COPPER

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In 1998, mine production of recoverable copper in the United States reversed its decade-long upward trend, declining by about 80,000 metric tons to the lowest level since 1995. Mine cutbacks and closures were attributed to low copper prices. Lower production in combination with significantly lower average copper prices resulted in the estimated value of domestic mine production falling by almost 30%. Although the United States maintained its position as the world's second largest mine producer of copper, accounting for about 15% of world production, its share of global production continued to decline from its 19% share in 1994. Chile, where mine production increased by about 9% in 1998 and 85% since 1993, was the largest mine producer, increasing its share to 30% of world production. The United States retained its position as the largest producer and consumer of refined copper, accounting for 18% and 21% of world production and consumption, respectively. Domestic production and consumption of refined copper in 1998 rose by about 1% and 3%, respectively, both reaching record-high levels. The U.S. import dependence for refined copper, measured as a percentage of refined copper consumption, was essentially unchanged at 13%.

Of the 38 mines operating in 9 States that produced reportable quantities of copper, the top 15 accounted for 98% of production. The remaining 23 mines were either small leach operations or byproduct producers of copper. The principal mining States, in descending order, Arizona, Utah, New Mexico, Nevada, and Montana accounted for 99.6% of production. Mine capacity of 2.07 million tons was essentially unchanged from that of 1997, though capacity utilization fell from 93% to 90%, the lowest level since 1995.

During the year, 7 primary and 3 secondary smelters, 8 electrolytic and 4 fire refineries, and 16 electrowinning plants operated in the United States. By yearend, one mine and one secondary smelter and associated electrolytic refinery had closed, and closure of a primary smelter in the first quarter of 1999 had been announced. Startup plans for several electrowinning facilities were deferred.

Electrowon production continued its 5-year growth trend, increasing by about 22,000 tons, or 4%, and accounted for 33% and 28% of domestic mine and refinery production, respectively. The conversion of old scrap to alloys and refined copper, which declined by 30,000 tons, or 6%, from the high level of 1997, contributed 463,000 tons of copper to the market and accounted for 15% of apparent industrial demand. Lower copper prices and closure of a secondary copper smelter during the year led to lower scrap recovery.

Copper was consumed as refined copper and as direct melt scrap at about 35 brass mills, 17 wire-rod mills, and 600 foundries, chemical plants, and miscellaneous operations. According to data compiled by the Copper Development Association Inc. (1999, p.18), mill and foundry product shipments to the U.S. market, including net imports of mill products, rose to a record high level of 3.92 million tons, an increase of 2% from the revised 1997 figure.

The net import reliance for refined copper, as a percentage of apparent consumption, remained unchanged at about 13%. Canada was the largest U.S. trading partner for unwrought copper, accounting for 39% and 35%, respectively, of refined copper imports and total imports of unwrought copper, and 19% and 40%, respectively, of refined exports and total unwrought copper exports.

Copper was mined in about 50 countries, of which the top 2, Chile and the United States, accounted for 46%, and the top 10 for about 82% of the world total. The world reserves and reserve base for copper were estimated to be 340 million tons and 650 million tons, respectively. The United States had about 13% each of reserves and reserve base.

According to data compiled by the International Copper Study Group (ICSG) (1999, p. 20), world copper inventories during the first half of 1998 declined slightly from the high level of 1.01 million tons established at yearend 1997. Beginning in July, inventories resumed their upward trend and had risen to 1.35 million tons by yearend, the highest level since 1984. Most of the increase went into London Metal Exchange (LME) warehouses in the United States where inventories rose from 129,000 tons at yearend 1997 to 341,000 tons at yearend 1998. Copper prices reacted to the world trend in inventories, rising slightly during the first half of the year from the low levels at yearend 1997 before falling sharply at yearend 1998. The LME spot price averaged only $0.66 per pound in December, the lowest monthly average since 1987.

Legislation and Government Programs

In April 1998, the U.S. Environmental Protection Agency (EPA) proposed national emission standards for hazardous air pollutants (NESHAP's) for new and existing primary copper smelters. The hazardous pollutants emitted in greatest quantities from copper smelters are arsenic and lead, although other toxic elements, including antimony, beryllium, cadmium, chromium, cobalt, manganese, and nickel, have been identified as frequently being present in copper ores. The proposed rule does not set specific limits on individual toxic components, but seeks to reduce fugitive gaseous and particulate emissions and, therefore, to reduce the overall emissions of toxic elements. The proposed NESHAP would require use of air emission

controls to reduce emissions from the six primary flash smelting furnaces that are integrated with batch copper converters. The EPA estimated that hazardous air pollutant releases would be reduced by approximately 20%, or 34 tons per year, through the application of "maximum achievable control technology" to five identified point sources. The sources are batch copper converters, copper concentrate dryers, flash smelting furnaces, fugitive dust sources associated with concentrate storage and handling, fugitive dust sources associated with other materials containing hazardous substances, and slag cleaning vessels. The EPA estimated the total capital investment cost to install the required equipment to be $6 million, and the annualized cost to be $2.2 million per year, or 0.07% of 1996 sales revenue. This standard would supplement emissions standards promulgated under two previous Clean Air Act rulemakings for primary copper smelters (U.S. Environmental Protection Agency, 1998b).

In August, the EPA sought public comment on proposed revisions to the National Primary Drinking Water Regulations for copper and lead. The proposed revisions would modify compliance determination for water systems subject to monitoring for compliance with corrosion control parameters. The changes would increase flexibility and reduce disincentives to monitor quality parameters more frequently than required under the existing copper and lead regulations. Under existing guidelines, promulgated in 1991 to minimize copper and lead levels at the consumers tap, more frequent monitoring puts water systems at greater risk of noncompliance (U.S. Environmental Protection Agency, 1998a).

The U.S. Mint began issuing the first of five State commemorative coins in January 1999. According to the "50 States Commemorative Coin Program Act," signed into law in December of 1997, the Mint was authorized to issue circulating commemorative 25-cent coins honoring each of the 50 States. Each year, five State coins are to be issued. The metallic makeup (91.7% copper and 8.3% nickel), size, and shape will be consistent with the current quarters. According to an industry study, collector demand for the complete set of coins could require the minting of an additional 3 billion commemorative quarters above the baseline economic demand for quarters and would increase Mint demand for copper (Platt's Metals Week, 1998d).

Production

Although mine capacity remained essentially unchanged at about 2.1 million tons in 1998, production fell by about 80,000 tons, or 4%, owing to closures and cutbacks attributed to low copper prices. Capacity utilization fell to 90%, the lowest level since 1995. Significant cutbacks included the curtailment of sulfide production at BHP Copper Inc.'s Pinto Valley Mine and a reduction in mill throughput at Cyprus Amax Minerals Company's Bagdad and Sierrita Mines. Primary smelter production rose by about 3.5% owing to improved capacity utilization at Kennecott Utah Copper Corp.'s smelter, which had experienced protracted technical difficulties since startup in 1995. Maintenance closures at most of the other smelters during the year, however, limited the increase in production. Curtailment of domestic concentrate production and expansion of smelter capacity created a shortfall in domestic concentrate supply. Secondary smelter production declined by about 18%, reflecting the impact of low prices on scrap availability and processing margins. By yearend, only two secondary smelters remained in operation.

Refined production in 1998 rose by about 28,000 tons, or 1%, as an increase in primary production overshadowed lower secondary refined production. Production of refined copper from foreign-sourced concentrate helped to maintain production despite lower domestic mine production.

Company Reviews.—ASARCO Incorporated's copper mine production, including its share of Southern Peru Copper Corp.'s production, rose by 34,000 tons, or 5%, to 465,000 tons. In Arizona, a full year of production from the Silver Bell Mine solvent extraction-electrowinning (SX-EW) operation begun in July 1997, and the introduction of a new acid cure process at the Ray Mine SX-EW operation boosted electrowon production by 40%, or 15,700 tons. The Ray acid cure process uses higher acid concentrations and a shorter leach cycle and produces a higher copper recovery than conventional leaching. A tankhouse expansion was expected to boost annual production by more than 5,000 tons beginning in mid-1999. New loading and hauling equipment, including an overland conveying system designed to handle 53 million tons per year of waste rock, helped reduce costs at the Mission Complex in Arizona and nominally boosted production to 116,000 tons. New drilling, loading and hauling equipment at the Ray Mine, installed late in 1997, helped boost sulfide production by 6,000 tons to 111,000 tons, and new crushing equipment at Asarco's 49.9% owned Continental Mine in Montana boosted production by about 4,000 tons, to 45,000 tons (ASARCO Incorporated, 1999, p. 6-9).

In September, Asarco announced that it had completed the sale of its Missouri Lead Division to the Doe Run Company, including the Sweetwater and the West Fork Mines, both of which were small byproduct producers of copper (ASARCO Incorporated, 1998a).

In early June, Asarco announced that it was cutting refined copper output at its Amarillo refinery in Texas by 15%, or 5,400 tons per month, owing to a shortage of blister and anode feed. According to industry reports, Asarco's feed shortage was the result of several factors, including reduced production at Chemetco Inc.'s secondary smelter in East Alton, IL, which ships its entire production to Asarco; rail delays in the southwest that stranded anode shipments en route to Amarillo; and a scheduled maintenance shutdown at its Hayden, AZ, smelter that reduced output in March and April (Platt's Metals Week, 1998a).

On November 30, Asarco announced its intention to suspend operations at its El Paso smelter for a period of 3 years, beginning on about February 1, 1999. Asarco attributed the shutdown to a shortage of concentrates. The company expected that the same market conditions would allow them to sell surplus concentrates for a better overall return. The shutdown was expected to reduce refinery production at Amarillo by an additional 63,000 tons per month for a combined overall reduction of 30% (ASARCO Incorporated, 1998b).

Phelps Dodge Corp. (1999, p. 1-11) reported a record-high mine production of 792,000 tons, exclusive of minority participant shares, an increase of 8%, compared with the previous year, owing to a 38% growth in output from its Candelaria Mine in Chile and purchase of the Continental Mines in New Mexico. Total production from its domestic operations, including the largest U.S. Copper mine, was unchanged at 383,000 tons. At the Morenci Mine in Arizona, Continental's lower mill throughput and lower ore grades (0.68% copper) resulted in concentrate production falling by 9%, or 21,000 tons, to 224,000 tons. Electrowon production was essentially unchanged at 250,000 tons. Previously announced plans to develop its Ajo, AZ, reserves were deferred indefinitely.

On February 3, Phelps Dodge acquired the assets of Cobre Mining Co. for $109 million, including the two Continental underground mines and open pit and 11,000 acres of land adjacent to their Chino, NM, operations. On October 21, Phelps Dodge announced that it would close its Continental Mines, close its Ojos del Salado Mine in Chile, and curtail production at its Chino Mine. These changes will reduce Phelps Dodge's production by about 91,000 tons of copper per year. At Chino, which had previously announced a 3-year cutback in leach production, annual production would be further reduced by 32,000 tons, beginning in January 1999, and approximately 300 jobs are expected to be eliminated. Phelps Dodge indicated the potential to completely shutter the mine if market conditions deteriorated further and also cited difficult ore conditions and the lack of a labor agreement as compounding factors. At the 32,000-ton-per-year Continental Mine, underground operations ceased immediately, with the entire operation scheduled to close in the first half of 1999. Approximately 200 jobs were to be eliminated. The 19,000-ton-per-year Ojos del Salado Mine in Chile was closed immediately (Phelps Dodge Corp., 1998b).

Production from Cyprus Amax's domestic mines declined by 28,000 tons, or 10%, to 278,000 tons. The company announced in January that it would curtail 27,000 tons of its higher cost production at its Bagdad and Sierrita Mines in Arizona. At Bagdad, a satellite crushing plant, installed in 1993 to eliminate a choke-point in the semi-autogenous milling circuit, was closed. Combined production from the two facilities fell by 23,000 tons to 200,000 tons in 1998. Cyprus Amax reported unit cash cost savings of 7% and 17% at Bagdad and Sierrita, respectively, and an average cash operating cost for all its copper operations, including its El Abra and Cerro Verde mines in Chile, of $0.56 per pound, down by 20% over a 2-year period. At its Tohono, AZ, operation, mining of leach ore ceased in July 1997, but leaching from existing pads continued through February 1999. Production in 1998 fell to 3,600 tons, down from 12,200 in 1997. Electrowon production at its Miami, AZ, leach operation rose to a record-high 74,000 tons, up by about 4,000 tons from the 1997 record-high level. The Miami refinery and rod mill achieved record production of 172,000 tons and 139,000 tons, respectively (Cyprus Amax Minerals Company, 1999a, p. 6-9; 1999b, p. 3-6).

Mine production at Kennecott's Bingham Canyon Mine in Utah declined by about 2% to 298,000 tons owing to increased ore hardness and equipment failures during April and May. Refinery production rose by 123,000 tons, or 106%, to 239,000 tons owing to improved smelter performance. The smelter, which was commissioned in 1995, had been plagued by numerous technical problems. Although the smelter continued to experience operating problems earlier in the year, by yearend the smelter was performing at or above its design capacity of 281,000 tons per year of copper. A $510 million expansion of the tailings facilities, begun in March 1996, was nearing completion and was expected to begin operation in 1999. Following completion of feasibility studies on large-scale underground mining below the ultimate open pit, Kennecott added 290 million tons of ore grading 0.8% copper to its reserves. Underground mining was expected to increase mine life by 15 years beyond the anticipated exhaustion of open pit reserves in 2015. Total Bingham Canyon reserves were estimated to be almost 1.2 billion tons grading an average 0.6% copper (Rio Tinto, 1999, p. 30-31).

