	20,200	r19,400	r18,200	17,100	18,980
United States	12,004	12,544	r12,280	r12,525	[2]12,692	12,409
India[3]	5,300	6,205	6,661	7,022	7,044	6,446
Canada	2,887	3,289	r3,339	r3,054	3,016	3,117
Netherlands	2,287	r2,699	r2,906	r3,194	3,000	2,817
Indonesia	2,364	2,367	2,526	e2,600	2,500	2,471
Germany[4]	3,107	2,980	2,882	2,671	2,348	7,024
Mexico	1,743	2,067	2,100	2,164	2,221	2,059
Poland	2,177	2,338	r2,360	e2,006	1,669	2,110
France	2,029	1,832	1,476	1,586	1,604	1,705
Trinidad and Tobago	1,128	1,386	e1,514	1,520	1,595	1,429
Japan	1,556	1,524	1,539	1,531	[2]1,553	1,541
Bulgaria	1,070	1,342	e1,300	r1,309	1,300	1,264
Pakistan	1,179	1,173	e1,175	e1,180	1,185	1,178
Italy	1,435	1,561	1,446	1,197	1,147	1,357
Romaniae	[2]2,788	2,800	2,600	1,900	1,130	2,244
United Kingdom	1,415	1,105	1,037	1,148	866	1,114
Total[5]	r80,468	r83,912	r83,542	r82,306	79,970	86,266
Other	r14,636	r15,363	r15,509	r15,239	13,742	14,898
Grand total	r95,104	r99,275	r99,051	r97,545	93,712	101,164

eEstimated. rRevised.
[1]Table includes data available through May 20, 1992.
[2]Reported figure.
[3]Data are for years beginning Apr. 1 of that stated.
[4]Includes both Eastern and Western states.
[5]Data may not add to totals shown due to independent rounding.

TABLE 42
LEADING WORLD PRODUCERS OF PHOSPHATE ROCK[1]

(Thousand metric tons, gross weight)

Country	1987	1988	1989	1990	1991e	Average 1987-91
United States	40,954	45,389	r49,817	46,343	2 48,096	46,120
U.S.S.R.e	34,100	34,400	34,400	33,500	30,000	33,280
Chinae	r15,000	r17,000	r18,500	r19,000	20,000	17,900
Morocco[3]	21,300	25,015	18,067	21,396	2 17,900	20,736
Tunisia	6,390	6,103	6,610	6,259	6,000	6,272
Jordan	6,800	6,611	6,900	5,925	4,000	6,047
Israel	3,798	3,479	3,922	3,516	3,370	3,617
Brazil	4,777	4,672	3,655	2,968	2 3,309	3,876
South Africa, Republic of	2,623	2,850	2,963	3,165	2 3,050	2,930
Togo	2,644	3,464	3,355	2,314	2,965	2,948
Total	r138,386	r148,983	r148,189	r144,386	138,690	143,727
Other	r11,771	r12,225	r11,843	r9,970	8,169	10,795
Grand total	r150,157	r161,208	r160,032	r154,356	146,859	154,522

eEstimated. rRevised.

[1]Data for major phosphate rock-producing countries derived in part from the International Fertilizer Association; other figures are from official country sources where available. Table includes data available through May 19, 1992.

[2]Reported figure.

[3]Production from Western Sahara included.

TABLE 43
LEADING WORLD PRODUCERS OF MARKETABLE POTASH[1]

(Thousand metric tons, K_2O equivalent)

Country	1987	1988	1989	1990	1991p	Average 1987-91
U.S.S.R.	10,888	11,301	10,200	r9,000	e8,400	9,958
Canada	7,668	8,154	r7,014	r7,345	7,012	7,439
Germany[2]	5,709	5,800	6,034	4,865	3,868	5,255
United States	1,262	1,521	1,595	1,713	1,749	1,568
Israel	1,253	1,244	r1,273	r1,311	e1,270	1,270
France	1,539	1,502	1,195	r1,230	1,129	1,319
Total	28,319	29,522	r27,311	r25,464	23,428	26,809
Other	r2,137	r2,314	r2,269	r2,221	2,120	2,212
Grand total	r30,456	r31,836	r29,580	r27,685	25,548	29,021

eEstimated. pPreliminary. rRevised.

