



2022 Minerals Yearbook

ZINC [ADVANCE RELEASE]

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ZINC

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In 2022, U.S. zinc mine production was 763,000 metric tons (t) (zinc content), 8% more than that in 2021 (table 1). Recoverable zinc mine production was 747,000 t, 8% more than that in 2021, and the value of domestic recoverable zinc mine production, based on the North American price for Special High Grade (SHG) zinc, was approximately \$3.1 billion (table 1). Alaska continued to be the leading zinc-producing State, accounting for 80% of recoverable zinc mine production in 2022 (table 2). Other producing States included Idaho, Missouri, New York, and Tennessee (table 3). The United States exported most of its zinc mine production to foreign smelters for processing. Leading destinations for domestic exports of zinc ores and concentrates were Canada (37%), the Republic of Korea (19%), Spain (12%), and Japan (10%) (table 9). Imports for consumption of zinc ores and concentrates were significantly less than exports because the only domestic primary zinc smelter mostly consumed domestically produced zinc concentrate (table 1).

Total U.S. refined zinc production in 2022 was estimated to have remained unchanged from that in 2021 at 220,000 t (table 1). Imports for consumption of refined zinc in 2022 were 762,000 t, 9% more than 701,000 t (revised) in 2021. Domestic exports of refined zinc decreased to 8,070 t from 13,200 t in 2021. Apparent consumption of refined zinc, defined as smelter production plus imports for consumption minus domestic exports, increased by 7% from that in 2021 to 974,000 t. Most reported refined zinc consumption was for galvanizing, and other major end uses were brass and bronze and zinc-base alloys (table 7).

Global zinc mine production in 2022 decreased slightly to 12.5 million metric tons (Mt) (zinc content) from 12.8 Mt (revised) in 2021, and zinc smelter production decreased by 3% to 12.9 Mt from 13.3 Mt (revised) in 2021 (tables 1, 16, 17). According to data from the International Lead and Zinc Study Group (ILZSG), global zinc metal consumption decreased by 4% to 13.5 Mt in 2022 from 14.0 Mt in 2021 (International Lead and Zinc Study Group, 2023c, p. 31).

Data in this report are rounded to no more than three significant digits, percentages are calculated from unrounded data, and zinc mine data are in terms of zinc content unless otherwise specified.

Government Actions and Legislation

A U.S. Government stockpile of refined zinc has been maintained since 1967 for national defense purposes. Public Law 102-484, signed in 1992, authorized the disposal of the entire inventory of zinc from the National Defense Stockpile (NDS). The Defense Logistics Agency Strategic Materials listed zinc for potential disposal in the Annual Materials Plan (AMP) for fiscal year 2022 (October 1, 2021, through September 30, 2022). The AMP ceiling disposal quantity for zinc in fiscal year 2022 was 7,250 t (7,993 short tons), which represented the maximum quantity of zinc that could be sold

from the NDS during the fiscal year. During calendar year 2022, the Defense Logistics Agency Strategic Materials sold 1,630 t (1,800 short tons) of zinc from the NDS under three separate awards for a combined value of \$5.68 million (Defense Logistics Agency Strategic Materials, 2021, 2022a-c).

In response to the Energy Act of 2020, the U.S. Department of the Interior (DOI) was directed to review and update a list of critical minerals at least every 3 years. A critical mineral is defined by the Energy Act of 2020 as a nonfuel mineral or mineral material essential to the economic or national security of the United States and which has a supply chain vulnerable to disruption. Critical minerals are also characterized as serving an essential function in the manufacturing of a product, the absence of which would have significant consequences for the economy or national security. In February, the U.S. Geological Survey (USGS) published the 2022 final list of critical minerals. Compared with the prior list published in 2018, the 2022 list added nickel and zinc and removed helium, potash, rhenium, and strontium. The minerals were updated based on current data on supply and demand, concentration of production, and policy priorities (U.S. Geological Survey, 2022).

In February, the DOI announced that it would form an interagency working group to review hard-rock mining laws, regulations, and permitting policies in the United States and make recommendations to increase community and Tribal engagement and permitting efficiency. The group planned to organize roundtable discussions to gather feedback from conservation and environmental groups, the mining industry, State and local governments, Tribal Nations, and other stakeholders (U.S. Department of the Interior, 2022).

On March 31, the President of the United States invoked section 303 of the Defense Production Act of 1950 to expand the mining, beneficiation, and value-added processing of critical minerals in the United States for the domestic production of large-capacity batteries for the electric-powered vehicle and stationary energy storage sectors. This order would support the administration's policy of ensuring a robust and sustainable domestic industrial base to meet the requirements of a clean energy economy. The United States has been dependent on foreign sources for many of the materials necessary for the clean energy transition (Biden, 2022). Several types of large-capacity zinc-based battery technologies could potentially be used for renewable energy storage applications (Daniel-Ivad, 2022).

The Office of Management and Budget (OMB) provided implementation guidance on the Build America, Buy America Act in a memorandum signed in April. The act, passed in November 2021, specified that federally funded infrastructure projects must use iron, steel, manufactured products, and construction materials produced in the United States. The 2022 OMB memorandum further specified that all iron and steel used in infrastructure projects must be produced in the United States

from the initial melting stage through the application of coatings (Office of Management and Budget, 2022, p. 1–2).

In July, the U.S. International Trade Commission determined that revoking existing antidumping and countervailing duties on corrosion-resistant steel products from China, India, Italy, and the Republic of Korea and antidumping duties from Taiwan would likely lead to material injury to United States industry. As a result, existing duty orders on imports of corrosion-resistant steel from these countries would remain in place. The determination was made under the 5-year sunset review process of duty orders, as required by the Uruguay Round Agreements Implementation Act (U.S. International Trade Commission, 2022).

In August, the Inflation Reduction Act was signed into law (Public Law 117–169). As part of the new law, taxpayers that produce certain critical minerals, including zinc, could receive an advanced manufacturing production credit equal to 10% of the production costs. The law also appropriated \$500 million towards the Defense Production Act of 1950 to strengthen U.S. supply chains (U.S. Congress, 2022).

Production

Mine.—In 2022, zinc was produced in five States, including Alaska, Idaho, Missouri, New York, and Tennessee. Domestic mine production of zinc in ores and concentrates was 763,000 t, and recoverable zinc mine production was 747,000 t, both 8% more than that in 2021. About 80% of U.S. recoverable zinc mine production took place in Alaska, mostly at the Red Dog Mine, followed by the Greens Creek Mine. Zinc mine production increased in Alaska and in all other States combined in 2022 (tables 1–3).

Alaska.—Teck Alaska Inc. (a subsidiary of Teck Resources Ltd., Canada) operated the open pit Red Dog zinc-lead mine in the Northwest Arctic Borough, the leading zinc-producing mine in the United States and one of the leading zinc-producing mines in the world. The Red Dog property consists of several sedimentary-exhalative lead-zinc sulfide ore bodies and was leased and operated under an agreement with NANA Regional Corp. (Kotzebue, AK), an Alaska Native-owned corporation. Teck was currently mining the Aqqaluk and Qanaiyag deposits at Red Dog and reported that zinc-in-concentrate production increased by 10% to 553,100 t in 2022 from 503,400 t in 2021 owing mostly to an increase in ore grade and mill recovery rate. Most of Red Dog’s concentrates were exported to Asia, Europe, and Australia, and the rest were processed at Teck’s metallurgical complex at Trail, British Columbia, Canada. Reported reserves at yearend 2022 contained about 4.0 Mt of recoverable zinc metal. Teck projected that zinc production at Red Dog would range from 550,000 to 580,000 t in 2023 and from 500,000 to 550,000 metric tons per year (t/yr) in 2024 through 2026. Current mine life was projected to extend to 2031. However, Teck was considering the development of the Aktigirug deposit located within 10 to 20 kilometers of the Red Dog operation and planned to conduct scoping studies on the deposit in 2023 and 2024 (Teck Resources Ltd., 2023, p. 34–36, 48).

Hecla Mining Co.’s (Coeur d’Alene, ID) underground Greens Creek Mine recovered metals from a polymetallic (silver-zinc-gold-lead) massive sulfide deposit on Admiralty Island in the Tongass National Forest near Juneau. The mine produced

bulk zinc-lead, lead-silver, zinc concentrates, and a gravity concentrate that was upgraded into gold and silver dore by a third-party processor. Hecla reported that zinc-in-concentrate production in 2022 was 47,500 t, slightly less than production in 2021. Reported yearend proven and probable ore reserves at Greens Creek contained 630,000 t of zinc, and the mine life was projected to extend for 12 years through 2034. Hecla planned to conduct definition and exploration drilling in 2023 to potentially add reserves and resources (Hecla Mining Co., 2023b, p. 26–28).