At the end of February, BHP announced that it would curtail copper sulfide operations at its Pinto Valley Mine in Arizona and eventually lay off 447 of its 598 employees. In 1997, Pinto Valley produced 68,000 tons of copper in concentrate and 18,000 tons of electrowon copper cathode. Leaching operations were expected to continue at an annual rate of 16,000 tons and limited stripping operations in preparation for eventual reopening continued until October. At the Miami Unit, in situ leaching of rubble above the closed underground mine and hydraulic mining/leaching of concentrator tailings continued. At its Robinson Mine, located west of Ely, NV, production from open pit operations continued (Mining Engineering, 1998b).

In January, Exxon Minerals Company sold its 50% share in the Crandon, WI, mining project to its project partner Rio Algom Ltd. of Canada for $17.5 million. Shortly thereafter, Rio Algom renamed the operating company Nicolet Mineral Company. Regulatory review of the proposed project continued throughout 1998, and in December, addressing public concerns, Nicolet announced significant improvements to its mine design. To reduce tailings acid runoff, pyrite will be removed from the tailings and disposed of in a cement matrix underground. To reduce drawdown of local ground water, the company will install a grout curtain above the mine site, which is anticipated to reduce inflow by 50%. Reduced water volumes will then allow the company to treat mine wastewater more economically prior to discharge to a drain field. At full capacity, it is anticipated that the Crandon Mine will process about 2 million tons per year of ore and produce between 200,000 and 300,000 tons of zinc concentrate and 20,000 tons of a copper-lead concentrate (Nicolet Minerals Company, 1998).

In September, the U.S. Department of the Interior, Interior Board of Land Appeals (IBLA) issued a ruling that allowed Summo Minerals Corp. to proceed with the development of its Lisbon Valley Copper Project. Summo anticipated producing 18,000 tons per year of electrowon copper from three deposits located in San Juan County, UT. A request to IBLA to reconsider its ruling was subsequently denied (Summo Minerals Corp., 1999).

Arimetco International Inc. continued to operate the Johnson Camp Mine in Arizona and the Yerington Mine in Nevada

under the auspices of the Arizona Bankruptcy Court. Arimetco had originally filed for reorganization under Chapter 11 of the U.S. Federal Bankruptcy Code at the end of 1996. In July, Summo announced that it had signed a letter of intent with Arimetco for the purchase of its Johnson Camp Mine, subject to due diligence review and approval of the bankruptcy court, for $1.85 million and a $0.02 per pound of copper royalty payment at copper prices at or above $1.05 per pound with a $1 million cap on royalties. Summo would assume other costs totaling about $2 million at acquisition. Though mining at Johnson Camp was suspended in May 1997, production continued from inventory in the heap leach. Summo's intent upon acquisition was to restart mining and increase production to the full capacity of 6,350 tons per year of electrowon cathode (Summo Minerals Corp., 1998). At yearend, the proposed purchase was still pending. Arimetco continued to mine and leach ore at its Yerington Mine.

Trade

Net imports of refined copper rose sharply for the third consecutive year to 597,000 tons compared with 539,000 in 1997 and 374,000 tons in 1996. General imports of refined copper of 725,000 tons were 42,000 tons greater than imports for consumption, reflecting about one-half of the 90,000-ton rise in inventories held in LME warehouses in New Haven and New Orleans. General imports and imports for consumption were essentially equal in 1997. Owing to the closure of the Flambeau Mine in Wisconsin in 1997, which exported concentrates to Canada, greater capacity utilization at Kennecott's Utah smelter, and cutbacks in domestic concentrate production, the United States went from being a net exporter of concentrates (83,000 tons) in 1997, to a net importer (180,000 tons) in 1998. As a result of increased refined imports and the shift in concentrate trade, net imports of all unwrought copper products rose to 775,000 tons, compared with 370,000 tons in 1997. Although the volume in trade of copper scrap fell significantly in 1998, net exports of scrap of about 142,000 tons gross weight were down by only about 25,000 tons.

According to Bureau of the Census data compiled by the Copper and Brass Fabricators Council (1999, p. 1-17), U.S. net imports of all copper and copper-alloy semifabricated products, excluding wire rod and mill products, declined to 86,000 tons in 1998 from 100,000 tons in 1997. Canada and Mexico, the largest U.S. trading partners, together accounted for 73% of semifabricated copper exports and 30% of imports. Imports of bare wire, including wire rod, rose to 114,000 tons in 1998 from 57,000 tons in 1997 owing to increased imports from Canada and Mexico, which together accounted for 97% of imports. Shipments from a new wire rod mill in Mexico caused exports to the United States to jump to 42,000 tons in 1998 from 278 tons in 1997.

Prices and Stocks

In response to a growing oversupply of copper and rising inventories, copper prices continued their downward trend begun at midyear 1997. In February, the U.S. producer price averaged only $0.79 per pound, down from $1.20 the previous June. Prices rallied slightly in March and April before resuming their downward trend. Although total domestic inventories of refined copper remained at the same high level during the March-to-May period, there was a large inventory shift out of COMEX (COMEX Division of the New York Mercantile Exchange) warehouses and into LME warehouses in California in May. At the end of May, 68% of total LME worldwide inventories were held in U.S. warehouses. This trend continued, and by the end of July, domestic LME inventories had risen to 224,000 tons (199,000 tons of which were in California warehouses). The rise was almost a 250% increase from the total in July 1997 and accounted for 86% of global LME inventories. Although inventories accumulated in California, a tight copper supply was reported in U.S. East Coast markets and Europe. Industry attributed the shift in inventories to several factors, including weakness in the Asian market that discouraged exports from the West Coast, disruptions to rail transport and associated higher trucking costs, and incentives offered by LME-registered warehouses to attract metal into their warehouses. Industry expressed concern that outage charges, the cost of removing copper from the warehouses, impeded the withdrawal of copper from California warehouses. According to an LME notice on warehouse outcharges, the California LME-registered warehouses had the highest outcharges of any of the LME warehouses (Platt's Metals Week, 1998c). Industry was also concerned that incentives offered by the warehouse operators, coupled with LME price premiums over COMEX, served to make the LME warehouses a delivery point of first resort, rather than the LME's stated intent of being a destination of last resort. The LME had been criticized for locating warehouses in California, away from the consuming industry, the traditional location of other LME warehouses. An LME spokesman countered that the California warehouses fit with this tradition in that they are a "natural conduit" for copper destined for Asian markets. Several proposals were proffered by industry to prevent the continued accumulation of stocks in California warehouses and to limit the perceived market distortions (Platt's Metals Week, 1998b).

At the beginning of September, the LME acknowledged industry concerns over the buildup of LME inventories in California warehouses in Long Beach and Los Angeles and announced that it would set a maximum copper inventory limit equal to stocks on hand effective December 2, 1998 (Burgert, 1998). Inventories continued to build in the California warehouses, reaching 247,000 tons by the deadline. Total domestic LME inventories rose to 341,000 tons. Copper prices reacted to the upward trend in inventories, and by yearend, the monthly average U.S. producer price had fallen to $0.70 per pound, the lowest level since 1987, and in constant dollar terms, the lowest level since the Great Depression in 1933.

Copper scrap prices followed the generally downward trend in refined copper prices. The low prices squeezed processing margins, and the discount to refined copper narrowed for all scrap types. The average discount to the producer price for refined copper for No.1 and No. 2 scrap fell from $0.073 per pound and $0.216 cents per pound, respectively, in 1997 to

$0.053 cents per pound and $0.149 cents per pound, respectively, in 1998. In December, the average discount for No. 1 scrap fell to $0.045 per pound.

Consumption

Reported consumption of refined copper by domestic manufacturers rose by 3.3%, to almost 2.9 million tons. In addition to refined copper, domestic manufacturers directly consumed (melted or processed into chemicals) 1.3 million tons of copper-base scrap containing about 1 million tons of recoverable copper. An additional 76,000 tons of copper was recovered in the consumption of aluminum-, nickel-, and zinc-base scrap. The total quantity of copper recoverable from the direct consumption of scrap, 1.07 million tons, was unchanged from that of 1997.

Consumption of refined copper at wire rod mills increased by only about 1.5% and accounted for about 75% of domestic consumption of refined copper. Consumption growth at wire-rod mills was moderated by increased imports of wire rod from Mexico that rose to more than 40,000 tons in 1998 from negligible quantities in 1997. Wire mill capacity rose by about 100,000 tons in 1998 as several mills took steps to increase capacity incrementally; at the end of June, Encore Wire Corp. began production at a new wire-rod mill in McKinney, TX. The mill had a design capacity of about 60,000 tons per year of wire rod. Encore Wire also produced commercial, coaxial, thermostat and telecommunication cable at its wire mill at the same location (Encore Wire Corp., About our company, accessed September 25, 1999, at URL http://www.encorewire/index.html). U.S. wire rod capacity increased to 2.3 million tons in 1998 from an estimated 2.13 million tons prior to the closure of several mills in 1995.

At brass mills, which were the second largest consumers of refined copper, consumption of refined copper rose by about 10% owing to low copper prices that reduced the cost of using refined copper and reduced the availability of scrap for processing. Brass mills still remained the largest consumers of scrap, accounting for about 60% of the total copper recoverable from scrap. Copper recovery from scrap at brass mills was essentially unchanged in 1998.

According to data compiled by the Copper Development Association Inc. (1999, p.18), the supply of copper and copper-alloy products to the U.S. market by fabricators (wire mills, brass mills, foundries, and powder producers), including net imports, rose by about 2% to 3.92 million tons, up from the revised value of 3.84 million tons in 1997, and contained an estimated 3.5 million tons of copper. About 71% of these shipments were as pure (unalloyed) copper products. Wire mill products accounted for about 49% of total shipments to the domestic market; brass mill products, 46%; and foundry and powder products, 5%. In building construction, the largest end use sector, shipments rose by 2.7% and accounted for about 41.4% of the market. Building construction included products used for building wire, plumbing and heating, air conditioning and commercial refrigeration, builders hardware, and architectural applications. Other use sectors included electric and electronic products, 26.0% of shipments; industrial machinery, 11.2%; transportation equipment, 12.4%; and consumer and general products, 9.0%. Mill product shipments have risen 25% since 1993. This followed 15 years of a cyclical but generally stagnant market; mill shipments in 1993 were actually about 1% below those in 1978. Since 1978, however, there has been a gradual shift in market distribution, with industrial machinery, transportation, and consumer products losing market share; building construction increased market share from 33% in 1978 to 41% in 1998. The percentage of shipments to electric and electronic products has remained relatively unchanged.

World Review

The global oversupply of copper that developed at midyear 1997, continued into 1998. According to data compiled by the ICSG (1999, p. 7), reported world inventories of refined copper rose by about 340,000 tons to a total of 1,350,000 tons. At the prevailing rate of consumption, yearend world inventories represented a 5.2 week supply of refined copper, up from 2.7 weeks at yearend 1996. Most of the surplus copper accumulated in LME warehouses, where yearend stocks rose to 592,000 tons in 1998 from 338,000 tons in 1997. The oversupply reflected the failure of consumption to keep pace with large increases in global mine and refinery production. According to ICSG data, world consumption of refined copper rose by 405,000 tons, or 3%; world mine production grew by 660,000 tons, or 5.7%; and downstream refinery production by 527,000 tons, or 4%.

Although world consumption, excluding Asia and Oceania, grew by 6.6%, consumption in Asia and Oceania, which together accounted for 38% of 1998 world consumption, declined by more than 2%. The economic crises that beset Asia in 1997 persisted in 1998 (see 1997 Copper Annual Review).

In Japan, the largest regional consumer, Government spending failed to restart the economy, and consumer demand weakened. In 1998, domestic automobile sales fell by 15%; domestic wire and cable shipments, by 9.8%; and housing starts, by 13%. In the Republic of Korea, demand for copper fell by about 15%, despite a large increase in semifabricate exports (CRU International Ltd., 1999, p. 4-7).

In 1998, world mine capacity rose by 770,000 tons, or 6%, to 13.35 million tons, extending the rapid growth trend that began in 1995; capacity was about 25% greater than that of 1994. Chile and Indonesia accounted for most of the capacity expansion, their capacities having grown by 370,000 tons and 260,000 tons, respectively. Capacity also increased significantly in Australia (70,000 tons), Canada (27,000 tons), and Argentina (120,000 tons). World smelter capacity rose by almost 500,000 tons owing to the opening of two new smelters (Indo Gulf Fertilizers and Chemical Corp.'s Biria smelter in India and L.G. Metals Co.'s Onsan II smelter in the Republic of Korea) and incremental expansions at several other smelters (International Copper Study Group, 1998, p. 35-39). World smelter production however, rose by only about 240,000 tons owing to reduced secondary production, and tight supplies of copper concentrate. According to CRU International (1999, p. 40-43), there was an estimated 200,000-ton (contained copper) shortfall in concentrate output that resulted in a drawdown in

inventories and a sharp drop in the combined spot treatment and refining charges to about $0.12 per pound in the fourth quarter. World refinery capacity rose by about 900,000 tons owing to a 280,000-ton expansion of electrowinning capacity, principally in Chile; the opening of new electrolytic refineries in China, India, Korea, and Mexico, totaling about 500,000 tons; and incremental expansions of numerous other electrolytic refineries (International Copper Study Group, 1998, p. 52-71).