[1]Table includes data available through Apr. 20, 1992.

[2]Includes both Eastern and Western states.

TABLE 44
LEADING WORLD PRODUCERS OF SALT[1]

Thousand metric tons)

Country	1987	1988	1989	1990	1991e	Average 1987-91
United States (including Puerto Rico)e	33,141	34,361	35,292	36,959	35,943	35,139
Chinae	18,000	22,000	28,000	20,000	25,500	22,700
U.S.S.R.	15,400	14,800	15,000	r14,700	14,000	14,780
Germanye 2	16,600	15,507	14,938	14,288	13,785	15,024
Canada	10,129	10,687	11,057	11,097	11,000	10,794
Indiae	9,902	9,204	9,603	9,503	9,503	9,543
Australia	6,486	7,165	r7,069	r7,227	7,791	7,148
Mexico	6,393	6,788	6,942	7,135	37,595	6,971
Francee	7,840	7,570	7,500	r6,450	6,500	7,164
Romania	5,395	e5,400	6,771	e6,500	6,500	6,113
United Kingdom	7,081	6,130	r6,756	r6,434	5,200	6,320
Italye	4,265	4,289	r3,951	r4,046	4,000	4,110
Poland	6,175	6,179	4,670	r4,055	3,900	4,996
Brazil	4,550	4,356	3,653	r5,630	3,800	4,398
Netherlands	3,979	3,693	3,756	r3,653	3,400	3,696
Spaine	33,195	3,455	3,100	3,200	3,200	3,230
Chile	865	1,043	904	1,834	1,800	1,289
Turkey	1,218	1,384	r1,739	r e1,600	1,700	1,528
Japan	1,397	1,363	1,367	r1,377	1,380	1,377
Total4	r162,011	r165,375	r172,068	r165,688	166,497	166,328
Other	r16,748	r17,447	r18,409	r17,092	17,162	17,371
Grand total	r178,759	r182,822	r190,477	r182,780	183,659	183,699

eEstimated. rRevised.
[1]Table includes data available through June 15, 1992.
[2]Includes both Eastern and Western states.
[3]Reported figure.
[4]Data may not add to totals shown due to independent rounding.

TABLE 45

LEADING WORLD PRODUCERS OF ELEMENTAL SULFUR[1]

(Thousand metric tons)

Country	1987				1988			
	Native	From pyrites	Byproducts	Total	Native	From pyrites	Byproducts	Total
United States[2]	3,202	W	7,336	10,538	3,174	W	7,572	10,746
U.S.S.R.e[3]	3,500	2,150	4,100	9,750	3,500	2,150	5,115	10,765
Canadae	—	—	6,687	6,687	—	—	r6,908	r6,908
Chinae	300	3,700	500	4,500	300	3,900	550	4,750
Polande[3]	r 4,960	—	r227	r5,187	r 5,000	—	r200	r5,200
Japan	—	79	2,270	2,349	—	71	2,361	2,432
Germanye[5]	—	—	2,139	2,139	—	—	2,062	2,062
Mexicoe[2]	1,806	—	655	2,461	1,628	—	750	2,378
Saudi Arabia	—	—	1,432	1,432	—	—	1,378	1,378
Francee	—	—	1,263	1,263	—	—	1,181	1,181
Spaine	—	960	235	1,195	—	1,057	120	1,177
Irane	r—	—	r260	r260	r—	—	r231	r231
Romaniae	—	340	350	690	—	370	380	750
Finlande	—	r317	r282	r599	—	r313	287	r600
Italye	—	314	r250	r564	—	r 308	r310	r618
South Africa, Republic of	—	r545	re215	r e760	—	r507	r e231	r e738
Iraqe[2]	707	—	250	957	r 958	—	r 227	r 1,185
Chile	37	—	335	372	38	—	416	454
Swedene	—	215	180	395	—	286	170	456
Yugoslaviae	—	258	178	436	—	252	173	425
Belgiume	—	—	300	300	—	—	310	310
Total	r14,512	r8,878	r29,445	r52,834	r14,597	r9,214	r30,932	r54,743
Other	r111	r1,120	r2,903	r4,133	r101	r1,232	r3,039	r4,373
Grand total[6]	r14,622	r9,998	r32,347	r56,968	r14,699	r10,446	r33,971	r59,117