Arizona.—South32 Ltd. (Australia) continued to advance the development of its Hermosa project, which included the polymetallic Clark and Taylor deposits, in Santa Cruz County. The company completed a prefeasibility study for the Taylor zinc-lead-silver deposit, which would be developed as an underground mine and would produce zinc and lead concentrates containing byproduct silver. Initial resource estimates supported a 22-year mine life with annual production averaging approximately 111,000 t of zinc. The company planned to complete the feasibility study and a final investment decision in mid-2023. South32 also completed a scoping study of the Clark deposit, which potentially would operate as an underground mine producing zinc, silver, and battery-grade manganese, and commenced a prefeasibility study on the project (South32 Ltd., 2022, p. 1–4).

Idaho.—Hecla operated the Lucky Friday Mine, an underground silver-lead-zinc mine in the Coeur d’Alene mining district in northern Idaho, which produced silver-lead concentrate and zinc concentrate. Zinc production in 2022 increased to 11,300 t from 9,040 t in 2021. The company attributed the increase to a new deep-vein mining method used at the mine since early 2020. Reported proven and probable ore reserves at yearend contained 180,000 t of zinc, and mine life was expected to extend for 16 years under the current mine plan (Hecla Mining Co., 2023a, p. 4; 2023b, p. 29–31).

Bunker Hill Mining Corp. (Canada) continued to advance the restart of the Bunker Hill zinc-lead-silver mine in Shoshone County, ID, which had previously operated between 1891 and 1981. Estimated initial capital costs were \$55 million to bring the mine into operation by the end of 2023. Lead and zinc concentrates would be produced at an onsite mill with an ore-processing rate of 1,630 metric tons per day. Based on recent mineral reserves estimates, about 144,000 t of zinc was expected to be produced during an initial 5-year mine life. In March, the company signed a purchase agreement with Teck Resources to acquire the processing plant at Teck’s Pend Oreille Mine, which had been on care-and-maintenance status since 2019. The mill equipment would be transported from Pend Oreille in Washington State to Bunker Hill. Total probable reserves at Bunker Hill, as of August 29, 2022, contained 170,000 t of zinc (Bunker Hill Mining Corp., 2022a, b).

Missouri.—Doe Run Resources Corp. (St. Louis, MO) operated a series of production shafts that ran along the Viburnum Trend within the Mississippi Valley-type lead-zinc-copper ore bodies in southeastern Missouri. In 2022, Doe Run recovered zinc from ore produced at the Brushy Creek, Fletcher, Sweetwater, and Viburnum (#29 and #39) Mines.

New York.—Titan Mining Corp. (Canada) owned and operated the underground Empire State (No. 4) zinc mine,

formerly known as the Balmat (No. 4) Mine, in St. Lawrence County. Empire State is one of several sedimentary-exhalative deposits in the Balmat-Edwards zinc mining district. In 2022, zinc-in-concentrate production was 28,000 t, an 11% increase from 25,300 t in 2021. During 2022, Titan received a permit to expand mining into its Sphaleros project area, a series of near-surface mineralized zones in and near the historic No. 2 mine site. The company planned to mine the Sphaleros area by underground methods and expected the project to incrementally increase ore feed and improve the operational efficiency of the mill (Titan Mining Corp., 2023, p. 4–8).

Tennessee.—Nyrstar NV (operating business owned by Trafigura Group Pte. Ltd., Singapore) owned and operated the East Tennessee Zinc Complex and the Middle Tennessee Mine that recovered ore from Mississippi Valley-type zinc deposits. Zinc concentrate from both operations were sent to Nyrstar’s Clarksville, TN, zinc smelter for processing. Zinc-in-concentrate production from the mines was not publicly disclosed for 2022.

Utah.—In November, the Utah Geological Survey received a grant from the USGS’s Earth Mapping Resource Initiative (Earth MRI) program to study American West Metals Ltd.’s (Australia) West Desert zinc-copper-indium deposit in Juab County, UT. The 3-year grant would support research on the spatial and mineralogical distribution of indium throughout the deposit and exploration indicators to help identify similar deposits (American West Metals Ltd., 2022).

Intermediate.—Several plants produced Waelz oxide, or crude zinc oxide, from electric arc furnace dust (EAFD) in the United States (table 4). EAFD is a waste product generated from the recycling of steel scrap at steel mini mills and, on average, is 14% to 35% zinc (Suetens and others, 2014, p. 153). Recyclers of EAFD processed the material in Waelz kilns to produce Waelz oxide, which is about 62% zinc (Steel Dust Recycling LLC, 2016) and an iron-rich slag. The Waelz oxide can be sold to zinc smelters or other processors for the production of zinc metal, zinc oxide, or zinc sulfate.

Smelter.—In 2022, refined zinc was produced mainly in Tennessee (Nyrstar’s Clarksville zinc refinery) and North Carolina (Befesa Zinc Metal LLC’s Mooresboro zinc refinery). A smaller quantity of zinc metal was produced by EverZinc USA Inc.’s recycling operation in Houston, TX. The three facilities did not publicly disclose their zinc production in 2022. Refined zinc production was estimated to be 220,000 t, unchanged from estimated production in 2021 (tables 1, 5).

Nyrstar’s Clarksville electrolytic zinc refinery was the only primary zinc smelter in the United States. Clarksville was designed specifically to treat zinc concentrate produced at the East Tennessee and Middle Tennessee Mines but could also treat imported zinc concentrate and Waelz oxide. Clarksville produced SHG and Continuous Galvanizing Grade (CGG) zinc. Byproducts included cadmium metal, copper cementate, copper sulfate, germanium leach product, sulfuric acid, and synthetic gypsum.

In September, Befesa S.A., a Luxembourg-based recycler of waste from the steel and aluminum industries, acquired the remaining 93% interest in American Zinc Products LLC, a solvent extraction–electrowinning (SX–EW) secondary zinc refinery in Rutherford County, NC, from American Zinc Recycling (Pittsburgh, PA) for \$47 million. Befesa previously

acquired four EAFD recycling plants and an initial 7% stake in the zinc refinery from American Zinc Recycling in August 2021 for \$460 million. The refinery had the capacity to produce 141,000 t/yr of SHG zinc from Waelz oxide sourced from Befesa’s EAFD recycling operations in Barnwell, SC, Calumet, IL, Palmerton, PA, and Rockwood, TN. The refinery operation was renamed Befesa Zinc Metal LLC (Befesa S.A., 2021, 2022, 2023).

U.S. Zinc Corp. (Houston, TX) produced Prime Western zinc and zinc dust at its zinc recycling facility in Houston, TX. Feed materials were mainly top dross from continuous galvanizers and bottom dross and skimmings from general galvanizers (U.S. Zinc Corp., 2017). In early June, private-investment firm Aterian Investment Partners (New York, NY) announced that it had combined its subsidiary, U.S. Zinc, with EverZinc Group S.A. (Belgium). According to Aterian, the combined company would be a leading global producer of zinc chemical products. Across four facilities in Tennessee and Texas, U.S. Zinc produced zinc metal, zinc oxide, and zinc powder, which were sold primarily domestically. EverZinc produced zinc oxide and zinc powder across 10 facilities in Belgium, Canada, China, the Netherlands, Norway, and Malaysia. The combined company would operate as EverZinc and would be headquartered in Houston, TX (Aterian Investment Partners, 2022).

Consumption

Changes in zinc consumption generally follow trends in industrial production or, more generally, economic growth. Domestic apparent consumption of refined zinc (defined as smelter production plus imports for consumption minus domestic exports) in 2022 was 974,000 t, a 7% increase from that in 2021 (table 1).

According to reported data, most of the zinc consumed domestically in 2022 was for the production of galvanized (zinc-coated) steel (table 7). Galvanized steel was used extensively in the automotive and construction industries and in consumer durables. Most of the zinc consumed domestically for galvanizing was at continuous galvanizing plants. According to the American Iron and Steel Institute (2022, 2023a), domestic net shipments of galvanized sheet and strip (including hot dipped, electrolytic, and all other metallic coated) were 16.3 Mt in 2022, a 9% decrease from net shipments in 2021. More broadly, U.S. raw steel capacity utilization decreased to 78% in 2022 from 81% in 2021 (American Iron and Steel Institute, 2023b). Zinc also was consumed to a lesser extent at general galvanizing plants that treated fabricated steel shapes (for example, structural beams or fasteners).