Argentina.—The Bajo el Alumbrera Mine, owned by M.I.M. Holdings Ltd. (50%), North Ltd. (25%), and Rio Algom (25%), began production in October 1997. In 1997, the mine processed 45 million tons of ore to produce more than 30,000 tons of copper in concentrate. In 1998, the mine produced 154,000 tons of copper in concentrate, and by yearend, the mine was producing above its projected capacity of 190,000 tons per year of copper. The project, with proven and probable ore reserves of almost 700 million tons, cost more than $1 billion to develop and is projected to have at least a 20-year mine life (Rio Algom Ltd., 1999). A nearby property, Agua Rica, 70% owned by BHP, was reported to have 1.2 billion tons of copper resources. Field activities during the year included drilling into high-grade ore zones and development of two bulk sample adits and test pads for leaching (Mining Engineering, 1998a). Cambior Inc. filed its feasibility study for the El Pachón copper project with Argentina and presented and received approval of its environmental impact study for the infrastructure in Chile. El Pachón is located in Argentina near the border with Chile. Cambior estimated reserves to be 880 million tons grading 0.62% copper. Initial production of 250,000 tons per year of copper in concentrate was anticipated. The capital cost was estimated at $900 million and construction, which would take approximately 42 months, was pending improved copper markets and project financing (Cambior Inc., 1999, p. 26).

Australia.—Expansion of Western Mining Corp.'s Olympic Dam Project was reported to be ahead of schedule, with full commissioning planned for the first quarter of 1999. At capacity, the mine and new Outokumpu smelter are expected to produce 200,000 tons of copper. Western Mining announced that it would seek necessary approvals for the project to expand to 350,000 tons per year by 2008. Its focus on the Olympic Dam expansion led Western Mining to sell its Nifty copper operations in June, 1998, to Straits Resources Ltd. In 1998, Olympic Dam produced 73,600 tons and, prior to sale in July, Nifty produced about 8,000 tons of electrowon copper (Western Mining Corp., WMC at work—Copper, accessed September 28, 1999, at URL http://www.wmc.com.au/waw/copper.htm).

Mount Isa Mines Ltd. announced plans to develop its new Enterprise Mine in ore bodies grading 4% copper that extend from 1,200 to 1,950 meters below the surface. Production was scheduled to begin by early 2000. By yearend development was more than 50% complete. The Mount Isa smelter was shut for 5 weeks in July and August to accommodate the upgrade of the smelter with an ISASMELT furnace, which replaced the older roaster/reverberatory furnace and boosted capacity to 250,000 tons per year. A parallel rise in the Townsville refinery from 210,000 to 255,000 tons was completed. Commercial production of copper and gold began in May at Mount Isa's new Ernest Henry open pit in Queensland. At capacity, the mine was expected to produce 95,000 tons per year of copper in concentrate and 3,730 kilograms of gold (M.I.M. Holdings Ltd., 1998, p. 14-19).

Canada.—Production and capacity rose in 1998, reversing a 2-year downward trend. In British Columbia, which accounted for the mine production increase, Royal Oak Mines Inc. began production from its Kemess gold-copper project (27,000 tons per year of copper in concentrate).

Princeton Mining Corp.'s Huckleberry Mine (37,000 tons of copper in concentrate per year), which began production in September 1997, experienced its first full year of production. At Highland Valley, mill output rose 6% to 166,000 tons. Rio Algom, which owned 33.6% of Highland Valley, reported its operating losses to be $3 million. By yearend, however, several mine closures had been announced. In December, citing low ore grades and low copper prices, Boliden Ltd. closed its Gibraltar Mine, which had produced 33,000 tons of copper in concentrate in 1997. Boliden also temporarily suspended production at its Myra Falls Mine on Vancouver Island to address ground stability issues. Inco Ltd. completed a comprehensive review of mining operations at its Ontario division, closing its Shebandowan and Whistle Mines and, by the end of 1998, had achieved permanent employment reductions of 1,200 employees. In Newfoundland, the Voisey's Bay nickel-copper-cobalt project, which was initially slated to generate 90,000 tons per year of copper, was undergoing regulatory and provincial review. An Environmental Assessment Panel in Labrador recommended that the project be authorized subject to negotiation of agreements among the Governments of Labrador and Newfoundland, Voisey's Bay Nickel Company, and Aboriginal groups (Bokovay, 1999)

Chile.—Mine production and capacity continued to escalate, rising by about 295,000 tons and 375,000 tons, respectively (International Copper Study Group, 1998, p. 9). Production by State-owned Corporación Nacional del Cobre de Chile (CODELCO), the world's largest copper producer, rose from 1.36 million tons to 1.50 million tons, including its share of El Abra Mine. At the Andina Mine, expansion to 250,000 tons per year of copper in concentrate from 170,000 tons per year was completed in November, and production rose from 145,000 to 164,000 tons. Construction was completed in January and production began in March at CODELCO's newest division, Radomiro Tomic. Constructed over a 23-month period at a cost of $683 million, the project is expected to produce 180,000 tons per year of electrowon copper. Production in 1998 was 162,000 tons from treatment of 38.3 million tons of ore grading 0.71% copper at a cash operating cost of $0.367 per pound. CODELCO estimated cash costs from all its divisions to have averaged $0.447 per pound (Corporación Nacional del Cobre de Chile, 1999, p. 6 and 19-40).

At the Escondida Mine, which became the world's largest copper mine following the completion of a $560 million Phase 3 expansion in 1996, production declined to about 850,000 tons of copper in concentrate, or about 8%, owing to reduced ore grades. In late 1998, a $282 million well field project to increase water supply was completed, allowing mill throughput to be raised from 105,000 tons to 127,000 tons per day, offsetting the lower ore grades. Startup of a $473 million

processing facility to treat oxide ore from the main pit began in November and was expected to reach design capacity of 125,000 tons per year in early 1999. The concentrate ammonia leach plant was closed early in the year as a result of technical difficulties. At yearend, the phase 4 expansion to increase mill capacity by 90,000 tons per day was under consideration (Rio Tinto, 1999, p. 32).

At El Abra, 51% owned by Cyprus Amax, SX-EW production rose by about 3% to 200,000 tons and leach reserves rose to 447 million tons (Cyprus Amax Minerals Company, 1999b, p. 5).

Completion of facility expansion at the end of 1997 allowed Phelps Dodge to boost production at the Candelaria Mine to 215,000 tons, an increase of 48%. In October, operations were suspended indefinitely at Phelps Dodge's 19,000-ton-per-year Ojos del Salado Mine (Phelps Dodge Corp., 1999, p. 2). Construction of the Collahuasi Mine (Falconbridge Ltd., 44%; Minorco S.A., 44%; Japanese consortium, 12%) and infrastructure was completed and commercial production begun in January 1999. Annual production is expected to rise to 350,000 tons of copper in concentrate and 50,000 tons of electrowon cathode. Development costs for the project were estimated to be $1.8 billion (Falconbridge Ltd., Collahuasi at a glance, accessed August 8, 1998, at URL: http:// www. Falconbridge.com/bus/coll.htm).

Congo (Kinshasa).—The Canadian-based Tenke Mining Company announced that it had reached an agreement with BHP Copper whereby BHP acquired the option to participate in the development of the Tenke Fungurume copper-cobalt project in exchange for funding certain predevelopment expenses. Although the option remained in force, Tenke Mining subsequently declared a *force majeure* on its agreement with the Congo to develop the project owing to the Congo's continuing military turmoil and political instability (Tenke Mining Company, 1998).

In October, Iscor Ltd. of South Africa announced that the Government of the Democratic Republic of the Congo had ratified an agreement signed in February between Iscor and state-owned La Générale des Carrièreset des Mines for the rehabilitation of the Kamato copper-cobalt mine. Reserves at Kamato were estimated to be 50 million tons grading 4.5% copper and 0.5% cobalt. Iscor planned to increase annual production to 2 million tons of ore yielding 70,000 tons of copper within 4 years (Iscor Ltd., 1998).

Indonesia.— In 1998, P.T. Freeport Indonesia Co.'s Grasberg Mine in Irian Jaya achieved record production of about 771,000 tons, a 40% increase of about 217,000 tons. Early in the year, Freeport completed a fourth concentrator expansion that allowed it to increase average daily mill throughput to 128,600 tons, up from 96,400 tons in 1997. Mill throughput was expected to increase by about 15% in 1999. The expansion included a 38-foot semiautogenous mill, four 24-foot ball mills, and related flotation circuits. Freeport estimated 1998 cash operating costs, including credits from its 2.8 million ounces of coproduct gold, to be $0.12 per pound of copper. In 1996, Freeport formed an exploration and development joint venture with Rio Tinto, sharing in the incremental cash flow attributable to the fourth expansion, beginning in 1998. At yearend, reserves were estimated to contain more than 23 million tons of recoverable copper, up from 21 million tons in 1997. Construction was completed on the copper smelter/refinery complex in Gresik, Indonesia (Freeport, 25%, and Mitsubishi Metals Corp., 75%.) during the third quarter and the first cathode was plated in December. Production was expected to rise to the design capacity of 200,000 tons over the following 2 years. Freeport completed a "debottlenecking" of its Atlantic smelter-refinery in Spain in 1997, which enabled it to produce 291,000 tons of copper, twice its capacity when purchased in 1993 (Freeport-McMoRan Copper & Gold Inc., 1999, p. 2-3, 19-23, and 50).

Peru.—Production from Southern Peru Copper Corp. mines declined by 2.8% to 302,000 tons as increased production from the Toquepala SX-EW plant was more than offset by lower copper grades and production disruptions associated with commissioning of the new expanded mill at the Cuajone Mine. The expanded mill, which started up late in the year, was expected to boost production at Cuajone to 202,000 tons in 1999 from 143,000 tons in 1998. At Toquepala, SX-EW production of 47,000 tons was expected to rise to 56,000 tons following completion of an expansion in 1999. Modernization of the Ilo smelter, which will boost capacity by 10%, was proceeding and was expected to be completed in stages by 2003. The $87 million project will include construction of a new acid plant, installation of a new smelting furnace, modernization of converters, and expansion of the refinery (ASARCO Incorporated, 1999, p. 6-9). Production from Cyprus Amax's Cerro Verde Mine, which consists of the Cerro Verde and the Santa Rosa Pits, rose to 59,000 tons, or 7%, up from 55,000 in 1997 and 24% above original design capacity. At yearend, Cyprus Amax approved the $100 million development of the adjacent Cerro Negro deposit; development was subsequently delayed owing to low copper prices (Cyprus Amax Minerals Company, 1999b, p. 4-6).

A Canadian consortium consisting of Rio Algom, Noranda Inc., and Tech Corp., announced that it would proceed with the development of the Antamina Project. Antamina is one of the world's largest undeveloped copper-zinc ore deposits, with estimated in-pit reserves of 500 million tons averaging 1.2% copper, 1.0% zinc, 0.03% molybdenum, and 12 grams per ton silver. It is expected to produce 270,000 tons per year of copper in concentrate beginning in 2002 or later. Engineering, prestripping, and road construction were underway (Mining Journal, 1998). In November, the consortium announced that it had signed commitment letters with a syndicate of eight banks for $600 million in financing and had awarded engineering, procurement, and construction management to Bechtel Group. A change in project scope calling for the transport of concentrate to the port of Huarmey, 300 kilometers away, raised the projected cost from $2.2 billion to $2.35 billion (Rio Algom Ltd., 1998).

A feasibility study has been completed for Cambior's La Granja project in northern Peru. Yearend reserves were placed at 2.3 billion tons grading 5.9% copper, including 540 million tons grading 0.65% copper that could be to leached. The feasibility study filed with Peruvian authorities was based on an open pit generating from 250,000 to 300,000 tons per year of copper at a development cost of $1.3 billion. In 1998, the mine

plan was reengineered to allow phase development, focusing first on leaching-SX-EW of secondary mineralization (Cambior Inc., 1999, p. 26).

Zambia.—In May, Phelps Dodge and Noranda announced that they had withdrawn as members of the Kafue Consortium, a group that had been negotiating with the Government of the Republic of Zambia on the purchase of a 94% interest in the Nkana and the Nchanga Divisions of the state-owned Zambia Consolidated Copper Mines Ltd. (ZCCM). The Kafue Consortium, which also included Avmin Ltd. of South Africa and Commonwealth Development Corp. of the United Kingdom, had been formed in 1997 to "address the considerable technical, social, and financial issues associated with acquiring and revitalizing the ZCCM assets" as part of Zambia's mine privatization plan (Phelps Dodge, 1998a). In 1996, ZCCM began offering a group of investment packages to a group of prequalified investors for distribution of its mining and electrical power assets.