Country	1989				1990			
	Native	From pyrites	Byproducts	Total	Native	From pyrites	Byproducts	Total
United States[2]	3,888	W	7,704	11,592	3,726	W	7,834	11,560
U.S.S.R.e[3]	3,450	2,150	4,300	9,900	3,000	1,900	4,125	9,025
Canadae	—	—	r6,632	r6,632	—	—	r6,849	r6,849
Chinae	300	r4,270	600	r5,170	r320	r4,400	r650	r5,370
Polande[3]	r 4,864	—	190	r5,054	r 4,664	—	r170	r4,834
Japan	—	62	r2,496	r2,559	—	53	r2,604	r2,657
Germanye[5]	—	—	2,175	2,175	—	—	2,018	2,018
Mexicoe[2]	1,528	—	841	2,369	r 1,441	—	r991	2,432
Saudi Arabia	—	—	r1,423	r1,423	—	—	r1,435	r1,435
Francee	—	—	1,036	1,036	—	—	r1,049	r1,049
Spaine	—	938	120	1,058	—	r 748	r110	r858
Irane	—	—	r500	r500	—	—	r680	r680
Romaniae	—	r 359	r 375	r 734	—	300	350	650
Finlande	—	r 306	r221	r527	—	r 357	r279	r636
Italye	—	r323	r315	r638	—	r290	r297	r587
South Africa, Republic of	—	461	r e215	r e676	—	452	r e232	r e683
Iraqe[2]	r960	—	370	r1,330	800	—	250	1,050
Chile	16	—	e400	e416	28	—	e400	e428
Swedene	—	233	165	398	—	r 230	165	r395

See footnotes at end of table.

TABLE 45—Continued

LEADING WORLD PRODUCERS OF ELEMENTAL SULFUR[1]

(Thousand metric tons)

Country	1989				1990			
	Native	From pyrites	Byproducts	Total	Native	From pyrites	Byproducts	Total
Yugoslavia*	—	r e296	r179	r475	—	r e222	r178	r400
Belgium*	—	—	320	320	—	—	r310	r310
Total	r15,006	r9,398	r30,577	r54,981	r13,979	r8,952	r30,975	r53,906
Other	r97	r1,157	r3,237	r4,490	r73	r1,046	r3,128	r4,247
Grand total[6]	r15,102	r10,555	r33,814	r59,471	r14,052	r9,998	r34,103	r58,154

Country	1991*				Average, 1987-91			
	Native	From pyrites	Byproducts	Total	Native	From pyrites	Byproducts	Total
United States[2]	e2,869	W	e7,947	r10,816	3,372	—	7,679	11,050
U.S.S.R.* [3]	2,700	1,700	3,700	8,100	3,230	2,010	4,268	9,508
Canada*	—	—	7,100	7,100	—	—	6,835	6,835
China*	320	4,500	650	5,470	308	4,154	590	5,052
Poland* [3]	e4,650	—	170	4,820	e4,828	—	191	5,019
Japan	—	54	2,700	2,754	—	64	2,486	2,550
Germany* [5]	—	—	1,990	1,990	—	—	2,077	2,077
Mexico* [2]	1,100	—	880	1,980	1,501	—	823	2,324
Saudi Arabia	—	—	1,450	1,450	—	—	1,424	1,424
France*	—	—	1,199	1,199	—	—	1,146	1,146
Spain*	—	800	110	910	—	901	139	1,040
Iran*	—	—	700	700	—	—	474	474
Romania*	—	300	350	650	—	334	361	695
Finland*	—	369	267	636	—	332	267	600
Italy*	—	285	315	600	—	304	297	601
South Africa, Republic of	—	e293	224	3517	—	451	223	675
Iraq* [2]	400	—	30	430	765	—	225	990
Chile	20	—	400	420	28	—	390	418
Sweden*	—	225	160	385	—	238	168	406
Yugoslavia*	—	200	162	362	—	246	174	420
Belgium*	—	—	300	300	—	—	308	308
Total	12,059	8,726	30,804	51,589	14,031	9,034	30,547	53,611
Other	77	1,071	2,855	4,003	92	1,125	3,032	4,249
Grand total[6]	12,136	9,796	33,660	55,592	14,122	10,159	33,579	57,860

