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ZINC [ADVANCE RELEASE]

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ZINC

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In 2018, U.S. mine production of contained zinc in ores and concentrates was 824,000 metric tons (t), 6% more than that in 2017. Recoverable zinc mine production was 799,000 t, a 7% increase from that in 2017, and the value of domestic recoverable zinc mine production was approximately $2.48 billion in 2018 (table 1). Alaska continued to be the dominant zinc-producing State (table 2). Other States that produced zinc included Idaho, Missouri, New York, Tennessee, and Washington (table 3). The United States exported most of its zinc mine production to foreign smelters for processing. Leading destinations for domestic exports of zinc contained in concentrates were Canada (35%), Spain (14%), the Republic of Korea (11%), and Australia (10%) (table 6). Regionally, 36% of exports were sent to North America, 35% to Europe, 17% to Asia, and 10% to Australia and Oceania. U.S. imports for consumption of zinc contained in concentrates were significantly less than exports, as the only domestic primary zinc smelter consumed primarily domestically produced zinc concentrates (table 1).

Estimated total U.S. refined zinc production in 2018 decreased by 12% to 116,000 t. Imports for consumption of refined zinc in 2018 increased by 6% to 775,000 t. Domestic exports of refined zinc decreased by 29%, or by 9,380 t, to 23,300 t. Apparent consumption of refined zinc increased by 5% from that of the prior year to 868,000 t (table 1). Most reported refined zinc consumption was used for galvanizing, specifically galvanized steel; other major end-use products included brass and bronze, chemicals, and zinc-base alloys (table 5).

Global zinc mine production increased slightly to 12.5 million metric tons (Mt) of zinc content, and zinc smelter production was essentially unchanged at 13.3 Mt (tables 9–10). According to data from the International Lead and Zinc Study Group (ILZSG), global zinc metal consumption decreased slightly to 13.7 Mt in 2018 (International Lead and Zinc Study Group, 2020).

Legislation and Government Programs

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 on the Annual Materials Plan (AMP) for fiscal year 2018 (October 1, 2017, through September 30, 2018). The AMP ceiling disposal quantity for zinc in fiscal year 2018 was 7,250 t, which represented the maximum quantity of zinc that could be sold from the NDS during the fiscal year and the same quantity of zinc remaining in the stockpile (Defense Logistics Agency Strategic Materials, 2017).

U.S. imports for consumption of zinc-coated (hot-dipped and electrogalvanized) steel from Vietnam increased notably beginning in December 2015 after the U.S. Department of Commerce (DOC) announced in November 2015 that it had determined preliminarily that countervailable subsidies were provided to producers and exporters of corrosion-resistant steel in China. In November 2016, the DOC initiated an anticircumvention inquiry on imports of cold-rolled and corrosion-resistant steel from Vietnam in response to requests from United States-based steel producers AK Steel Corp., ArcelorMittal USA LLC, California Steel Industries, Nucor Corp., Steel Dynamics Inc., and United States Steel Corp. The United States producers asserted that steel mills in Vietnam toll-processed hot-rolled steel from China into cold-rolled and corrosion-resistant steel for export to the United States in order to avoid the antidumping and countervailing duties imposed on imports of these steel products from China. The United States companies claimed that Vietnam did not have the capacity to produce hot-rolled steel, and the cost of manufacturing value-added steel (cold-rolled and corrosion-resistant) products in Vietnam was small (Cowden, 2016; Schier, 2016; U.S. Department of Commerce, International Trade Administration, 2016). In May 2018, the DOC announced its final affirmative ruling that certain cold-rolled and corrosion-resistant steel from Vietnam produced from substrate originating from China were circumventing antidumping and countervailing duty orders on those products from China. As a result, U.S. Customs and Border Protection collected antidumping and countervailing duties on imports of corrosion-resistant steel from Vietnam at rates of 199.43% and 39.05%, respectively. The antidumping and countervailing rates for cold-rolled steel were 199.76% and 256.44%, respectively. The import value of corrosion-resistant steel from Vietnam increased to $80 million in 2018 from $2 million after preliminary duties were imposed on those imports from China in 2015, and the import value of cold-rolled steel from Vietnam increased to $215 million from $9 million during the same time period (Cowden, 2017; U.S. Department of Commerce, 2018b).

In April 2017, the President of the United States signed a memorandum instructing the Secretary of Commerce to investigate the impact of steel imports on national security. The investigation was conducted under the authority of section 232 of the Trade Expansion Act of 1962. In January 2018, the Secretary of Commerce concluded this investigation and advised the President that steel mill articles were imported into the United States in quantities that threatened to impair national security. The quantity of U.S. steel imports and the global excess steel production capacity could result in further closure of domestic steel production facilities, which could decrease the United States' ability to meet production requirements in a national emergency. In March 2018, the President of the United States exercised his authority under section 232 of the Trade Expansion Act of 1962 to impose an additional 25% tariff on certain steel article imports. Throughout the year, modifications and changes were made to the list of countries subject to the tariffs. By yearend, the additional import duty was 25% for most countries and 50% for Turkey. Argentina, Brazil, and the Republic of Korea were excluded from the additional import duty, but were subject to import quotas. Australia was exempted from both the duty and import quotas (White House, The, 2017, 2018; U.S. Department of Commerce, 2018a, p. 2–6).