During the year, Nucor Corp. (Charlotte, NC) announced several investments that would significantly increase its galvanizing capacity. In January, the company announced that it had selected Mason County, WV, as the location for a new \$2.7 billion sheet mill that would include an automotive galvanizing line and a construction-grade galvanizing line. Nucor also announced plans to expand its sheet mill in Crawfordsville, IN, by constructing a 270,000-t/yr construction-grade continuous galvanizing line and a 230,000-t/yr prepaint line. The \$290 million investment was projected to take 2 years to complete. Later in the year, Nucor announced that it would

construct two additional continuous galvanizing lines, one at its Nucor Steel Berkeley plant in South Carolina and the other at its mill in Fontana, CA, operated by California Steel Industries Inc. (CSI), a joint venture between JFE Steel Corp. (Japan) and Nucor. The \$425 million galvanizing line at Berkeley would have a capacity of 450,000 t/yr and would serve the automotive and consumer durables markets. Startup was planned for mid-2025. The new galvanizing line at CSI would have a capacity of 360,000 t/yr and would serve construction markets in the western United States. Investment costs for the line at CSI were \$370 million, and construction would take 30 months to complete following regulatory approval (Nucor Corp., 2022a–d).

Zekelman Industries Inc. (Chicago, IL) completed construction of a plant in Rochelle, IL, that would produce galvanized tubular products for the electrical, fence, and solar markets. The plant included four in-line galvanizing tube mills with a combined capacity of 270,000 t/yr and a hot-dip galvanizing line with a capacity of 91,000 t/yr. Full operations were expected to begin in January 2023 (Zekelman Industries Inc., 2022).

Other major end uses of zinc included brass and bronze, chemicals, semimanufactures, and zinc-base alloys. Zinc oxide was one of the leading zinc chemicals, by production quantity, and was used extensively in the rubber and tire manufacturing industry as an activator in the vulcanization process. Zinc oxide also was used in a variety of other industries including the agriculture, ceramics, chemical, coatings and paints, and pharmaceutical industries. Major zinc oxide producers in the United States included U.S. Zinc (renamed EverZinc) and Zochem LLC (Zinc Oxide LLC) (Dickson, TN) (table 5). U.S. Zinc consumed zinc dross and skimmings to produce zinc oxide at its two plants in Clarksville, TN, and Millington, TN. Zochem consumed zinc metal and secondary zinc materials at its zinc oxide plant in Dickson, TN, and operated a zinc oxide plant in Brampton, Ontario, Canada. The two facilities had a combined production capacity of 100,000 t/yr of zinc oxide (Zochem LLC, 2023).

Zinc semimanufactures included mainly zinc sheet, also known as rolled zinc, which was used in architectural applications and for the production of the U.S. 1-cent coin. Zinc-base alloys were used predominantly to make die-cast parts for such applications as automotive parts, builders and household hardware, electronics, home appliances, medical instruments, office equipment, power tools, and zippers.

Stocks

Reported producer and consumer stocks of zinc in the United States were 134,000 t at yearend 2022 (table 1). Monthend stocks of zinc in London Metal Exchange Ltd. (LME)-approved warehouses in the United States decreased during 2022 from 33,150 t in January to 25 t in December. Monthend off-warrant stocks of zinc in LME-approved warehouses in the United States decreased from 7,642 t in January to 464 t in March, and there were no reported off-warrant stocks in U.S. warehouses between April and December. Global LME stocks of zinc similarly decreased during the year from 154,850 t at the end of January to 30,475 t at the end of December (London Metal Exchange Ltd., 2023a, b).

Prices

The annual average LME cash price for SHG zinc in 2022 increased by 16% from that in 2021 to \$3,484 per metric ton (158 cents per pound) (table 1). The average monthly price increased from \$3,609 per metric ton (164 cents per pound) in January to an annual high of \$4,370 per metric ton (198 cents per pound) in April. The LME cash price then generally trended downward during the rest of the year to \$3,128 per metric ton (142 cents per pound) in December. The annual average S&P Global Platts North American price for SHG zinc in 2022, which was based on the LME cash price plus a regional North American premium, was 190 cents per pound, 30% more than that in 2021 (table 1). The monthly average North American SHG premium began the year at 20.3 cents per pound in January and increased to an annual high of 39.5 cents per pound in August and then generally decreased for the rest of the year to 36.9 cents per pound in December. Increasing regional premiums are generally indicative of a decreasing supply of zinc in a regional market.

Foreign Trade

The United States was a net exporter of zinc in ores and concentrates, as domestic zinc mine production was significantly more than domestic primary smelting capacity. In 2022, domestic exports of zinc in ores and concentrates were 644,000 t, unchanged from those in 2021, and were sent for processing primarily to Canada (37%), the Republic of Korea (19%), Spain (12%), Japan (10%), China (8%), and Belgium (7%). Imports of zinc in ores and concentrates were 4,870 t, a decrease from 13,400 t in 2021 (tables 1, 8–9, 12–13).

The United States was reliant on imports of refined zinc to meet its domestic consumption needs. Domestic imports for consumption of refined zinc were 762,000 t in 2022, a 9% increase from 701,000 t (revised) in 2021. More than 95% of imports were sourced from Canada (50%), Mexico (14%), the Republic of Korea (12%), Australia (10%), Peru (7%), and Spain (4%) (tables 1, 12, 15).

The leading zinc compounds, by import quantity and value, were zinc oxide and zinc sulfate. U.S. imports for consumption of zinc oxide were 104,000 t in 2022, 5% less than imports in 2021 and were sourced mostly from Canada (43%) and Mexico (40%) (tables 12, 14). Imports of zinc sulfate were 95,200 t, 14% less than those in 2021. Mexico (50%), China (29%), and Canada (16%) were the leading import sources. Domestic exports of zinc oxide, the leading zinc compound in terms of export quantity and value, were 71,300 t, 3% more than exports in 2021. Most (89%) of these exports went to Mexico (tables 8, 10).

World Review

Mine Production.—Global zinc mine production in 2022 decreased slightly to 12.5 Mt from 12.8 Mt (revised) in 2021. China (32% share of global production), Peru (11%), and Australia (10%) were the leading producers of zinc in concentrate in 2022 (table 16). The United States ranked fifth, accounting for 6% of global mine production. Zinc mine production decreased most notably in Peru (163,000-t decrease), China (95,000 t), Burkina Faso (72,000 t), and Australia

(71,000 t). Partially offsetting these decreases were increases in Mongolia (61,000-t increase), the United States (57,000 t), India (55,000 t), and South Africa (44,000 t). According to the ILZSG (2023b, p. 10), global zinc mine capacity increased in 2022 from that in 2021 by a net 55,000 t.

Metal Production.—Global zinc metal production decreased by 3% in 2022 to 12.9 Mt from 13.3 Mt (revised) in 2021 (table 17). Most of this total was production by primary smelters. China (49% share of global production), the Republic of Korea (7%), India (6%), and Japan (4%) were the leading producers of refined zinc metal in 2022. The United States accounted for less than 2% of global zinc metal production. In terms of quantity, production decreased most notably in Canada (156,000-t decrease), Italy (80,000 t), the Netherlands (80,000 t), France (68,000 t), Australia (55,000 t), and China (50,000 t). These production decreases were partially offset by production increases in Iran (72,000-t increase), India (57,000 t), and the Republic of Korea (16,000 t). Global zinc smelter production capacity increased in 2022 by a net 87,000 t (International Lead and Zinc Study Group, 2023c, p. 14).

Metal Consumption.—According to the ILZSG (2023c, p. 30–31, 43), global zinc metal consumption decreased by 4% to 13.5 Mt in 2022 from 14.0 Mt in 2021. The leading consumer of zinc was China, accounting for 48% of global consumption. Other leading consumers included, in descending order of consumption, the United States, India, the Republic of Korea, Germany, Japan, Belgium, and Turkey. The ILZSG's data indicated that zinc metal consumption exceeded production for the second year in a row by 98,000 t in 2022, which was a decrease compared with the 149,000-t shortfall in 2021.

