



2020 Minerals Yearbook

COPPER [ADVANCE RELEASE]

COPPER

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In 2020, mine production of recoverable copper in the United States decreased by 4% to 1.20 million metric tons (Mt) from 1.26 Mt in 2019 (tables 1, 3). Production decreased primarily because of lower ore grades at a leading mine in Utah and the temporary closure of a mine in New Mexico after workers tested positive for coronavirus disease 2019 (COVID-19). Globally, the United States remained the fifth-ranked mine producer of copper behind Chile, Peru, China, and Congo (Kinshasa), in descending order of output, and accounted for 6% of global production. World mine production of copper increased to 20.6 Mt in 2020 from 20.4 Mt in 2019, mostly owing to increases in production in Congo (Kinshasa), Indonesia, Panama, and Zambia. These increases were partially offset by lower output in Chile, Laos, Peru, and the United States (table 20).

Smelter production of copper in the United States decreased by 32% in 2020 to an estimated 315,000 metric tons (t) from 464,000 t (reported) in 2019, and domestic output of refined copper was 918,000 t, 11% less than 1.03 Mt in 2019 (table 1). One smelter in Arizona and the refinery in Texas temporarily shut down in October 2019 as the result of a worker strike and remained closed for all of 2020. Smelter and refinery production also were affected by multiple disruptions of the smelting facility in Utah, where the flash converting furnace required a rebuild after an earthquake in March and the startup of the smelter was delayed following planned major maintenance in May and June. The United States remained the sixth-ranked producer of refined copper, following China, Chile, Japan, Congo (Kinshasa), and Russia, in descending order of production, and accounted for 4% of global output. World refinery production of copper increased to 25.0 Mt from 24.4 Mt (revised) in 2019. Large production increases in China, Chile, Congo (Kinshasa), Indonesia, Japan, and Zambia were partially offset by significant decreases in output in Brazil, India, and the United States (table 22).

Reported U.S. consumption of refined copper was 1.77 Mt in 2020, slightly lower than 1.81 Mt in 2019 because of reduced economic activity resulting from the global COVID-19 pandemic (tables 1, 4, 5). Domestic consumption of refined copper decreased from a record high of 3.02 Mt in 2000 to 1.65 Mt in 2009 and remained at approximately 1.8 Mt every year since 2010. In 2020, China (including Hong Kong) accounted for 58% of world apparent consumption, which increased slightly to 25.0 Mt from 24.4 Mt (revised) in 2019, according to data compiled by the International Copper Study Group (ICSG). Consumption in China increased by 1.68 Mt from that in 2019, whereas consumption in all other countries and localities collectively decreased by 1.08 Mt. The ICSG calculation of China's apparent consumption was based on reported production, trade, and Shanghai Futures Exchange (SHFE) stock data and did not include unreported Government

or industry stocks, which can fluctuate significantly on an annual basis. The United States remained the second-ranked consumer of refined copper and accounted for 7% of global apparent consumption, followed by Germany, Japan, and the Republic of Korea, in descending order of consumption (International Copper Study Group, 2021a, p. 9, 19–20).

In 2020, the average annual Commodity Exchange Inc. (COMEX) spot copper price increased by 3% to \$2.80 per pound from \$2.72 per pound in 2019 (table 1). Factors that contributed to the increased price included strong demand for copper in China during the second half of the year; supply disruptions resulting from COVID-19 containment measures, particularly in Peru; and expectations of additional global investments in copper-intensive technologies in the near future (Freeport-McMoRan Inc., 2021, p. 70; Glencore plc, 2021, p. 56; PJSC MMC Norilsk Nickel, 2021a, p. 60).

Production

Domestic production data were compiled from U.S. Geological Survey (USGS) monthly canvasses of the mines, smelters, and refineries operating in the United States. In 2020, responses to the surveys and data from public company documents represented more than 99% of the total mine production and 61% of the total refinery production reported in table 1. To avoid disclosing company proprietary data, smelter and electrolytic refinery production in 2020 were estimated based on information in public company reports and do not reflect actual output reported to the USGS.

Mine.—Recoverable copper production in the United States decreased by 4% to 1.20 Mt in 2020 from 1.26 Mt in 2019, and the value of production decreased slightly to \$7.60 billion from \$7.75 billion. Copper recoverable in concentrates and precipitates accounted for 53% of mine output and decreased by 12% to 643,000 t in 2020 from 730,000 t in 2019, and copper produced by solvent extraction (leaching) and electrowinning (SX–EW) represented 47% of mine production and increased by 6% to 559,000 t from 527,000 t (tables 1, 3). Arizona was the leading copper-producing State and accounted for 73% of U.S. output (880,000 t of recoverable copper) in 2020. Copper also was produced in Michigan, Missouri, Montana, Nevada, New Mexico, and Utah. Although 25 mines in the United States (including 14 SX–EW facilities) recovered copper in 2020, 17 mines accounted for more than 99% of production (table 2). Most of the remaining mines were small leach operations or byproduct producers of copper.

Domestic mine output of copper decreased in 2020 primarily owing to lower production at Rio Tinto Kennecott's Bingham Canyon Mine and Freeport-McMoRan Inc.'s Chino Mine. At Bingham Canyon, copper production decreased by 46,800 t from that in 2019 because ore grades decreased by 25% and Rio Tinto prioritized molybdenum production during a lengthy

shutdown of the smelter. At Freeport's Chino Mine, operations were suspended in April 2020 following a limited outbreak of COVID-19; copper output consequently decreased by 37,600 t. These decreases were partially offset by higher production from Freeport's Safford Mine, where copper output increased by 23,100 t owing to the start of production from a new open pit in the third quarter of 2020 (Freeport-McMoRan Inc., 2020, p. 1; 2021, p. 9, 28; Rio Tinto Group, 2021, p. 52, 339).

Smelter and Refinery.—In 2020, smelter production in the United States, which consisted of primary (from ore) output only, decreased by 32% to an estimated 315,000 t from 464,000 t (reported) in 2019. Production of primary electrolytically refined copper consequently decreased by 31% to an estimated 315,000 t from 457,000 t (reported) (table 1). To avoid disclosing company proprietary data, smelter and electrolytic refinery output were estimated in 2020 based on information in public company reports and do not reflect actual production reported to the USGS. Smelter and electrolytic refinery production were affected by multiple disruptions in 2020. ASARCO LLC's smelter and electrolytic refinery temporarily shut down in October 2019 as the result of a worker strike and remained closed for all of 2020 (Grupo México, S.A.B. de C.V., 2021, p. 83). In March 2020, the flash converting furnace at the Rio Tinto smelter was damaged by an earthquake and needed to be entirely rebuilt. The restart of the Rio Tinto smelter also was delayed by unexpected issues after planned major maintenance in May and June (Rio Tinto Group, 2021, p. 52).

In total, U.S. refinery production in 2020 was 918,000 t, 11% less than 1.03 Mt in 2019. Primary refined copper produced by electrowinning was 559,000 t in 2020, an increase of 6% from that in 2019, primarily owing to the start of copper production at the Lone Star expansion of Freeport's Safford Mine (Freeport-McMoRan Inc., 2021, p. 9, 28). Secondary (from scrap) electrolytic and fire-refined copper decreased by 3% to 43,200 t. Primary copper accounted for 95% of total domestic refined output (34% electrolytic and 61% electrowon), and secondary copper accounted for 5% (table 1). Three smelters, three electrolytic refineries, 14 electrowon refineries, and four fire refineries operated in the United States in 2020.

Operating Property Reviews.—In 2020, ASARCO LLC (a subsidiary of Grupo México, S.A.B. de C.V.) produced a total of 128,000 t of copper at its three mines in Arizona, a slight increase from 125,000 t in 2019. At the Mission Mine, the company produced 57,800 t of copper in concentrates in 2020 (54,800 t in 2019). Output from the Ray Mine was 37,900 t of copper in concentrates (33,900 t in 2019) and 11,400 t of copper by SX-EW (16,300 t in 2019). The Silver Bell Mine produced 20,400 t of electrowon copper (unchanged from that in 2019). ASARCO's smelter in Hayden, AZ, and electrolytic refinery in Amarillo, TX, remained idled for all of 2020 following what the company described as temporary shutdowns in October 2019 because of a worker strike. Although the strike ended in July 2020, ASARCO had not publicly announced as of yearend 2020 when operations were expected to resume nor a reason for the continued closures (Grupo México, S.A.B. de C.V., 2021, p. 83, 108–110, 113–114).

Primarily owing to mill optimization measures that offset planned lower ore grades, copper production at the Pinto Valley Mine in Arizona, owned by Capstone Mining Corp., increased to 54,000 t in 2020 (51,700 t in concentrates and 2,270 t of electrowon cathode) from 53,400 t in 2019 (51,600 t in concentrates and 1,710 t of cathode). In December 2020, Capstone tested a flotation technology that increased copper recovered in concentrates by 6%. The combination of higher mill throughput and improved copper recovery rates had the potential to increase annual output of copper in concentrates by up to 5,400 t. The company announced in July 2020 that production of electrowon cathode per area leached had doubled during the prior twelve months because of the implementation of a new technology developed by Jetty Resources, LLC for leaching low-grade sulfide ores. Capstone planned to expand SX-EW operations at Pinto Valley and to produce about 135,000 to 160,000 t of cathodes over the next 20 years, significantly greater than the roughly 2,000 t that were produced on an annual basis as of 2020 (Capstone Mining Corp., 2020; 2021, p. 5–6, 17).

In December 2020, Excelsior Mining Corp. produced the first copper cathode at the Gunnison Mine in Arizona, with the first sales expected in January 2021. Copper production had been anticipated to begin in the second quarter of 2020 but was delayed by the COVID-19 pandemic; the company placed the project on care-and-maintenance status from late March 2020 until early November 2020. Excelsior planned to develop Gunnison in three stages, with a maximum annual copper output of approximately 57,000 metric tons per year (t/yr) and total production of approximately 980,000 t over a mine life of 24 years. The company projected that the mine would ramp up to the first stage design capacity of 11,300 t/yr of copper by yearend 2021. Gunnison used in situ recovery, which involves injecting sulfuric acid directly into a deposit, leaching copper in the ground without mining any ore, and pumping the copper-bearing solution to an electrowon plant through a series of recovery wells (Excelsior Mining Corp., 2021, p. 17–18, 21, 23, 32).

Total output of recoverable copper at Freeport-McMoRan Inc.'s U.S. operations in 2020 was approximately 768,000 t, a decrease of 3% from about 790,000 t during the prior year. The lower production was primarily a result of the suspension of operations at the Chino Mine in April 2020 following a limited outbreak of COVID-19; the mine was expected to restart at a reduced operating rate of 50% of full capacity in January 2021. Decreased production from Chino was partially offset by the completion of development activities at the Lone Star expansion of the Safford Mine in the third quarter of 2020, where Freeport anticipated that copper output would ramp up to more than 90,000 t in 2021. Combined copper in concentrates and (or) electrowon production at each of the company's mines in Arizona was as follows: Bagdad—98,000 t (98,900 t in 2019), Miami—7,710 t (6,800 t in 2019), Morenci (the third-ranked global copper mine by production quantity in 2020, 72%-owned by Freeport)—445,000 t (460,000 t in 2019), Safford—73,000 t (49,900 t in 2019), and Sierrita—80,700 t (72,600 t in 2019). In New Mexico, copper output at the Chino Mine totaled 41,700 t (79,400 t in 2019), and SX-EW production at the Tyrone Mine

was 20,400 t (21,800 t in 2019). Freeport also produced refined copper cathodes at its electrolytic facility in El Paso, TX, but did not publicly report cathode output (Freeport-McMoRan Inc., 2020, p. 1; 2021, p. 7, 9, 28).

KGHM International Ltd. (a subsidiary of KGHM Polska Miedź S.A.) produced 47,400 t of recoverable copper in concentrates at the Robinson Mine in Nevada. Output decreased by 3% compared with 48,800 t in 2019 because of lower ore grades and decreased copper recovery rates. At the Carlota Mine in Arizona, electrowon production was 5,000 t in 2020 and 4,400 t in 2019 (KGHM Polska Miedź S.A., 2020, p. 12–13; 2021, p. 12–13, 76).

In 2020, Lundin Mining Corp. produced 18,700 t of copper in concentrates at the Eagle nickel-copper mine in Michigan, 31% more than 14,300 t in 2019 owing to a full year of mining from the Eagle East expansion. The company processed the first ore from Eagle East in the fourth quarter of 2019. As of yearend 2016, Eagle and Eagle East contained 117,000 t of probable copper reserves, enough to extend the mine life to 2023. In addition to the higher copper grades, Lundin processed a record quantity of ore through the Eagle mill in 2020 (Roscoe Postle Associates Inc., 2017, p. 1-6, 15-2; Lundin Mining Corp., 2020, p. 17; 2021, p. 1, 17).

Nevada Copper Corp. began producing copper at the underground Pumpkin Hollow Mine in Nevada on December 16, 2019. In 2020, the company suspended operations at Pumpkin Hollow from April 6 through August 19 because of COVID-19 restrictions implemented by the State of Nevada, and the mine was affected by a series of additional unplanned stoppages owing to geotechnical and mechanical issues. The rampup to steady-state production consequently was expected to be delayed until the third quarter of 2021. At full capacity, Nevada Copper projected the underground portion of Pumpkin Hollow to generate approximately 23,000 t/yr of copper in concentrates over a mine life of nearly 14 years. Copper output from the underground mine in 2020 was 1,200 t of copper contained in concentrates. An additional open pit project at the site, which was still in the feasibility stage, would potentially yield about 77,000 t/yr of copper in concentrates over a mine life of 19 years (French and others, 2019, p. 1-23, 20-14; Nevada Copper Corp., 2019a; 2019b, p. 9, 11; 2021, p. 3–4, 11).

At the Bingham Canyon Mine in Utah, owned by Rio Tinto Kennecott (a subsidiary of Rio Tinto Group), production of copper in concentrates was 140,000 t in 2020, 25% lower than 187,000 t in 2019 as a result of lower copper ore grades and the prioritization of molybdenum production during disruptions of the company's smelter in Magna, UT. The flash converting furnace at the smelter required a rebuild after an earthquake in March, and the restart of the smelter was delayed following planned major maintenance in May and June. Publicly reported production of copper cathodes at the company's electrolytic refinery in Magna, UT, consequently decreased by 54% to 84,800 t in 2020 from 185,000 t in 2019. Total refinery output reported to the USGS was higher than that stated in company reports because smelter and refinery production from purchased and toll third-party concentrates were not included in the company's public figures. Rio Tinto continued a project to push back the south wall of the Bingham Canyon open pit, which was

anticipated to result in higher copper ore grades beginning in 2021 (Rio Tinto Group, 2021, p. 33, 52, 339).