Production

Domestic zinc production data were compiled from a U.S. Geological Survey (USGS) monthly canvass of mines and an annual canvas of smelters operating in the United States. Data on domestic zinc mine production were collected by means of the "Lode-Mine Production of Gold, Silver, Copper, Lead, and Zinc" survey, and data on domestic zinc smelter production were collected by means of the "Zinc" survey.

Mine.—In 2018, zinc was produced in six States: Alaska, Idaho, Missouri, New York, Tennessee, and Washington (table 3). Domestic mine production of zinc in ores and concentrates was 824,000 t, 6% more than that in 2017. Recoverable zinc mine production in 2018 was 799,000 t, 7% more than that in 2017 (table 1).

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 (table 3). 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. Inc. (Kotzebue, AK), an Alaska Native-owned corporation. Teck reported that zinc-in-concentrate production at Red Dog increased to 583,000 t in 2018 from 542,000 t in 2017 owing primarily to a higher average zinc ore grade and mill recovery rate compared with those in 2017. Approximately 34% of the zinc concentrates produced at Red Dog were refined at Teck's metallurgical complex in Trail, British Columbia, Canada. The remaining concentrates were exported to Asia and Europe. Most of Red Dog's concentrates were sold through long-term contracts. During 2018, Teck continued to upgrade the mill at Red Dog to increase the ore throughput rate by 15% to offset the lower ore grades and harder ore of the Aqqaluk deposit. The company expected to complete the project by yearend 2019. Reported reserves at yearend 2018 contained 5.9 Mt of recoverable zinc metal, and the mine life was expected to extend to 2031. Teck projected that zinc production at Red Dog would decrease during the next few years, ranging from 535,000 to 555,000 t in 2019 and from 500,000 to 520,000 metric tons per year (t/yr) from 2020 through 2022 (Teck Resources Ltd., 2019, p. 45–47, 55).

Hecla Mining Co.'s (Coeur d'Alene, ID) underground Greens Creek Mine recovered metals from a polymetallic (gold-lead-silver-zinc) massive sulfide deposit on Admiralty Island in the Tongass National Forest near Juneau. The mine produced bulk zinc-lead, lead, and 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 increased by 5% from that in 2017 to 50,200 t. Reported yearend proven and probable ore reserves at Greens Creek contained 640,000 t of zinc. Hecla planned to conduct exploration and definition drilling at Greens Creek in 2019 to add potential reserves. Based on 2018 yearend reserves, the mine life was expected to extend to 2029 (Hecla Mining Co., 2019, p. 29–33).

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. Reported zinc production decreased in 2018 to 611 t from 2,320 t in 2017. The decrease in production was a result of an ongoing strike by unionized employees. The strike began in March 2017 and was ongoing at yearend 2018. All concentrates were sent to Teck's metallurgical facility in Trail, British Columbia, Canada, for processing. Reported proven and probable ore reserves at yearend contained 200,000 t of zinc, and the mine life was expected to extend for 17 years (Hecla Mining Co., 2019, p. 34–37).

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 southeast Missouri. In 2018, Doe Run processed ore from the Brushy Creek, Fletcher, Sweetwater, and Viburnum (#29 and #35) Mines at four mills to produce primarily lead concentrates and, to a lesser extent, zinc and copper concentrates.

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, 2 kilometers southwest of Fowler in St. Lawrence County. Empire is one of several sedimentary exhalative deposits in the Balmat-Edwards zinc mining district. In December 2016, Titan acquired the mine, which had been on care-and-maintenance status since 2008. The company began ramping up operations in January 2018 and milling commenced in March. Zinc-in-concentrate production at the Empire State Mine was 12,800 t in 2018. All zinc concentrates were sold to Glencore Ltd. (Switzerland) through a long-term offtake agreement (Titan Mining Corp., 2019a, p. 6, 12, 14, 25, 28; 2019b, p. 6).

Tennessee.—Nyrstar NV (Belgium) owned the East Tennessee and Middle Tennessee zinc mine complexes that recovered ore from Mississippi Valley-type zinc deposits. The two mine complexes produced zinc concentrates, and the Middle Tennessee concentrates contained recoverable quantities of gallium and germanium. In 2018, zinc-in-concentrate production at the East Tennessee mine complex (the Coy Mine, Immel Mine, and Young Mine and mill) increased by 15% from that in 2017 to 76,000 t. The Middle Tennessee mine complex (the Cumberland Mine, Elmwood Mine, and Gordonsville Mine and mill) produced 39,000 t of zinc in concentrate, compared with 22,000 t produced in 2017. Concentrates were sent to Nyrstar's Clarksville, TN, zinc refinery for processing. At yearend, reported proven and probable ore reserves contained 250,000 t of zinc at East Tennessee and 80,000 t at Middle Tennessee (Nyrstar NV, 2019b, p. 15; 2019c).

Washington.—Teck American Inc. (a subsidiary of Teck Resources Ltd.) operated the underground Pend Oreille zinc mine near Metaline Falls in northeastern Washington State. Pend Oreille is a carbonate-hosted zinc-lead ore body. Zinc concentrates from the mine were shipped to Teck's nearby metallurgical facility in Trail, British Columbia, Canada, for processing. Zinc-in-concentrate production at Pend Oreille was 29,700 t in 2018 compared with 33,100 t in 2017. Teck projected that zinc production would be between 20,000 and 30,000 t in the first 9 months of 2019; however, the company reported that production rates beyond the third quarter of 2019 were uncertain. Reported reserves at yearend 2018 contained 20,000 t of recoverable zinc (Teck Resources Ltd., 2019, p. 48, 55).