In July, ZCCM completed the sale of 85% of its interest in its mothballed Chambishi Mine to China Nonferrous Metal Industry's Foreign Engineering and Construction Corporation Group for $20 million and a commitment by the company to invest $70 million to develop the mine to achieve a production rate of up to 6,000 tons per day of ore within 4 years. The mine, which had been idle since 1987, had reserves of 136 million tons grading 2.4% copper (Platt's Metal Week, 1998e).

In December, ZCCM announced that it had finally sold its Konkola, Nchanga, and Nkana Mines to Anglo American Corp. (South Africa) for $72 million. ZCCM was to retain a 20% interest, and Anglo was to assume operation by March 31, 1999. Anglo reportedly pledged to invest $300 million over a 3-year period and also agreed to subsequently purchase the Konkola Deep Mining Project and to invest $800 million. The Konkola Deep Project is widely viewed as the future of Zambian copper mining (WOZA Internet, PTY, Ltd., 1998).

Cyprus Amax Zambia Corp. Kansanshi drilled 44,000 meters of core sample at the Kansanshi project. Exploration rights to more than 15 million hectares has been established and early stage exploration has found numerous copper prospects that will be further assessed (Cyprus Amax Minerals Company, 1999a, p. 10).

Outlook

U.S. mine capacity is expected to decline by about 125,000 tons in 1999 owing to the closure of sulfide operations at Pinto Valley, the shutdown of the Continental Mines, and other announced reductions. Mine production and capacity utilization in 1999, however, are expected to decline more sharply, with projected mine production falling by more than 200,000 tons to 1.66 million tons and capacity utilization falling to 85%. In addition to the above closures, the full effect of mine cutbacks announced during 1998 at Bagdad, Chino, and Sierrita will be felt in 1999.

On June 25, 1999, following months of industry speculation about sale or closure, BHP announced that it would cease operations at its North American properties by the end of August, including its San Manuel Mine in Arizona and Robinson Mine in Nevada, with a combined capacity of about 150,000 tons per year of copper. Its smelter, refinery, and wire rod mill, all at San Manuel, will also close. The San Manuel smelter, with a capacity of 340,000 tons per year of copper, had yet to reopen following its April renovation shutdown (Broken Hill Proprietary Ltd., 1999). Mine production was projected to fall to below 1.5 million tons in 2000 as the full impact of these announced closures are felt.

On June 30, 1999, Phelps Dodge Corp. announced a cost-reduction program that included shutdown of its Hidalgo, NM, smelter and the smaller of its two concentrators at Morenci, AZ, during the third quarter of 1999 (Phelps Dodge Corp., June 30, 1999, Phelps Dodge curtails copper production and restructures wire and cable business, Other News, accessed June 30, 1999, at URL http://www.phelpsdodge.com/news/financialnews/other news. html).

As a result of mine and smelter closures and cutbacks, as well as reduced secondary refined production, refinery production in 1999 and 2000 is expected to decline to 2.1 million and 1.8 million tons, respectively.

Consumption of refined copper during the first 6 months of 1999 was unchanged from that of the same period in 1998, although a strong third quarter indicates that domestic consumption of refined copper will rise more than 2% in 1999. The amount of copper recovered from old scrap declined during the first half of 1999 in response to sustained low copper prices and facility closures. No new secondary capacity is expected, and lower prices could further depress scrap collection. Recycling of new scrap, which has trended upward with increased domestic consumption of mill products, is expected to be relatively unchanged in 1999, as low copper prices encourage substitution of refined copper for scrap.

World mine capacity is expected to continue to grow significantly in the next several years, albeit at a slower rate. According to data compiled by the International Copper Study Group (1998, p. 1-27), world mine capacity growth is expected to increase by about 500,000 tons in 1999 and 150,000 tons in 2000. Smelter capacity growth is projected to outstrip the growth in concentrate production. The current shortage of concentrate relative to smelter capacity is expected to persist and result in continued low capacity utilization of global smelters. Refinery capacity is projected to grow by more than 1.2 million tons through the year 2000 and to be more than sufficient to meet the growth in mine production. Global demand for refined copper grew by only 200,000 tons, or 1.5%, in 1998.

Preliminary estimates for the first half of 1999 indicate no increase in global consumption compared with the first half of 1998 (International Copper Study Group, 1999). The continuing economic crisis in Asia is expected to limit consumption growth in 1999, as it did in 1998. Given the large expansion of mine and refinery capacity, production of refined copper in 1999 is projected to continue to exceed demand, despite U.S. production cutbacks.

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TABLE 1
SALIENT COPPER STATISTICS 1/

(Metric tons unless otherwise specified)

		1994	1995	1996	1997	1998
United States:						
Mine production:						
Ore concentrated	thousand metric tons	271,000	267,000	274,000	284,000	268,000
Average yield of copper 2/	percent	0.47	0.46	0.46	0.46	0.46
Recoverable copper:						
Arizona		1,160,000	1,170,000	1,240,000	1,250,000	1,190,000
Michigan, Montana, Utah		397,000	384,000	339,000	337,000	337,000
New Mexico		234,000	250,000	256,000	259,000	252,000
Other States		55,700	47,400	84,700 r/	96,500	78,900
Total recoverable		1,850,000	1,850,000	1,920,000	1,940,000	1,860,000
Total value	millions	$4,430	$5,640	$4,610	$4,570	$3,230
Smelter production: 3/						
From domestic and foreign ores		1,310,000	1,250,000	1,300,000	1,440,000 r/	1,490,000
From scrap (new and old)		397,000	354,000	339,000	285,000 r/	232,000
Total smelter		1,710,000	1,600,000	1,640,000	1,720,000	1,720,000
Byproduct sulfuric acid, sulfur content	thousand metric tons	1,200	1,210	1,240	1,430 r/	1,420
Refinery production:						
Primary materials:						
Electrolytic from domestic ores		1,280,000	1,300,000	1,290,000	1,370,000	1,290,000
Electrolytic from foreign materials		63,500	91,200	147,000	113,000	238,000
Electrowon		493,000	539,000	574,000	586,000	609,000
Total primary		1,840,000	1,930,000	2,010,000	2,070,000 r/	2,140,000
Secondary materials (scrap):						
Electrolytic		269,000	215,000	193,000	233,000	202,000
Fire refined		122,000	137,000	152,000	163,000 r/	147,000
Total secondary		392,000	352,000	345,000	396,000 r/	349,000
Total refined		2,230,000	2,280,000	2,350,000	2,470,000 r/	2,490,000
Secondary copper produced:						
Recovered from new scrap		827,000	874,000	891,000	967,000 r/	955,000
Recovered from old scrap		500,000	442,000	428,000	497,000 r/	463,000
Total copper from scrap		1,330,000	1,320,000	1,320,000	1,460,000 r/	1,420,000
Copper sulfate:						
Production		48,400	52,000	30,500 r/	48,400	44,000
Stocks, December 31		2,510	2,770	W	W	W
Exports:						
Refined		157,000	217,000	169,000	92,900	86,200
Unmanufactured 4/		752,000	894,000	748,000 r/	628,000 r/	412,000
Imports:						
Refined		470,000	429,000	543,000	632,000 r/	683,000
Unmanufactured 4/		763,000	825,000	961,000	999,000 r/	1,190,000
Copper stocks, December 31:						
Blister and in-process material		167,000 r/	171,000 r/	173,000	180,000	160,000
Refined copper:						
Refineries		42,500	38,000	32,200	59,700	44,200
Wire rod mills		39,800	24,800	32,100	24,600	37,300
Brass mills		8,530	7,110	14,000	14,300	20,800
Other industry		4,090	3,030	2,700	3,390 r/	3,870
New York Commodity Exchange (COMEX)		24,200	21,500	26,600	83,000	85,200
London Metal Exchange (LME), U.S. warehouses		--	68,200	38,300	129,000	341,000
Total refined		119,000	163,000	146,000	314,000	532,000
Consumption:						
Refined copper, reported		2,680,000	2,530,000	2,610,000	2,790,000	2,890,000
Apparent consumption, primary refined and old scrap		2,690,000	2,540,000	2,830,000	2,950,000	3,020,000
Price:						
Producer, weighted average	cents per pound	111.05	138.33	109.04	106.95 r/	78.64
COMEX, first position	do.	107.05	134.72	105.87	103.58	75.08
LME, Grade A cash	do.	104.64	133.12	104.05	103.25	75.01
World production:						
Mine	thousand metric tons	9,490 r/	10,100	11,000	11,400	12,200 e/
Smelter	do.	10,000	10,400 r/	11,000 r/	11,300 r/	11,600 e/
Refinery	do.	11,200	11,900	12,700 r/	13,600 r/	14,100 e/

e/ Estimated. r/ Revised. W Withheld to avoid disclosing company proprietary data.

1/ Data, except prices, are rounded to three significant digits; may not add to totals shown.

2/ Yield calculations include precipitates but exclude copper recovered from leaching by solvent extraction-electrowinning.

3/ Includes primary copper produced from foreign ores, matte, etc., to avoid disclosing company proprietary data.

4/ Includes copper content of alloy scrap.

TABLE 2
LEADING COPPER-PRODUCING MINES IN THE UNITED STATES IN 1998, IN ORDER OF OUTPUT 1/

Rank	Mine	County and State	Operator	Source of copper	Capacity (thousand metric tons)
1	Morenci	Greenlee, AZ	Phelps Dodge Corp.	Copper-molybdenum ore, concentrated and leached	495
2	Bingham Canyon	Salt Lake, UT	Kennecott Utah Copper Corp.	Copper-molybdenum ore, concentrated	310
3	Ray	Pinal, AZ	ASARCO Incorporated	Copper ore, concentrated and leached	150
4	Chino	Grant, NM	Phelps Dodge Corp.	Copper-molybdenum ore, concentrated and leached	160
5	San Manuel	Pinal, AZ	BHP Copper Inc.	do.	147
6	Mission Complex	Pima, AZ	ASARCO Incorporated	Copper ore, concentrated.	120
7	Sierrita	do.	Cyprus Amax Minerals Co.	Copper-molybdenum ore, concentrated and leached	115
8	Bagdad	Yavapai, AZ	do.	do.	115
9	Tyrone	Grant, NM	Burro Chief Copper Co.	Copper ore, leached	75
10	Inspiration	Gila, AZ	Cyprus Amax Minerals Co.	do.	75
11	Robinson	White Pine, NV	BHP Copper Inc.	Copper ore, concentrated	70
12	Continental	Silver Bow, MT	Montana Resources Inc.	Copper-molybdenum ore, concentrated	50
13	Continental	Grant, NM	Cobre Mining Co. 2/	Copper ore, concentrated	35
14	Silver Bell	Pima, AZ	ASARCO Incorporated	Copper ore, leached.	20
15	Pinto Valley	Gila, AZ	BHP Copper Inc.	Copper-molybdenum ore, concentrated and leached	85

1/ The mines in this list accounted for 98% of the U.S. mine production in 1998.
2/ Acquired by Phelps Dodge Corp. in February 1998.

TABLE 3
MINE PRODUCTION OF COPPER-BEARING ORES AND RECOVERABLE COPPER CONTENT OF ORES PRODUCED IN THE UNITED STATES, BY SOURCE AND TREATMENT PROCESS 1/

(Metric tons)

	1997		1998	
Source and treatment process	Gross weight	Recoverable copper	Gross weight	Recoverable copper
Mined copper ore:				
Concentrated	284,000,000	1,310,000	268,000,000 2/	1,230,000
Leached	NA	586,000	NA	609,000
Total	NA	1,900,000	NA	1,840,000
Copper precipitates shipped: leached from tailings, dumps, and in-place material	20,800	15,600	8,790	8,390
Other copper-bearing ores 3/	7,700,000	28,200	11,700,000	8,230
Grand total	XX	1,940,000	XX	1,860,000

NA Not available. XX Not applicable.
1/ Data rounded to three significant digits; may not add to totals shown.
2/ In 1998, 16,000 kilograms of gold and 401 metric tons of silver were recovered from concentrated ore. The average value of gold and silver per metric ton of ore concentrated was $0.81.
3/ Includes gold ore, lead ore, silver ore, silver-copper ore, zinc ore, and ore shipped directly to smelter.

TABLE 4
CONSUMPTION OF COPPER AND BRASS MATERIALS IN THE UNITED STATES, BY ITEM 1/

(Metric tons)

Item	Brass mills	Wire rod mills	Foundries, chemical plants, miscellaneous users	Smelters, refiners, ingot makers	Total
1997:					
Copper scrap	1,010,000 2/	W	62,700	693,000 r/	1,760,000 r/
Refined copper 3/	597,000	2,140,000	47,500	W	2,790,000
Hardeners and master alloys	652	--	2,240	--	2,890
Brass ingots	--	--	125,000	--	125,000
Slab zinc	54,400	--	W	W	76,800 4/
1998:					
Copper scrap	1,020,000 2/	W	58,100	644,000	1,720,000
Refined copper 3/	659,000	2,170,000	51,400	W	2,890,000
Hardeners and master alloys	588	--	2,570 --	--	3,160
Brass ingots	--	--	117,000 --	--	117,000
Slab zinc	53,200	--	W	W	75,000 4/

r/ Revised. W Withheld to avoid disclosing company proprietary data.
1/ Data are rounded to three significant digits; may not add to totals shown.
2/ Includes copper scrap at wire rod mills to avoid disclosing company proprietary data.
3/ Detailed information on consumption of refined copper can be found in table 5.
4/ Includes slab zinc items indicated by symbol W.