Consumption

Domestic consumption data were compiled from USGS annual and monthly canvasses of U.S. manufacturers. In 2020, copper was consumed (used) as refined copper and scrap at about 30 brass mills; 14 wire-rod mills; and 500 chemical plants, foundries, and miscellaneous manufacturers in the United States. Reported U.S. consumption of refined copper was 1.77 Mt, slightly lower than 1.81 Mt in 2019; consumption by wire-rod mills was 1.30 Mt (73% of total refined use), and consumption by brass mills was 414,000 t (23%). Domestic consumption of copper-base scrap in 2020 was 926,000 t (gross weight), essentially unchanged from 931,000 t in 2019. Brass mills consumed 649,000 t of copper-base scrap (equivalent to 70% of total use), and wire-rod mills consumed 120,000 t (13%) (tables 1, 4, 5, 10, 11). The overall decreases in consumption of refined copper and copper scrap in 2020 were likely a consequence of reduced U.S. copper demand resulting from the COVID-19 pandemic.

Copper recovered from refined or remelted scrap (of copper-base and non-copper-base) in the United States decreased to 858,000 t in 2020 (81% from new scrap and 19% from old scrap) from 866,000 t (revised) in 2019 and accounted for 35% of the total U.S. copper supply of 2.47 Mt (defined as primary refined production plus copper recovered from new and old scrap plus refined imports for consumption minus refined exports, including adjustments for changes in refined copper stocks). The conversion of old (post-consumer) scrap to alloys and refined copper decreased by 3% to 160,000 t in 2020 from 166,000 t (revised) in 2019, and recovery of copper from new (manufacturing) scrap decreased to 697,000 t from 700,000 t (tables 1, 6). Brass and wire-rod mills accounted for 83% of copper recovered from scrap in 2020 (table 7).

In June 2020, Freeport announced that it would close its wire-rod manufacturing operation in Norwich, CT, with most employees halting work by the end of August. The company attributed the closure to a decrease in economic activity associated with the COVID-19 pandemic. In September 2020, SDI LaFarga LLC, a joint venture of Steel Dynamics, Inc. and the LaFarga Group, commissioned a new furnace at its wire-rod facility in New Haven, IN. The furnace was expected to more than double the plant capacity and increase the company's domestic wire-rod production to about 17,500 metric tons per month (Bera, 2020; Grahn, 2020).

According to preliminary data from the Copper Development Association Inc. (2021, p. 18), copper and copper-alloy product supply to the U.S. market by fabricators (brass mills, foundries, powder producers, and wire mills), consisting of shipments from domestic plants and net imports, decreased slightly to 2.55 Mt of copper content in 2020 from 2.59 Mt in 2019. Since 2000, when the copper supply reached a record high of 4.33 Mt, deliveries to the domestic market trended downward, and those in 2020 were 41% less than those in 2000. In 2020, wire-mill products accounted for 55% of the total U.S. copper supply; brass mill products, 31%; net imports, 11%; and foundry and powder products, 3% combined. The building construction sector

remained the leading end-use market and accounted for 46% of total shipments, followed by electrical and electronic products, 21%; transportation equipment, 16%; consumer and general products, 10%; and industrial machinery and equipment, 7%. Examples of product categories included in each sector are as follows: building construction—air conditioning, building wire, commercial refrigeration, and heating and plumbing; consumer and general products—appliances, consumer electronics, and cords; electrical and electronic products—lighting and wiring devices, power utilities, and telecommunications; industrial machinery and equipment—industrial valves and fittings and plant equipment; and transportation equipment—aircraft, automobiles, railroad, and ships.

The decreased quantity of copper and copper-alloy product shipments to the domestic market in 2020 compared with those in 2019 corresponded with mostly negative economic trends in major industries that used copper. In 2020, housing starts in the United States increased by 7% to 1.38 million units from 1.29 million units, and manufacture of telecommunications equipment increased by 4%. In contrast, fabrication of equipment for heating, ventilation, and air-conditioning (HVAC) decreased by 3%; production of appliances and electrical equipment (such as batteries, generators, lighting components, and wiring devices) decreased by 4%; output of aircraft, automobiles, and ships decreased by 14%; and manufacture of power transmission products was 21% lower than output in 2019 (U.S. Census Bureau, 2021; Board of Governors of the Federal Reserve System, 2022).

Stocks

In 2020, total refined copper stocks in the United States increased by 8,020 t (7%) to 118,000 t at the end of December from 110,000 t at the beginning of January. Inventories of domestic refined copper at yearend were located primarily in COMEX warehouses (60% of total stocks), London Metal Exchange Ltd. (LME) warehouses (16%), and wire-rod mills (9%). LME and wire-rod stocks decreased by 16,700 t (48%) and 9,270 t (46%), respectively, and COMEX stocks increased by 36,200 t (more than twofold). Combined stockpiles at brass mills, refineries, and other manufacturers decreased by 2,180 t (11%) from those at yearend 2019 (table 1).

Prices

The average annual COMEX spot copper price increased by 3% to \$2.80 per pound in 2020 from \$2.72 per pound in 2019 (table 1). The monthly average COMEX price decreased in each of the first 4 months of the year, to a low of \$2.31 per pound in April, because of economic uncertainty related to the COVID-19 pandemic, then increased in each of the last 8 months of the year to a high of \$3.53 per pound in December. Factors that contributed to the increased annual price included strong demand for copper in China during the second half of the year, supply disruptions resulting from COVID-19 containment measures (particularly in Peru), and expectations of additional global investments in copper-intensive technologies in the near future (Freeport-McMoRan Inc., 2021, p. 70; Glencore plc, 2021, p. 56; PJSC MMC Norilsk Nickel, 2021a, p. 60).

Copper scrap prices generally followed the trend in refined copper prices, and trends for prices of various types of scrap in 2020 ranged from a decrease of 4% to an increase of 9%. The refiners no. 2 scrap price averaged \$2.43 per pound, 4% greater than \$2.33 per pound in 2019. The average annual discount for refiners no. 2 scrap from the COMEX spot price decreased to 36.5 cents per pound from 39.1 cents per pound (tables 1, 13).

Foreign Trade

Imports of refined copper into the United States increased slightly and exports of refined copper from the United States decreased by 67% in 2020. Overall, net imports (imports minus exports) were 635,000 t (676,000 t of imports and 41,200 t of exports), 18% higher than 537,000 t (663,000 t of imports and 125,000 t of exports) in 2019 (tables 1, 14, 16). Imports likely increased in 2020 because the decrease in domestic refined production (112,000 t) was greater than the decrease in domestic refined copper consumption (32,300 t) (table 1). Shipments to Canada and Mexico accounted for nearly all U.S. refined copper exports in 2020 and decreased by a combined 84,900 t from those in 2019. Canada and Mexico likely imported less refined copper from the United States because of oversupplied markets. In Canada, output of refined copper increased by an estimated 8,800 t in 2020, whereas refined consumption decreased by 15,400 t. In Mexico, refined production increased by 5,000 t in 2020, whereas consumption of refined copper decreased by 34,500 t (table 22; International Copper Study Group, 2021a, p. 19).

In 2020, refined copper accounted for 88% of all U.S. unmanufactured copper imports (consisting of refined copper, unalloyed copper scrap, and the copper content of alloyed copper scrap, blister and anodes; matte, ash, and precipitates; and ore and concentrates), and the copper content of scrap accounted for 12% (8% copper-alloy scrap and 4% unalloyed scrap). The copper content of scrap was the primary source of copper shipped to international markets and represented 59% of total unmanufactured copper exports (23% alloyed and 36% unalloyed), followed by the copper content of ore and concentrates (35%), and refined copper (4%). Chile was the leading foreign source of refined copper for the United States and accounted for 61% of the total refined import quantity, followed by Canada (22%) and Mexico (14%). The leading destinations for refined copper exports from the United States were Mexico (65%) and Canada (31%). Imports of copper ore and concentrates originated entirely from Canada in 2020 and predominantly (greater than 99%) from Mexico in 2019 and decreased by 92% to 2,170 t of copper content in 2020. Exports of copper ore and concentrates increased by 8% and were primarily shipped to Mexico (65%), China (13%), Canada (9%), and Japan (4%). Ore and concentrate exports to China increased to 49,300 t in 2020 from 7 t in 2019 (tables 14, 16, 18, 19). The Government of China enacted a tariff on copper ore and concentrate shipments from the United States in September 2018, but companies in China were allowed to apply for tariff waivers beginning in March 2020 (Daly, 2020).

The United States imported an estimated 89,900 t of copper contained in scrap in 2020, a decrease of 17% from 108,000 t in 2019. Imports of copper in scrap originated primarily from

Canada (49%) and Mexico (40%) (table 19). Shipments of copper in scrap from the United States to international markets decreased by 10% in 2020, to an estimated copper content of 643,000 t from 714,000 t. Total global imports of copper scrap (in gross weight) decreased by 17% to 4.69 Mt in 2020 from 5.65 Mt in 2019. COVID-19 lockdowns in many countries restricted global flows of scrap because the scrap industry was typically not classified as an essential economic activity (International Copper Study Group, 2020, p. 13; 2021a, p. 40–41). Malaysia was the leading destination for domestic copper scrap in 2020 and accounted for 21% of total copper exported in scrap, followed by China (16%), Canada (11%), the Republic of Korea (9%), Germany (5%), and India (5%), in descending order of quantity (table 18).

World Industry Structure

Mine Production.—According to S&P Global Market Intelligence, the COVID-19 pandemic caused at least 275 mines, including 51 copper mines, in 36 countries to suspend production from March to June 2020. Nearly 90% of the affected operations restarted by late June (MacDonald, 2020). Despite the high level of disruption, world mine production of copper increased to 20.6 Mt in 2020 from 20.4 Mt in 2019. Copper in concentrates accounted for 80% of global mine output and increased to 16.4 Mt from 16.3 Mt in 2019. Copper produced by SX–EW represented 20% of world mine production and increased slightly to 4.19 Mt from 4.11 Mt (revised). Fifty-three countries and localities were known to have mined copper in 2020. Chile was the leading producer of mined copper in 2020 and accounted for 28% of total global production, followed by Peru (10%), China (8%), Congo (Kinshasa) (8%), and the United States (6%). The remaining countries among the 10 leading producers, in descending order of output, were Australia, Zambia, Russia, Mexico, and Canada. The 10 leading producers accounted for 79% of production, and the 20 leading producers accounted for 94%. The largest increases in production took place in Congo (Kinshasa), where output increased by 231,000 t (17% higher than country production in 2019); Indonesia, by 155,000 t (44%); Panama, by 58,100 t (39%); and Zambia, by 52,800 t (7%). These increases were partially offset by significant decreases in Peru, where output was lower by 301,000 t (12%); the United States, by 55,400 t (4%); Chile, by 54,300 t (essentially unchanged); and Laos, by 53,100 t (38%) (table 20). According to data compiled by the International Copper Study Group (2021a, p. 9), global annual mine capacity increased slightly to 24.8 Mt in 2020 from 24.2 Mt in 2019.

Refined Production.—Global output of refined copper in 2020 increased by 3% to 25.0 Mt from 24.4 Mt (revised) in 2019. Primary copper represented 84% of world refined production and totaled 21.1 Mt, an increase of 4% from 20.3 Mt in 2019; electrowon copper output (17% of worldwide refined production) increased slightly, and primary copper produced by electrolytic and fire refining (other primary, 67%) was 4% greater than that in 2019. Secondary copper accounted for 16% of global refined output in 2020 and decreased by 4% to 3.97 Mt from 4.13 Mt (revised), primarily owing to reduced production in China. In 2020, 44 countries and localities were

known to have produced refined copper. China was the leading producer of refined copper and accounted for 40% of world refinery production, followed by Chile (9%), Japan (6%), Congo (Kinshasa) (5%), Russia (4%), and the United States (4%). The remaining countries among the 10 leading producers, in descending order of output, were the Republic of Korea, Germany, Poland, and Kazakhstan. The 10 leading producers represented 78% of worldwide output, and the 20 leading producers represented 93%. Most of the growth in refined copper production was in China, where output increased by 243,000 t (slightly greater than country production in 2019). Large increases also took place in Congo (Kinshasa), by 206,000 t (18%); Zambia, by 114,000 t (43%); Indonesia, by 88,400 t (49%); Japan, by 87,700 t (6%); and Chile, by 60,200 t (3%). The most significant decreases were in the United States, where production decreased by 112,000 t (11%); India, by 92,700 t (22%); and Brazil, by 65,300 t (37%) (table 22). Global refinery capacity increased by 3% to 29.9 Mt in 2020 from 29.0 Mt (revised) in 2019 (International Copper Study Group, 2021a, p. 9).

Apparent Consumption.—In 2020, global apparent consumption of refined copper increased slightly to 25.0 Mt from 24.4 Mt (revised) in 2019, according to the ICSG. China (including Hong Kong) was the leading user of refined copper and accounted for 58% of worldwide consumption, followed by the United States (7%), Germany (4%), Japan (3%), and the Republic of Korea (3%). The remaining countries among the 10 leading consumers, in descending order of quantity, were Turkey, Italy, India, the United Arab Emirates, and Taiwan. The 10 leading consumers accounted for 83% of global apparent consumption, and the 20 leading consumers accounted for 94%. Consumption of copper in China increased by 1.68 Mt to 14.4 Mt in 2020 from 12.8 Mt (revised) in 2019, and consumption collectively decreased by 1.08 Mt in all countries and localities except China. The ICSG calculation of China's apparent consumption was based on reported production, trade, and SHFE stock data and did not include unreported Government or industry stocks, which can fluctuate significantly on an annual basis. By region, use of refined copper in Asia accounted for 77% of the global total in 2020 (20% excluding China), followed by Europe (11%); North America (9%); and South America, Africa, and Oceania (3% combined). Consumption increased by 6% in Asia (but decreased by 11% outside of China) and decreased by 10% and 5% in Europe and North America, respectively, compared with that in 2019 (International Copper Study Group, 2021a, p. 9, 19–20).

World Review

Chile.—In 2020, 9 of the leading 25 copper mines in the world were located in Chile, the first-ranked global producer of mined copper every year since 1982. The COVID-19 pandemic caused limited disruption to the Chilean mining industry; workforces at many companies were reduced to prevent outbreaks, but the Government considered mining to be an essential economic activity and did not require mines to suspend production (International Copper Study Group, 2020, p. 7; MacDonald, 2020). Mined copper output in Chile was 5.73 Mt in 2020, essentially unchanged from 5.79 Mt in 2019 (table 20).