Smelter.—In 2018, refined zinc was produced mainly in Tennessee (Nyrstar's Clarksville zinc refinery). A smaller quantity of zinc metal was produced by U.S. Zinc Corp.'s (owned by Votorantim Metais SA, Brazil) zinc recycling operation in Houston, TX. Refined zinc production in 2018 decreased by 12% from that in 2017 to 116,000 t (table 1).

Nyrstar's Clarksville electrolytic zinc refinery was the only primary zinc smelter in the United States. Clarksville was specifically designed to treat zinc concentrates produced at the East Tennessee and Middle Tennessee mines, but could also treat imported zinc concentrates and domestically sourced secondary crude zinc oxide. Refined zinc production at Clarksville in 2018 decreased by 14% from that in 2017 to 101,000 t. Clarksville produced Special High Grade (SHG) and Continuous Galvanizing Grade (CGG) zinc. Byproducts included cadmium metal, copper cementate, copper sulfate, germanium leach product, sulfuric acid, synthetic gypsum, and zinc sulfate (Nyrstar NV, 2019a; 2019b, p. 13).

Horsehead Holding Corp.'s (Pittsburgh, PA) solvent extraction–electrowinning (SX–EW) zinc refinery in Mooresboro, NC, began operating in May 2014 and was idled in January 2016. The plant produced SHG and CGG zinc in addition to Prime Western-grade (PW) zinc from secondary materials sourced mostly from the company's four electric arc furnace dust recycling operations in Barnwell, SC, Calumet, IL, Palmerton, PA, and Rockwood, TN. In February 2016, Horsehead Holding Corp. filed for Chapter 11 bankruptcy protection and exited bankruptcy protection as a private company in September 2016 (Business Wire, 2016). In May 2017, Horsehead Holding Corp. changed its name to American Zinc Recycling Corp. (AZR) (Maltais, 2017). In June 2017, the company announced that its Mooresboro, NC, secondary zinc refinery was not expected to restart operations before 2018 (Dent, 2017). In December 2017, the company announced that a subsidiary of Glencore purchased a 10% stake in AZR. Under the terms of the investment, Glencore would provide engineering services to AZR to advance the restart of the Mooresboro refinery. Engineering studies were ongoing in 2018. Glencore operated the Portovesme zinc smelter in Italy, which used a similar process technology to the one used at Mooresboro (Díaz and others, 2014, p. 36). The two companies entered into a 10-year offtake agreement, in which Glencore would purchase full metal output from the refinery when fully operational (American Zinc Recycling Corp., 2017).

U.S. Zinc Corp. produced PW 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 also produced zinc oxide at two recycling facilities in Tennessee (U.S. Zinc Corp., 2017).

Consumption

Changes in zinc consumption generally follow trends in industrial production or, more generally, economic growth. Domestic apparent consumption of refined zinc in 2018 was 868,000 t, a 5% increase from that in 2017 (table 1).

Reported zinc consumption statistics (table 5) were collected by the U.S. Geological Survey from an annual survey of U.S. operations. Data on domestic consumption of zinc metal by grade and end use were collected by means of the "Consumption of Zinc" survey. According to reported data, most of the zinc consumed domestically in 2018 was used in the production of galvanized (zinc-coated) steel (table 5). Galvanized steel is used extensively in the automotive and construction industries. Most of the zinc consumed domestically for galvanizing was at continuous galvanizing plants. An estimated 48 continuous galvanizing plants were operated by 20 companies in the United States; leading producers of galvanized sheet included AK Steel Corp. (West Chester, OH), ArcelorMittal USA LLC (East Chicago, IN), Nucor Corp. (Charlotte, NC), Steel Dynamics (Fort Wayne, IN), and U.S. Steel (Pittsburgh, PA). According to the American Iron and Steel Institute (2019), domestic net shipments of galvanized sheet and strip were 15.0 Mt in 2018, a slight increase from shipments in 2017, but a slight decrease from those in 2014. During the past 5 years, net shipments of hot-dipped galvanized sheet and strip have generally increased, while shipments of electrogalvanized sheet and strip have decreased. However, most steel sheet and strip were galvanized by the hot-dip process rather than by electroplating.

The balance of zinc consumed for galvanizing was at general galvanizing plants that treated fabricated steel shapes (for example, structural beams or fasteners). About 170 general galvanizing plants were operated by 80 companies in the United States in 2018, of which the leading companies included AZZ Inc. (Fort Worth, TX), Valmont Industries Inc. (Omaha, NE), and Voigt & Schweitzer LLC (Columbus, OH).

Other major end uses of zinc included brass and bronze, chemicals, semimanufactures, and zinc-base alloys. According to the Copper Development Association Inc. (2019), approximately 121,000 t of zinc was consumed by brass mills in 2018, essentially unchanged from that in 2017. Generally, the quantity of zinc consumed by brass mills has trended downward during the past 10 years. Leading zinc chemicals, by production quantity, included zinc oxide, which is used extensively in the tire manufacturing industry as an activator in the vulcanization process, and zinc sulfate, which is used as a micronutrient additive in animal feed and fertilizers. Leading zinc oxide producers included U.S. Zinc and Zinc Oxide LLC (Dickson, TN). U.S. Zinc consumed zinc dross and skimmings to produce as much as 78,000 t/yr of zinc oxide at its two plants in Clarksville, TN, and Millington, TN (U.S. Zinc Corp., 2017). Zinc Oxide LLC consumed zinc metal and secondary zinc materials at its 40,000-t/yr zinc oxide plant in Dickson, TN (Zinc Oxide LLC, undated).