TABLE 5
CONSUMPTION OF REFINED COPPER SHAPES IN THE UNITED STATES, BY CLASS OF CONSUMER 1/

(Metric tons)

Class of consumer	Cathodes	Ingots and ingot bars	Cakes and slabs	Wirebar, billets, other	Total
1997:					
Wire rod mills	2,130,000	--	--	12,800	2,140,000
Brass mills	356,000	26,300	81,100	134,000	597,000
Chemical plants	--	--	--	1,010	1,010
Ingot makers	W	--	W	4,190 2/	4,190
Foundries	1,410	3,110 r/	W	12,100 2/	16,600
Miscellaneous 3/	W	W	W	29,900 2/	29,900
Total	2,490,000	29400 r/	81,100	194,000	2,790,000
1998:					
Wire rod mills	2,160,000	--	--	13,800	2,170,000
Brass mills	439,000	27,100	76,200	117,000	659,000
Chemical plants	--	--	--	1,090	1,090
Ingot makers	W	W	W	5,360 2/	5,360
Foundries	1,200	2,840	W	14,500 2/	18,500
Miscellaneous 3/	W	W	W	31,800 2/	31,800
Total	2,600,000	29,900	76,200	184,000	2,890,000

r/ Revised. W Withheld to avoid disclosing company proprietary data; included with "Wirebar, billets, and other."
1/ Data are rounded to three significant digits; may not add to totals shown.
2/ Includes items indicated by symbol W.
3/ Includes consumers of copper powder and copper shot, iron and steel plants, primary smelters producing alloys other than copper, and other manufacturers.

TABLE 6
COPPER RECOVERED FROM SCRAP PROCESSED IN THE UNITED STATES,
BY KIND OF SCRAP AND FORM OF RECOVERY 1/

(Metric tons)

	1997	1998
Kind of scrap:		
New scrap:		
Copper-base	923,000 r/	913,000
Aluminum-base	44,100 r/	42,400
Nickel-base	91	91
Total	967,000 r/	955,000
Old scrap:		
Copper-base	466,000 r/	429,000
Aluminum-base	30,300	34,000
Nickel-base	28	47
Zinc-base	19	39
Total	497,000 r/	463,000
Grand total	1,460,000 r/	1,420,000
Form of recovery:		
As unalloyed copper:		
At electrolytic plants	233,000	202,000
At other plants	174,000 r/	156,000
Total	407,000 r/	357,000
In brass and bronze	981,000 r/	983,000
In alloy iron and steel	743	658
In aluminum alloys	75,000 r/	76,600
In other alloys	113	132
In chemical compounds	252	83
Total	1,060,000	1,060,000
Grand total	1,460,000 r/	1,420,000

r/ Revised.

1/ Data are rounded to three significant digits; may not add to totals shown.

TABLE 7
COPPER RECOVERED AS REFINED COPPER AND IN ALLOYS AND OTHER FORMS
FROM COPPER-BASE SCRAP PROCESSED IN THE UNITED STATES, BY TYPE OF OPERATION 1/

(Metric tons)

	From new scrap		From old scrap		Total	
Type of operation	1997	1998	1997	1998	1997	1998
Ingot makers	36,100 r/	34,800	97,500 r/	95,000	134,000 r/	130,000
Refineries 2/	104,000 r/	86,300	292,000	263,000	396,000 r/	349,000
Brass and wire rod mills	771,000	781,000	32,800	30,400	804,000	811,000
Foundries and manufacturers	11,200	10,500	43,900	40,800	55,100	51,300
Chemical plants	252	83	--	--	252	83
Total	923,000 r/	913,000	466,000 r/	429,000	1,390,000 r/	1,340,000

r/ Revised.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Electrolytically refined and fire-refined scrap based on source of material at smelter level.

TABLE 8
PRODUCTION OF SECONDARY COPPER AND COPPER-ALLOY PRODUCTS
IN THE UNITED STATES, BY ITEM PRODUCED FROM SCRAP 1/

(Metric tons)

Item produced from scrap	1997	1998
Unalloyed copper products:		
Electrolytically refined copper	233,000	202,000
Fire-refined copper	163,000 r/	147,000
Copper powder	9,880	7,600
Copper castings	739	705
Total	407,000 r/	357,000
Alloyed copper products:		
Brass and bronze ingots:		
Tin bronzes	14,300	16,400
Leaded red brass and semired brass	88,600 r/	95,100
High leaded tin bronze	14,100	12,600
Yellow brass	7,380	6,090
Manganese bronze	7,610 r/	8,040
Aluminum bronze	7,430	7,560
Nickel silver	2,280	2,360
Silicon bronze and brass	6,240	4,500
Copper-base hardeners and master alloys	13,400	12,900
Miscellaneous	600	1,300
Total	162,000	167,000
Brass mill and wire rod mill products	986,000 r/	1,000,000
Brass and bronze castings	46,000 r/	43,800
Brass powder	740	25
Copper in chemical products	252	83
Grand total	1,600,000 r/	1,570,000

r/ Revised.
1/ Data are rounded to three significant digits; may not add to totals shown.

TABLE 9
COMPOSITION OF SECONDARY COPPER-ALLOY PRODUCTION IN THE UNITED STATES 1/

(Metric tons)

	Copper	Tin	Lead	Zinc	Nickel	Aluminum	Total
Brass and bronze ingot production: 2/							
1997	129,000 r/	5,220 r/	9,180 r/	18,300 r/	272 r/	22	162,000
1998	135,000	5,140	8,690	17,400	265	25	167,000
Secondary metal content of brass mill products:							
1997 r/	800,000	1,010	7,910	175,000	W	W	986,000
1998	811,000	991	7,740	181,000	W	W	1,000,000
Secondary metal content of brass and bronze castings:							
1997	41,400 r/	693	1,010	2,680 r/	79 r/	151	46,000 r/
1998	39,300	616	936	2,690	120	149	43,800

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total."
1/ Data are rounded to three significant digits; may not add to totals shown.
2/ Includes approximately 97% from scrap and 3% from other than scrap in 1997 (revised) and approximately 96% from scrap and 4% from other than scrap in 1998.

TABLE 10
CONSUMPTION AND YEAREND STOCKS OF COPPER-BASE SCRAP 1/

(Metric tons, gross weight)

Scrap type and processor	1997		1998	
	Consumption	Stocks	Consumption	Stocks
No. 1 wire and heavy:				
Smelters, refiners and ingot makers	149,000	8,320	139,000	2,500
Brass and wire rod mills	413,000	NA	411,000	NA
Foundries and miscellaneous manufacturers	35,800	NA	33,900	NA
No. 2 mixed heavy and light:				
Smelters, refiners and ingot makers	234,000 r/	6,070 r/	205,000	5,790
Brass and wire rod mills	34,900	NA	32,600	NA
Foundries and miscellaneous manufacturers	2,770	NA	2,870	NA
Total unalloyed scrap:				
Smelters, refiners and ingot makers	383,000 r/	14,400 r/	343,000	8,290
Brass and wire rod mills	448,000	14,300 r/	443,000	17,300
Foundries and miscellaneous manufacturers	38,600	2,990	36,700	2,570
Red brass: 2/				
Smelters, refiners and ingot makers	60,800 r/	2,330 r/	54,600	2,550
Brass mills	8,780	NA	9,920	NA
Foundries and miscellaneous manufacturers	10,100	NA	7,140	NA
Leaded yellow brass:				
Smelters, refiners and ingot makers	28,800 r/	1,420 r/	24,300	1,180
Brass mills	404,000	NA	395,000	NA
Foundries and miscellaneous manufacturers	1,930	NA	1,520	NA
Yellow and low brass, all plants	53,900	899 r/	65,400	854
Cartridge cases and brass, all plants	66,800	NA	82,600	NA
Auto radiators:				
Smelters, refiners and ingot makers	75,400 r/	1,410 r/	56,900	1,890
Foundries and miscellaneous manufacturers	4,470	NA	4,710	NA
Bronzes:				
Smelters, refiners and ingot makers	12,500 r/	787 r/	13,200	917
Brass mills and miscellaneous manufacturers	14,900	NA	14,500	NA
Nickel-copper alloys, all plants	17,800	424	17,400	343
Low grade and residues:				
Smelters, refiners and miscellaneous manufacturers	87,100	14,000	124,000	9,260
Other alloy scrap: 3/				
Smelters, refiners and ingot makers	38,500 r/	2,050	20,300	1,520
Brass mills and miscellaneous manufacturers	6,570	NA	6,700	NA
Total alloyed scrap:				
Smelters, refiners and ingot makers	310,000 r/	23,400 r/	301,000	18,500
Brass mills	558,000	28,600 r/	575,000	34,400
Foundries and miscellaneous manufacturers	24,100	2,930 r/	21,300	3,240
Total scrap:				
Smelters, refiners and ingot makers	693,000 r/	37,800 r/	644,000	26,800
Brass and wire rod mills	1,010,000	42,900	1,020,000	51,700
Foundries and miscellaneous manufacturers	62,700	5,910	58,100	5,820

r/ Revised. NA Not available.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes cocks and faucets, commercial bronze, composition turnings, gilding metal, railroad car boxes, and silicon bronze.

3/ Includes aluminum bronze, beryllium copper, and refinery brass.

TABLE 11
CONSUMPTION OF PURCHASED COPPER-BASE SCRAP 1/ 2/

(Metric tons, gross weight)

Type of operation	From new scrap		From old scrap		Total	
	1997	1998	1997	1998	1997	1998
Ingot makers	47,600 r/	46,200	138,000 r/	135,000	186,000 r/	181,000
Smelters and refineries	134,000 r/	100,000	373,000	363,000	507,000 r/	463,000
Brass and wire rod mills	972,000	987,000	33,800	31,400	1,010,000	1,020,000
Foundries and miscellaneous manufacturers	13,600	12,700	49,100	45,400	62,700	58,100
Total	1,170,000 r/	1,150,000	594,000 r/	574,000	1,760,000 r/	1,720,000

r/ Revised.
1/ Data are rounded to three significant digits; may not add to totals shown.
2/ Consumption at brass and wire rod mills assumed equal to receipts.

TABLE 12
FOUNDRIES AND MISCELLANEOUS MANUFACTURERS CONSUMPTION
OF BRASS INGOT AND REFINED COPPER AND COPPER SCRAP
IN THE UNITED STATES 1/

(Metric tons)

Ingot type	1997	1998
Tin bronzes	31,200	33,200
Leaded red brass and semired brass	73,800	65,900
Yellow, leaded, low brass 2/	7,920 r/	7,680
Manganese bronze	5,780	5,120
Nickel silver 3/	2,040	755
Aluminum bronze	4,110	3,910
Hardeners and master alloys 4/	2,240	2,570
Total brass ingot	127,000	119,000
Refined copper consumed	47,500	51,400
Copper scrap consumed	62,700	58,100

r/ Revised.
1/ Data are rounded to three significant digits; may not add to totals shown.
2/ Includes brass and silicon bronze.
3/ Includes brass, copper nickel, and nickel bronze.
4/ Includes special alloys.

TABLE 13
AVERAGE PRICES FOR COPPER SCRAP AND ALLOY-INGOT, BY TYPE

(Cents per pound)

			Dealers' buying (New York)		Alloy-ingot (New York) 1/	
Year	Brass mills No. 1 scrap	Refiners No. 2 scrap	No. 2 scrap	Red brass turnings and borings	No. 115 brass (85-5-5-5)	Yellow brass (405)
1997	99.58	81.98	69.15	51.25	138.5	135.25
1998	73.55	60.19	49.46	40.33	138.5	135.25

1/ List price quotes effective July 1996.

Source: American Metal Market.

TABLE 14
U.S. EXPORTS OF UNMANUFACTURED COPPER (COPPER CONTENT), BY COUNTRY 1/

	Ore and concentrate		Matte, ash and, precipitates		Refined		Unalloyed copper scrap		Blister and anodes		Total	
Country	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
1997	127,000	$180,000	57,900	$93,700	92,900	$221,000	205,000	$365,000	31,600	$71,700	515,000	$931,000
1998:												
Belgium	39	214	323	4,720	17	32	2,730	22,000	961	1,580	4,080	28,500
Canada	33,600	49,900	12,800	22,200	16,100	28,500	39,600	36,000	16,400	20,700	118,000	157,000
China	--	--	--	--	360	746	28,600	39,700	63	160	29,100	40,600
France	--	--	30	42	37	125	2	12	554	1,170	624	1,350
Germany	1,470	1,230	6,660	2,080	294	512	7,800	18,000	92	207	16,300	22,000
Hong Kong	15	37	--	--	1,310	1,990	14,400	19,700	3,350	7,740	19,100	29,500
India	35	57	--	--	112	219	3,460	3,290	46	189	3,660	3,760
Italy	34	21	--	--	69	176	75	619	354	763	531	1,580
Japan	1,050	2,880	34	134	17,000	28,100	10,200	28,400	695	2,190	28,900	61,800
Korea, Republic of	46	95	15	49	2,870	4,910	2,720	3,810	130	319	5,780	9,180
Mexico	97	110	1,060	764	11,200	18,000	1,230	1,790	1,330	2,690	15,000	23,300
Netherlands	3	3	4	3	10,100	16,700	27	35	2	5	10,100	16,700
Singapore	--	--	6	83	687	1,050	266	244	726	1,800	1,690	3,180
Sweden	--	--	945	1,650	3	5	--	--	--	--	948	1,650
Taiwan	(2/)	4	--	--	19,100	32,300	2,110	3,810	1,800	4,460	23,000	40,500
Thailand	18	18	--	--	5,830	9,720	--	--	46	89	5,890	9,830
Other	162	283	115	272	1,180	2,520	913	1,930	553	1,320	2,920	6,320
Total	36,500	54,800	22,000	32,000	86,200	146,000	114,000	179,000	27,100	45,400	286,000	457,000

1/ Data are rounded to three significant digits; may not add to totals shown.
2/ Less than 1/2 unit.