Production at the Escondida Mine [the first-ranked global mine by copper output in 2020, majority-owned by BHP Group (57.5%)] was unchanged at 1.16 Mt in 2020, as increased concentrator throughput mostly offset lower quantities of ore stacked onto the leaching pads as a preventive measure in response to COVID-19 (BHP Group, 2020, p. 14; 2021, p. 11; Rio Tinto Group, 2021, p. 52). At the Collahuasi Mine [second-ranked, Anglo American plc and Glencore plc (44% each)], copper production increased by 11% to 629,000 t in 2020 because of processing improvements implemented in 2019 and higher ore grades (Anglo American plc, 2021, p. 73, 251). Copper output at the Los Pelambres Mine [10th-ranked, Antofagasta plc (60%)] was 360,000 t in 2020, essentially unchanged from 363,000 t in 2019 (Antofagasta plc, 2021, p. 2, 66). Owing to planned mining of lower ore grades and drought conditions that restricted water availability, copper production decreased by 3% at the Los Bronces Mine [12th-ranked, Anglo American (50.1%)], to 325,000 t from 335,000 t (Anglo American plc, 2021, p. 73, 251). The Centinela Mine [18th-ranked, Antofagasta (70%)] produced 247,000 t of copper in 2020, 11% less than 277,000 t in 2019 as a result of expected lower ore grades in the concentrates circuit (Antofagasta plc, 2021, p. 2, 68–69). In 2020, the Corporación Nacional del Cobre de Chile (Codelco) owned 7 mines in the country, 4 of which were ranked among the 25 leading global copper mines. Total production of mined copper from Codelco's operations increased slightly to 1.62 Mt from 1.59 Mt in 2019. The company attributed the higher output to improved processing plant performance and increased copper ore grades (Corporación Nacional del Cobre de Chile, 2021, p. 38). These 12 operations accounted for 76% of mined copper production in Chile in 2020.

Codelco, the leading copper-producing company in the world, initiated production from an expansion of the El Teniente Mine (fourth-ranked) on January 23, 2020. The project contained enough copper resources to extend the mine life into the 2070s and was one in a series of expansions planned at multiple mines to prevent a decrease in Codelco's copper output in the coming years amid declining grades and ore depletion (Rostás, 2020). Additional projects were in progress at Codelco's Andina (24th-ranked) and Salvador Mines in 2020, and the company began extracting ore from an underground expansion of the Chuquicamata Mine (sixth-ranked in 2020) in 2019. Open pit mining at Chuquicamata, ongoing since 1915, had been anticipated to cease in 2020, but Codelco announced in November 2020 that operations would be extended for an additional year (Rostás, 2019; Corporación Nacional del Cobre de Chile, 2020a, p. 90; 2020b; 2021, p. 161, 163).

In 2020, refined copper output in Chile was 2.33 Mt, 3% higher than 2.27 Mt in 2019 (table 22). Codelco's three electrolytic refineries and five wholly owned electrowon refineries accounted for 55% of the refined copper capacity in Chile, and other SX–EW operations accounted for the remainder (International Copper Study Group, 2021b, p. 194–201). Codelco did not report its total refined copper production in 2020, but the company's refined sales increased by 125,000 t (11%) to 1.23 Mt from 1.11 Mt in 2019 (Corporación Nacional del Cobre de Chile, 2020a, p. 40; 2021, p. 57). Owing to a greater volume of ore leached and higher oxide ore grades,

output of refined copper in the form of SX–EW cathodes increased at Centinela in 2020 by 12,200 t (15%) (Antofagasta plc, 2020, p. 2, 58; 2021, p. 2, 69). These increases were partially offset by lower production of electrowon copper at BHP's Spence Mine, by 47,400 t (25%); at the Zaldivar Mine [Antofagasta and Barrick Gold Corp. (50% each)], by 19,800 t (17%); at Escondida, by 16,300 t (7%); and at Freeport's 51%-owned El Abra complex, by approximately 9,500 t (12%). Mining rates and (or) leach pad throughput in 2020 were lower at Escondida, El Abra, and Zaldivar than those in 2019. Copper ore grades and recovery rates decreased at Zaldivar, and copper output at Spence was impacted by unplanned maintenance (BHP Group, 2020, p. 14, 18; 2021, p. 5, 11, 15; Antofagasta plc, 2021, p. 2, 71; Freeport-McMoRan Inc., 2021, p. 15–16, 28; Rio Tinto Group, 2021, p. 52). Using sales from the Codelco facilities as a proxy for production, these 13 operations accounted for approximately 80% of refined copper output in Chile in 2020.

China.—Widespread COVID-19-related business closures in early 2020 significantly affected copper smelters and refineries in China (CRU International Ltd., 2020c, p. 15–16; Luk and Hunter, 2020). In February, CRU International Ltd. (2020a) reported that daily blister output in the country was 15% lower than average production levels and estimated that cathode supply to manufacturing plants would decrease by 9% in the first quarter compared with the first 3 months of 2019. Copper demand in China recovered significantly during the second half of 2020, and total production of refined copper increased slightly to 10.0 Mt at yearend from 9.78 Mt (revised) in 2019 (table 22). Secondary refined copper output in China decreased by 195,000 t (9%) in 2020, owing to lockdowns in Malaysia that restricted the flow of copper scrap. In contrast to the smelting and refining industry, COVID-19 lockdowns had a minimal impact on copper mining in China (International Copper Study Group, 2020, p. 8, 13). Production of mined copper in 2020 increased slightly to 1.72 Mt from 1.68 Mt in 2019 (table 20).

On November 1, 2020, updated standards for imports of high-grade copper scrap into China took effect, with minimum copper contents ranging from 94% to 99.9%, depending on the scrap type. The Government of China planned to ban imports of material that it classified as solid waste, including some types of copper scrap, beginning on January 1, 2021. Imports of scrap that contained no less than the minimum copper quantities would no longer be considered solid waste under the new regulations (CRU International Ltd., 2020b; Mir, 2020; Staub, 2020).

Congo (Kinshasa).—Copper operations in Congo (Kinshasa) produced at normal capacity in 2020 and were not affected by COVID-19 (International Copper Study Group, 2020, p. 6). Mined copper production increased by 231,000 t (17%) to 1.60 Mt in 2020 from 1.37 Mt (revised) in 2019, and refined copper output was 1.35 Mt, higher by 206,000 t (18%) compared with 1.14 Mt (revised) in 2019 (tables 20, 22). The Katanga Mine [14th-ranked; Katanga Mining Ltd. (75%), a subsidiary of Glencore], also known as the Kamoto Mine, continued to ramp up following the completion of expansion projects in late 2018. Production of SX–EW cathode increased by 36,200 t (15%) in 2020 to 271,000 t (90% of capacity) from 235,000 t in 2019 (Katanga Mining Ltd., 2019; Glencore

plc, 2021, p. 66, 228). Output also increased significantly, by 30,000 t (36%), at the Kolwezi Mine [Zijin Mining Group Co., Ltd. (72%)]; the mine produced 114,000 t of copper in 2020, consisting of 57,400 t of electrowon cathodes and 56,900 t of copper in concentrates, compared with 84,300 t of copper in 2019, consisting of 58,100 t of copper in concentrates and 26,200 t of electrowon cathodes (Zijin Mining Group Co., Ltd., 2020, p. 24; 2021, p. 40). At the Tenke Fungurume Mine and electrowon refinery [China Molybdenum Co., Ltd. (80%)], copper metal output was 183,000 t, 4,640 t (3%) more than 178,000 t in 2019 (China Molybdenum Co., Ltd., 2020, p. 18; 2021, p. 17). MMG Ltd. increased production of SX-EW cathodes at its Kinsevere Mine by 4,070 t (6%), to 72,000 t in 2020, despite suspending mining activity in the third quarter. Higher ore grades, increased leach pad throughput, and improved copper recovery rates offset a significant decrease in the volume of mined ore. MMG expected to process ore stockpiles until the projected restart of mining in the second quarter of 2021 (MMG Ltd., 2021, p. 26–27). In contrast, Glencore’s copper-cobalt Mutanda Mine did not have any production in 2020. Glencore reduced operations at Mutanda and placed the mine on temporary care-and-maintenance status in 2019 owing to low cobalt prices and global cobalt oversupply. The company planned to reopen the mine when it determined that the cobalt market had sufficiently recovered. Mutanda produced 103,000 t of refined copper in 2019 (Glencore plc, 2020, p. 8, 49, 70; 2021, p. 161, 228). In 2020, these five operations accounted for 40% of copper mine production and 47% of copper refinery production in Congo (Kinshasa). Copper output and other operational information were not publicly available for most of the other mines in the country.

India.—In 2020, refined copper production in India was 334,000 t, a decrease of 22% from 426,000 t in 2019 (table 22). The Tuticorin smelter and refinery, owned by Vedanta Resources Ltd., were shut down in March 2018, and production at the Gujarat refinery, owned by Hindustan Copper Ltd., was suspended in August 2019 (Vedanta Resources Ltd., 2019, p. 5; Hindustan Copper Ltd., 2021, p. 128). With the closures of these facilities, Hindalco Industries Ltd.’s Dahej complex accounted for nearly all of the refined copper capacity in India in 2020. Hindalco shut down the plant at the beginning of the global COVID-19 pandemic in March 2020 and did not resume operations until June (Hindalco Industries Ltd., 2020, p. 6; 2021, p. 43, 54; International Copper Study Group, 2021b, p. 208–209).

Indonesia.—Mine production of copper in Indonesia increased by 44%, to 505,000 t in 2020 from 351,000 t (revised) in 2019, owing to significantly higher output from PT Freeport Indonesia’s (PT-FI) Grasberg Mine (ninth-ranked) and PT Medco Energi Internasional Tbk’s Batu Hijau Mine (table 20). PT-FI mined the final ore from the Grasberg open pit in 2019; in 2020, the rampup of production from four underground ore deposits advanced on schedule, and output of copper in concentrates increased by 33% to 367,000 t from 275,000 t in 2019 (Freeport-McMoRan Inc., 2021, p. 17, 19, 28). At Batu Hijau, PT Medco began producing from a new ore zone in April 2020 and increased production of copper in concentrates by more than twofold to 133,000 t compared with 59,100 t in 2019 (PT Medco Energi Internasional Tbk, 2020, p. 40; 2021,

p. 42). These two mines accounted for 99% of mined copper output in Indonesia in 2020.

Laos.—In 2020, mined copper production in Laos was 88,200 t, a decrease of 38% from 141,000 t (revised) in 2019 (table 20). Two copper mines operated in the country, the Phu Kham Mine [PanAust Ltd. (90%)] and the Sepon Mine [Chifeng Jilong Gold Mining Co., Ltd. (90%)]. At Phu Kham, operations were halted for most of April after two employees tested positive for COVID-19, and the processing plant was shut down from May 10 to May 27 because of a worker shortage. Phu Kham produced 48,400 t of copper in concentrates in 2020, 30% less than 69,300 t in 2019 (PanAust Ltd., 2021, p. 18, 25). The Sepon Mine was not disrupted by the COVID-19 pandemic, but leaching operations ramped down in anticipation of the projected cessation of copper production in 2021. Output of electrowon copper from the mine decreased by 45% to 39,700 t from 72,000 t in 2019 (Chifeng Lane Xang Minerals Ltd., 2020a, b, 2021).

Panama.—First Quantum Minerals Ltd. commenced production at its 90%-owned Cobre Panama Mine (20th-ranked in 2020) in 2019 and expected that the rampup to a full capacity of 285,000 to 310,000 t/yr of copper would be completed in 2020. Output of copper in concentrates at Cobre Panama in 2020 was significantly less than anticipated but increased by 39% to 206,000 t from 147,000 t in 2019. Owing to restrictions enacted by the Government of Panama related to the COVID-19 pandemic, First Quantum placed the mine on care-and-maintenance status on April 7, 2020. Normal activities resumed on July 7, and all mills were fully operational by August 8. Production also was affected by unplanned maintenance of the crusher in the first quarter of 2020 and planned maintenance of the milling circuit in October 2020 (First Quantum Minerals Ltd., 2020, p. 27; 2021, p. 12, 20–21). Cobre Panama was the only copper mine in Panama and represented the largest addition to global copper mine capacity from a new mine or expansion since the Las Bambas Mine in Peru began operating in late 2015.

Peru.—Six of the leading twenty-five copper mines in the world were located in Peru in 2020, and mine production of copper in the country decreased by 12% to 2.15 Mt from 2.46 Mt in 2019 (table 20). To limit the spread of COVID-19, the Government of Peru declared a national emergency on March 15, 2020, that required the mining industry to adopt strict health protocols and reduce workforce sizes (International Copper Study Group, 2020, p. 7). Many leading mines in Peru consequently operated at reduced capacity in 2020. Output by mine was as follows: Antamina [seventh-ranked, BHP and Glencore (33.75% each)]—381,000 t (67,800 t lower than that in 2019); Cerro Verde [eighth-ranked, Freeport (53.56%)]—372,000 t (83,000 t); Las Bambas [13th-ranked, MMG (62.5%)]—311,000 t (71,500 t); Toquepala (16th-ranked; Southern Copper Corp., a subsidiary of Grupo México)—255,000 t (2,900 t); and Antapaccay (22d-ranked, Glencore)—186,000 t (12,000 t). The Antamina and Cerro Verde Mines shut down for some of the first and (or) second quarters to comply with Government requirements, whereas all other leading mines remained open throughout the COVID-19 pandemic. In addition to COVID-19, production at Las Bambas was affected by protests that blocked access roads and restricted the transport of copper concentrates for 64 days in 2020 (International Copper Study Group, 2020, p. 20–22;

Freeport-McMoRan Inc., 2021, p. 15, 28; Glencore plc, 2021, p. 66, 228; Grupo México, S.A.B. de C.V., 2021, p. 104–105; MMG Ltd., 2021, p. 23–24; Teck Resources Ltd., 2021, p. 12). These five operations accounted for 70% of mined Peruvian copper production in 2020. The Toromocho Mine, owned by Aluminum Corp. of China Ltd., also ranked among the leading 25 copper mines in the world according to a production estimate by S&P Global Market Intelligence, but copper output was not publicly available (S&P Capital IQ, undated).

Russia.—In 2020, refined copper production in Russia was 1.04 Mt, essentially unchanged compared with that in 2019 (table 22). PJSC MMC Norilsk Nickel (Nornickel), which owned multiple refineries that accounted for approximately 40% of the refined copper capacity in Russia, reported refined output of 416,000 t from its Russian facilities in 2020, a decrease of 3% from 431,000 t in 2019. Nornickel stated that the COVID-19 pandemic did not disrupt any of its operations and attributed the reduced production to decreased output of its own copper-bearing ores and lower than expected copper content of the concentrate feedstock supplied by another company (International Copper Study Group, 2021b, p. 218–220; PJSC MMC Norilsk Nickel, 2021a, p. 88, 90–94; 2021b). None of the other major copper refining companies in Russia reported publicly available information on the refined copper output of their facilities in 2020.