Zinc semimanufactures included mainly zinc sheet, also known as rolled zinc, which is used in architectural applications and for the production of the U.S. 1-cent coin. Zinc-base alloys were produced primarily by 15 companies and predominantly used to make die-cast parts for applications such 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 117,000 t in 2018. Global London Metal Exchange Ltd. (LME) warehouses held 129,000 t of zinc at yearend 2018, a 29% decrease from the yearend 2017 stock level; the Shanghai Futures Exchange (SHFE) held 20,000 t of zinc, a 71% decrease compared with 69,000 t held at yearend 2017. In the United States, LME stocks of zinc were held in warehouses in Chicago, IL, and New Orleans, LA. At yearend 2018, LME warehouses in New Orleans, LA, held 93,625 t of zinc, or 73% of global LME stocks, a 48% decrease from 179,225 t held at yearend 2017. Warehouses in Chicago, IL, held 350 t of zinc at yearend (London Metal Exchange Ltd., 2017, 2018; International Lead and Zinc Study Group, 2020).

Aside from the United States, China was the only other country known to hold a Government stockpile of zinc. China's State Reserve Bureau manages its stockpile, which reportedly contained 254,000 t of zinc at yearend 2018, unchanged from the stock level at yearend 2017 (International Lead and Zinc Study Group, 2020).

Prices

The annual average LME cash price for SHG zinc in 2018 increased slightly from that in 2017 to $2,924.55 per metric ton (132.66 cents per pound) (table 1). The price reached an average monthly high of $3,539.35 per metric ton (160.54 cents per pound) in February and generally decreased for the remainder of the year to $2,624.87 per metric ton (119.06 cents per pound) in December. According to S&P Global Platts Metals Week, the annual average North American price for SHG zinc in 2018, which was based on the LME cash price plus a regional North American premium, was 141.05 cents per pound, slightly more than that in 2017 (table 1). The monthly average North American SHG premium ranged from a low of 8.0 cents per pound in January to a high of 8.6 cents per pound in December. Increasing premiums are generally indicative of a decreasing supply of zinc in a regional market.

World Review

Mine Production.—Global zinc mine production in 2018 increased slightly from that of the prior year to 12.5 Mt. China (33% share of global production), Peru (12%), Australia (9%), the United States (7%), and India (6%) were the leading producers of zinc in concentrate in 2018. Zinc mine production increased significantly in Australia (263,000 t increase), the United States (50,300 t increase), and Cuba and Turkey (an estimated 40,000 t increase, each). Partially offsetting these increases were estimated production decreases in China (128,000 t decrease), India (70,000 t decrease), and Bolivia (23,700 t decrease) (table 9).

According to ILZSG (2019b, p. 40), approximately 960,000 t of zinc mine capacity was added in 2018. Notably, New Century Resources Ltd. (Australia) began processing tailings at the Century Mine in Australia in August. The Century Mine was previously closed in 2015 owing to reserves depletion, and at that time, was one of the leading zinc-producing mines in the world. Estimated production capacity from processed tailings were 264,000 t/yr of zinc in concentrate during a 6.3-year mine life. The first concentrate shipment was sent to China (Konst, 2018; Luk, 2018a; McCrae, 2018). Vedanta Zinc International (South Africa) began zinc concentrate production at the new Gamsberg Mine in South Africa in the fourth quarter. Initial production capacity at the mine was 250,000 t/yr of zinc in concentrate, and the mine life was estimated to be 30 years. The first concentrates were sent to the Republic of Korea for processing (Luk, 2018b; Vedanta Zinc International, 2020). Also contributing to the increase in global capacity was Glencore's reopening of the Lady Loretta Mine in Australia, which was expected to produce 100,000 t of zinc in concentrate in 2018. Glencore previously suspended operations at Lady Loretta in 2015 during a period of low zinc prices (Jamasmie, 2018).

Metal Production.—Global zinc metal production was essentially unchanged in 2018 from that of the prior year at 13.3 Mt. China (43% share of global production), the Republic of Korea (7%), Canada (5%), and India (5%) were the leading producers of refined zinc metal in 2018. In terms of quantity, production decreased most notably in China (170,000-t decrease) and India (79,000-t decrease), which was partially offset by a large production increase in Canada (98,200-t increase) (table 10). Global zinc smelter production capacity increased in 2018 owing to several openings and expansions. In China, Baiyin Nonferrous Group Co. Ltd. completed construction of an additional 100,000-t/yr electrolytic zinc refinery in Gansu Province in June and planned to expand capacity to 200,000 t/yr by 2019. In May, Yunnan Hualian Zinc & Indium Co. Ltd. also commenced production at a new 100,000-t/yr electrolytic zinc smelter in Yunnan Province that had the capacity to produce 60 t/yr of indium. In Poland, Zakłady Górniczo-Hutnicze "Bolesław" SA expanded zinc production capacity by 20,000 t/yr to 100,000 t/yr. In Russia, Chelyabinsk Zinc Plant OJSC increased capacity by 20,000 t/yr with the installation of a new Waelz kiln and leaching unit to treat zinc-bearing residues. These increases were partially offset by the suspension of operations and subsequent closure of Ural Mining and Metallurgical Co.'s 110,000-t/yr Electrozinc refinery in Russia after a fire at the plant in late October (Belda and Hinton, 2019; International Lead and Zinc Study Group, 2019b, p. 45–46).