Source: Bureau of the Census.

TABLE 15
U.S EXPORTS OF COPPER SEMIMANUFACTURES, BY COUNTRY 1/

Country	Pipes and tubing		Plates, sheets, foil, bars		Bare wire 2/		Wire and cable, stranded		Copper sulfate	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
1997	25,100	$89,500	42,400	$181,000	47,700	$153,000	15,000	$91,800	11,400	$31,600
1998:										
Australia	249	1,440	101	284	232	1,480	51	638	346	889
Canada	10,100	28,000	15,300	44,800	15,900	35,300	3,680	8,470	1,080	2,490
China	378	1,850	886	6,100	13	249	171	879	274	610
Costa Rica	3	11	942	5,720	3,730	7,340	69	591	--	--
Denmark	10	63	(3/)	35	34	384	19	201	285	595
Dominican Republic	132	239	4	21	2,530	5,010	158	860	--	--
El Salvador	21	21	350	1,930	809	1,540	120	734	--	--
France	826	2,500	35	600	226	2,770	120	3,740	58	160
Germany	3	14	2,890	10,200	57	746	86	2,370	162	656
Hong Kong	100	589	1,420	11,400	161	1,390	142	1,700	300	699
India	267	939	838	1,070	3	66	122	468	9	34
Italy	157	667	2,420	7,980	6	40	47	523	112	300
Jamaica	7	32	171	485	11	62	247	1,050	--	--
Japan	63	250	809	16,800	43	273	163	2,420	1,900	4,650
Korea, Republic of	221	1,070	2,070	7,820	20	141	38	722	1,220	2,700
Malaysia	99	572	46	296	665	1,750	10	123	--	--
Mexico	10,600	33,000	4,250	15,200	22,300	58,000	9,680	53,300	233	675
Netherlands	225	776	1,050	3,580	7	66	8	223	--	--
Pakistan	35	109	756	1,550	--	--	4	32	--	--
Saudi Arabia	239	783	39	237	212	1,560	213	1,220	--	--
Singapore	251	822	93	836	24	172	226	2,120	749	1,860
Spain	303	1,370	49	149	79	211	33	463	93	276
Sweden	(3/)	5	10	186	1	11	28	389	1,010	2,430
Taiwan	52	213	1,360	8,480	179	989	88	997	424	786
Thailand	569	2,330	3	41	87	216	497	2,840	19	34
Trinidad and Tobago	14	30	40	186	1,130	2,270	32	201	--	--
United Arab Emirates	380	1,220	106	548	(3/)	6	30	1,090	7	38
United Kingdom	64	463	966	2,810	171	876	166	2,100	905	2,280
Venezuela	217	722	229	672	28	126	495	3,320	10	27
Other	1,890	6,750	1,040	6,610	1,090	4,510	1,860	14,100	464	1,170
Total	27,400	86,900	38,300	157,000	49,700	128,000	18,600	108,000	9,660	23,300

1/ Data are rounded to three significant digits; may not add to totals shown.
2/ Total exports of wire rod for 1997 and 1998 were not available.
3/ Less than 1/2 unit.

Source: Bureau of the Census.

TABLE 16
U.S. IMPORTS FOR CONSUMPTION OF UNMANUFACTURED COPPER (COPPER CONTENT), BY COUNTRY 1/

Country	Ore and concentrate		Matte, ash, precipitates		Blister and anode		Refined		Unalloyed scrap		Total	
	Quantity (metric tons)	Value 2/ (thousands)	Quantity (metric tons)	Value 2/ (thousands)	Quantity (metric tons)	Value 2/ (thousands)	Quantity (metric tons)	Value 2/ (thousands)	Quantity (metric tons)	Value 2/ (thousands)	Quantity (metric tons)	Value 2/ (thousands)
1997	44,300	$64,600	1,620	$1,910	143,000 r/	$382,000 r/	632,000 r/	$1,490,000 r/	91,400	$166,000	912,000	$2,100,000
1998:												
Argentina	9,930	6,090	--	--	--	--	--	--	20	15	9,950	6,110
Brazil	--	--	--	--	--	--	9,000	15,500	--	--	9,000	15,500
Bulgaria	--	--	--	--	--	--	--	--	1,010	2,140	1,010	2,140
Canada	1,690	2,800	140	121	82,100	246,000	265,000	461,000	30,900	57,900	380,000	768,000
Chile	147,000	126,000	--	--	24,100	45,600	78,700	135,000	3,310	5,810	253,000	312,000
Colombia	--	--	--	--	--	--	--	--	836	1,090	836	1,090
Costa Rica	--	--	--	--	--	--	--	--	800	952	800	952
Denmark	--	--	54	61	--	--	--	--	--	--	54	61
Dominican Republic	--	--	--	--	--	--	--	--	942	1,230	942	1,230
Indonesia	29,400	52,000	--	--	--	--	--	--	--	--	29,400	52,000
Japan	--	--	240	151	(3/)	28	8,680	18,100	19	28	8,940	18,300
Mexico	4,980	7,530	998	620	29,400	51,000	178,000	330,000	12,900	16,800	226,000	406,000
Namibia	--	--	--	--	3,360	5,970	--	--	--	--	3,360	5,970
Netherlands	--	--	551	347	--	--	4,570	8,250	--	--	5,120	8,600
Papua New Guinea	5,900	10,300	--	--	--	--	--	--	--	--	5,900	10,300
Peru	18,200	14,100	--	--	6,870	11,400	128,000	219,000	335	530	153,000	245,000
Russia	--	--	--	--	--	--	9,170	24,300	--	--	9,170	24,300
South Africa	--	--	--	--	2,830	4,840	--	--	2	11	2,830	4,850
Taiwan	--	--	213	970	--	--	42	108	109	1,030	365	2,110
Other	12	186	39	90	1,480	2,030	2,510	25,900	3,210	4,200	7,250	32,400
Total	217,000	219,000	2,230	2,360	150,000	367,000	683,000	1,240,000	54,400	91,700	1,110,000	1,920,000

r/ Revised.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ C.i.f. value at U.S. port.

3/ Less than 1/2 unit.

Source: Bureau of the Census.

TABLE 17
U.S. IMPORTS FOR CONSUMPTION OF COPPER SEMIMANUFACTURES, BY COUNTRY 1/

Country	Pipes and tubing		Plates, sheets, foil, bars		Bare wire, including wire rod		Wire and cable, stranded		Copper sulfate	
	Quantity (metric tons)	Value 2/ (thousands)	Quantity (metric tons)	Value 2/ (thousands)	Quantity (metric tons)	Value 2/ (thousands)	Quantity (metric tons)	Value 2/ (thousands)	Quantity (metric tons)	Value 2/ (thousands)
1997	1,010	$5,660	65,900	$269,000	56,800	$152,000	5,740	$32,600	22,500	$21,400
1998:										
Belgium	(3/)	14	308	1,280	54	163	21	53	715	555
Canada	215	1,130	14,400	45,200	72,500	137,000	1,040	2,230	5,490	5,190
Chile	78	208	1,420	3,580	--	--	--	--	282	249
China	108	343	451	1,830	150	513	964	2,920	6,240	4,850
Colombia	--	--	--	--	--	--	--	--	20	16
Finland	--	--	3,690	13,300	404	1,710	(3/)	4	--	--
Germany	350	1,750	10,700	35,100	277	1,790	117	1,270	39	195
Israel	--	--	--	--	--	--	2,780	15,800	1,210	923
Italy	--	--	1,570	4,050	91	738	8	98	18	16
Japan	2	104	11,900	47,900	474	3,410	24	223	9	77
Korea, Republic of	--	--	309	1,030	81	556	117	463	198	115
Mexico	2	10	1,180	3,350	41,800	68,900	(3/)	12	10,500	8,050
Netherlands	75	392	203	799	3	16	1	11	--	--
Peru	--	--	197	459	198	536	--	--	1,740	1,230
Poland	--	--	6	14	--	--	102	253	32	26
Russia	--	--	124	383	--	--	--	--	840	529
Sweden	--	--	14,700	47,900	13	51	(3/)	3	--	--
Taiwan	4	50	53	622	309	1,530	325	1,200	219	136
Turkey	--	--	--	--	1,120	3,950	115	444	--	--
Other	9	115	4,020	23,300	604	4,200	124	1,550	42	93
Total	845	4,120	65,300	230,000	118,000	225,000	5,740	26,600	27,600	22,300

1/ Data are rounded to three significant digits; may not add to totals shown.
2/ C.i.f. value at U.S. port.
3/ Less than 1/2 unit.

Source: Bureau of the Census.

TABLE 18
U.S. EXPORTS OF COPPER SCRAP, BY COUNTRY 1/

	Unalloyed copper scrap				Copper-alloy scrap			
	1997		1998		1997		1998	
Country	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Belgium	3,850	$22,600	2,730	$22,000	740	$1,640	434	$1,230
Canada	116,000	174,000	39,600	36,000	44,300	57,300	68,200	77,100
China	20,000	30,000	28,600	39,700	21,100	18,000	20,700	20,100
Germany	13,700	37,700	7,800	18,000	2,810	4,300	5,920	11,700
Hong Kong	27,200	42,800	14,400	19,700	32,500	41,300	23,600	27,900
India	3,510	3,790	3,460	3,290	24,100	25,500	24,900	21,400
Japan	15,500	45,900	10,200	28,400	16,100	28,700	10,400	15,300
Korea, Republic of	2,490	3,810	2,720	3,810	11,400	17,700	11,600	15,100
Mexico	859	1,590	1,230	1,790	7,940	15,700	10,200	13,400
Taiwan	677	1,110	2,110	3,810	4,070	5,690	6,210	7,870
United Kingdom	24	57	176	751	687	930	3,890	3,240
Other	1,430 r/	1,740	1,110	2,090	8,630 r/	10,500 r/	7,310	7,570
Total	205,000	365,000	114,000	179,000	174,000	227,000	193,000	222,000

r/ Revised.

1/ Data are rounded to three significant digits; may not add to totals shown.

Source: Bureau of the Census.

TABLE 19
U.S. IMPORTS FOR CONSUMPTION OF COPPER SCRAP, BY COUNTRY 1/

	Unalloyed copper scrap		Copper-alloy scrap		
Country or Territory	Quantity (metric tons)	Value 2/ (thousands)	Gross weight (metric tons)	Copper content e/ 3/ (metric tons)	Value 2/ (thousands)
1997 r/	91,400	$166,000	120,000	86,700	$185,000
1998:					
Bulgaria	1,010	2,140	--	--	--
Canada	30,900	57,900	55,800	40,200	73,000
Chile	3,310	5,810	1,440	1,040	2,380
Colombia	836	1,090	2,560	1,840	3,590
Costa Rica	800	952	778	560	681
Dominican Republic	942	1,230	1,250	896	1,850
El Salvador	82	98	795	572	824
Guatemala	519	672	969	698	1,390
Honduras	249	339	504	363	480
Jamaica	491	539	571	411	444
Malaysia	--	--	1,440	1,040	2,220
Mexico	12,900	16,800	35,400	25,500	42,400
Taiwan	109	1,030	720	518	707
United Kingdom	--	--	1,090	781	2,240
Venezuela	462	499	1,500	1,080	1,300
Other	1,790	2,630	6,510	4,690	8,630
Total	54,400	91,700	111,000	80,100	142,000

e/ Estimated. r/ Revised.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ C.i.f. value at U.S. port.

3/ Under the Harmonized Tariff System that was implemented January 1989, copper content is no longer available. Content is estimated to be 72% of gross weight.

Source: Bureau of the Census.