Australia.—In April, Nyrstar announced plans to replace and modernize the cellhouse at its Hobart zinc smelter in Tasmania. The project was estimated to cost about \$277 million,¹ including \$175,000 in funding to be provided by the Australian Federal and Tasmanian Governments, and would take 28 months to complete. The new cellhouse would increase the zinc production capacity of the operation to 300,000 t/yr from 280,000 t/yr (Nyrstar Hobart Pty. Ltd., 2021, p. 10; Nyrstar NV, 2022a). Midyear, Sun Metals Corp. Pty. Ltd. (a subsidiary of Korea Zinc Co. Ltd., Republic of Korea) commissioned an expansion project at its refinery in Townsville, Queensland, increasing zinc production capacity to 300,000 t/yr from 230,000 t/yr. The company had also invested in an onsite solar farm and a nearby wind energy project to power the refinery and, by 2024, expected these renewable energy projects to supply more than 80% of the smelter's electricity (Harper and Gray, 2022).

Brazil.—Nexa Resources SA (Luxembourg) commissioned the Aripuanã Mine in Mato Grosso State. The mine was expected to reach its full production rate in the second quarter of 2023, and average annual production was estimated to be 70,000 t of zinc during a mine life of 11 years, based on current mineral reserves estimates. Nexa was focused on underground activities at Aripuanã, including preparing underground areas for mining, and drilling in new areas to increase mineral reserves (Nexa Resources SA, 2022).

¹Where necessary, values have been converted from Australian dollars (AUD) to U.S. dollars (US\$) at an average annual exchange rate of AUD1.442=US\$1.00, for 2022.

Burkina Faso.—Trevali Mining Corp. (Canada) suspended operations at the Perkoa zinc mine after a flash flood took place at the mine in April resulting in eight fatalities. The mine was later reported to be closed as available funds were insufficient to rehabilitate the mine. Zinc mine production capacity was 90,000 t/yr (Thomson Reuters, 2022; International Lead and Zinc Study Group, 2023b, p. 54).

Canada.—In June, Hudbay Minerals Inc. concluded mining activities at the 777 copper-zinc-gold-silver mine in Flin Flon, Manitoba, owing to reserves depletion, consistent with the company's mine plan. The mine began production in 2004. Hudbay's nearby 115,000-t/yr zinc smelter in Flin Flon also would be closed after 25 years of operation. The company planned to place the concentrator and tailings impoundment at the mine on care-and-maintenance status for the possibility of another mineral discovery in the Flin Flon area. Employees and equipment would be transitioned to Hudbay's Lalor gold-zinc-copper-silver mine in Snow Lake, Manitoba (Hudbay Minerals Inc., 2022, p. 9).

In June, Glencore plc (Switzerland) closed the Matagami Mine in Quebec owing to reserves depletion. The Matagami mining area began operations in the early 1960s and contained several deposits that had been mined over the years, mostly for zinc. The mine produced 17,300 t of zinc in concentrate in 2022, down from 47,400 t in 2021 (Glencore plc, 2023, p. 11).

In August, Trevali Mining suspended operations at the Caribou zinc-lead-silver mine in New Brunswick owing to financial challenges and filed for creditor protection under the Companies' Creditors Arrangement Act in Canada. The Caribou Mine had restarted operations in March 2021 after being on care-and-maintenance status since March 2020, and produced 18,400 t of payable zinc in 2021 (Trevali Mining Corp., 2022a, p. 12–13; 2022b).

Teck Resources carried out major maintenance work at its lead-zinc metallurgical operations in Trail, British Columbia, between September and December, which included replacing the KIVCET furnace hearth and zinc roaster dome. As a result, refined zinc production in 2022 decreased by 10% to 249,000 t from that in 2021. The company expected zinc production to increase to between 270,000 and 290,000 t in 2023. Production capacity at Trail was 315,000 t/yr of refined zinc (Teck Resources Ltd., 2023, p. 37).

Noranda Income Fund temporarily shut down the cellhouse at its 265,000-t/yr zinc smelter in Salaberry-de-Valleyfield, Quebec, in late October to carry out repairs. The smelter was later recommissioned in December. The Fund noted that it would eventually need to replace all cells in the cellhouse to improve operating conditions in the long term, but this replacement work would not commence before 2024. In 2022, zinc production decreased by 33% to 198,000 t from that in 2021. The refinery was operated and managed by Canadian Electrolytic Zinc Ltd., a subsidiary of Glencore (Noranda Income Fund, 2022, 2023).

China.—According to Beijing Antaike Information Co. Ltd. (2023, p. 15, 18–19), zinc mine production in China decreased slightly in 2022 mostly because of decreased output by mines in Inner Mongolia Autonomous Region and decreased production in Guizhou, Hebei, and Yunnan Provinces and Tibet

Autonomous Region. Zinc smelter production in China also decreased slightly owing to a combination of several factors including operational disruptions brought about by the global coronavirus disease 2019 (COVID-19) pandemic, power issues, and earthquakes; difficulty in securing raw materials; and lower zinc demand.

China was a significant global importer of zinc concentrate. Imports of zinc concentrate (gross weight) totaled 4.1 Mt in 2022, an increase of 13% from that in 2021, and were sourced predominantly from Australia, Peru, South Africa, and Russia, in descending order of quantity. In 2022, China was a net exporter of refined zinc for the first time since 2007. Net exports were 1,880 t in 2022, a switch from a net import total of 429,000 t in 2021 (Zen Innovations AG, 2024).

France.—In early December, Nyrstar reported that scheduled maintenance work at its zinc smelter in Auby, which began in October, had been completed. However, the smelter was placed on care-and-maintenance status until further notice owing to challenging market conditions (Nyrstar NV, 2022d). Zinc production capacity at the Auby smelter was previously reported to be 172,000 t/yr (Nyrstar NV, 2017).

Germany.—Glencore placed its 165,000-t/yr zinc smelter in Nordenham on care-and-maintenance status beginning on November 1. Glencore reported that the closure was due to “various external factors affecting the business and wider European industry,” and the zinc smelter would remain closed until macroeconomic conditions improved. The lead smelter at Nordenham continued to operate (Holman, 2022).

Mexico.—Refined zinc production at Industrias Peñoles SAB de CV’s Met-Mex metallurgical complex in Torreón, Coahuila State, decreased by 10% in 2022 to 237,000 t owing to operational issues relating to the interaction of the roasting plant with a new direct leaching plant, which were resolved by yearend. The company projected that zinc production would increase in 2023, and the plant would reach its operating capacity of 350,000 t/yr by 2024 (Industrias Peñoles SAB de CV, 2023, p. 50).

Netherlands.—Nyrstar’s 315,000-t/yr Budel zinc smelter operated at a reduced rate for most of the year and was placed on care-and-maintenance status in early September. Nyrstar reported that the decision was due to external factors affecting the business. Production resumed on a limited basis in November. Continued operations at Budel would be dependent on market conditions, which remained challenging, according to the company (Nyrstar NV, 2021, 2022b, c).

Portugal.—In the first quarter, Lundin Mining Corp. completed work on a zinc expansion project at the Neves Corvo copper-zinc mine, which would increase zinc ore-processing capacity at the mine to 2.5 million metric tons per year (Mt/yr) from 1.15 Mt/yr. Full production was expected to be reached in 2024, and zinc-in-concentrate production would average 150,000 t/yr during 10 years (Lundin Mining Corp., 2023, p. 76).

Russia.—The government of the Republic of Buryatia announced that the Ozernoye lead-zinc project would be operational in 2023. The mine, located in the Yeravninsky District of Buryatia in Siberia, would process 6 Mt/yr of ore to produce zinc in concentrate, equivalent to 4% of global zinc mine production, according to the government. The mine also

would produce a lead-silver concentrate. Reported costs were about \$1.3 billion² (Bouckley, 2022a).

First Ore Mining Co. JSC, a subsidiary of Russia’s state-owned State Atomic Energy Corp. Rosatom, received approval to begin development of the Pavlovskoye zinc-lead-silver deposit, one of Russia’s northernmost mining projects. Pavlovskoye was on Yuzhny Island of the Novaya Zemlya Archipelago in the Arctic region of Russia. Annually, the mine was expected to produce 220,000 t of zinc concentrate and 50,000 t of lead concentrate. Rosatom also planned to construct a port for shipping concentrates on Novaya Zemlya by 2026. Investment in Pavlovskoye was part of a broader Federal initiative to develop the Arctic zone of Russia (Bouckley, 2022b).

Outlook

According to forecast data compiled for its meeting held in October 2023, the ILZSG projected global zinc metal consumption in 2023 to increase slightly from that in 2022 to approximately 13.6 Mt. Zinc metal consumption increases in China, India, Saudi Arabia, and the United States were expected to more than offset decreased consumption in Europe, Brazil, Japan, Taiwan, Thailand, and Turkey. On the supply side, the ILZSG forecast global zinc mine production to remain essentially unchanged at 12.4 Mt. Mine production decreases in Australia, Bolivia, Burkina Faso, Canada, Ireland, and Sweden would be offset by increases in China, India, Mongolia, Peru, and Russia. Metal production is forecast to increase by 4% to 13.8 Mt, mostly as a result of increased production in China, partially offset by decreased production in Europe. Overall, zinc metal production is expected to exceed consumption in 2023 by 248,000 t (International Lead and Zinc Study Group, 2023a).