Zambia.—As in neighboring Congo (Kinshasa), the COVID-19 pandemic did not significantly affect the copper industry in Zambia (International Copper Study Group, 2020, p. 6). Output of mined copper increased by 7% in 2020 to 853,000 t from 800,000 t (revised) in 2019 (table 20). Production at some of the leading copper mines in Zambia was as follows: the Sentinel Mine (17th-ranked, First Quantum)—251,000 t in 2020 (220,000 t in 2019); the Kansanshi Mine [19th-ranked, First Quantum (80%)]—221,000 t (232,000 t in 2019); the Lumwana Mine (Barrick)—125,000 t (108,000 t in 2019); and the Chambishi Mine [China Nonferrous Mining Corp. Ltd. (85%)]—40,200 t (14,200 t in 2019). First Quantum attributed the decreased production at Kansanshi to lower copper ore grades and the higher output at Sentinel to a significant increase in mill throughput. The increased production at Lumwana reflected higher ore grades and improved mill performance. At Chambishi, China Nonferrous Mining brought an additional ore zone into commercial production in July 2020 (China Nonferrous Mining Corp. Ltd., 2020, p. 27; 2021, p. 29; Barrick Gold Corp., 2021, p. 72, 105; First Quantum Minerals Ltd., 2021, p. 22–25). The combined output of these four operations was equivalent to 75% of the country's total mined copper in 2020.

Refined copper production in Zambia was 378,000 t in 2020, 43% greater than 265,000 t (revised) in 2019 (table 22). At Glencore's Mopani operations, output of refined copper in 2020 increased by 61% to 82,500 t from 51,300 t in 2019, when the smelter was shut down for extensive planned maintenance in the second half of the year (Glencore plc, 2020, p. 70; 2021, p. 228). Copper production by SX–EW at the Kansanshi Mine was 52,000 t, 15% greater than 45,000 t in 2019 (First Quantum Minerals Ltd., 2021, p. 61). Public information was not available for any of the other major copper refineries that operated in Zambia.

Outlook

Based on production guidance published by companies that operate in the United States, domestic mine and refined output of copper will likely increase in 2021. The Chino Mine (which produces copper in concentrates and refined SX–EW cathode) will restart at a reduced operating rate in January 2021, and the Gunnison (cathode) and Pumpkin Hollow (concentrates) Mines are projected to complete rampups to full capacity by yearend 2021. At the Bingham Canyon Mine (concentrates), a project to push back the south wall of the open pit will yield higher copper ore grades in 2021. Production of refined copper at Rio Tinto's electrolytic refinery will likely recover from multiple disruptions in 2020, whereas output from Freeport's electrolytic refinery might decrease because of planned major maintenance of the company's smelter. Globally, two major mines are anticipated to begin producing copper in 2021, the Qulong Mine in China and the Kamao-Kakula Mine in Congo (Kinshasa). The ICSG projects that world mine production capacity will increase by 4% and world refinery production capacity will be essentially unchanged in 2021. As economies recover from the global COVID-19 pandemic, worldwide copper production and consumption are expected to increase. Copper consumption will continue to depend on economic trends in sectors such as automobiles, housing and building construction, HVAC, power utilities, and telecommunications.

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TABLE 1
SALIENT COPPER STATISTICS¹

(Metric tons, copper content, unless otherwise specified)

	2016	2017	2018	2019	2020
United States:					
Mine production:					
Copper ore concentrated, gross weight	226,000,000 ^r	229,000,000 ^r	228,000,000 ^r	235,000,000 ^r	221,000,000
Average yield of concentrated copper ore percent	0.34 ^r	0.29 ^r	0.29 ^r	0.30 ^r	0.28
Recoverable copper:²					
Arizona	969,000	868,000	801,000	859,000	880,000
Other States	461,000	391,000	421,000	398,000	322,000
Total	1,430,000	1,260,000	1,220,000	1,260,000	1,200,000
Total value ³ millions	\$7,090	\$7,920	\$8,050	\$7,750	\$7,600
Smelter production:					
Primary (from ore) ⁴	563,000	470,000	536,000	464,000	315,000 ^{e,5}
Byproduct sulfuric acid, sulfur content	590,000	489,000	586,000	522,000	508,000
Refinery production:					
Primary (from ore):					
Electrolytic	561,000	482,000	538,000	457,000	315,000 ^{e,5}
Electrowon	615,000	557,000	532,000	527,000	559,000
Total	1,180,000	1,040,000	1,070,000	985,000	874,000
Secondary (from scrap), electrolytic and fire-refined	46,300	40,100	41,200	44,400	43,200
Grand total, primary and secondary	1,220,000	1,080,000	1,110,000	1,030,000	918,000
Secondary production, refineries and manufacturers:⁶					
Recovered from new (manufacturing) scrap	690,000	702,000	712,000	700,000	697,000
Recovered from old (post-consumer) scrap	149,000	146,000	141,000	166,000 ^r	160,000
Total	838,000	847,000	853,000	866,000 ^r	858,000
Copper sulfate production, gross weight	18,400	18,400	18,200	17,500	17,500
Exports, refined ⁷	134,000	94,200	190,000	125,000	41,200
Imports for consumption, refined ⁷	708,000	813,000	778,000	663,000	676,000
Closing stocks, December 31:					
Blister and anodes					
	14,400	12,600	9,230	16,400	9,380
Refined copper:					
Refineries	4,190	5,840	3,850	7,010	3,850
Wire-rod mills	26,700	27,800	21,800	20,000	10,700
Brass mills	7,380	7,870	8,210	7,520	7,850
Other industry	5,430	5,360	7,070	6,200	6,850
Commodity Exchange Inc. (COMEX) ⁸	80,700	191,000	99,600	34,100	70,200
London Metal Exchange Ltd. (LME), U.S. warehouses ⁸	98,900	27,100	104,000	35,000	18,300
Total	223,000	265,000	244,000	110,000	118,000
Consumption:					
Reported, refined copper	1,800,000	1,800,000	1,820,000	1,810,000	1,770,000
Apparent, primary refined and copper from old scrap ⁹	1,880,000	1,860,000	1,820,000	1,820,000	1,660,000
Price, annual average:⁸					
U.S. producers cathode ¹⁰ cents per pound	224.873	285.393	298.738	279.596	286.745
COMEX, high grade first position do.	219.727	280.425	292.568	272.267	279.948
LME, grade A cash do.	220.571	279.518	295.960	272.364	279.797
World, production:¹¹					
Mine	20,500,000	20,100,000 ^r	20,600,000 ^r	20,400,000	20,600,000
Smelter	19,100,000	19,500,000	20,100,000	19,900,000 ^r	21,200,000
Refinery	23,700,000 ^r	23,900,000	24,400,000	24,400,000 ^r	25,000,000

See footnotes at end of table.

TABLE 1—Continued
SALIENT COPPER STATISTICS¹

^cEstimated. ^rRevised. do. Ditto.

¹Table includes data available through January 31, 2022. Data are rounded to no more than three significant digits, except prices; may not add to totals shown.

²Includes the recoverable copper content of concentrates (of copper and other metals), copper produced by solvent extraction and electrowinning (SX-EW), and copper recovered as precipitates.

³Calculated with the U.S. producers cathode price.

⁴May contain small quantities of copper from scrap.

⁵To avoid disclosing company proprietary data, production is an estimate based on information in public company reports and does not reflect actual output reported to the U.S. Geological Survey.

⁶Copper converted to refined metal, alloys, and other forms by refineries and manufacturers (brass mills, chemical plants, foundries, wire-rod mills, and other).

⁷Source: U.S. Census Bureau.

⁸Source: S&P Global Platts Metals Week.

⁹Primary refined copper production plus copper recovered from old (post-consumer) scrap plus refined imports for consumption minus refined exports, including adjustments for changes in refined stocks.

¹⁰Sum of the annual average COMEX price and annual average New York dealer cathode premium; reflects the delivered spot price of copper to U.S. consumers by U.S. producers.

¹¹May include estimated data.

TABLE 2
LEADING COPPER-PRODUCING MINES IN THE UNITED STATES IN 2020, IN ORDER OF PUBLICLY AVAILABLE OUTPUT^{1, 2}

Rank	Mine	County and State	Operator	Source of copper	Capacity ³ (thousand metric tons)
1	Morenci	Greenlee, AZ	Freeport-McMoRan Inc.	Copper-molybdenum ore, concentrated and leached	595
2	Bingham Canyon	Salt Lake, UT	Rio Tinto Kennecott ⁴	Copper-molybdenum ore, concentrated	220
3	Bagdad	Yavapai, AZ	Freeport-McMoRan Inc.	Copper-molybdenum ore, concentrated and leached	115
4	Sierrita	Pima, AZ	do.	do.	110
5	Safford	Graham, AZ	do.	Copper ore, leached	130
6	Mission	Pima, AZ	ASARCO LLC ⁵	Copper ore, concentrated	65
7	Pinto Valley	Gila, AZ	Capstone Mining Corp.	Copper-molybdenum ore, concentrated and leached	75
8	Ray	Pinal, AZ	ASARCO LLC ⁵	Copper ore, concentrated and leached	135
9	Robinson	White Pine, NV	Robinson Nevada Mining Co. ⁶	Copper-molybdenum ore, concentrated	65
10	Chino	Grant, NM	Freeport-McMoRan Inc.	Copper ore, concentrated and leached	140
11	Silver Bell	Pima, AZ	ASARCO LLC ⁵	Copper ore, leached	25
12	Tyrone	Grant, NM	Freeport-McMoRan Inc.	do.	45
13	Phoenix	Lander, NV	Nevada Gold Mines LLC ⁷	Gold-copper ore, concentrated and leached	20 ^c
14	Eagle	Marquette, MI	Lundin Mining Corp.	Nickel-copper ore, concentrated	20
15	Miami	Gila, AZ	Freeport-McMoRan Inc.	Copper ore, leached	90
16	Carlota	do.	Carlota Copper Co. ⁶	do.	35 ^c
(8)	Continental	Silver Bow, MT	Montana Resources LLP	Copper-molybdenum ore, concentrated	(8)

^cEstimated. do. Ditto.

¹Table includes data available through January 31, 2022.

²The mines listed accounted for more than 99% of U.S. mine production of copper in 2020.

³For copper produced from concentrates, capacity is calculated based on the material handling capacity of the mill and the copper content of ore reserves. For copper produced by solvent extraction and electrowinning (SX-EW), capacity is the reported design capacity of the tankhouse.

⁴Wholly owned subsidiary of Rio Tinto Group.

⁵Wholly owned subsidiary of Grupo México, S.A.B. de C.V.

⁶Wholly owned subsidiary of KGHM International Ltd., which is a wholly owned subsidiary of KGHM Polska Miedź S.A.

⁷A joint venture of Barrick Gold Corp. and Newmont Corp. The mine was operated by Barrick.

⁸The rank order and capacity are not shown because public data are not available.

TABLE 3
MINE PRODUCTION OF COPPER-BEARING ORES AND RECOVERABLE COPPER CONTENT OF ORES
PRODUCED IN THE UNITED STATES¹

(Metric tons)

Source and treatment process	2019		2020	
	Gross weight	Recoverable copper	Gross weight	Recoverable copper
Copper ore:				
Concentrated	235,000,000 ^r	706,000	221,000,000	609,000
Leached	NA	527,000	NA	559,000
Total	NA	1,230,000	NA	1,170,000
Copper precipitates, leached from tailings, dumps, and in-place material	NA	W	NA	W
Other copper-bearing ores, concentrated ²	7,290,000 ^r	24,100	9,910,000	33,500
Grand total	XX	1,260,000	XX	1,200,000

^rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data; included with "Other copper-bearing ores, concentrated." XX Not applicable.

¹Table includes data available through January 31, 2022. Data are rounded to no more than three significant digits; may not add to totals shown.

²Includes gold ore, lead ore, and nickel ore.

TABLE 4
CONSUMPTION OF COPPER AND BRASS MATERIALS IN THE UNITED STATES¹

(Metric tons, gross weight)

Item	Brass mills	Wire-rod mills	Foundries, chemical plants, miscellaneous users	Smelters, refiners, ingot makers	Total
2019:					
Copper scrap	646,000	107,000	48,700	130,000	931,000
Refined copper	413,000	1,330,000	54,900	8,740	1,810,000
Hardeners and master alloys	W	--	3,550 ^e	--	3,550 ^e
Brass ingots	--	--	56,700 ^r	--	56,700 ^r
Slab zinc	W	--	413	W	42,400
2020:					
Copper scrap	649,000	120,000	45,500	112,000	926,000
Refined copper	414,000	1,300,000	53,300	8,880	1,770,000
Hardeners and master alloys	W	--	3,550 ^e	--	3,550 ^e
Brass ingots	--	--	51,100	--	51,100
Slab zinc	W	--	410 ^e	W	42,800

^eEstimated. ^rRevised. W Withheld to avoid disclosing company proprietary data; included with "Slab zinc" under "Total." -- Zero.

¹Table includes data available through January 31, 2022. Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 5
CONSUMPTION OF REFINED COPPER SHAPES IN THE UNITED STATES¹

(Metric tons)

Class of consumer	Cathodes	Ingots and ingot bars	Cakes and slabs	Wirebar, billets, other	Total
2019:					
Wire-rod mills	1,330,000	--	--	(2)	1,330,000
Brass mills	317,000	W	43,900	51,600	413,000
Chemical plants ^e	W	--	--	236	236
Ingot makers	W	W	--	8,740	8,740
Foundries	W	3,860	--	26,800	30,700
Miscellaneous ³	W	W	--	23,900	23,900
Total	1,650,000	3,860	43,900	111,000	1,810,000
2020:					
Wire-rod mills	1,300,000	--	--	(2)	1,300,000
Brass mills	317,000	W	43,700	52,600	414,000
Chemical plants ^e	W	--	--	240	240
Ingot makers	W	W	--	8,880	8,880
Foundries	W	3,740	--	26,000	29,700
Miscellaneous ³	W	W	--	23,300	23,300
Total	1,620,000	3,740	43,700	111,000	1,770,000

^eEstimated. Withheld to avoid disclosing company proprietary data; included with "Wirebar, billets, other." -- Zero.

¹Table includes data available through January 31, 2022. Data are rounded to no more than three significant digits; may not add to totals shown.

²Withheld to avoid disclosing company proprietary data; included with "Cathodes."

³Includes consumers of copper powder and copper shot, iron and steel plants, and other manufacturers.