TABLE 20
COPPER: WORLD MINE PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons)

Country	1994	1995	1996	1997	1998 e/
Albania e/	800 3/	800	800	1,000	1,000
Argentina e/	--	--	--	30,421 r/ 3/	170,273 p/
Armenia e/	4,900 3/	7,000	9,100	9,000	9,200
Australia:					
By concentration or cementation	392,000	379,700	471,000 e/	490,000 e/	549,000
Leaching (electrowon)	23,600	40,200	53,800 e/	55,000 e/	55,000
Total	415,600	419,900	525,000 r/ e/	545,000	604,000
Bolivia	79	127	92	182 r/	44 3/
Botswana 4/	22,780	21,029	20,980 r/	18,350 r/	18,000
Brazil (concentrate)	39,673	48,933	46,203	39,952 r/	40,000
Bulgaria	73,900	93,800	105,600	100,000 e/	100,000
Burma:					
By concentration or cementation	5,025	5,282	4,841 r/	2,927 r/	2,500
Leaching (electrowon)	--	--	--	--	4,200
Total	5,025	5,282	4,841	2,927	6,700
Canada:					
By concentration or cementation	614,500	723,700	685,900	659,500 r/	705,045 3/
Leaching (electrowon)	2,300	2,600	2,500	2,700	1,700 3/
Total	616,800	726,300	688,400	662,200 r/	706,745 3/
Chile: 5/					
By concentration or cementation	2,018,900	2,116,100	2,480,100	2,511,000	2,583,400 3/
Leaching (electrowon)	201,000	372,500	635,700	881,000	1,108,000 3/
Total	2,219,900	2,488,600	3,115,800	3,392,000	3,691,400 3/
China e/	396,000	445,000	439,000	496,000 r/	476,400 3/
Colombia	2,581 r/	2,747 r/	2,222	1,800 r/	1,400 3/
Congo (Kinshasa): 6/ 7/					
By concentration or cementation	7,200	6,800	6,200 e/	-- r/	--
Leaching (electrowon)	22,800	22,600	43,800	40,100 r/	38,000
Total	30,000	29,400	50,000 e/	40,100 r/	38,000
Cuba e/	2,900	2,000	2,000	1,000 r/	--
Cyprus	--	--	1,688	6,000 e/	7,800 3/
Ecuador e/	100	100	100	100	100
Finland	13,243	9,790	9,261 r/	8,500 e/	9,000
France	174 r/	172 r/	--	-- e/	--
Georgia	1,600	3,000 e/	5,100	6,000 e/	6,000
Honduras	500 e/	--	--	--	-- 3/
India	45,944	46,975	47,800	37,200 r/ e/	36,700
Indonesia 7/	322,190	443,618	507,484	529,121	781,410 3/
Iran					
By concentration or cementation	117,900	102,200	107,600	117,200 r/	118,800
Leaching (electrowon)	--	--	--	1,500	9,500
Total	117,900	102,200	107,600	118,700	128,300
Japan	6,043	2,376	1,145	932	1,070 3/
Kazakhstan	210,000 r/	200,000 r/	250,000 e/	316,000 e/	337,400 3/
Korea, North e/	16,000	16,000	16,000	16,000	14,000
Korea, Republic of	5 e/	31	3 r/	-- e/	41 3/
Macedonia	7,140 r/	8,560 r/	8,484 r/	8,500 r/	8,500
Malaysia	25,267	20,751	20,219	18,821 r/	14,200
Mexico:					
By concentration or cementation	268,889	294,647	295,303	342,319	335,822 3/
Leaching (electrowon)	25,799	38,918	45,407	48,217	48,819 3/
Total	294,688	333,565	340,710	390,536	384,641 3/
Mongolia	120,159 r/	121,901 r/	123,039 r/	124,400 r/	128,900 3/
Morocco	13,020	14,000	14,550	14,600 e/	15,000
Namibia	26,555	22,530	14,845 r/	20,320 r/	5,000
Nepal e/	2	2	--	--	--
Norway	7,408	6,799	7,400	6,671 r/	2,700
Oman	4,300	--	--	--	--
Papua New Guinea	209,329	212,737	185,665 r/	111,615 r/	151,556 3/
Peru:					
By concentration or cementation	395,900 r/	410,814 r/	405,615 r/	396,295 r/	419,148 3/
Leaching (electrowon)	-- r/	33,392	88,539 r/	98,080 r/	101,837 3/
Total	395,900 r/	444,206 r/	494,154 r/	494,375 r/	520,985 3/

See footnotes at end of table.

TABLE 20--Continued
COPPER: WORLD MINE PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons)

Country	1994	1995	1996	1997	1998 e/
Philippines	116,163	108,063	54,487	46,959	48,600
Poland	378,000	384,200	421,900	414,000 e/	415,000
Portugal	133,629	134,181	109,935 r/	106,479 r/	114,400 3/
Romania 7/	26,034	24,528	24,434	23,190	23,000
Russia	573,300	525,000	520,000 e/	505,000 e/	515,000
Saudi Arabia	917	925 e/	834	703 r/	700
Serbia and Montenegro	65,000	87,575	82,526	82,500 e/	80,000
Slovakia e/	--	--	386	300	300
South Africa	160,100	161,600	152,595	153,058 r/	163,000
Spain	4,940	22,614	37,510	37,883 r/	40,000
Sweden	79,384	83,603 r/	71,660 r/	86,640 r/	86,000
Turkey 8/	34,902	40,085	33,792 r/	31,900 r/ e/	35,000
United States: 7/					
By concentration or cementation	1,320,000 r/	1,310,000	1,340,000 r/	1,350,000	1,250,000 3/
Leaching (electrowon) 9/	493,000	539,000	574,000	586,000	608,000 3/
Total	1,820,000 r/	1,850,000	1,920,000	1,940,000	1,860,000 3/
Uzbekistan	50,000	40,000	65,000 e/	73,000 r/	73,000
Zambia: 10/					
By concentration or cementation (smelted)	289,800	254,000 r/	276,000 r/	288,900 r/	260,000
Leaching (electrowon)	83,400	62,000 r/	58,000 r/ e/	64,000 r/	60,100
Total	373,200	316,000 r/	334,000 r/	352,900 r/	320,100
Zimbabwe: e/					
By concentration	9,350	7,900	9,000	4,000 r/	2,000
Leaching (electrowon)	--	200	3,200	4,000	6,000
Total	9,350	8,100	12,200	8,000 r/	8,000
Grand total	9,490,000 r/	10,100,000	11,000,000	11,400,000	12,200,000

e/ Estimated. p/ Preliminary. r/ Revised.

1/ World totals, U.S. data, and estimated data are rounded to three significant digits; may not add to totals shown.

2/ Data represent copper content by analysis of concentrates produced except where otherwise noted. Table includes data available through July 9, 1999.

3/ Reported figure.

4/ Copper content of pelletized nickel-copper matte produced in smelter.

5/ Reported by Comision Chilena del Cobre. Includes recoverable copper content of nonduplicative mine and metal products produced from domestic ores and concentrates and leach production for electrowinning.

6/ Formerly Zaire.

7/ Recoverable content.

8/ Excludes copper content of pyrite.

9/ Includes electrowon from roast-leached concentrates.

10/ Data are for fiscal years beginning April 1 of year stated. Zambian-mined copper reported recovered during smelting and electrowinning.

TABLE 21
COPPER: WORLD SMELTER PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons)

Country 3/	1994	1995	1996	1997	1998 e/
Albania, primary e/	1,500	3,000	2,400	2,500	2,500
Australia:					
Primary	315,000 e/	215,000	289,000 e/	208,400 r/	232,000
Secondary e/	9,600	1,200	1,200	1,000	1,000
Total e/	325,000	216,000	290,000	209,000	233,000
Austria, secondary e/	49,562 4/	53,400	65,400	73,000 r/	70,000
Belgium:					
Primary	2,600	2,700	3,500	2,000 r/	--
Secondary	145,000	151,900	153,800	140,500 r/	138,400 4/
Total	147,600	154,600	157,300	142,500	138,400 4/
Brazil, primary	170,033	164,966	172,075	177,060 r/	177,000
Bulgaria:					
Primary	84,400	102,560	99,398	109,630 r/	110,000
Secondary e/	5,000	5,000	5,000	5,000	5,000
Total	89,400	107,560	104,398	114,630 r/	115,000
Canada:					
Primary	515,000	522,761	529,349	529,524	553,100 4/
Secondary	45,000 e/	90,929	83,344	96,957	71,300 4/
Total	560,000 e/	613,690	612,693	626,481	624,400 4/
Chile, primary 5/	1,234,900 r/	1,293,700	1,355,600	1,390,000 r/	1,403,100 4/
China: e/					
Primary	482,000	538,000	615,600 4/	789,000 r/	810,000
Secondary	212,000	466,000	382,000	200,000	250,000
Total	694,000	1,000,000	998,000	989,000 r/	1,060,000
Congo (Kinshasa), primary: e/ 6/					
Electrowon	22,800	22,600 r/	43,800 r/	40,100 r/	40,000
Other	7,200	6,200 r/	6,000	-- r/	--
Total	30,000	28,800 r/	49,800 r/	40,100 r/	40,000
Finland:					
Primary	129,265	120,577	135,400	149,000 e/	140,000
Secondary e/	12,000	12,000	15,000	10,000	16,000
Total e/	141,000	133,000	150,000	159,000	156,000
France, secondary e/	4,400	2,580	2,300	2,400	2,800
Germany:					
Primary	237,400	242,100	296,800	273,000	258,600 4/
Secondary e/	54,800 4/	66,000	88,600	76,000	80,000 4/
Total	292,200	308,000 e/	385,400	349,000	338,600 4/
Hungary, secondary e/	100	100	100	100	--
India, primary	51,232	39,496	45,300	59,400	100,000
Iran: 7/					
Primary	123,800	113,700 r/	126,000 r/ e/	131,000 r/ e/	134,000
Secondary e/	6,800	8,000 r/	6,000	6,100 r/	6,000
Total	130,600	121,700 r/	132,000 r/ e/	137,000 r/ e/	140,000
Japan:					
Primary	1,029,742	1,043,275	1,122,571	1,214,172	1,171,657 4/
Secondary	92,257	125,206	110,856	136,274	131,979 4/
Total	1,121,999	1,168,481	1,233,427	1,350,446	1,303,636 4/
Kazakhstan, undifferentiated	285,000 e/	242,800	245,000	310,000	330,000
Korea, North: e/					
Primary	23,000	24,000	24,000	24,000	23,000
Secondary	5,000	5,000	5,000	5,000	4,500
Total	28,000	29,000	29,000	29,000	27,500
Korea, Republic of, undifferentiated e/	150,000 r/	160,000 r/	150,000 r/	160,000 r/	310,000
Mexico:					
Primary	271,741	274,356	280,462	348,290	378,302 4/
Secondary e/	21,700	14,100	21,800	4,000	4,000
Total e/	293,000	288,000	302,000	352,000	382,000
Namibia, primary 8/	29,781	29,799	16,659	16,029	5,000
Norway, primary	39,416	31,146	33,900 r/	32,600 e/	31,700 4/
Oman, primary	31,200	34,200	24,663 r/	22,800 r/	22,800
Peru, primary	373,298 r/	378,511 r/	411,969 r/	423,120 r/	398,900 4/
Philippines, primary	200,255	242,171	201,661	206,160	200,000

See footnotes at end of table.

TABLE 21--Continued
COPPER: WORLD SMELTER PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons)

Country 3/	1994	1995	1996	1997	1998 e/
Poland:					
Primary	388,600	395,260	399,800	415,000 e/	415,000
Secondary e/	15,000	15,000	15,000	15,000	15,000
Total	403,600	410,260	414,800	430,000 e/	430,000
Romania:					
Primary	23,449	23,345	32,622	25,024	25,000
Secondary e/	1,000	1,000	1,000	1,000	1,000
Total e/	24,400	24,300	33,600	26,000	26,000
Russia:					
Primary e/	514,000	525,000	550,000	575,000	585,000
Secondary e/	10,000	20,000	20,000	25,000	25,000
Total	524,000	545,000	570,000	600,000 e/	610,000
Serbia and Montenegro:					
Primary	69,000	70,074	59,940	60,000 e/	50,000
Secondary	17,400	17,336	65,287	60,000 e/	65,000
Total	86,400	87,410	125,227	120,000 e/	115,000
Slovakia, primary e/	3,000	3,000	3,000	3,000	3,000
South Africa, primary	165,900	154,400	148,400	164,000 e/	160,000
Spain:					
Primary	157,900	139,900	248,500	288,900	291,000
Secondary	18,800	19,100	22,400	23,800	23,800
Total	176,700	159,000	270,900	312,700	315,000
Sweden:					
Primary	79,100 e/	85,000	100,000	100,000 e/	100,000
Secondary	19,600 e/	20,000	25,000	25,000 e/	25,000
Total	98,700 e/	105,000	125,000	125,000 e/	125,000
Turkey, undifferentiated 9/	30,400	33,700 e/	38,600 e/	32,491 r/	35,000
United States:					
Primary 10/	1,310,000	1,250,000	1,300,000	1,440,000 r/	1,490,000 4/
Secondary	397,000	354,000	339,000	285,000 r/	232,000 4/
Total	1,710,000	1,600,000	1,640,000	1,720,000	1,720,000 4/
Uzbekistan: e/					
Primary	65,000 r/	70,000 r/	75,000 r/	80,000 r/	75,000
Secondary	5,000	5,000	5,000	5,000	5,000
Total	70,000 r/	75,000 r/	80,000 r/	85,000 r/	80,000
Zambia, primary: 11/					
Electrowon	26,700	65,400	73,900 e/	70,400 r/ e/	70,000
Other	241,000	234,500	250,000 e/	245,000 r/ e/	252,000
Total	267,700	299,900	324,000 e/	316,000 e/	322,000
Zimbabwe, primary e/ 12/	10,100	8,000	7,600 r/	5,000 r/	3,000
Grand total:	10,000,000	10,400,000 r/	11,000,000 r/	11,300,000 r/	11,600,000
Of which:					
Primary:					
Electrowon	49,500	88,000 r/	118,000 r/	111,000 r/	110,000
Other	8,380,000 r/	8,380,000 r/	8,970,000 r/	9,500,000 r/	9,600,000
Secondary	1,150,000	1,450,000	1,430,000	1,200,000 r/	1,170,000
Undifferentiated	465,000 r/	437,000 r/	434,000 r/	502,000 r/	675,000

e/ Estimated. r/ Revised.