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TABLE 1
SALIENT ZINC STATISTICS¹

(Metric tons unless otherwise specified)

	2018	2019	2020	2021	2022
United States:					
Production:					
Domestic ores and concentrates:					
Contained zinc	824,000	753,000	723,000	704,000	763,000
Recoverable zinc: ²					
Quantity	799,000	731,000	701,000	688,000	747,000
Value thousands	\$2,480,000	\$2,000,000	\$1,710,000	\$2,210,000	\$3,130,000
Refined zinc:					
At primary smelters	101,000	99,900 ^e	110,000 ^e	110,000 ^e	110,000 ^e
At secondary smelters ^c	15,000	15,000	70,000	110,000	110,000
Total	116,000	115,000 ^e	180,000 ^e	220,000 ^e	220,000 ^e
Exports:					
Ores and concentrates, zinc content	806,000	792,000	546,000	644,000	644,000
Refined zinc	23,300	5,170	2,480	13,200	8,070
Imports for consumption:					
Ores and concentrates, zinc content	32	10	3,170	13,400	4,870
Refined zinc	775,000	830,000	700,000	701,000 ^f	762,000
Reported stocks of refined zinc, December 31:					
Producer and consumer	118,000 ^f	152,000 ^f	120,000 ^e	115,000 ^f	134,000
Government stockpile	7,250	7,250	7,250	7,250	NA
Consumption, refined zinc:					
Reported	514,000	562,000	535,000	430,000	519,000
Apparent ³	868,000	939,000	878,000	908,000	974,000
Price: ⁴					
North American cents per pound	141.05	124.13	110.79	145.85	190.19
London Metal Exchange Ltd., cash do.	132.66	115.60	102.71	136.29	158.05
World production: ⁵					
Mine thousand metric tons	12,700	12,800 ^f	12,200 ^f	12,800 ^f	12,500
Smelter do.	13,100 ^f	13,600	13,800	13,300 ^f	12,900

^eEstimated. ^fRevised. do. Ditto. NA Not available.

¹Table includes data available through February 1, 2024. Data are rounded to no more than three significant digits, except "Price"; may not add to totals shown.

²Amount of zinc that can be recovered after smelting and refining.

³Smelter production plus imports for consumption minus domestic imports.

⁴Special High Grade. Source: S&P Global Platts Metals Week.

⁵May include estimated data.

TABLE 2
MINE PRODUCTION OF RECOVERABLE ZINC
IN THE UNITED STATES, BY STATE¹

(Metric tons)

State	2021	2022
Alaska	546,000	598,000
Other ²	143,000	149,000
Total	688,000	747,000

¹Table includes data available through February 1, 2024. Data are rounded to no more than three significant digits; may not add to totals shown.

²Includes production from Idaho, Missouri, New York, and Tennessee.

TABLE 3
LEADING ZINC-PRODUCING MINES IN THE UNITED STATES IN 2022¹

Mine	County and State ²	Operator	Source of zinc
Brushy Creek	Reynolds, MO	Doe Run Resources Corp.	Lead ore.
East Tennessee Zinc Complex ³	Jefferson and Knox, TN	Nyrstar Tennessee Mines - Strawberry Plains LLC	Zinc ore.
Empire State	St. Lawrence, NY	Titan Mining Corp.	Do.
Fletcher	Reynolds, MO	Doe Run Resources Corp.	Lead ore.
Greens Creek	Southeastern Region, AK	Hecla Mining Co.	Silver-zinc ore.
Lucky Friday	Shoshone, ID	do.	Silver ore.
Middle Tennessee	Smith, TN	Nyrstar Tennessee Mines - Gordonsville LLC	Zinc ore.
Red Dog	Northern Region, AK	Teck Alaska Inc.	Zinc-lead ore.
Sweetwater	Reynolds, MO	Doe Run Resources Corp.	Lead ore.
Viburnum (#29 and #35)	Washington and Iron, MO	do.	Do.

¹The mines on this list accounted for 100% of recoverable U.S. zinc mine production in 2022.

²For Alaska, mines are located by geographic region, as delineated by the Alaska Division of Geological & Geophysical Surveys in its Special Report 77, Alaska's mineral industry 2021.

³Includes the Coy, Immel, and Young Mines.

TABLE 4
WAEZ ZINC OXIDE PRODUCERS IN THE UNITED STATES IN 2022¹

Company	Location
Befesa Zinc US Inc.	Barnwell, SC.
Do.	Calumet, IL.
Do.	Palmerton, PA.
Do.	Rockwood, TN.
Steel Dust Recycling LLC	Millport, AL.
Waelz Sustainable Products LLC	Logansport, IN.

Do. Ditto.

¹Table includes data available through February 1, 2024.

TABLE 5
ZINC SMELTERS AND ZINC OXIDE PRODUCERS IN THE
UNITED STATES IN 2022¹

Type and company	Location
Zinc smelters:	
Primary, Nyrstar Clarksville Inc. ²	Clarksville, TN.
Secondary:	
Befesa Zinc Metal LLC	Mooresboro, NC.
EverZinc USA Inc.	Houston, TX.
Zinc oxide plants:	
EverZinc USA Inc.	Clarksville and Millington, TN.
Zochem LLC	Dickson, TN.

¹Table includes data available through February 1, 2024.

²Capable of processing some secondary raw materials.

TABLE 6
ZINC RECOVERED FROM SCRAP PROCESSED IN THE
UNITED STATES, BY TYPE OF SCRAP¹

(Metric tons)

Type of scrap	2021	2022
New scrap:		
Zinc-base	W	W
Copper-base	84,900 ^r	83,300
Magnesium-base	452	450 ^e
Total	W	W
Old scrap:		
Zinc-base	W	W
Copper-base	7,000 ^e	7,000 ^e
Aluminum-base	538	540 ^e
Magnesium-base	46	46 ^e
Total	W	W
Grand total	W	W

^eEstimated. ^rRevised. W Withheld to avoid disclosing company proprietary data.

¹Table includes data available through February 1, 2024. Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 7
U.S. REPORTED CONSUMPTION OF ZINC IN 2022, BY INDUSTRY USE AND GRADE¹

(Metric tons)

Industry use	Special High Grade	High Grade	Continuous Galvanizing Grade	Prime Western	Remelt and other grades	Total
Galvanizing	104,000	89,600	241,000	12,100	160	447,000
Zinc-base alloys	28,400	6,630	--	--	--	35,000
Brass and bronze	30,100	54	--	337	28	30,500
Other	5,880	--	--	--	--	5,880
Total	169,000	96,300	241,000	12,400	188	519,000

-- Zero.

¹Table includes data available through February 1, 2024. Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 8
U.S. EXPORTS OF ZINC, BY MATERIAL¹

(Gross weight unless otherwise specified)

Material	Schedule B number	2021		2022	
		Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Ores and concentrates (zinc content)	2608.00.0030	644,000	\$1,460,000	644,000	\$1,530,000
Slag, ash, and residues: ²					
Hard zinc spelter	2620.11.0000	13,300	26,200	12,300	29,300
Other (zinc content)	2620.19.0000	26,300	45,000	26,900	52,900
Total		39,600	71,200	39,200	82,200
Zinc compounds:					
Zinc oxide	2817.00.0000	69,100	110,000	71,400	137,000
Zinc chloride	2827.39.6500	318	563	1,250	1,550
Zinc sulfide	2830.90.1000, 2830.90.1500	2,130	17,800	2,400	14,500
Zinc sulfate	2833.29.4500	578	502	808	769
Chromates of zinc or of lead	2841.90.4500	8	544	4	344
Lithopone	3206.42.0000	447	2,400	510	1,900
Unwrought zinc:					
Zinc, not alloyed:					
Containing 99.99% or more zinc	7901.11.0000	12,800	33,500	7,800	27,400
Containing less than 99.99% zinc	7901.12.0000	366	989	269	826
Total		13,200	34,500	8,070	28,300
Zinc alloys	7901.20.0000	28,300	91,000	44,300	124,000
Zinc waste and scrap	7902.00.0000	64,600 ^r	68,300 ^r	190,000	183,000
Zinc dust, powders, flakes:					
Dust	7903.10.0000	5,990	24,900	7,190	37,700
Powders and flakes	7903.90.0000	5,040	16,100	3,440	14,000
Total		11,000	41,000	10,600	51,700
Wrought zinc and other articles of zinc:					
Bars, rods, profiles, wire	7904.00.0000	8,130	26,600 ^r	3,220	21,200
Plates, sheets, strip, foil	7905.00.0000	7,740	30,300	5,830	24,800
Other articles of zinc:					
Articles for household use	7907.00.1000	1,130	5,890	3,470	15,500
Tubes, pipes, tube or pipe fittings	7907.00.2000	671	4,790	720	5,870
Other	7907.00.6000	5,390	51,900	5,130	54,500

^rRevised.