TABLE 6
COPPER RECOVERED FROM SCRAP PROCESSED IN THE UNITED STATES¹

(Metric tons)

	2019	2020
Kind of scrap:		
New:		
Copper-base	662,000	665,000
Aluminum-base	38,300	32,000
Nickel-base ^e	20	20
Total	700,000	697,000
Old:		
Copper-base	141,000	138,000
Aluminum-base	24,700 ^r	22,400
Nickel- and zinc-base	286	70
Total	166,000 ^r	160,000
Grand total, new and old scrap	866,000 ^r	858,000
Form of recovery:		
As unalloyed copper	44,400	43,200
In brass and bronze	757,000 ^r	758,000
In aluminum alloys	63,000 ^r	54,300
In alloy iron and steel and other alloys	304	88
In chemical compounds ^e	1,800	1,800
Total	866,000 ^r	858,000

^eEstimated. ^rRevised.

¹Table includes data available through January 31, 2022. Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 7
COPPER RECOVERED AS REFINED COPPER AND IN ALLOYS AND OTHER FORMS
FROM PURCHASED COPPER-BASE SCRAP IN THE UNITED STATES¹

(Metric tons)

Type of operation	From new scrap ²		From old scrap ²		Total	
	2019	2020	2019	2020	2019	2020
Ingot makers	5,840	4,730	58,000	46,900	63,900	51,600
Refineries ³	20,100 ^e	20,100 ^e	24,200	23,100	44,400	43,200
Brass and wire-rod mills	617,000	631,000	36,500	38,100	653,000	670,000
Foundries and miscellaneous manufacturers	19,300	9,150	22,100	29,600	41,400	38,800
Total	662,000	665,000	141,000	138,000	803,000	803,000

^eEstimated.

¹Table includes data available through January 31, 2022. Data are rounded to no more than three significant digits; may not add to totals shown.

²New scrap refers to material generated during the manufacturing process. Old scrap consists of copper items used by consumers.

³Electrolytically refined and fire refined from scrap based on source of material at smelter or refinery level.

TABLE 8
PRODUCTION OF SECONDARY COPPER AND COPPER-ALLOY PRODUCTS
IN THE UNITED STATES¹

(Metric tons, gross weight)

Item produced from scrap	2019	2020
Unalloyed copper products ²	44,400	43,200
Alloyed copper products:		
Brass and bronze ingots:		
Tin bronzes	6,830	3,750
Leaded red brass and semi-red brass	39,600	36,200
High leaded tin bronze	8,830	9,310
Yellow brass	1,710	1,210
Manganese bronze	7,260	7,010
Aluminum bronze	5,360	3,870
Nickel silver	1,320	918
Silicon bronze and brass	4,930	3,090
Copper-base hardeners and master alloys	4,480 ^e	4,500
Miscellaneous	7,500	7,050
Total	87,800	76,900
Brass mill and wire-rod mill products	739,000	755,000
Brass and bronze castings	33,900	33,700
Copper in chemical products ^e	1,800	1,800
Grand total	907,000	910,000

^eEstimated.

¹Table includes data available through January 31, 2022. Data are rounded to no more than three significant digits; may not add to totals shown.

²Includes electrolytically refined copper, fire-refined copper, and copper castings.

TABLE 9
ESTIMATED COMPOSITION OF SECONDARY COPPER-ALLOY PRODUCTION IN THE UNITED STATES¹

(Metric tons)

	Copper	Tin	Lead	Zinc	Nickel	Aluminum	Total
Brass and bronze ingots:							
2019	77,800	1,960	2,860	5,120	135	9	87,800
2020	65,100	2,320	3,170	6,150	150	13	76,900
Brass mill and wire-rod mill products:							
2019	655,000	414	1,680	80,200	1,150	16	739,000
2020	670,000	462	1,670	81,700	1,140	15	755,000
Brass and bronze castings:							
2019	32,900	137	145	642	47	27	33,900
2020	32,700	137	145	642	47	27	33,700

¹Table includes data available through January 31, 2022. Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 10
CONSUMPTION AND YEAREND STOCKS OF COPPER-BASE SCRAP IN THE UNITED STATES¹

(Metric tons, gross weight)

Scrap type and processor	2019		2020	
	Consumption	Stocks	Consumption	Stocks
Unalloyed scrap:				
No. 1 wire and heavy:				
Smelters, refiners, and ingot makers	14,300	W	12,400	W
Brass and wire-rod mills	387,000	(2)	400,000	(2)
Foundries and miscellaneous manufacturers	21,900	(2)	20,500	(2)
No. 2 mixed heavy and light:				
Smelters, refiners, and ingot makers	57,000	W	49,400	W
Brass and wire-rod mills	95,000	(2)	99,900	(2)
Foundries and miscellaneous manufacturers	14,600	(2)	13,700	(2)
Total unalloyed scrap:				
Smelters, refiners, and ingot makers	71,300	68,000	61,800	49,300
Brass and wire-rod mills	482,000	700	500,000	986
Foundries and miscellaneous manufacturers	36,600	3,040	34,200	2,260
Alloyed scrap:				
Red brass: ³				
Smelters, refiners, and ingot makers	13,000	1,610	11,300	2,750
Brass mills	W	(2)	W	(2)
Foundries and miscellaneous manufacturers	W	(2)	W	(2)
Leaded yellow brass:				
Smelters, refiners, and ingot makers	9,070	628	4,700	596
Brass mills	W	(2)	W	(2)
Foundries and miscellaneous manufacturers	739	(2)	607	(2)
Yellow and low brass, all plants	72,800	885	71,400	725
Cartridge cases and brass, all plants	W	(2)	W	(2)
Auto radiators:				
Smelters, refiners, and ingot makers	16,600	621	13,200	600
Foundries and miscellaneous manufacturers	W	(2)	W	(2)
Bronzes:				
Smelters, refiners, and ingot makers	10,100	1,220	8,530	1,230
Brass mills and miscellaneous manufacturers	198	(2)	1,000	(2)
Nickel-copper alloys, all plants	10,900	171	10,300	296
Low grade and residues; smelters, refiners, miscellaneous manufacturers	3,460	477	2,280	470
Other alloy scrap: ⁴				
Smelters, refiners, and ingot makers	1,520	233	1,350	410
Brass mills and miscellaneous manufacturers	W	(2)	W	(2)
Total alloyed scrap:				
Smelters, refiners, and ingot makers	58,300	6,520	50,600	3,710
Brass mills	270,000	385	269,000	564
Foundries and miscellaneous manufacturers	12,200	1,110	11,400	1,010
Grand total, scrap:				
Smelters, refiners, and ingot makers	130,000	74,500	112,000	53,000
Brass and wire-rod mills	752,000	1,090	768,000	1,550
Foundries and miscellaneous manufacturers	48,700	4,150	45,600	3,280

W Withheld to avoid disclosing company proprietary data; included in "Total unalloyed scrap," "Total alloyed scrap," and grand totals.

¹Table includes data available through January 31, 2022. Data are rounded to no more than three significant digits; may not add to totals shown.

²Individual breakdown is not available; included in "Total unalloyed scrap," "Total alloyed scrap," and grand totals.

³Includes cocks and faucets, commercial bronze, composition turnings, gilding metal, railroad car boxes, and silicon bronze.

⁴Includes aluminum bronze, beryllium copper, and refinery brass.

TABLE 11
CONSUMPTION OF PURCHASED COPPER-BASE SCRAP IN THE UNITED STATES¹

(Metric tons, gross weight)

Type of operation	New scrap ²		Old scrap ²		Total	
	2019	2020	2019	2020	2019	2020
Ingot makers	15,500	12,600	68,200	55,200	83,700	67,800
Smelters and refineries	20,800 ^e	20,800 ^e	25,100	23,800	45,900	44,600
Brass and wire-rod mills ³	714,000	729,000	38,800	39,900	752,000	768,000
Foundries and miscellaneous manufacturers	22,700	10,800	26,000	34,800	48,700	45,500
Total	773,000	773,000	158,000	154,000	931,000	926,000

^eEstimated.

¹Table includes data available through January 31, 2022. Data are rounded to no more than three significant digits; may not add to totals shown.

²New scrap refers to material generated during the manufacturing process. Old scrap consists of copper items used by consumers.

³Consumption at brass and wire-rod mills assumed equal to receipts.

TABLE 12
CONSUMPTION OF BRASS INGOT, REFINED COPPER, AND COPPER SCRAP AT
FOUNDRIES AND MISCELLANEOUS MANUFACTURERS IN THE UNITED STATES¹

(Metric tons, gross weight)

Ingot type or material consumed	2019	2020
Brass ingot:		
Tin bronzes	3,510 ^f	3,680
Leaded red brass and semi-red brass	20,900	19,100
Yellow, leaded, low brass ²	15,500	9,090
Manganese bronze	2,830	2,620
Nickel silver ³	5,560	8,800
Aluminum bronze	4,600	3,900
Hardeners and master alloys ^{e, 4}	3,550	3,550
Lead free alloys ^{e, 5}	3,880	3,880
Total	60,300 ^f	54,700
Refined copper	54,900	53,300
Copper scrap	48,700	45,500

^eEstimated. ^fRevised.

¹Table includes data available through January 31, 2022. Data are rounded to no more than three significant digits; may not add to totals shown.

²Includes brass and silicon bronze.

³Includes brass, copper nickel, and nickel bronze.

⁴Includes special alloys.

⁵Includes copper-bismuth and copper-bismuth-selenium alloys.

TABLE 13
AVERAGE BUYING PRICES FOR COPPER SCRAP
IN THE UNITED STATES¹

(Cents per pound)

Year	Brass mills no. 1 scrap	Refiners no. 2 scrap	Dealers ²	
			No. 2 scrap	Red brass turnings and borings
2019	262.76	233.19	185.19	136.53
2020	268.76	243.47	201.72	130.67

¹Table includes data available through January 31, 2022.

²As of January 2020, domestic dealer prices were available only for the entire United States, whereas dealer prices were available only for individual domestic markets prior to January 2020. Dealer prices in 2019 are for New York.

Source: Fastmarkets-AMM.

TABLE 14
U.S. EXPORTS OF UNMANUFACTURED COPPER (COPPER CONTENT), BY COUNTRY OR LOCALITY¹

Country or locality	Ore and concentrates ²		Matte, ash, and precipitates ³		Blister and anodes ⁴		Refined ⁵		Unalloyed copper scrap ⁶		Total	
	Quantity (metric tons)	Value ⁷ (thousands)	Quantity (metric tons)	Value ⁷ (thousands)	Quantity (metric tons)	Value ⁷ (thousands)	Quantity (metric tons)	Value ⁷ (thousands)	Quantity (metric tons)	Value ⁷ (thousands)	Quantity (metric tons)	Value ⁷ (thousands)
2019	353,000	\$2,150,000	21,800	\$45,600	7,270	\$39,200	125,000	\$795,000	422,000	\$1,960,000	929,000	\$5,000,000
2020:												
Belgium	230	920	6,110	7,950	190	731	64	155	20,900	105,000	27,500	115,000
Canada	36,100	199,000	13,100	29,600	1,690	10,100	12,600	79,500	51,800	285,000	115,000	603,000
China	49,300	279,000	62	219	148	931	233	814	81,200	423,000	131,000	704,000
Germany	--	--	288	673	128	823	22	163	22,400	104,000	22,800	106,000
Greece	--	--	--	--	43	60	--	--	13,000	75,000	13,000	75,000
Hong Kong	9	40	--	--	86	543	18	20	7,810	37,800	7,930	38,400
India	20	91	37	127	247	1,220	--	--	9,570	38,400	9,880	39,800
Italy	--	--	--	--	197	1,300	86	297	220	1,010	503	2,600
Japan	14,600	84,100	251	79	24	146	4	107	16,400	91,300	31,300	176,000
Korea, Republic of	8,140	46,300	1	5	1,390	9,170	1,160	6,740	45,700	238,000	56,400	301,000
Malaysia	--	--	3	4	218	1,160	--	--	54,400	182,000	54,600	184,000
Mexico	250,000	1,300,000	2,720	5,150	848	2,930	26,800	173,000	2,650	14,500	283,000	1,500,000
Netherlands	4	17	59	181	--	--	--	--	5,480	23,900	5,550	24,100
Philippines	6,250	32,300	--	--	10	68	--	--	340	1,370	6,600	33,700
Poland	--	--	--	--	--	--	--	--	5,000	26,400	5,000	26,400
Russia	--	--	--	--	--	--	--	--	7,310	38,300	7,310	38,300
Slovakia	--	--	1,050	4,390	--	--	--	--	56	245	1,110	4,640
Spain	8,990	48,400	1,820	1,370	35	210	--	--	4,070	21,100	14,900	71,100
Sweden	--	--	--	--	135	309	--	--	1,800	7,850	1,940	8,160
Taiwan	1,510	8,860	2	45	60	392	25	162	17,000	88,400	18,600	97,900
Thailand	--	--	2	3	256	1,030	(8)	3	4,800	17,400	5,050	18,400
Vietnam	--	--	--	--	--	--	--	--	7,480	40,200	7,480	40,200
Other	7,460	34,200	366	479	498	2,510	151	1,680	17,000	85,300	25,500	124,000
Total	383,000	2,040,000	25,900	50,300	6,210	33,600	41,200	262,000	396,000	1,950,000	852,000	4,330,000

-- Zero.

¹Table includes data available through June 16, 2021. Data are rounded to no more than three significant digits; may not add to totals shown.

²Schedule B of the United States code 2603.00.0010. Includes copper ore and concentrates only; excludes copper contained in ore and concentrates of other metals.

³Schedule B codes 2620.30.0000, 7401.00.0010, and 7401.00.0050. Includes copper matte, ash, and precipitates only; excludes the copper content of mattes and ashes of other metals.

⁴Schedule B code 7402.00.0000.

⁵Schedule B codes 7403.11.0000, 7403.12.0000, 7403.13.0000, and 7403.19.0000.

⁶Schedule B codes 7404.00.0010, 7404.00.0015, 7404.00.0025, and 7404.00.0030.

⁷Free alongside ship value.

⁸Less than 1/2 unit.

Source: U.S. Census Bureau.