Metal Consumption.—According to ILZSG (2020), global zinc metal consumption decreased slightly to 13.7 Mt from that in 2017. Notable decreases in China, South Africa, and Turkey more than offset reported significant increases in Belgium, the United States, and Poland. The leading consumer of zinc was China, accounting for 48% of global consumption. Other significant consumers included, in decreasing order of consumption, the United States, India, the Republic of Korea, Japan, Germany, and Belgium. Collectively, these countries accounted for 25% of global consumption. ILZSG's data indicated that zinc metal consumption exceeded production by 522,000 t in 2018. In 2017, metal consumption exceeded production by 481,000 t.

Outlook

ILZSG forecast that global zinc consumption in 2019 would be unchanged from that in 2018 at 13.67 Mt. After decreasing for 2 consecutive years, zinc metal consumption is expected to increase in China as a result of increased use of galvanized steel in the construction, public infrastructure, and export markets. In Europe, consumption is projected to decrease by 4% mostly as a result of decreases in Germany and the United Kingdom. On the supply side, the ILZSG forecast global zinc mine production to increase slightly. Increases in mine production in Australia, China, and South Africa are expected to be partially offset by decreases in Peru and the United States. Metal production is forecast to also increase slightly in 2019 owing mostly to a significant increase of production in China. Overall, zinc metal consumption is expected to exceed production by 178,000 t in 2019 (International Lead and Zinc Study Group, 2019a).

References Cited

American Iron and Steel Institute, 2019, 2018 annual statistical report—Table 10—Net shipments of steel mill products, all grades: Washington, DC, American Iron and Steel Institute, unpaginated.

American Zinc Recycling Corp., 2017, American Zinc Recycling announces strategic investment by Glencore: Pittsburgh, PA, American Zinc Recycling Corp. news release, December 8, 1 p. (Accessed April 16, 2018, at http://azr.com/news/view/american-zinc-recycling-announces-strategic-investment-by-glencore.)

Belda, Cristina, and Hinton, Amy, 2019, Russian zinc producer OJSC Electrozinc terminates Vladikavkaz plant: Metal Bulletin, February 11. (Accessed May 14, 2020, via https://www.metalbulletin.com/.)

Business Wire, 2016, Horsehead Holding Corp. and certain of its subsidiaries commence voluntary restructuring: Business Wire, February 2. (Accessed September 27, 2017, at http://www.businesswire.com/news/home/20160202005804/en/Horsehead-Holding-Corp.-Subsidiaries-Commence-Voluntary-Restructuring.)

Copper Development Association Inc., 2019, Annual data 2019—Table 3—Consumption of metals by wire rod mills, brass mills, ingot makers, foundries, powder plants and other industries: McLean, VA, Copper Development Association Inc., p. 14. (Accessed May 15, 2020, at https://www.copper.org/resources/market_data/pdfs/annual_data_2019.pdf.)

Cowden, Michael, 2016, Circumvention probes initiated vs. Vietnam: American Metal Market, November 7. (Accessed November 7, 2016, via http://www.amm.com/.)

Cowden, Michael, 2017, US slaps Vietnam sheet with triple-digit duties: American Metal Market, December 5. (Accessed May 15, 2018, via http://www.amm.com/.)

Defense Logistics Agency Strategic Materials, 2017, Annual Materials Plan for FY 2018: Fort Belvoir, VA, Defense Logistics Agency Strategic Materials news release, October 1, 1 p. (Accessed May 18, 2020, at https://www.dla.mil/Portals/104/Documents/Strategic%20Materials/Announcements/3134%20FY18%20AMP.pdf?ver=2017-09-29-133647-847.)

Dent, Millicent, 2017, Mooresboro zinc plant won't reopen before 2018: American Metal Market, June 26. (Accessed June 26, 2017, via http://www.amm.com/.)

Díaz, G., Mejias, A.B., Martín, D., and Cubeddu, F., 2014, ZincexTM technology—Recent industrial operations: Proceedings of Hydrometallurgy, 37 p. (Accessed February 6, 2019, at https://ddtp.tecnicasreunidas.es/wp-content/uploads/2016/11/Solutions-for-secondary-zinc-materials-WOX-PORTOVESME-HORSEHEAD.pdf.)

Hecla Mining Co., 2019, Form 10–K—2018: U.S. Securities and Exchange Commission, 103 p. (Accessed March 8, 2018, at http://d18rn0p25nwr6d.cloudfront.net/CIK-0000719413/59c0ad31-1ce1-4e70-bf97-c337744299ad.pdf.)

International Lead and Zinc Study Group, 2019a, ILZSG session/forecasts: Lisbon, Portugal, International Lead and Zinc Study Group press release, October 28, 7 p. (Accessed May 18, 2020, via http://www.ilzsg.org/pages/document/p1/list.aspx?ff_aa_document_type=R&from=3.)

International Lead and Zinc Study Group, 2019b, Lead and zinc new mine and smelter projects: Lisbon, Portugal, International Lead and Zinc Study Group, 70 p.

International Lead and Zinc Study Group, 2020, ILZSG monthly data 02-2020: Lisbon, Portugal, International Lead and Zinc Study Group, February. (Accessed May 15, 2020, via http://www.ilzsg.org/.)