1/ World totals, U.S. data, and estimated data are rounded to three significant digits; may not add to totals shown.

2/ This table includes total production of copper metal at the unrefined stage, including low-grade cathode produced by electrowinning methods. The smelter feed may be derived from ore, concentrates, copper precipitate or matte (primary), and/or scrap (secondary). To the extent possible, primary and secondary output of each country is shown separately. In some cases, total smelter production is officially reported, but the distribution between primary and secondary has been estimated. Table includes data available through July 9, 1999.

3/ Argentina presumably produces some smelter copper using its own small mine output together with domestically produced cement copper and possibly using other raw materials, including scrap, but the levels of such output can not be reliably estimated.

4/ Reported figure.

5/ Data include low-grade electrowon, which is re-refined. Low-grade electrowon production, in thousand metric tons, is as follows: 1994--24.5 and 1995-98-- not available.

6/ Formerly Zaire.

7/ Data are for year beginning March 21 of year stated. Secondary production is estimated to be about 5% of total.

8/ Includes products of imported concentrate.

9/ Secondary production is estimated to be about 5% to 10% of total.

TABLE 21--Continued
COPPER: WORLD SMELTER PRODUCTION, BY COUNTRY 1/ 2/

10/ Figures for U.S. primary smelter production may include a small amount of copper derived from precipitates shipped directly to the smelter for further processing production derived from electrowinning and fire-refining is not included. Copper content of precipitates shipped directly to smelter, in metric tons, are as follows: 1994--26,400; 1995--21,500; 1996--18,900; 1997--15,600; and 1998--8,400.
11/ For fiscal year beginning April 1 of year stated. Electrowon is total electrowon production reported less the quantity reported as "finished production, leach cathodes."
12/ Includes impure cathodes produced by electrowinning in nickel processing.

TABLE 22
COPPER: WORLD REFINERY PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons)

Country	1994	1995	1996	1997	1998 e/
Albania, primary e/	1,000	1,000	1,000	1,000	500
Argentina, secondary e/	16,000	16,000	-- r/	-- r/	--
Australia:					
Primary	311,900	242,000	314,000	271,000	285,000 3/
Secondary e/	24,000	18,000	--	--	--
Total	336,000 e/	260,000 e/	314,000	271,000	285,000 3/
Austria: e/					
Primary	2,904 3/	530	1,000	2,000	2,000
Secondary	49,562 3/	53,000	57,000	65,000 r/	76,000
Total	52,466 3/	53,530	58,000	67,000 r/	78,000
Belgium: 4/					
Primary	215,200	216,000	191,000	190,000 r/	185,000 3/
Secondary	160,000	160,000	163,000	183,000	183,000 3/
Total	375,200	376,000	354,000	373,000 r/	368,000 3/
Brazil, primary	170,033	164,966	172,075	177,060 r/	177,000
Bulgaria:					
Primary e/	21,500	25,700	17,300	20,000	20,000
Secondary e/	5,000	3,332 3/	5,000	5,000	5,000
Total	26,500	29,077	22,301	25,000 e/	25,000
Burma, electrowon	--	--	--	--	4,200
Canada:					
Electrowon	2,300	2,600	2,500	2,700	1,800 3/
Primary	502,200	479,100	475,000	464,000 r/	489,900 3/
Secondary	45,400	90,900	81,700	99,300 r/	72,600 3/
Total	549,900	572,600	559,200	566,000 r/	564,300 3/
Chile:					
Electrowon	201,000	372,500	635,700	881,000	1,108,000 3/
Primary	1,076,400 r/	1,119,000 r/	1,112,500 r/	1,235,600 r/	1,226,900 3/
Total	1,277,400	1,491,500	1,748,200	2,116,600	2,334,900 3/
China: e/					
Primary	482,000	612,000	692,000	801,000 r/	830,000
Secondary	254,000	467,000	428,000	379,000 r/	322,000
Total	736,000	1,080,000	1,120,000	1,180,000 r/	1,150,000
Congo (Kinshasa), primary 5/ 6/	29,000	33,000	42,000 r/	40,100 r/	38,000
Cyprus, electrowon	--	--	1,700	3,900	6,200
Egypt, secondary	4,300	4,400	4,600 e/	4,600 e/	4,600
Finland: e/					
Primary	58,400 3/	63,700	64,000	100,000	100,000
Secondary	10,800 3/	10,000	10,000	16,000	20,000
Total	69,200 3/	73,700	74,000	116,000	120,000
France: e/					
Primary	16,600	4,200	10,500	-- r/	--
Secondary	25,200	38,300	28,600	35,600 r/	22,400
Total	41,800 3/	42,500	39,100	35,600 r/	22,400
Germany:					
Primary	253,000 e/	247,200	316,000 e/	297,900 r/	322,800 3/
Secondary	339,000 e/	369,100	355,000 e/	375,800 r/	373,000 3/
Total	591,859	616,300	671,000 e/	673,700 r/	695,800 3/
Hungary, primary and secondary e/	11,000	11,000	11,000	11,000	11,000

See footnotes at end of table.

TABLE 22--Continued
COPPER: WORLD REFINERY PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons)

Country	1994	1995	1996	1997	1998 e/
India:					
Primary, electrolytic	40,100	33,900	29,100 r/	30,200 r/	100,000
Secondary e/	8,900 3/	5,700 r/	10,200 r/	6,000 r/	7,000
Total e/	49,000	39,600 r/	39,300 r/	36,200 r/	107,000
Iran: 7/					
Electrowon	--	--	1,500	7,300 e/	14,000
Primary 8/	90,200	90,400	99,100 r/	103,500 r/	120,000
Total	90,200	90,400	100,600 r/	111,000 r/ e/	134,000
Italy:					
Primary	6,200	14,300	25,000	5,600	--
Secondary	77,800	83,700	60,800	80,100	29,100
Total	84,000	98,000	85,800	85,700 r/	29,100
Japan:					
Primary	1,025,510	1,081,235	1,140,502	1,157,299 r/	1,149,266 3/
Secondary	93,658	106,724	110,871	121,400	128,086 3/
Total	1,119,168	1,187,959	1,251,373	1,278,699 r/	1,277,352 3/
Kazakhstan, primary	280,000	255,600	267,100 r/	301,100 r/	324,900 3/
Korea, North: e/					
Primary	22,000	22,000	23,000	23,000	23,000
Secondary	5,000	5,000	5,000	5,000	5,000
Total	27,000	27,000	28,000	28,000	28,000
Korea, Republic of:					
Primary	244,169	234,895	246,305	265,426	373,300 3/
Secondary e/	2,000	2,000	2,000	2,000	2,000
Total e/	246,000	237,000	248,000	267,000	375,000
Mexico:					
Primary:					
Electrowon	25,799	38,918	45,407	48,217	48,819 3/
Other	144,800	140,500	180,100	234,000 e/	383,181 3/
Secondary	26,501	32,782	16,493	14,800 e/	15,000
Total	197,100	212,200	242,000	297,000	447,000 3/
Mongolia, electrowon	--	--	--	2,751 r/	2,319 3/
Norway, primary 8/	39,416	34,322	28,526	32,600 e/	32,000
Oman, primary	24,194	33,900	24,150	23,600 r/	22,700
Peru:					
Electrowon	17,200	33,392	88,172	98,080 r/	101,837 3/
Primary	248,213	261,751	249,890	296,993 r/	305,507 3/
Total	265,413	295,143	338,062	395,073 r/	407,344 3/
Philippines, primary	154,713	158,109	155,774	146,630	150,000
Poland:					
Primary	405,093	405,708	424,700	425,000 e/	425,000
Secondary	20,318	28,976	20,000 e/	20,000 e/	20,000
Total	425,411	434,684	444,700	445,000 e/	445,000
Romania:					
Primary	22,113	22,013	28,305	21,912	20,000
Secondary e/	4,600	1,000	1,000	1,000	1,000
Total e/	26,700	23,000	29,300	22,900	21,000
Russia:					
Primary	452,000	504,000	513,000	550,000 e/	565,000
Secondary	50,000	56,000	57,000	60,000 e/	60,000
Total	502,000	560,000	570,000	610,000 e/	625,000
Serbia and Montenegro:					
Primary	66,308	71,304	59,940	60,000 e/	60,000
Secondary	5,841	7,147	44,060	53,536	56,000
Total	72,149	78,451	104,000	113,536	116,000
Slovakia, primary and secondary e/	25,000 3/	25,000	25,000	25,000	25,000
South Africa, primary 8/	129,622	124,300	123,000 e/	127,000 e/	123,000
Spain: e/					
Primary	142,000	117,000	210,000	229,000	247,000
Secondary	46,800	47,100	54,000	63,300	57,200
Total	188,000	164,000	264,000	292,000	304,000

See footnotes at end of table.

TABLE 22--Continued
COPPER: WORLD REFINERY PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons)

Country	1994	1995	1996	1997	1998 e/
Sweden:					
Primary e/	77,300	78,000	100,000	128,000 r/	130,000
Secondary	25,750	27,100	25,000 e/	33,000 r/	35,000
Total	103,050	105,100	125,000	161,000 r/	165,000
Taiwan, secondary e/	10,000	8,000	6,000	4,000	4,000
Turkey:					
Primary	59,100 r/	80,300 r/	80,700 r/	104,000 r/	110,000
Secondary	23,600	20,000	20,000	10,000	10,000
Total	82,700	100,300	100,700	114,000	120,000
United Kingdom:					
Primary	11,078	28,000 e/	12,869	9,100 r/	8,000 3/
Secondary	35,586	50,500 e/	43,746	51,300 r/	44,000 3/
Total	46,664	78,500 e/	56,615	60,400 r/	52,000 3/
United States:					
Primary:					
Electrowon	493,000	539,000	574,000	586,000 r/	608,000 3/
Other	1,350,000	1,390,000	1,430,000	1,480,000	1,530,000 3/
Secondary	392,000	352,000	345,000 r/	383,000	336,000 3/
Total	2,230,000	2,280,000	2,350,000 r/	2,450,000	2,480,000 3/
Uzbekistan: e/					
Primary	85,000	90,000 r/	95,000 r/	105,000 r/	75,000
Secondary	5,000	5,000	5,000	5,000	5,000
Total	90,000	95,000 r/	100,000 r/	110,000 r/	80,000
Zambia, primary: 9/					
Electrowon	67,300	62,000	58,000	66,600 r/	52,600
Other	284,800	266,000	276,000	271,800 r/	250,000
Total	352,100	328,000	334,000	338,400 r/	303,000
Zimbabwe: 10/					
Electrowon	--	200	3,200 e/	4,000 e/	4,000
Primary	9,350	6,875	10,900 e/	8,800 r/ e/	5,000
Secondary e/	6,000	6,000	6,000	6,000	5,000
Total e/	15,400	13,100	20,100	18,800 r/	14,000
Total, primary	9,130,000 r/	9,390,000 r/	9,920,000 r/	10,400,000 r/	10,900,000
Total, secondary	1,770,000 r/	2,070,000 r/	1,960,000 r/	2,080,000 r/	1,900,000
Total, primary and secondary, undifferentiated	257,000 r/	445,000 r/	769,000 r/	1,040,000 r/	1,280,000
Grand total	11,200,000	11,900,000	12,700,000 r/	13,600,000 r/	14,100,000

e/ Estimated. r/ Revised.

1/ World totals, U.S. data, and estimated data are rounded to three significant digits; may not add to totals shown.

2/ This table includes total production of refined copper, whether produced by pyrometallurgical or electrolytic refining methods and whether derived from primary unrefined copper or from scrap. Copper cathode derived from electrowinning processing is also included. Table includes data available through July 9, 1999.

3/ Reported figure.

4/ Includes leach cathode from Congo (Kinshasa), which is processed.

5/ Formerly Zaire.

6/ Excludes leach cathode exported for processing in Belgium.

7/ Data are for Iranian years beginning March 21 of that stated.

8/ May include secondary.

9/ Data are for fiscal year beginning April 1 of that stated. Electrowon covers only presumably high-grade electrowon cathodes reported as "finished production leach cathodes." Other, in addition to electrowon cathodes, includes a smaller amount of "finished product shapes" presumably cast from electro-refined cathodes, or any blister-anodes and low-anodes and low-grade electrowon cathodes that were furnace- or fire-refined.

10/ May include copper-nickel matte (copper content more than 6,000 tons per year) imported from Botswana for toll refining.