*Estimated. rRevised. W Withheld to avoid disclosing company proprietary data; included with "byproduct."

[1]Includes all recorded production of sulfur, regardless of the form in which it is recovered. Thus, it includes elemental sulfur, whether mined by conventional methods or by the Frasch process, as well as (1) elemental sulfur and the S content of compounds such as H_2S, SO_2 and H_2SO_4 recovered as a principal product of pyrite mining and as a byproduct of the recovery of crude oil and natural gas and as a byproduct of petroleum refining, coal treatment, and metal smelting and/or refining, and (2) sulfur recovered from tar sands, spent oxides, and other miscellaneous sources. Table includes data available through June 8, 1992.

[2]Native is entirely native Frasch process sulfur.

[3]Native includes Frasch process sulfur as follows, in thousand metric tons: Poland (estimated): 1987—4,410; 1988—4,411; 1989—4,276 (revised); 1990—4,027; 1991—4,100. The U.S.S.R. (estimated): 1987—1,100; 1988—1,100; 1989—1,100; 1990—1,000; 1991—900. World: 1987—11,230 (revised); 1988—11,277 (revised); 1989—11,757 (revised); 1990—11,000 (revised); 1991—9,375.

[4]Reported figure.

[5]Includes both Eastern and Western States.

[6]Data may not add to totals shown because of independent rounding.

TABLE 46

LEADING WORLD PRODUCERS OF COAL (ALL GRADES)[1]

(Million metric tons)

Country	1987			1988		
	Lignite and brown	Bituminous and anthracite	Total	Lignite and brown	Bituminous and anthracite	Total
China[2]	NA	r920	r920	NA	r945	r945
United States	71	762	833	77	785	862
U.S.S.R.	164	595	759	172	599	771
Germany	418	76	494	419	73	492
Australia	44	179	223	43	177	220
India	8	177	185	13	189	202
Poland	73	193	266	74	193	267
South Africa, Republic of	—	177	177	—	181	181
Czechoslovakia	102	26	128	100	26	126
United Kingdom	(3)	r104	r104	(3)	104	104
North Korea[e]	e15	55	70	e18	62	80
Canada	10	51	61	12	58	r70
Yugoslavia	71	(3)	72	72	(3)	73
Greece	r43	—	r43	48	—	48
Turkey	46	8	54	39	7	46
Spain	16	19	35	r13	19	r32
Romania	r42	r9	r51	r50	r9	r59
Bulgaria	r37	(3)	r37	r34	(3)	r34
Colombia	—	15	15	—	15	15
Hungary	21	2	23	19	2	21
Total	r1,182	r3,368	r4,550	r1,202	r3,444	r4,646
Other	23	103	r126	23	r102	r125
Grand total[5]	r1,204	r3,471	r4,675	r1,225	r3,546	r4,771

Country	1989			1990		
	Lignite and brown	Bituminous and anthracite	Total	Lignite and brown	Bituminous and anthracite	Total
China[2]	NA	1,040	1,040	NA	1,053	1,053
United States	78	811	889	r80	r854	r934
U.S.S.R.	164	577	741	r160	e543	r e703
Germany	411	71	482	388	70	458
Australia	48	190	238	48	r199	r247
India	13	199	212	14	r213	r227
Poland	72	178	250	68	148	r216
South Africa, Republic of	—	176	176	—	175	175
Czechoslovakia	94	25	119	r85	22	r107
United Kingdom	(3)	r103	r103	(3)	r96	r96
North Korea	e20	65	85	e22	68	90
Canada	11	60	71	9	59	68
Yugoslavia	70	(3)	71	76	(3)	76
Greece	r52	—	r52	r52	—	r52
Turkey	r53	r6	59	r48	6	r54
Spain	17	19	36	16	19	35
Romania	5	8	61	34	4	38
Bulgaria	34	(3)	34	32	(3)	32
Colombia	—	19	19	—	e20	e20

See footnotes at end of table.