Jamasmie, Cecilia, 2018, Glencore in 'hiring frenzy' as it readies to restart Lady Loretta zinc mine: Mining.com, January 26. (Accessed May 15, 2020, at https://www.mining.com/glencore-hiring-frenzy-readies-restart-lady-loretta-zinc-mine-australia/.)

Konst, Benedict, 2018, Century zinc mine starts tailings operations: Metal Bulletin, August 14. (Accessed May 15, 2020, via https://www.metalbulletin.com/.)

London Metal Exchange Ltd., 2017, Metals reports 29 Dec 2017: London, United Kingdom, London Metal Exchange Ltd., December 29. (Accessed May 15, 2020, via https://www.lme.com/Market-Data/Reports-and-data/Warehouse-and-stocks-reports/Stock-breakdown-report.)

London Metal Exchange Ltd., 2018, Metals reports 31 Dec 2018: London, United Kingdom, London Metal Exchange Ltd., December 31. (Accessed May 15, 2020, via https://www.lme.com/Market-Data/Reports-and-data/Warehouse-and-stocks-reports/Stock-breakdown-report.)

Luk, Julian, 2018a, MRI signs offtake with New Century—75% of initial zinc concs output sold: Metal Bulletin, April 23. (Accessed May 15, 2020, via https://www.metalbulletin.com/.)

Luk, Julian, 2018b, Vedanta will deliver first Gamsberg zinc concs parcel to Korea in Dec—Sources: Metal Bulletin, December 3. (Accessed May 15, 2020, via https://www.metalbulletin.com/.)

Maltais, Kirk, 2017, Horsehead now American Zinc Recycling: American Metal Market, May 1. (Accessed May 11, 2017, via http://www.amm.com/.)

McCrae, Michael, 2018, Un-mothballed Century Mine sells $19.5M of zinc concentrate in September: Mining.com, October 2. (Accessed May 15, 2020, at https://www.mining.com/un-mothballed-century-mine-sells-a27m-zinc-concentrate-september/.)

Nyrstar NV, 2019a, 2019 fact sheet—Clarksville smelter: Balen, Belgium, Nyrstar NV, June, 2 p. (Accessed May 14, 2020, at https://www.nyrstar.com/~/media/Files/N/Nyrstar/operations/melting/2019%20Fact%20Sheet%20-Clarksville.pdf.)

Nyrstar NV, 2019b, Annual report 2018: Balen, Belgium, Nyrstar NV, [variously paged]. (Accessed May 14, 2020, at https://www.nyrstar.com/~/media/Files/N/Nyrstar/results-reports-and-presentations/english/2019/annual-report-2018-en.pdf.)

Nyrstar NV, 2019c, Nyrstar 2018 mineral resource and mineral reserve statement: Balen, Belgium, Nyrstar NV news release, May 24, 10 p. (Accessed May 14, 2020, at https://www.nyrstar.be/~/media/Files/N/Nyrstar-IR/results-reports-and-presentations/english/2019/Nyrstar%202018%20Mineral%20Resource%20and%20Mineral%20Reserve%20Statement.pdf.)

Schier, Thorsten, 2016, China said skirting US sheet duties via Vietnam: American Metal Market, September 22. (Accessed September 22, 2016, via http://www.amm.com/.)

Teck Resources Ltd., 2019, 2018 annual information form: Vancouver, British Columbia, Canada, Teck Resources Ltd., February 25, 121 p. (Accessed May 13, 2020, at https://www.teck.com/media/2019-AIF.pdf.)

Titan Mining Corp., 2019a, Annual information form—For the year ended December 31, 2018: Vancouver, British Columbia, Canada, Titan Mining Corp., March 21, 52 p. (Accessed May 14, 2020, at https://www.titanminingcorp.com/site/assets/files/5135/aif-ti-dec312018.pdf.)

Titan Mining Corp., 2019b, Management's discussion and analysis—For the year ended December 31, 2018: Vancouver, British Columbia, Canada, Titan Mining Corp., 19 p. (Accessed May 14, 2020, at https://www.titanminingcorp.com/site/assets/files/5133/titan2018mda.pdf.)

U.S. Department of Commerce, International Trade Administration, 2016, Certain corrosion-resistant steel products from the People's Republic of China—Initiation of anti-circumvention inquiries on the antidumping duty and countervailing duty orders: Federal Register, v. 81, no. 219, November 14, p. 79454–79458.

U.S. Department of Commerce, 2018a, The effect of imports on the national security: U.S. Department of Commerce, January 11, 263 p. (Accessed May 16, 2018, at https://www.bis.doc.gov/index.php/documents/steel/2224-the-effect-of-imports-of-steel-on-the-national-security-with-redactions-20180111/file.)
U.S. Department of Commerce, 2018b, U.S. Department of Commerce issues affirmative final circumvention rulings on steel from Vietnam: U.S. Department of Commerce news release, May 21. (Accessed February 6, 2019, at https://www.commerce.gov/news/press-releases/2018/05/us-department-commerce-issues-affirmative-final-circumvention-rulings.)
U.S. Zinc Corp., 2017, Zinc oxide: Houston, TX, U.S. Zinc Corp. (Accessed April 16, 2018, at http://www.uszinc.com/products/zinc-oxide/.)
Vedanta Zinc International, 2020, Gamsberg: Sandton, South Africa, Vedanta Zinc International. (Accessed May 15, 2020, at https://www.vedanta-zincinternational.com/our-operations/gamsberg.)
White House, The, 2017, President Donald J. Trump—Standing up to unfair steel trade practices: The White House fact sheet, April 20. (Accessed September 16, 2020, at https://www.whitehouse.gov/briefings-statements/president-donald-j-trump-standing-unfair-steel-trade-practices/.)
White House, The, 2018, Presidential proclamation on adjusting imports of steel into the United States: The White House, March 18. (Accessed May 18, 2020, at https://www.whitehouse.gov/presidential-actions/presidential-proclamation-adjusting-imports-steel-united-states/.)
Zinc Oxide LLC, [undated], Company profile: Dickson, TN, Zinc Oxide LLC. (Accessed November 4, 2016, at https://www.zochem.com/company/company-profile/.)