TABLE 15
U.S. EXPORTS OF REFINED COPPER SEMIMANUFACTURES AND COPPER SULFATE, BY COUNTRY OR LOCALITY^{1,2}

Country or locality	Pipes and tubing ³		Plates, sheets, foil, bars ⁴		Bare wire, including wire rod ⁵		Wire and cable, stranded ⁶		Copper sulfate (gross weight) ⁷	
	Quantity (metric tons)	Value ⁸ (thousands)	Quantity (metric tons)	Value ⁸ (thousands)	Quantity (metric tons)	Value ⁸ (thousands)	Quantity (metric tons)	Value ⁸ (thousands)	Quantity (metric tons)	Value ⁸ (thousands)
2019	13,000	\$111,000	24,100	\$263,000	159,000	\$1,030,000	34,500	\$295,000	8,380	\$47,000
2020:										
Canada	2,100	18,700	6,010	50,200	30,700	206,000	11,300	85,100	2,230	4,770
China	583	2,850	888	14,900	451	3,460	199	4,040	641	8,620
Dominican Republic	21	244	9	40	62	216	108	789	182	406
Germany	117	889	634	5,250	7	192	35	968	36	59
Hong Kong	1	35	777	19,800	345	1,050	22	668	5	66
Ireland	(9)	4	27	120	1	19	1	10	1,480	10,300
Israel	1	8	12	293	7	36	40	1,020	972	3,380
Italy	8	51	101	622	16	121	14	142	--	--
Japan	18	172	389	14,000	42	466	30	650	92	420
Jordan	247	2,220	(9)	9	1	7	--	--	--	--
Korea, Republic of	25	426	256	4,040	342	2,260	69	1,040	1,120	9,760
Malaysia	21	145	237	3,220	61	207	417	834	149	253
Mexico	5,330	45,900	13,000	107,000	92,600	617,000	13,100	112,000	6	27
Qatar	125	1,100	--	--	6	28	(9)	3	--	--
Saudi Arabia	1,810	15,400	108	921	(9)	9	162	1,020	--	--
Singapore	109	554	227	2,040	251	3,010	19	694	134	1,510
Taiwan	3	22	382	7,980	39	144	60	355	944	15,300
Thailand	2	43	105	1,020	17	54	5	93	--	--
United Arab Emirates	1,190	10,800	5	35	10	28	2	59	--	--
United Kingdom	38	542	161	875	120	529	123	1,230	--	--
Vietnam	384	2320	17	427	1	58	2	61	--	--
Other	697	6,890	605	5,930	362	3,220	512	11,400	167	1,180
Total	12,800	109,000	23,900	239,000	125,000	838,000	26,200	222,000	8,160	56,100

-- Zero.

¹Table includes data available through June 16, 2021. Data are rounded to no more than three significant digits; may not add to totals shown.

²Copper-alloy products are excluded.

³Includes all products listed under the Schedule B of the United States heading 7411.10 (tubes and pipes of refined copper), whether or not seamless.

⁴Includes all products listed under the Schedule B headings 7407.10 (bars, rods, and profiles of refined copper); 7409.11 and 7409.19 (plates, sheets, and strip of refined copper), whether or not coiled; and 7410.11 (foil of refined copper, not backed).

⁵Includes all products listed under the Schedule B headings 7408.11 and 7408.19 (wire of refined copper), regardless of the maximum cross-sectional dimension. Exports of wire rod (wire with a maximum cross-sectional dimension of more than 6 millimeters) were 149,000 metric tons (t) valued at \$951 million in 2019 and 118,000 t valued at \$783 million in 2020.

⁶Includes all products listed under the Schedule B heading 7413 (stranded wire and cables of refined copper, not electrically insulated), excluding those with fittings or made into articles.

⁷Schedule B code 2833.25.0000.

⁸Free alongside ship value.

⁹Less than 1/2 unit.

Source: U.S. Census Bureau.

TABLE 16
U.S. IMPORTS FOR CONSUMPTION OF UNMANUFACTURED COPPER (COPPER CONTENT), BY COUNTRY OR LOCALITY¹

Country or locality	Ore and concentrates ²		Matte, ash, and precipitates ³		Blister and anodes ⁴		Refined ⁵		Unalloyed scrap ⁶		Total	
	Quantity (metric tons)	Value ⁷ (thousands)	Quantity (metric tons)	Value ⁷ (thousands)	Quantity (metric tons)	Value ⁷ (thousands)	Quantity (metric tons)	Value ⁷ (thousands)	Quantity (metric tons)	Value ⁷ (thousands)	Quantity (metric tons)	Value ⁷ (thousands)
2019	27,000	\$149,000	1,960	\$5,390	236	\$1,850	663,000	\$4,010,000	32,500	\$145,000	724,000	\$4,310,000
2020:												
Bahrain	--	--	--	--	--	--	76	388	--	--	76	388
Belgium	--	--	354	1,430	--	--	--	--	(8)	3	354	1,440
Bolivia	--	--	--	--	--	--	1,030	6,780	40	130	1,070	6,910
Canada	2,170	8,140	459	1,900	(8)	6	149,000	900,000	14,500	67,600	166,000	978,000
Chile	--	--	--	--	--	--	410,000	2,510,000	76	489	411,000	2,510,000
China	--	--	--	--	--	--	426	2,620	(8)	2	426	2,620
Colombia	--	--	--	--	--	--	--	--	60	340	60	340
Congo (Kinshasa)	--	--	--	--	--	--	148	792	--	--	148	792
Costa Rica	--	--	--	--	--	--	--	--	619	1,980	619	1,980
Dominican Republic	--	--	--	--	--	--	--	--	876	4,200	876	4,200
Finland	--	--	--	--	275	1,650	--	--	--	--	275	1,650
Germany	--	--	--	--	(8)	20	1,910	13,000	179	79	2,090	13,100
Honduras	--	--	--	--	--	--	--	--	54	226	54	226
Japan	--	--	176	821	(8)	38	2,060	14,000	--	--	2,240	14,800
Korea, Republic of	--	--	--	--	(8)	2	72	4,930	--	--	72	4,930
Mexico	--	--	(8)	46	(8)	6	95,200	554,000	9,450	39,200	105,000	593,000
Netherlands	--	--	11	56	(8)	8	(8)	4	78	176	89	244
Nicaragua	--	--	--	--	--	--	--	--	114	596	114	596
Panama	--	--	--	--	--	--	--	--	714	2,770	714	2,770
Peru	--	--	--	--	--	--	14,500	86,900	495	2,760	15,000	89,700
Spain	--	--	49	294	--	--	654	3,830	--	--	703	4,130
Vietnam	--	--	--	--	--	--	--	--	121	540	121	540
Other	--	--	11	105	5	315	50	494	174	797	240	1,710
Total	2,170	8,140	1,060	4,650	280	2,040	676,000	4,100,000	27,600	122,000	707,000	4,230,000

-- Zero.

¹Table includes data available through June 16, 2021. Data are rounded to no more than three significant digits; may not add to totals shown.

²Harmonized Tariff Schedule of the United States (HTS) code 2603.00.0010. Includes copper ore and concentrates only; excludes copper contained in ore and concentrates of other metals.

³HTS codes 2620.30.0010 and 7401.00.0000. Includes copper matte, ash, and precipitates only; excludes the copper content of mattes and ashes of other metals.

⁴HTS code 7402.00.0000.

⁵HTS codes 7403.11.0000, 7403.12.0000, 7403.13.0000, and 7403.19.0000.

⁶HTS codes 7404.00.3020 and 7404.00.6020.

⁷U.S. Customs value.

⁸Less than 1/2 unit.

Source: U.S. Census Bureau.

TABLE 17
U.S. IMPORTS FOR CONSUMPTION OF REFINED COPPER SEMIMANUFACTURES AND COPPER SULFATE, BY COUNTRY OR LOCALITY^{1,2}

Country or locality	Pipes and tubing ³		Plates, sheets, foil, bars ⁴		Bare wire, including wire rod ⁵		Wire and cable, stranded ⁶		Copper sulfate (gross weight) ⁷	
	Quantity (metric tons)	Value ⁸ (thousands)	Quantity (metric tons)	Value ⁸ (thousands)	Quantity (metric tons)	Value ⁸ (thousands)	Quantity (metric tons)	Value ⁸ (thousands)	Quantity (metric tons)	Value ⁸ (thousands)
2019	63,300	\$502,000	62,900	\$603,000	197,000	\$1,280,000	3,760	\$32,400	43,600	\$94,100
2020:										
Bahrain	2,240	16,700	--	--	--	--	--	--	--	--
Brazil	1,560	10,800	2,280	16,100	20	211	--	--	220	437
Bulgaria	--	--	1,620	11,100	--	--	--	--	--	--
Canada	13,300	134,000	274	3,440	149,000	965,000	1,170	7,650	1,970	3,920
Chile	--	--	72	345	--	--	--	--	589	1,060
China	430	3,860	878	8,830	411	3,750	33	495	54	118
Finland	369	4,570	4,490	34,800	521	4,250	--	--	--	--
France	22	352	1,660	14,300	150	5,580	55	1,220	--	--
Germany	1,420	13,000	17,800	143,000	865	9,080	43	1,090	1	34
Greece	2,980	21,000	78	387	--	--	--	--	--	--
India	839	6,390	155	1,160	46	372	50	845	299	556
Italy	1,410	12,900	930	6,900	5	90	3	48	--	--
Japan	30	383	5,780	103,000	521	5,910	5	127	413	510
Korea, Republic of	10,400	75,500	2,020	22,100	4,350	36,200	1	48	1	3
Malaysia	2,110	15,300	12	107	1	9	(9)	5	--	--
Mexico	4,630	37,100	2,500	17,800	10,900	67,200	592	4,200	32,800	68,600
Netherlands	1	55	874	7,100	1	10	--	--	--	--
Peru	--	--	8,480	62,600	1,970	12,200	--	--	1,800	3,350
Russia	--	--	4	40	(9)	3	--	--	10,600	13,800
Taiwan	92	1,010	2,220	25,900	116	1,300	7	129	957	1,850
Thailand	4,520	30,200	68	672	158	1,030	42	470	--	--
Turkey	--	--	266	1,780	59	474	1,510	10,800	--	--
Vietnam	29,100	202,000	--	--	11	60	--	--	--	--
Other	587	4,690	915	10,600	144	2,340	48	1,060	212	1,060
Total	76,000	590,000	53,300	491,000	169,000	1,110,000	3,560	28,100	49,800	95,300

¹Revised. -- Zero.

²Table includes data available through June 16, 2021. Data are rounded to no more than three significant digits; may not add to totals shown.

³Copper-alloy products are excluded.

⁴Includes all products listed under the Harmonized Tariff Schedule of the United States (HTS) heading 7411.10 (tubes and pipes of refined copper), whether or not seamless and (or) coiled.

⁵Includes all products listed under the HTS headings 7407.10 (bars, rods, and profiles of refined copper), whether or not hollow; 7409.11 and 7409.19 (plates, sheets, and strip of refined copper), whether or not coiled; and 7410.11 (foil of refined copper, not backed).

⁶Includes all products listed under the HTS headings 7408.11 and 7408.19 (wire of refined copper), regardless of the maximum cross-sectional dimension. Imports of wire rod (wire with a maximum cross-sectional dimension of more than 6 millimeters) were 178,000 metric tons (t) valued at \$1.15 billion in 2019 and 149,000 t valued at \$973 million in 2020.

⁷HTS code 2833.25.0000.

⁸U.S. Customs value.

⁹Less than 1/2 unit.

Source: U.S. Census Bureau.

TABLE 18
U.S. EXPORTS OF COPPER SCRAP, BY COUNTRY OR LOCALITY¹

Country or locality	Unalloyed copper scrap ²		Copper-alloy scrap ³		
	Quantity (metric tons)	Value ⁴ (thousands)	Gross weight (metric tons)	Copper content ^{4, 5} (metric tons)	Value ⁴ (thousands)
2019	422,000	\$1,960,000	449,000	292,000	\$853,000
2020:					
Austria	3,970	20,200	1,010	658	2,800
Belgium	20,900	105,000	11,100	7,240	28,900
Cambodia	49	218	2,650	1,720	15,500
Canada	51,800	285,000	32,200	21,000	34,600
Chile	1,860	10,700	325	211	190
China	81,200	423,000	35,400	23,000	78,300
Germany	22,400	104,000	16,000	10,400	56,000
Greece	13,000	75,000	1,450	941	5,410
Hong Kong	7,810	37,800	7,750	5,040	15,000
India	9,570	38,400	34,800	22,600	77,000
Indonesia	277	1,150	1,090	711	1,240
Japan	16,400	91,300	13,800	8,960	59,800
Korea, Republic of	45,700	238,000	18,500	12,000	60,100
Malaysia	54,400	182,000	122,000	79,100	157,000
Mexico	2,650	14,500	2,210	1,440	10,400
Netherlands	5,480	23,900	645	419	2,150
Pakistan	697	3,290	14,500	9,400	8,940
Poland	5,000	26,400	6,560	4,270	5,030
Russia	7,310	38,300	830	539	610
Singapore	362	1,460	1,540	1,000	2,040
Slovakia	56	245	2,170	1,410	6,950
Spain	4,070	21,100	7,610	4,950	22,800
Sweden	1,800	7,850	2,510	1,630	10,200
Taiwan	17,000	88,400	16,400	10,700	21,600
Thailand	4,800	17,400	20,900	13,600	29,600
Turkey	1,820	7,950	293	191	259
United Arab Emirates	3,450	16,200	747	485	591
Vietnam	7,480	40,200	2,340	1,520	5,640
Other	5,120	26,600	2,390	1,550	5,860
Total	396,000	1,950,000	380,000	247,000	725,000

⁴Estimated.

¹Table includes data available through June 16, 2021. Data are rounded to no more than three significant digits; may not add to totals shown.

²Schedule B of the United States codes 7404.00.0010, 7404.00.0015, 7404.00.0025, and 7404.00.0030.

³Schedule B codes 7404.00.0041, 7404.00.0046, 7404.00.0051, 7404.00.0056, 7404.00.0061, 7404.00.0066, 7404.00.0075, 7404.00.0085, and 7404.00.0095.

⁴Free alongside ship value.

⁵Content is estimated by the U.S. Geological Survey to be 65% of gross weight.

Source: U.S. Census Bureau.

TABLE 19
U.S. IMPORTS FOR CONSUMPTION OF COPPER SCRAP, BY COUNTRY OR LOCALITY¹

Country or locality	Unalloyed copper scrap ²		Copper-alloy scrap ³		
	Quantity (metric tons)	Value ⁴ (thousands)	Gross weight (metric tons)	Copper content ^{e, 5} (metric tons)	Value ⁴ (thousands)
2019	32,500	\$145,000	105,000	75,800	\$461,000
2020:					
Antigua and Barbuda	--	--	151	109	370
Bahamas, The	--	--	681	490	1,810
Brazil	--	--	164	118	492
Canada	14,500	67,600	41,300	29,700	204,000
Cayman Islands	4	20	262	189	464
Colombia	60	340	808	582	3,400
Costa Rica	619	1,980	934	672	3,960
Dominican Republic	876	4,200	1,150	829	3,160
Ecuador	--	--	154	111	497
El Salvador	--	--	294	212	1,290
Germany	179	79	108	78	337
Guatemala	--	--	289	208	906
Haiti	--	--	145	104	504
Honduras	54	226	844	608	3,050
Jamaica	--	--	258	186	531
Mexico	9,450	39,200	37,100	26,700	139,000
Nicaragua	114	596	--	--	--
Panama	714	2,770	335	241	1,150
Peru	495	2,760	251	181	846
Philippines	31	118	133	96	605
St. Lucia	--	--	118	85	406
Venezuela	--	--	147	106	674
Vietnam	121	540	22	16	98
Other	331	1,460	859	618	2,650
Total	27,600	122,000	86,500	62,300	371,000

^eEstimated. -- Zero.