TABLE 46—Continued

LEADING WORLD PRODUCERS OF COAL (ALL GRADES)[1]

(Million metric tons)

Country	1989			1990		
	Lignite and brown	Bituminous and anthracite	Total	Lignite and brown	Bituminous and anthracite	Total
Hungary	18	2	20	16	2	18
Total	r1,208	r3,551	r4,759	r1,146	r3,552	r4,699
Other	r24	r99	r123	r27	r92	r119
Grand total[5]	r1,233	r3,649	r4,882	r1,174	r3,644	r4,818

Country	1991e			Average, 1987-91		
	Lignite and brown	Bituminous and anthracite	Total	Lignite and brown	Bituminous and anthracite	Total
China[2]	NA	4,090	4,090	—	1,010	1,010
United States	78	825	903	77	807	884
U.S.S.R.	180	449	629	168	553	721
Germany	4279	466	4345	383	72	455
Australia	450	4207	4257	47	190	237
India	415	4225	4240	13	201	214
Poland	469	4140	4209	71	170	241
South Africa, Republic of	—	4178	4178	—	177	177
Czechoslovakia	483	419	4102	93	24	117
United Kingdom	(3)	96	96	(3)	101	101
North Korea	420	70	90	19	e64	e83
Canada	49	462	471	10	58	68
Yugoslavia	469	(3)	469	72	(3)	72
Greece	52	—	52	49	—	49
Turkey	446	46	452	46	6	52
Spain	21	18	39	17	19	36
Romania	433	45	438	42	7	49
Bulgaria	428	(3)	428	33	(3)	33
Colombia	—	20	20	—	18	18
Hungary	415	42	417	18	2	20
Total	1,047	3,479	4,527	1,157	3,479	4,636
Other	28	92	120	25	98	123
Grand total[5]	1,075	3,572	4,647	1,182	3,576	4,759

eEstimated. NA Not available.

rTable includes data available through Mar. 1, 1993.

[2]Output of lignite and brown, if any, is included with the figures for bituminous coal production.

[3]Less than 1/2 unit.

[4]Reported figure.

[5]Data may not add to totals shown due to independent rounding.

TABLE 47

LEADING WORLD PRODUCERS OF MARKETED NATURAL GAS[1]

(Billion cubic meters)

Country	1987	1988	1989	1990	1991e	Average, 1987-91
U.S.S.R.	727	r770	r796	r815	2810	784
United States	471	484	490	503	506	491
Canada	80	r88	r93	99	2105	93
Netherlands	74	66	r72	72	73	71
Algeria	43	r45	48	r49	56	48
United Kingdom	44	42	41	50	55	46
Indonesia	37	39	r40	r43	46	41
Mexico	34	35	30	34	234	33
Saudi Arabia	27	29	30	31	232	30
Iran	16	20	22	24	225	21
United Arab Emirates	19	19	r23	r24	225	22
Venezuela	r13	re13	re14	r16	225	16
Norway	30	30	29	25	24	28
Romania	r30	r29	r30	r21	223	27
Australia	15	15	18	21	222	18
Germany	29	27	25	23	220	25
Argentina	15	18	19	18	218	18
Italy	16	17	17	17	18	17
Malaysia	13	13	14	14	16	14
China	r12	r13	r13	r13	213	13
Pakistane	r11	r12	r12	r12	13	12
Egypt	7	8	9	9	9	8
Brunei	9	8	8	9	28	8
India	r6	r7	r7	re7	8	7
Thailand	5	6	6	7	28	6
Total	r1,783	r1,853	r1,906	r1,956	1,992	1,898
Other	r92	r92	r94	r88	82	89
Grand total	r1,875	r1,945	r2,000	r2,044	2,074	1,987

eEstimated. rRevised.