GENERAL SOURCES OF INFORMATION

U.S. Geological Survey Publications

Historical Statistics for Mineral and Material Commodities in the United States. Data Series 140.
Zinc. Ch. in Mineral Commodity Summaries, annual.
Zinc. Ch. in United States Mineral Resources, Professional Paper 820, 1973.
Zinc. Mineral Industry Surveys, monthly.
Zinc (Zn). Ch. in Metal Prices in the United States Through 2010, Scientific Investigations Report 2012–5188, 2013.

Other

Defense Logistics Agency Strategic Materials.
Economics of Zinc. Roskill Information Services, Ltd.
International Lead and Zinc Study Group.
Zinc. Ch. in Mineral Facts and Problems, U.S. Bureau of Mines Bulletin 675, 1985.

TABLE 1
SALIENT ZINC STATISTICS[1]

(Metric tons, unless otherwise specified)

		2014	2015	2016	2017	2018
United States:						
Production:						
Domestic ores and concentrates:						
Contained zinc		831,000	825,000	805,000	774,000	824,000
Recoverable zinc:[2]						
Quantity		803,000	802,000 r	778,000	748,000	799,000
Value	thousands	$1,900,000	$1,690,000 r	$1,740,000	$2,300,000	$2,480,000
Refined zinc:						
At primary smelters		110,000	124,000	111,000	117,000	101,000
At secondary smelters[e]		70,000	48,300	15,000	15,000	15,000
Total		180,000	172,000	126,000	132,000	116,000
Exports:						
Ores and concentrates, zinc content		644,000	708,000	597,000	682,000	806,000
Refined zinc		19,800	12,700	46,900	32,600 r	23,300
Imports for consumption:						
Ores and concentrates, zinc content		2	22	60 r	6,780	32
Refined zinc		805,000	771,000	713,000	729,000	775,000
Reported stocks of refined zinc, December 31:						
Producer and consumer		88,000	86,700	79,500	112,000 r	117,000
Government stockpile		7,250	7,250	7,250	7,250	7,250
Consumption, refined zinc:						
Reported		403,000	434,000 r	462,000	517,000 r	509,000
Apparent[3]		965,000	931,000	792,000	829,000	868,000
Price:[4]						
North American	cents per pound	107.12	95.54	101.37	139.28	141.05
London Metal Exchange, cash	do.	98.05	87.64	94.82	131.25	132.66
World production:						
Mine	thousand metric tons	13,500 r	13,300 r	12,300 r	12,200 r	12,500
Smelter	do.	13,300 r	13,700	13,500 r	13,400 r	13,300

[e]Estimated. [r]Revised. do. Ditto.
[1]Table includes data available through September 24, 2020. Data are rounded to no more than three significant digits, except prices; may not add to totals shown.
[2]Amount of zinc that can be recovered after smelting and refining.
[3]Smelter production plus imports for consumption minus domestic imports.
[4]Special High Grade. Source: S&P Global Platts Metals Week.

TABLE 2
MINE PRODUCTION OF RECOVERABLE ZINC
IN THE UNITED STATES, BY STATE[1]

(Metric tons)

State	2017	2018
Alaska	611,000	620,000
Other[2]	138,000	179,000
Total	748,000	799,000

[1]Table includes data available through September 24, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes production from Idaho, Missouri, New York, Tennessee, and Washington.

TABLE 3
LEADING ZINC-PRODUCING MINES IN THE UNITED STATES IN 2018, IN ORDER OF OUTPUT[1]

Rank	Mine	County and State[2]	Operator	Source of zinc
1	Red Dog	Northern Region, AK	Teck Alaska Inc.	Zinc-lead ore.
2	East Tennessee Zinc Complex[3]	Jefferson and Knox, TN	Nyrstar Tennessee Mines - Strawberry Plains LLC	Zinc ore.
3	Greens Creek	Southeastern Region, AK	Hecla Mining Co.	Silver-zinc ore.
4	Middle Tennessee Zinc Complex[4]	Smith, TN	Nyrstar Tennessee Mines - Strawberry Plains LLC	Zinc ore.
5	Pend Oreille	Pend Oreille, WA	Teck American Inc.	Zinc-lead ore.
6	Empire State (No. 4)	St. Lawrence, NY	Titan Mining Corp.	Zinc ore.
7	Brushy Creek	Reynolds, MO	Doe Run Resources Corp.	Lead ore.
8	Viburnum (#29 and #35)	Washington and Iron, MO	do.	Do.
9	Sweetwater	Reynolds, MO	do.	Do.
10	Fletcher	do.	do.	Do.
11	Lucky Friday	Shoshone, ID	Hecla Mining Co.	Silver ore.
12	Buick	Iron, MO	Doe Run Resources Corp.	Lead ore.