¹Table includes data available through June 16, 2021. Data are rounded to no more than three significant digits; may not add to totals shown.

²Harmonized Tariff Schedule of the United States (HTS) codes 7404.00.3020 and 7404.00.6020.

³HTS codes 7404.00.3045, 7404.00.3055, 7404.00.3065, 7404.00.3090, 7404.00.6045, 7404.00.6055, 7404.00.6065, and 7404.00.6090.

⁴U.S. Customs value.

⁵Content is estimated by the U.S. Geological Survey to be 72% of gross weight.

Source: U.S. Census Bureau.

TABLE 20
COPPER: WORLD MINE PRODUCTION, BY COUNTRY OR LOCALITY^{1,2}

(Metric tons, copper content)

Country or locality	2016	2017	2018	2019	2020 ^p
Albania, concentrates	200 ^{c,3}	--	2,600	3,600	3,600 ^c
Argentina, concentrates	81,902	33,303	17,435	--	--
Armenia, concentrates	95,079	95,793	68,928	89,700 ^r	82,600
Australia:					
Concentrates	918,000	823,000	888,000	897,000 ^{r,4}	860,000
Leaching, electrowon	30,000	26,000	23,000	28,000 ^{r,4}	25,000
Total	948,000	849,000	911,000	925,000 ^{r,4}	885,000
Azerbaijan, concentrates	1,947	2,063	1,650	2,213	2,642
Bolivia:					
Concentrates	6,519	4,450	2,102	1,381 ^r	1,068
Leaching, electrowon	2,199	2,269	3,114	3,097 ^r	1,754
Total	8,718	6,719	5,216	4,478 ^r	2,822
Botswana, concentrates	12,415	1,239	1,462	--	--
Brazil, concentrates	338,921	384,542	385,762	363,268 ^r	352,635
Bulgaria, concentrates ⁵	70,573	73,003	69,841	70,927	75,000 ^c
Burma, leaching, electrowon	75,000	115,100	153,000	153,100	185,000
Canada, concentrates	695,508 ^r	597,194 ^r	542,932	572,705	584,609
Chile:					
Concentrates	3,892,300	3,917,300	4,256,300	4,207,200	4,265,600
Leaching, electrowon	1,660,300	1,586,200	1,575,300	1,580,200	1,467,500
Total	5,552,600	5,503,500	5,831,600	5,787,400	5,733,100
China:					
Concentrates	1,850,700	1,656,400	1,569,900	1,628,000	1,673,000
Leaching, electrowon	49,500	50,000	55,000	55,700	50,100
Total	1,900,200	1,706,400	1,624,900	1,683,700	1,723,100
Colombia, concentrates	8,493	9,355	9,920	7,644	9,371
Congo (Brazzaville), leaching, electrowon	--	15,400	15,875 ^r	15,000 ^c	10,000 ^c
Congo (Kinshasa):					
Concentrates ^{c,6}	212,000	276,000	280,000	244,000 ^r	276,000
Leaching, electrowon	811,274	818,730	945,607	1,126,500 ^r	1,325,600
Total	1,023,274	1,094,730	1,225,607	1,370,500 ^r	1,601,600
Cyprus, leaching, electrowon	1,754	1,293	908	703	--
Dominican Republic, concentrates	9,725	9,618	8,588	6,047 ^r	6,000 ^c
Ecuador, concentrates ^{c,3}	40,000	8,200	42,000	9,900 ^r	43,000
Eritrea, concentrates	25,300	7,900	17,000	16,008	21,725
Finland, concentrates	47,488	53,144	46,674	32,861	36,278
Georgia, concentrates	7,700 ^c	9,500 ^c	9,200 ^c	9,547 ^r	10,036
India, concentrates	30,500 ^r	31,800 ^r	34,100 ^r	28,000 ^r	22,800
Indonesia:					
Concentrates	699,000 ^r	577,000 ^r	591,000 ^r	334,000 ^r	500,000
Leaching, electrowon	11,760	23,160	17,071	16,777	5,377
Total	710,760 ^r	600,160 ^r	608,071 ^r	350,777 ^r	505,377
Iran:					
Concentrates	275,900	288,900	300,800	295,800	297,100
Leaching, electrowon	13,400	13,200	15,700	16,400	16,400
Total	289,300	302,100	316,500	312,200	313,500
Kazakhstan:					
Concentrates	432,400	515,600	592,800	522,600	513,600
Leaching, electrowon	35,100	42,200	42,700	39,500	38,200
Total	467,500	557,800	635,500	562,100	551,800
Korea, North, concentrates ^c	25,000	10,000	10,000	10,000	10,000
Korea, Republic of, concentrates	108	7	--	--	--
Kyrgyzstan, concentrates	8,300	8,000	7,600	7,400	5,400
Laos:					
Concentrates	89,187	90,363	83,680	69,284	48,433
Leaching, electrowon	78,492	62,941	68,200	72,006 ^r	39,730
Total	167,679	153,304	151,880	141,290 ^r	88,163

See footnotes at end of table.

TABLE 20—Continued
COPPER: WORLD MINE PRODUCTION, BY COUNTRY OR LOCALITY^{1,2}

(Metric tons, copper content)

Country or locality	2016	2017	2018	2019	2020 ^p
Macedonia:					
Concentrates	9,032	8,008	6,950	6,512	5,903
Leaching, electrowon	1,396	958	768	719	722
Total	10,428	8,966	7,718	7,231	6,625
Mauritania, concentrates					
	32,818	28,791	28,137	29,620	28,491
Mexico:					
Concentrates	571,900 ^r	540,200 ^r	517,300 ^r	526,100 ^r	566,100
Leaching, electrowon	222,100 ^r	202,000 ^r	179,300 ^r	187,600 ^r	166,800
Total	794,000	742,200	696,600	713,700 ^r	732,900
Mongolia:					
Concentrates ^{e,3}	332,000	303,000	301,000	290,000	294,000
Leaching, electrowon	15,010	14,689	14,175	11,758	9,488
Total ^c	347,000	318,000	315,000	302,000	303,000
Morocco, concentrates^{e,3}					
	28,000	30,000	29,000	25,000	26,900
Namibia:					
Concentrates	262	68	--	180 ^{r, e, 3}	110 ^{e, 3}
Leaching, electrowon	16,391	15,466	15,177	14,940	15,741
Total	16,653	15,534	15,177	15,120 ^r	15,851
Pakistan, concentrates					
	14,136	10,052	12,538	13,049	13,200
Panama, concentrates					
	--	--	--	147,480	205,548
Papua New Guinea, concentrates					
	80,022	105,000	97,300	99,400	82,800
Peru:					
Concentrates	2,280,005	2,383,163	2,370,778	2,389,145	2,086,694
Leaching, electrowon	73,854	62,421	66,257	66,295	67,258
Total	2,353,859	2,445,584	2,437,035	2,455,440	2,153,952
Philippines, concentrates					
	83,649	68,156	69,933	71,892	60,856
Poland, concentrates					
	424,300	419,300	401,300	398,900	392,700
Portugal, concentrates					
	74,352	63,812	49,064	41,553	32,230
Romania, concentrates					
	8,600	8,700	8,700	9,200	8,300
Russia:					
Concentrates	701,000	759,800 ^r	869,300 ^r	811,200 ^r	810,000 ^e
Leaching, electrowon	1,300	1,300	1,200 ^r	1,200 ^r	1,200 ^e
Total	702,300	761,100 ^r	870,500 ^r	812,400 ^r	811,000 ^e
Saudi Arabia, concentrates^{e,3}					
	27,500	67,097 ^r	60,340 ^r	88,491 ^r	92,915
Serbia, concentrates					
	41,312	44,750	42,500	43,550	52,207
South Africa, concentrates					
	65,300	65,500	46,900	52,500	29,100
Spain:					
Concentrates	94,093	124,689	116,976	122,466 ^r	136,000
Leaching, electrowon	73,643	73,664	70,738	48,090	54,352
Total	167,736	198,353	187,714	170,556 ^r	190,352
Sweden, concentrates					
	79,247	104,594	106,140	99,332 ^r	100,065
Tanzania, concentrates					
	17,400	15,800	10,000	10,000 ^e	10,000 ^e
Turkey, concentrates					
	100,000	83,000	79,600	73,500	107,000
Uganda, concentrates					
	550 ^e	-- ^e	--	--	--
United States:					
Concentrates ⁷	815,000	702,000	690,000	730,000	643,000
Leaching, electrowon	615,000	557,000	532,000	527,000	559,000
Total	1,430,000	1,260,000	1,220,000	1,260,000	1,200,000
Uzbekistan, concentrates					
	140,000 ^{r, e}	140,100 ^r	141,200 ^r	137,300 ^r	140,000 ^e
Vietnam, concentrates^e					
	22,300 ⁶	21,000 ⁶	26,200 ³	29,200 ^{r, 6}	38,000 ⁶
Zambia:					
Concentrates	595,500	628,400	677,300	655,500	706,700
Leaching, electrowon	195,800 ^r	201,300 ^r	210,000 ^r	144,400 ^r	146,000
Total	791,300 ^r	829,700 ^r	887,300 ^r	799,900 ^r	852,700
Zimbabwe, concentrates					
	9,101	8,839	9,077	8,452 ^r	7,933
Grand total					
	20,500,000	20,100,000 ^r	20,600,000 ^r	20,400,000	20,600,000
Of which:					
Concentrates	16,500,000	16,200,000 ^r	16,600,000 ^r	16,300,000	16,400,000
Leaching, electrowon	3,980,000 ^r	3,890,000 ^r	4,010,000 ^r	4,110,000 ^r	4,190,000

See footnotes at end of table.

TABLE 20—Continued
COPPER: WORLD MINE PRODUCTION, BY COUNTRY OR LOCALITY^{1, 2}

^cEstimated. ^pPreliminary. ^rRevised. -- Zero.

¹Table includes data available through September 27, 2021. All data are reported unless otherwise noted; totals may include estimated data. Grand totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.

²For some countries and (or) localities, the copper content of concentrates may include copper precipitates.

³Estimate based on reported production of ore and (or) concentrates.

⁴Total mine production is reported, but the distribution between concentrates and electrowon output is estimated.

⁵Copper content of concentrates produced in Bulgaria and then processed to produce anodes and cathodes within Bulgaria. Total output is higher, as the copper content of concentrates produced in and then exported from Bulgaria is not reported.

⁶Estimate based on a combination of reported copper production for some companies and reported production of concentrates for other companies.

⁷Recoverable copper content.

TABLE 21
COPPER: WORLD SMELTER PRODUCTION, BY COUNTRY OR LOCALITY^{1,2}

(Metric tons, copper content)

Country or locality	2016	2017	2018	2019	2020 ^P
Armenia, primary	12,920	12,051	8,831	--	--
Australia, primary	445,000	360,000	361,000	401,000	402,000
Austria, secondary	58,558 ^r	65,939 ^r	66,689 ^r	68,595 ^r	75,412
Belgium, secondary	143,800	126,900	140,500	139,900	152,000
Botswana, primary ³	11,348	--	--	--	--
Brazil:					
Primary	188,500	118,800	125,500 ^r	115,400 ^r	85,400
Secondary	27,000	24,800	15,300	41,700 ^r	24,000
Total	215,500	143,600	140,800 ^r	157,100 ^r	109,400
Bulgaria:					
Primary	245,000	322,700	316,800	260,600 ⁴	310,000
Secondary	51,800	52,500	41,800	49,600 ⁴	55,000
Total	296,800	375,200	358,600	310,200 ⁴	365,000
Canada:					
Primary	304,349	289,400	290,100	290,000 ^e	290,000 ^e
Secondary	29,165	31,000	30,000	30,000 ^e	30,000 ^e
Total	333,514	320,400	320,100	320,000 ^e	320,000 ^e
Chile, primary	1,365,300	1,264,600	1,246,100	1,011,200	1,206,300
China:					
Primary	6,215,000	6,600,000	7,035,600	7,400,000 ^r	7,907,000
Secondary	1,325,400	1,380,500	1,561,800	1,688,400	1,749,800
Total	7,540,400	7,980,500	8,597,400	9,088,400 ^r	9,656,800
Finland:					
Primary	120,600 ^{r,4}	112,400 ^{r,4}	123,500 ^{r,4}	109,700 ^{r,4}	130,000 ^e
Secondary	6,300 ^{r,4}	5,900 ^{r,4}	6,500 ^{r,4}	5,800 ^{r,4}	7,000 ^e
Total	126,900 ^{r,4}	118,300 ^{r,4}	130,000 ^{r,4}	115,500 ^{r,4}	137,000 ^e
Germany:					
Primary	342,800	332,600	311,200	288,600	312,600
Secondary	159,100	198,300	157,400	169,300	204,000
Total	501,900	530,900	468,600	457,900	516,600
India:					
Primary	769,800	813,100	481,500	342,300	243,200
Secondary	3,500	10,000	10,000	2,000	--
Total	773,300	823,100	491,500	344,300	243,200
Indonesia, primary	258,800	245,800 ^r	213,767 ^r	163,429 ^r	279,598
Iran:					
Primary	153,400	114,200	204,100	201,100	223,300
Secondary	72,200	70,900	100,300	109,100	127,500
Total	225,600	185,100	304,400	310,200	350,800
Japan:					
Primary	1,137,864	1,118,626	1,169,500	1,112,276	1,259,400
Secondary	358,810	369,525	421,736 ^r	394,401	332,100
Total	1,496,674	1,488,151	1,591,236 ^r	1,506,677	1,591,500
Kazakhstan, primary	310,001	334,844	327,314	371,359	375,000 ^e
Korea, North:^e					
Primary	10,000	10,000	10,000	10,000	10,000
Secondary	5,000	5,000	5,000	5,000	5,000
Total	15,000	15,000	15,000	15,000	15,000
Korea, Republic of:					
Primary	510,000	510,000	530,000	520,000	513,900
Secondary	125,000	125,000	140,000	160,000	166,000
Total	635,000	635,000	670,000	680,000	679,900
Mexico:					
Primary	267,800	270,200	286,200	277,700 ^r	283,600
Secondary ^c	5,000	5,000	5,000	5,000	5,000
Total	272,800	275,200	291,200	282,700 ^r	288,600
Namibia, primary	40,869	45,523	48,970	45,953	46,792

See footnotes at end of table.