¹Table includes data through November 28, 2023. Data are rounded to no more than three significant digits; may not add to totals

²Other than from the manufacture of iron or steel; containing mainly zinc.

Source: U.S. Census Bureau.

TABLE 9
U.S. EXPORTS OF ZINC-BEARING ORES, SLAG, AND ASH, BY COUNTRY OR LOCALITY¹

(Gross weight unless otherwise specified)

Material and country or locality	Schedule B number	2021		2022	
		Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Ores and concentrates (zinc content):	2608.00.0030				
Australia		63,600	\$153,000	19,300	\$40,000
Belgium		43,300	97,600	45,200	96,400
Canada		261,000	592,000	241,000	649,000
China		17,400	41,000	49,400	103,000
Finland		21,400	48,500	23,300	46,600
Germany		29,200	65,700	--	--
Italy		25,500	45,500	--	--
Japan		46,400	115,000	63,400	143,000
Korea, Republic of		79,900	196,000	120,000	278,000
Netherlands		--	--	3,080	9,190
Peru		5,060	6,280	--	--
Spain		51,400	104,000	79,500	168,000
Other [2 countries and (or) localities]		40	172	43	212
Total		644,000	1,460,000	644,000	1,530,000
Slag, ash, and residues: ²	2620.11.0000, 2620.19.0000				
Belgium		5,870	8,390	5,680	12,500
Canada		7,300	9,100	6,340	7,990
India		10,600	22,200	11,200	26,300
Italy		2,100	4,270	3,420	8,480
Japan		4,170	8,550	2,370	4,490
Malaysia		3,560	8,400	1,570	4,350
Netherlands		--	--	1,680	2,540
Taiwan		2,790	5,460	2,770	6,380
Turkey		555	632	654	916
United Kingdom		730	973	2,070	3,290
Other [26 countries and (or) localities]		1,900 ^r	3,320 ^r	1,490	4,910
Total		39,600	71,200	39,200	82,200

^rRevised. -- Zero.

¹Table includes data available through November 28, 2023. Data are rounded to no more than three significant digits; may not add to totals shown.

²Other than from the manufacture of iron or steel; containing mainly zinc.

Source: U.S. Census Bureau.

TABLE 10
U.S. EXPORTS OF ZINC COMPOUNDS, BY COUNTRY OR LOCALITY¹

(Gross weight unless otherwise specified)

Compound and country or locality	Schedule B number	2021		2022	
		Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Zinc oxide:	2817.00.0000				
Belgium		32	\$598	387	\$1,320
Brazil		249	903	285	783
Canada		4,640	8,720 ^r	3,710	7,590
China		216	1,330	129	896
Finland		--	--	797	3,400
France		286	664	57	469
Germany		295	767	85	233
India		531	2,570	828	3,740
Mexico		61,100	88,200	63,500	113,000
United Kingdom		214	708	145	284
Other [50 countries and (or) localities]		1,560 ^r	5,470 ^r	1,410	5,130
Total		69,100	110,000	71,400	137,000
Zinc chloride:	2827.39.6500				
Germany		97	110	5	5
Italy		12	18	500	537
Peru		--	--	233	234
Thailand		72	86	68	68
Other [19 countries and (or) localities]		137 ^r	349 ^r	444	705
Total		318	563	1,250	1,550
Zinc sulfide:	2830.90.1000, 2830.90.1500				
Canada		694	3,620	755	3,880
Mexico		1,130	1,340	1,400	2,130
Other [19 countries and (or) localities]		306	12,900	246	8,450
Total		2,130	17,800	2,400	14,500
Zinc sulfate:	2833.29.4500				
Mexico		233	173	252	183
South Africa		83	50	165	99
Other [20 countries and (or) localities]		262 ^r	279 ^r	391	487
Total		578	502	808	769
Chromates of zinc or of lead:	2841.90.4500				
Mexico		2	46	1	26
South Africa		4	474	2	318
Other [2 countries and (or) localities]		2	24	--	--
Total		8	544	4	344
Lithopone:	3206.42.0000				
Mexico		390	2,110	452	1,660
Other [13 countries and (or) localities]		57	292	58	238
Total		447	2,400	510	1,900

^rRevised. -- Zero.

¹Table includes data available through November 28, 2023. Data are rounded to no more than three significant digits; may not add to totals shown.

Source: U.S. Census Bureau.

TABLE 11
U.S. EXPORTS OF ZINC METAL PRODUCTS, BY COUNTRY OR LOCALITY¹

(Gross weight)

Product and country or locality	Schedule B number	2021		2022	
		Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Unwrought, unalloyed zinc:	7901.11.0000, 7901.12.0000				
Belgium		1,980	\$4,540	758	\$1,760
Canada		1,220	4,080	1,460	6,450
Italy		5,480	12,500	2,470	8,350
Mexico		3,400 ^r	10,700	2,840	10,200
Spain		1,000	2,290	250	572
Other [17 countries and (or) localities]		91	411	293	871
Total		13,200	34,500	8,070	28,300
Unwrought zinc alloys:	7901.20.0000				
Canada		14,700	46,300	28,000	65,800
Mexico		13,100	42,300	15,100	54,200
Other [32 countries and (or) localities]		507	2,470	1,170	4,090
Total		28,300	91,000	44,300	124,000
Waste and scrap:	7902.00.0000				
Canada		1,100	1,070	1,930	1,740
India		21,000 ^r	24,300 ^r	38,100	38,000
Italy		1,210	1,430	2,680	2,580
Japan		4,460	6,080 ^r	7,830	8,220
Luxembourg		1,500	2,550	3,050	4,120
Malaysia		12,000	10,400 ^r	99,100	94,300
Spain		339	649	3,010	3,470
Taiwan		15,600	13,200	25,200	20,500
United Kingdom		1,570	1,520	2,550	2,520
Vietnam		2,620	3,400	158	292
Other [23 countries and (or) localities]		3,150 ^r	3,650 ^r	6,260	6,800
Total		64,600 ^r	68,300 ^r	190,000	183,000
Dust, powders, flakes:	7903.10.0000, 7903.90.0000				
Australia		561	2,270	276	1,360
Brazil		460	1,730	1,100	5,950
Canada		445	2,000	1,010	4,960
Chile		402	1,630 ^r	418	2,200
China		4,180	13,300	2,510	11,300
India		217	790	216	572
Korea, Republic of		169	351	61	143
Mexico		3,570	13,700	4,110	20,400
Peru		133	484	114	614
Thailand		284	1,120	39	213
Other [33 countries and (or) localities]		616 ^r	3,690 ^r	783	4,050
Total		11,000	41,000	10,600	51,700
Bars, rods, profiles, wire:	7904.00.0000				
Canada		636 ^r	2,570	1,930	8,220
Malaysia		--	--	745	9,540
Mexico		6,980	22,000	400	2,350
Other [42 countries and (or) localities]		517 ^r	2,050 ^r	140	1,100
Total		8,130	26,600 ^r	3,220	21,200
Plates, sheets, strip, foil:	7905.00.0000				
China		739	2,880	451	2,050
Italy		717	3,710	294	1,750
Mexico		4,600	15,900	3,400	12,700
Other [36 countries and (or) localities]		1,690	7,890	1,690	8,360
Total		7,740	30,300	5,830	24,800

^rRevised. -- Zero.

¹Table includes data available through November 28, 2023. Data are rounded to no more than three significant digits; may not add to totals shown.

Source: U.S. Census Bureau.