[1]This 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 Mar. 1, 1993.

[2]Reported figure.

TABLE 48
LEADING WORLD PRODUCERS OF NATURAL GAS PLANT LIQUIDS[1]

(Million 42-gallon barrels)

Country	1987	1988	1989	1990	1991e	Average, 1987-91
United States	r582	r595	r564	r569	606	583
U.S.S.R.e	288	249	263	251	250	260
Saudi Arabia	126	149	154	195	2196	164
Mexico	123	133	139	156	2165	143
Canada	r130	139	r151	r151	2158	146
United Arab Emirates	53	47	r47	r58	60	53
Algeria	46	55	56	r56	57	54
United Kingdom	r59	58	51	r39	48	51
Total	r1,407	r1,425	r1,425	r1,475	1,540	1,454
Other	r226	r247	r266	r256	241	255
Grand total	r1,633	r1,672	r1,691	r1,731	1,781	1,709

eEstimated. rRevised.
[1]Table includes data available through Mar. 1, 1993.
[2]Reported figure.

TABLE 49
LEADING WORLD PRODUCERS OF CRUDE OIL[1]

(Million 42-gallon barrels)

Country	1987	1988	1989	1990	1991e	Average, 1987-91
U.S.S.R.	r4,590	r4,590	r4,460	4,190	23,785	4,323
Saudi Arabia	r1,536	r1,890	r1,848	r2,354	22,985	2,123
United States	3,047	r2,979	r2,779	r2,685	2,707	2,839
Iran	839	r825	r1,026	r1,127	21,217	1,007
China	978	999	1,004	1,008	21,015	1,001
Mexico	r930	919	920	932	2978	936
United Arab Emirates	r562	r571	r715	r773	2890	702
Venezuela	664	r691	r696	r770	2872	739
Norway	r373	r424	r567	r622	692	536
Nigeria	r487	r569	626	r660	2690	606
United Kingdom	878	r817	r658	r664	666	737
Indonesia	479	492	514	534	2581	520
Canada	r560	r584	r584	567	2563	572
Libya	r368	r374	412	r502	2541	439
Total	r16,291	r16,724	r16,809	r17,388	18,182	17,079
Other	r4,518	r4,954	r5,254	r5,232	3,763	4,744
Grand total	r20,809	r21,678	r22,063	r22,620	21,945	21,823

eEstimated. rRevised.
[1]Table includes data available through Mar. 1, 1993.
[2]Reported figure.

TABLE 50

LEADING WORLD PRODUCERS OF REFINED OIL[1]

(Million 42-gallon barrels)

Country	1987	1988	1989	1990	1991[e]	Average, 1987-91
United States	r5,506	r5,639	r5,729	r5,765	5,560	5,640
U.S.S.R.	3,255	3,160	3,000	2,790	[2]2,535	2,948
Japan	1,237	r1,274	1,340	1,474	[2]1,562	1,377
China	710	725	725	730	[2]800	738
Germany	r732	r776	r743	r765	[2]761	755
United Kingdom	625	r668	r663	r674	697	662
Italy	656	670	r671	r689	679	673
Canada	641	645	639	r637	[2]618	636
Mexico	520	522	540	r572	[2]582	547
France	r557	r532	r542	r567	[2]561	552
Netherlands	436	r473	r471	r447	448	455
Saudi Arabia	502	r526	r488	r446	[2]425	477
Spain	398	405	400	419	418	408
Brazil	457	450	461	r439	[2]410	443
Venezuela	364	r365	r353	r388	[2]390	372
Korea, Republic of	188	209	257	269	[2]353	255
India	r345	r347	r e350	r e345	345	346
Singapore	254	246	r258	r299	300	271
Total	r17,383	r17,632	r17,630	r17,715	17,444	17,557
Other	r4,616	r4,935	r5,207	r5,092	4,801	4,930
Grand total	r21,999	r22,567	r22,837	r22,807	22,245	22,487

[e]Estimated. [r]Revised.

[1]Table includes data available through Mar. 3, 1993.

[2]Reported figure.