TABLE 21—Continued
COPPER: WORLD SMELTER PRODUCTION, BY COUNTRY OR LOCALITY^{1,2}

(Metric tons, copper content)

Country or locality	2016	2017	2018	2019	2020 ^P
Oman, primary	11,300	5,100	6,000	--	--
Pakistan, primary	14,000 ^e	10,000 ^e	12,500 ^e	13,000 ^e	5,700
Peru, primary	309,469	316,882	327,821	294,315	342,738
Philippines, primary	215,000	240,000	170,900	217,800	247,000
Poland:					
Primary	446,902	457,549	461,865	489,242	462,868
Secondary	60,369	53,024	50,001	51,904	69,696
Total	507,271	510,573	511,866	541,146	532,564
Russia:					
Primary	665,000	730,000	789,000	801,000 ^r	815,200
Secondary	202,000	216,000	230,000	240,000 ^r	235,000
Total	867,000	946,000	1,019,000	1,041,000 ^r	1,050,200
Serbia:					
Primary	61,000	68,200	75,000	73,000	285,000 ^e
Secondary ^e	1,000	1,000	1,000	1,000	5,000
Total	62,000	69,200	76,000	74,000	290,000 ^e
Slovakia, secondary	42,691	48,152	38,379	51,796	55,316
South Africa, primary	51,000 ^r	52,600 ^r	33,300 ^r	26,000 ^r	13,000
Spain:					
Primary	292,300	272,000	284,800	255,700 ⁴	257,700
Secondary	4,600	11,100	10,600	16,300 ⁴	18,200
Total	296,900	283,100	295,400	272,000 ⁴	275,900
Sweden:					
Primary	131,500	150,000	152,100 ⁴	135,900	157,200 ⁴
Secondary	62,200	60,000	65,200 ⁴	60,000	67,400 ⁴
Total	193,700	210,000	217,300 ⁴	195,900	224,600 ⁴
Turkey:					
Primary	46,200	53,400	85,400	83,700	78,900
Secondary ^e	5,000	5,000	5,000	5,000	5,000
Total	51,200	58,400	90,400	88,700	83,900
United States, primary	563,000	470,000	536,000	464,000	315,000 ^{e,5}
Uzbekistan, primary ^e	140,000 ^r	140,000 ^r	140,000 ^r	145,000	145,000
Vietnam, primary	11,600 ^r	15,800	15,100	19,200	19,200
Zambia, primary	698,100	787,900	828,700	638,500	750,600
Grand total	19,100,000	19,500,000	20,100,000	19,900,000 ^r	21,200,000
Of which:					
Primary	16,400,000	16,600,000	17,000,000 ^r	16,600,000 ^r	17,800,000
Secondary	2,750,000	2,870,000 ^r	3,100,000	3,290,000 ^r	3,390,000

^eEstimated. ^PPreliminary. ^rRevised. -- Zero.

¹Table includes data available through September 27, 2021. All data are reported unless otherwise noted; totals may include estimated data. Grand totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.

²To the extent possible, primary and secondary output of each country and (or) locality is shown separately.

³Copper content of nickel-copper-cobalt matte.

⁴Total smelter production is reported, but the distribution between primary and secondary output is estimated.

⁵To avoid disclosing company proprietary data, production is an estimate based on information in public company reports and does not reflect actual output reported to the U.S. Geological Survey.

TABLE 22
COPPER: WORLD REFINERY PRODUCTION, BY COUNTRY OR LOCALITY^{1,2}

(Metric tons)

Country or locality	2016	2017	2018	2019	2020 ^P
Argentina, secondary ^c	16,000	16,000	16,000	16,000	16,000
Australia, primary:					
Leaching, electrowon	30,000	26,000	23,000	28,000 ^{r,3}	25,000
Other	445,000	360,000	354,000	398,000 ^{r,3}	402,000
Total	475,000	386,000	377,000	426,000 ³	427,000
Austria, secondary	103,215	109,823 ^r	107,210 ^r	128,207 ^r	132,019
Belgium:					
Primary	217,900	235,500	230,800	209,600	188,000
Secondary	148,800	163,400	159,400	147,000	133,500
Total	366,700	398,900	390,200	356,600	321,500
Bolivia, leaching, electrowon	2,199	2,269	3,114	3,097 ^r	1,754
Brazil:					
Primary	225,558	118,100 ^r	131,800 ^r	133,500 ^r	85,900
Secondary	38,500	24,800	15,300	41,700 ^r	24,000
Total	264,058	142,900 ^r	147,100 ^r	175,200 ^r	109,900
Bulgaria:					
Primary	197,300	203,500	199,000	182,000	200,000
Secondary	19,200	25,000	25,000 ^e	25,000 ^e	25,000 ^e
Total	216,500	228,500	224,000	207,000	225,000
Burma, leaching, electrowon	75,000	115,100	153,000	153,100	185,000
Canada:					
Primary	284,400	300,700 ³	259,300 ³	253,100 ³	260,000 ^e
Secondary	30,000	29,700 ³	32,000 ³	28,100 ³	30,000 ^e
Total	314,400	330,400 ³	291,300 ³	281,200 ³	290,000 ^e
Chile, primary:					
Leaching, electrowon	1,660,300	1,586,200	1,575,300	1,580,200	1,467,500
Other	952,200	843,300	885,900	688,900	861,800
Total	2,612,500	2,429,500	2,461,200	2,269,100	2,329,300
China:					
Primary:					
Leaching, electrowon	49,500	50,000	55,000	55,700	50,100
Other	6,195,700	6,564,300	7,001,800	7,556,400 ^r	7,999,800
Total, primary	6,245,200	6,614,300	7,056,800	7,612,100 ^r	8,049,900
Secondary	2,209,000	2,300,800	2,234,600	2,170,800	1,975,500
Total, primary and secondary	8,454,200	8,915,100	9,291,400	9,782,900 ^r	10,025,400
Congo (Brazzaville), leaching, electrowon	--	15,400	15,875 ^r	15,000 ^e	10,000 ^e
Congo (Kinshasa), primary:					
Leaching, electrowon	811,274	818,730	945,607	1,126,500 ^r	1,325,600
Other	10,039	11,757	7,631	14,838	21,663
Total	821,313	830,487	953,238	1,141,338 ^r	1,347,263
Cyprus, leaching, electrowon	1,754	1,293	908	703	--
Egypt, secondary	95,795	100,000 ^e	100,000 ^e	100,000 ^e	100,000 ^e
Finland:					
Primary	122,600 ^{r,3}	126,500 ^{r,3}	132,100 ^{r,3}	114,727 ^r	139,903
Secondary	6,500 ^{r,3}	6,700 ^{r,3}	7,000 ^{r,3}	5,642 ^r	5,944
Total	129,100 ³	133,200 ³	139,100 ³	120,369 ^r	145,847
Germany:					
Primary	396,100	413,200	396,700	351,400 ^r	358,000
Secondary	275,300	281,200	275,700	278,300	285,000
Total	671,400	694,400	672,400	629,700 ^r	643,000
India:					
Primary	769,300	819,000	541,000	424,200	333,500
Secondary	3,500	10,000	10,000	2,000	--
Total	772,800	829,000	551,000	426,200	333,500

See footnotes at end of table.

TABLE 22—Continued
COPPER: WORLD REFINERY PRODUCTION, BY COUNTRY OR LOCALITY^{1,2}

(Metric tons)

Country or locality	2016	2017	2018	2019	2020 ^P
Indonesia, primary:					
Leaching, electrowon	11,760	23,160	17,071	16,777	5,377
Other	234,395 ^r	224,015 ^r	213,853 ^r	163,427 ^r	263,208
Total	246,155 ^r	247,175 ^r	230,924 ^r	180,204 ^r	268,585
Iran:					
Primary:					
Leaching, electrowon	13,400	13,200	15,700	16,400	16,400
Other	125,700	90,000	149,600	160,400	167,500
Total, primary	139,100	103,200	165,300	176,800	183,900
Secondary	61,700	57,000	73,300	84,700	95,500
Total, primary and secondary	200,800	160,200	238,600	261,500	279,400
Italy, secondary	6,600	8,700	7,200	9,800	15,000
Japan:					
Primary	1,259,426	1,166,194	1,241,100	1,152,847	1,242,743
Secondary	293,707	321,886	353,417	342,512	340,348
Total	1,553,133	1,488,080	1,594,517	1,495,359	1,583,091
Kazakhstan, primary:					
Leaching, electrowon	35,100	42,200	42,700	39,500	38,200
Other	408,435	426,191	438,115	472,327	477,016
Total	443,535	468,391	480,815	511,827	515,216
Korea, North: ^c					
Primary	10,000	10,000	10,000	10,000	10,000
Secondary	5,000	5,000	5,000	5,000	5,000
Total	15,000	15,000	15,000	15,000	15,000
Korea, Republic of:					
Primary	522,400	501,300	500,500	473,600 ^r	489,500
Secondary	124,800	163,000	174,000	189,400	181,800
Total	647,200	664,300	674,500	663,000 ^r	671,300
Laos, leaching, electrowon	78,492	62,941	68,200	72,006 ^r	39,730
Macedonia, leaching, electrowon	1,396	958	768	719	722
Mexico:					
Primary:					
Leaching, electrowon	222,100 ^r	202,000 ^r	179,300 ^r	187,600 ^r	166,800
Other	263,900 ^r	256,300 ^r	289,300 ^r	294,300 ^r	320,100
Total, primary	486,000	458,300	468,600	481,900 ^r	486,900
Secondary ^e	5,000	5,000	5,000	5,000	5,000
Total, primary and secondary	491,000	463,300	473,600	486,900 ^r	491,900
Mongolia, leaching, electrowon	15,010	14,689	14,175	11,758	9,488
Namibia, leaching, electrowon	16,391	15,466	15,177	14,940	15,741
Norway, primary	28,100	22,700	20,600	22,000	20,500
Oman, primary	11,300	5,100	6,000	--	--
Peru, primary:					
Leaching, electrowon	73,854	62,421	66,257	66,295	67,258
Other	257,470	272,996	270,541	241,567	256,322
Total	331,324	335,417	336,798	307,862	323,580
Philippines, primary	185,100	205,000	170,800	217,300	220,900
Poland:					
Primary	429,000	429,600	423,600	463,600	428,500
Secondary	106,600	92,400	78,200	102,000	131,800
Total	535,600	522,000	501,800	565,600	560,300
Russia:					
Primary:					
Leaching, electrowon	1,300 ⁴	1,300 ⁴	1,200 ^{r,4}	1,200 ^{r,4}	1,200 ^e
Other	662,300 ⁴	729,700 ^{r,4}	781,400 ^{r,4}	790,600 ^{r,4}	800,500
Total, primary	663,600 ⁴	731,000 ^{r,4}	782,600 ^{r,4}	791,800 ^{r,4}	801,700
Secondary	197,800 ⁴	218,000 ^{r,4}	233,400 ^{r,4}	236,200 ^{r,4}	239,700
Total, primary and secondary	861,400 ⁴	949,000 ^{r,4}	1,016,000 ^{r,4}	1,028,000 ^{r,4}	1,041,400

See footnotes at end of table.

TABLE 22—Continued
COPPER: WORLD REFINERY PRODUCTION, BY COUNTRY OR LOCALITY^{1,2}

(Metric tons)

Country or locality	2016	2017	2018	2019	2020 ^P
Serbia:					
Primary	59,078 ^r	67,752	66,200 ^r	73,000	45,100
Secondary	2,231 ^r	1,469	1,000	1,000	1,900
Total	61,309 ^r	69,221	67,200 ^r	74,000	47,000
South Africa, primary	53,900 ^r	66,200 ^r	43,900 ^r	35,600 ^r	21,800
Spain:					
Primary:					
Leaching, electrowon	73,643	73,664	70,738	48,090	54,352
Other	281,600	260,700	273,200	252,900	256,600
Total, primary	355,243	334,364	343,938	300,990	310,952
Secondary	74,200	80,800	79,900	85,300	88,700
Total, primary and secondary	429,443	415,164	423,838	386,290	399,652
Sweden:					
Primary	148,600 ^r	157,500 ^r	167,900 ^r	146,600 ^r	167,200
Secondary	58,400 ^r	61,500 ^r	56,100 ^r	54,400 ^r	58,800
Total	207,000 ^r	219,000 ^r	224,000 ^r	201,000 ^r	226,000
Turkey:					
Primary	47,400	88,000	116,300	106,000	116,100
Secondary	5,000	7,000	10,000	10,000 ^e	10,000 ^e
Total	52,400	95,000	126,300	116,000	126,100
Ukraine, secondary	21,973	25,186	24,901	20,409	24,335
United States:					
Primary:					
Leaching, electrowon	615,000	557,000	532,000	527,000	559,000
Other	561,000	482,000	538,000	457,000	315,000 ^{e,5}
Total, primary	1,180,000	1,040,000	1,070,000	985,000	874,000
Secondary	46,300	40,100	41,200	44,400	43,200
Total, primary and secondary	1,220,000	1,080,000	1,110,000	1,030,000	918,000
Uzbekistan, primary	140,000 ^{r, e}	140,100 ^r	141,200 ^r	147,250	145,000 ^e
Vietnam, primary	11,600 ^r	15,800	15,100	19,200	19,200
Zambia, primary:					
Leaching, electrowon	195,800 ^r	201,300 ^r	210,000 ^r	144,400 ^r	146,000
Other	230,600	264,800	248,200	120,100	232,400
Total	426,400 ^r	466,100 ^r	458,200 ^r	264,500 ^r	378,400
Grand total	23,700,000 ^r	23,900,000	24,400,000	24,400,000 ^r	25,000,000
Of which:					
Primary:					
Leaching, electrowon	3,980,000 ^r	3,890,000 ^r	4,010,000 ^r	4,110,000 ^r	4,190,000
Other	15,700,000	15,900,000	16,300,000	16,100,000 ^r	16,900,000
Total	19,700,000	19,800,000 ^r	20,300,000	20,300,000	21,100,000
Secondary	3,960,000	4,150,000 ^r	4,120,000 ^r	4,130,000 ^r	3,970,000

^eEstimated. ^PPreliminary. ^rRevised. -- Zero.

¹Table includes data available through September 27, 2021. All data are reported unless otherwise noted; totals may include estimated data. Grand totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.

²To the extent possible, primary and secondary output of each country and (or) locality is shown separately. The “primary,” “primary, other,” and “secondary” categories consist of electrolytic and fire-refined copper, and the “leaching, electrowon” category consists of refined copper produced by solvent extraction and electrowinning.

³Total refined production is reported, but the distribution between primary (electrowon), primary (other), and (or) secondary output is estimated.

⁴Total refined production and electrowon production are reported, but the distribution between primary (other) and secondary output is estimated.

⁵To avoid disclosing company proprietary data, production is an estimate based on information in public company reports and does not reflect actual output reported to the U.S. Geological Survey.