TABLE 12
U.S. IMPORTS FOR CONSUMPTION OF ZINC, BY MATERIAL¹

(Gross weight unless otherwise specified)

Material	HTS ² code	2021		2022	
		Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Ores and concentrates (zinc content)	2603.00.0030, 2607.00.0030, 2608.00.0030, 2616.10.0030, 2616.90.0030	13,400	\$19,400	4,870	\$9,880
Slag, ash, and residues: ³					
Hard zinc spelter	2620.11.0000	--	--	--	--
Zinc dross and skimmings (zinc content)	2620.19.3000	3,710	8,130	3,700	8,550
Other (zinc content)	2620.19.6030	6,370 ^r	8,800 ^r	5,610	12,000
Total		10,100	16,900	9,310	20,600
Compounds:					
Zinc oxide	2817.00.0000, 3206.49.3000	109,000	306,000	104,000	371,000
Zinc chloride	2827.39.6500	189 ^r	1,350 ^r	419	2,830
Zinc sulfide	2830.90.1000, 2830.90.1500	1,190	7,110	1,930	9,710
Zinc sulfate	2833.29.4500	111,000	119,000	95,200	124,000
Chromates of zinc or of lead	2841.90.4500	50	1,060	83	1,630
Lithopone	3206.42.0000	1,820	5,380	1,110	4,520
Unwrought zinc:					
Zinc, not alloyed:					
Containing 99.99% or more zinc	7901.11.0000	412,000	1,170,000	517,000	1,800,000
Containing less than 99.99% zinc:					
Casting-grade zinc	7901.12.1000	84,900 ^r	254,000	71,800	271,000
Other	7901.12.5000	205,000	614,000 ^r	173,000	636,000
Total		701,000 ^r	2,040,000	762,000	2,710,000
Zinc alloys	7901.20.0000	6,330	19,200	3,780	15,200
Zinc waste and scrap	7902.00.0000	12,600	21,500	10,900	23,300
Zinc dust, powders, flakes:					
Dust	7903.10.0000	10,500	37,100	10,600	45,400
Powders	7903.90.3000	13,000	55,900	9,220	47,000
Flakes	7903.90.6000	28	245	26	263
Total		23,500	93,300	19,800	92,600
Wrought zinc and other articles of zinc:					
Bars, rods, profiles, wire	7904.00.0000	3,780	14,200	3,500	16,200
Plates, sheets, strip, foil	7905.00.0000	1,940	9,910	1,680	9,840
Other articles of zinc:					
Articles for household use	7907.00.1000	11,200	107,000 ^r	10,100	107,000
Tubes, pipes, tube or pipe fittings	7907.00.2000	6,530	33,200	6,720	39,700
Other	7907.00.6000	15,200 ^r	131,000	15,500	145,000

^rRevised. -- Zero.

¹Table includes data through November 28, 2023. Data are rounded to no more than three significant digits; may not add to totals shown.

²Harmonized Tariff Schedule of the United States.

³Other than from the manufacture of iron or steel; containing mainly zinc.

Source: U.S. Census Bureau.

TABLE 13
U.S. IMPORTS FOR CONSUMPTION OF ZINC-BEARING ORES, SLAG, AND ASH, BY COUNTRY OR LOCALITY¹

(Gross weight unless otherwise specified)

Country or locality	HTS ² code	2021		2022	
		Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Ores and concentrates (zinc content):	2603.00.0030, 2607.00.0030, 2608.00.0030, 2616.10.0030, 2616.90.0030				
Canada		2,470	\$2,670	1,610	\$1,490
China		151	12	358	59
Germany		47	27	--	--
India		--	--	230	63
Mexico		396	113	1	7
Peru		9,700	16,600	2,670	8,260
Taiwan		665	49	(3)	6
Total		13,400	19,400	4,870	9,880
Slag, ash, and residues: ⁴	2620.11.0000, 2620.19.3000 2620.19.6030				
Australia		--	--	33	103
Belgium		265	154	--	--
Canada		3,290 ^r	6,910 ^r	3,020	6,480
Congo (Kinshasa)		--	--	2,150	5,250
Dominican Republic		96	81	16	7
France		271	718	697	1,780
Germany		--	--	867	2,160
Mexico		615	1,360	550	1,640
Netherlands		668	440	144	83
Pakistan		--	--	95	279
Saudi Arabia		1,160	683	891	518
South Africa		319	251	--	--
Turkey		3,390	6,340	837	2,260
Total		10,100	16,900	9,310	20,600

^rRevised. -- Zero.

¹Table includes data available through November 28, 2023. Data are rounded to no more than three significant digits; may not add to totals shown.

²Harmonized Tariff Schedule of the United States.

³Less than ½ unit.

⁴Other than from the manufacture of iron or steel; containing mainly zinc.

Source: U.S. Census Bureau.

TABLE 14
U.S. IMPORTS FOR CONSUMPTION OF ZINC COMPOUNDS, BY COUNTRY OR LOCALITY¹

(Gross weight unless otherwise specified)

Country or locality	HTS ² code	2021		2022	
		Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Zinc oxide:	2817.00.0000, 3206.49.3000				
Canada		45,900 ^r	\$134,000 ^r	44,200	\$161,000
China		296	963	800	3,570
Germany		1,330	6,410	1,870	10,200
Greece		539	951	375	877
Japan		728	8,670	1,210	13,900
Korea, Republic of		210	1,100	428	1,550
Mexico		44,200	108,000	41,300	128,000
Netherlands		9,110	28,300	6,900	30,200
Peru		5,230	14,300	5,850	19,900
Other [19 countries and (or) localities]		1,270 ^r	3,760 ^r	642	2,630
Total		109,000	306,000	104,000	371,000
Zinc chloride:	2827.39.6500				
China		117	661	327	1,960
Spain		54 ^r	500 ^r	72	614
Other [11 countries and (or) localities]		19 ^r	184 ^r	20	259
Total		189 ^r	1,350 ^r	419	2,830
Zinc sulfide:	2830.90.1000, 2830.90.1500				
Austria		394	3,570	438	5,260
China		233	412	354	1,220
Germany		451	1,630	292	1,190
India		38	539	788	1,570
Other [12 countries and (or) localities]		70 ^r	958 ^r	55	467
Total		1,190	7,110	1,930	9,710
Zinc sulfate:	2833.29.4500				
Canada		14,800	5,130	15,000	5,330
China		31,800	29,100 ^r	28,000	31,500
Germany		1,980	2,020	1,640	2,220
India		3,250	4,050	2,320	2,280
Mexico		57,600	76,200	47,300	80,600
Other [10 countries and (or) localities]		1,440 ^r	2,620 ^r	928	1,720
Total		111,000	119,000	95,200	124,000
Chromates of zinc or of lead:	2841.90.4500				
Italy		50	1,060	73	1,600
Mexico		--	--	10	28
Total		50	1,060	83	1,630
Lithopone:	3206.42.0000				
China		403	537	110	433
Germany		1,250	4,070	846	3,240
Other [8 countries and (or) localities]		168	769	150	846
Total		1,820	5,380	1,110	4,520

^rRevised. -- Zero.

¹Table includes data available through November 28, 2023. Data are rounded to no more than three significant digits; may not add to totals shown.

²Harmonized Tariff Schedule of the United States.

Source: U.S. Census Bureau.

TABLE 15
U.S. IMPORTS FOR CONSUMPTION OF ZINC METAL PRODUCTS, BY COUNTRY OR LOCALITY¹

(Gross weight unless otherwise specified)

Country or locality	HTS ² code	2021		2022	
		Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Unwrought zinc, unalloyed:	7901.11.0000, 7901.12.1000, 7901.12.5000				
Australia		28,100	\$61,000	74,000	\$239,000
Belgium		4,940	14,500	1,800	4,120
Brazil		8,830	19,400	10	21
Canada		468,000	1,410,000	378,000	1,430,000
China		1,050	2,030	502	1,590
Germany		861	2,880	983	3,430
Kazakhstan		--	--	17,700	60,200
Korea, Republic of		30,500	79,000	94,000	337,000
Mexico		105,000	304,000	108,000	367,000
Netherlands		124	374	1,240	3,120
Peru		37,600	106,000	52,900	184,000
Spain		15,900	40,000	31,600	75,900
Other [9 countries and (or) localities]		197 ^r	599 ^r	628	1,780
Total		701,000 ^r	2,040,000	762,000	2,710,000
Unwrought zinc alloys:	7901.20.0000				
Canada		46	110	154	571
China		103	1,130	64	944
Mexico		6,070	17,500	3,420	12,800
Peru		73	243	127	614
Other [14 countries and (or) localities]		42 ^r	167 ^r	5	266
Total		6,330	19,200	3,770	15,200
Waste and scrap:	7902.00.0000				
Canada		7,320	12,500	7,000	14,900
Mexico		4,830	8,730	3,860	8,200
United Kingdom		367	154	--	--
Other [8 countries and (or) localities]		50	91	67	188
Total		12,600	21,500	10,900	23,300
Dust, powders, flakes:	7903.10.0000, 7903.90.3000, 7903.90.6000				
Austria		312	2,890	287	2,920
Belgium		10,100	37,600	8,770	39,100
Canada		3,230	12,500	4,120	18,100
Germany		8,380	33,900	5,100	25,500
Ireland		146	2,050	175	2,180
Malaysia		54	188	254	1,300
Mexico		299	593	677	1,500
Norway		712	1,890	251	714
Switzerland		149	1,110	144	1,080
Other [12 countries and (or) localities]		123 ^r	572 ^r	50	340
Total		23,500	93,300	19,800	92,600
Bars, rods, profiles, wire:	7904.00.0000				
Finland		2,600	9,290	2,440	10,700
Germany		738	2,820	684	3,350
Other [19 countries and (or) localities]		442	2,130	378	2,150
Total		3,780	14,200	3,500	16,200
Plates, sheets, strip, foil:	7905.00.0000				
France		647	3,100	566	2,780
Germany		613	3,780	504	3,020
Other [22 countries and (or) localities]		679 ^r	3,030 ^r	612	4,050
Total		1,940	9,910	1,680	9,840

^rRevised. -- Zero.

¹Table includes data available through November 28, 2023. Data are rounded to no more than three significant digits; may not add to totals shown.

²Harmonized Tariff Schedule of the United States.

Source: U.S. Census Bureau.

TABLE 16
ZINC: WORLD MINE PRODUCTION, BY COUNTRY OR LOCALITY¹

(Thousand metric tons, zinc content of concentrate and direct shipping ore, unless otherwise specified)

Country or locality ²	2018	2019	2020	2021	2022
Argentina	22	19	11	6	4
Armenia	6	6	8	6	5
Australia	1,147	1,337	1,315	1,315 ^r	1,244
Bolivia	520	529	360	500	518
Bosnia and Herzegovina	10	9	12	13	7 ³
Brazil	167	163	173	158	151
Bulgaria	16	19	16	15 ^r	15 ^e
Burkina Faso, concentrate	99	97	80	85	13
Burma	18	21	8	11	11 ^e
Canada	305	336	248	230 ^r	208
Chile	27	6	29	28	24
China	4,172	4,213	4,058	4,136	4,041
Congo (Brazzaville)	4 ^e	5 ^e	5 ^e	9 ^r	12
Congo (Kinshasa)	1	2	15	16	14
Cuba ^c	45	60	60	45	52
Dominican Republic	4	6	2	5 ^r	5 ^e
Eritrea	125	121	122	130	121
Finland	85	70	61	59	62
Greece	20	22	28	23	12
Honduras	28	29	30	34 ⁴	32 ⁴
India	750 ^e	720 ^e	731 ^e	785 ^r	840
Indonesia ^{e,4}	21	25	20	14	11
Iran ^c	145 ^r	150 ^r	150 ^r	150 ^r	150
Ireland	132	122	127	112	103
Kazakhstan	349 ^r	322 ^r	344 ^r	318 ^r	312
Korea, North ^c	20	20	10 ^r	10 ^r	10
Korea, Republic of ⁴	4	4	4	4	4 ^e
Kosovo, concentrate	4	3	4	5	4
Mexico	691	677	688	743 ^r	744
Mongolia ^{e,4}	44	42	38	38	99
Montenegro	11	10	10	9	8
Morocco ^c	57 ⁴	43 ⁴	40	45	48
Namibia	118	117	62	41 ^r	41
Nigeria ^c	27	23	27	33	30
North Macedonia ⁴	30 ^e	31 ^e	32 ^e	30	30 ^e
Pakistan	27 ^{e,4}	37 ^{e,4}	35	35	42
Peru	1,472 ^r	1,383 ^r	1,335	1,533 ^r	1,370
Poland	43	40	43	--	--
Portugal	145	162	177	188 ^r	200 ^e
Russia ⁵	288	275	261	306 ^r	300 ^e
Saudi Arabia	24	30	25 ⁴	27 ⁴	27 ^e
Serbia	4	7	7	6 ^r	14 ^{e,3}
South Africa	28	125	161	194	238
Spain	106	91	90	90	90 ^e
Sweden	234	245	232	234	234
Tajikistan	83	78	48	71	59
Turkey	190 ^{e,3}	150 ^{e,3}	130 ^{e,3}	170 ^{e,3}	176
United States	824	753	723	704	763
Uzbekistan	38	35	37	36 ^r	36 ^e
Vietnam	12	12	12 ^e	12 ^e	13 ^e
Total	12,700	12,800 ^r	12,200 ^r	12,800 ^r	12,500

^eEstimated. ^rRevised. -- Zero.

¹Table includes data available through August 15, 2023. All data are reported unless otherwise noted; totals may include estimated data. Totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.

²In addition to the countries and (or) localities listed, Algeria, Romania, Tunisia, and Zambia may have mined zinc, but available information was inadequate to make reliable estimates of output.

³Estimated based on reported exports of zinc ores and concentrates.

⁴Data derived from reported production of zinc concentrates.

⁵May not include production from some small-scale mining operations.

TABLE 17
ZINC: WORLD SMELTER PRODUCTION, BY COUNTRY OR LOCALITY^{1,2}

(Thousand metric tons, gross weight)

Country or locality	2018	2019	2020	2021	2022
Algeria, primary ³	2	1	1	1 ^e	1 ^e
Australia, primary	490	436	447	433 ^r	378
Belgium, primary	275	270 ^e	270 ^e	270 ^e	255 ^e
Brazil, primary	246	253	257	245	243
Bulgaria, primary	75	74	75	72 ^r	72 ^e
Canada, primary	620	655	682	641	485
China:					
Primary	5,057	5,372	5,462	5,558	5,541
Secondary	550	790	880	850	817
Total	5,607	6,162	6,342	6,408	6,358
Congo (Brazzaville), primary	--	--	--	9 ^r	12
Finland, primary	295	291	297	293	294
France, primary	155	150	166	168	100 ^e
Germany:					
Primary	130	130	116	135 ^r	115 ^e
Secondary	50	50	45	30 ^r	25 ^e
Total	180	180	161	165 ^r	140 ^e
India, primary	728	691	688	759	816
Iran, primary	136 ^{r,e}	140 ^e	131 ^{r,e}	136 ^{r,e}	208
Italy:					
Primary	68	74	76	66 ^r	-- ^e
Secondary	119	114	105	114 ^r	100 ^e
Total	187	188	181	180 ^r	100 ^e
Japan:					
Primary	442	438	417	NA	NA
Secondary	79	89	85	NA	NA
Total	521	527	501	517	517
Kazakhstan, primary and secondary	318	319 ^r	311	301 ^r	266
Korea, North, primary and secondary ^c	10	10	5 ^r	5 ^r	5
Korea, Republic of, primary	989	986	987	949	965
Mexico, primary	336	389	363	357	337
Namibia, primary	67	65	16	--	--
Netherlands, primary	268	250 ^e	250 ^e	260 ^e	180 ^e
Norway, primary	191	195	192	180	181
Peru, primary	334	340	305	328	333
Poland, primary	160	159	160 ^r	165 ^r	156
Russia, primary and secondary	255	207	212	198	182
Spain, primary	505	508	511	501 ^r	500 ^e
United States:					
Primary	101	100 ^e	110 ^e	110 ^e	110 ^e
Secondary ^e	15	15	70	110	110
Total	116	115 ^e	180 ^e	220 ^e	220 ^e
Uzbekistan, primary	70 ^e	68	73	90 ^r	90
Vietnam, primary ^e	10	11	10	10	10
Grand total	13,100 ^r	13,600	13,800	13,300 ^r	12,900
Of which:					
Primary	11,700 ^r	12,000	12,100	11,700 ^r	11,400
Secondary	814 ^r	1,060	1,190	1,100	1,050
Undifferentiated	583	535	528 ^r	504 ^r	453

^eEstimated. ^rRevised. NA Not available. -- Zero.

¹Table includes data available through August 16, 2023. 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.

²Wherever possible, detailed information on raw material source of output (primary—directly from ores, and secondary—from scrap) has been provided. In cases where raw material source is unreported and insufficient data are available to estimate the distribution of the total, that total has been left undifferentiated (primary and secondary). Some primary smelters also process secondary materials, such as Waelz oxide. However, the proportion of feedstock that is secondary is typically not reported. In these cases, all production is accounted for as primary. To the extent possible, this table reflects metal production at the first measurable stage of metal output.

³May include secondary production.