Do., do. Ditto.
[1]The mines on this list accounted for 100% of recoverable U.S. zinc mine production in 2018.
[2]For Alaska, mines are located by geographic region, as delineated by the Alaska Division of Geological & Geophysical Surveys in its Special Report 74, Alaska's mineral industry 2018.
[3]Includes the Coy, Immel, and Young Mines.
[4]Includes the Cumberland, Elmwood, and Gordonsville Mines.

TABLE 4
ZINC RECOVERED FROM SCRAP PROCESSED IN THE UNITED
STATES, BY TYPE OF SCRAP[1]

(Metric tons)

Type of scrap	2017	2018
New scrap:		
Zinc-base	52,800 e	W
Copper-base	81,800	81,700
Magnesium-base	465	437
Total	135,000	W
Old scrap:		
Zinc-base	22,900 e	W
Copper-base	6,140 e	6,040
Aluminum-base	923	976
Magnesium-base	72	68
Total	30,100	W
Grand total	165,000	W

[e]Estimated. W Withheld to avoid disclosing company proprietary data.
[1]Table includes data available through September 24, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 5
U.S. REPORTED CONSUMPTION OF ZINC IN 2018, BY INDUSTRY USE AND GRADE[1]

(Metric tons)

Industry use	Special High Grade	High Grade	Continuous Galvanizing Grade	Prime Western	Remelt and other grades	Total
Galvanizing	138,000	83,000	210,000	19,000	151	450,000
Zinc-base alloys	21,000	82	--	--	--	21,100
Brass and bronze	24,000	9,970	--	98	10	34,000
Other	4,490	--	--	--	--	4,490
Total	187,000	93,100	210,000	19,100	161	509,000

-- Zero.

[1]Table includes data available through September 24, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 6
U.S. EXPORTS OF ZINC ORES AND CONCENTRATES, BY COUNTRY OR LOCALITY[1]

	2017		2018	
Country or locality	Quantity (metric tons, zinc content)	Value (thousands)	Quantity (metric tons, zinc content)	Value (thousands)
Australia	93,000	$169,000	84,500	$132,000
Belgium	41,900	87,900	60,800	86,800
Belize	2	3	--	--
Brazil	--	--	7,640	11,300
Bulgaria	--	--	1,230	1,330
Canada	227,000	531,000	282,000	585,000
China	9,880	14,900	--	--
Djibouti	--	--	150	66
El Salvador	54	195	62	235
Finland	29,600	56,100	30,400	52,800
Germany	26,200	57,300	30,000	57,700
Hong Kong	40	26	--	--
India	69	72	--	--
Italy	29,500	57,400	32,500	62,200
Japan	43,600	95,200	47,600	107,000
Korea, Republic of	79,600	167,000	90,400	203,000
Mexico	4,610	6,970	9,110	10,100
Netherlands	7,050	10,500	--	--
Nigeria	184	193	--	--
Norway	--	--	4,230	14,400
Panama	5	20	6	30
Poland	5,770	11,000	--	--
Singapore	500	241	--	--
Spain	78,300	154,000	109,000	181,000
St. Lucia	1	4	--	--
Switzerland	4,570	9,090	15,400	22,400
Tunisia	500	241	--	--
United Arab Emirates	365	241	--	--
Total	682,000	1,430,000	806,000	1,530,000

-- Zero.

[1]Table includes data available through September 24, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.

Source: U.S. Census Bureau.

TABLE 7

U.S. EXPORTS OF ZINC COMPOUNDS[1]

	2017		2018	
	Quantity (metric tons, gross weight)	Value (thousands)	Quantity (metric tons, gross weight)	Value (thousands)
Chromates of zinc or lead	39	$847	31	$394
Lithopone	762	4,630	179	1,280
Zinc chloride	288	498	281	440
Zinc oxide	66,100	90,100	60,200	91,800
Zinc sulfate	776	871	1,000	879
Zinc sulfide	636	16,200	1,730	15,900

[1]Table includes data available through September 24, 2020. Data are rounded to no more than three significant digits.

Source: U.S. Census Bureau.

TABLE 8

U.S. IMPORTS FOR CONSUMPTION OF ZINC COMPOUNDS[1]

	2017		2018	
	Quantity (metric tons, gross weight)	Value (thousands)	Quantity (metric tons, gross weight)	Value (thousands)
Chromates of zinc or lead	236	$664	140	$379
Lithopone	1,940	1,860	272	822
Zinc chloride	204	1,770	208	1,840
Zinc oxide	114,000	294,000	115,000	334,000
Zinc sulfate	91,100	85,400	98,800	106,000
Zinc sulfide	2,140	6,480 r	2,730	10,400

[r]Revised.

[1]Table includes data available through September 24, 2020. Data are rounded to no more than three significant digits.

Source: U.S. Census Bureau.

TABLE 9
ZINC: WORLD MINE PRODUCTION, BY COUNTRY OR LOCALITY[1]

(Metric tons, zinc content)

Country or locality[2]	2014	2015	2016	2017	2018
Argentina	28,038	30,498	22,792	23,392 r	22,050
Armenia[3]	8,459	6,790	4,730 r	5,780 r	6,500
Australia	1,505,986	1,610,004	883,747	849,371 r	1,111,936
Bolivia	474,988	442,154	486,955	503,675 r	480,000 e
Bosnia and Herzegovina	8,100 e	8,800 e	10,000 e	10,200 r	10,000 e
Brazil	169,766	156,926 r	158,197 r	156,348 r	167,250
Bulgaria	11,900	16,300	19,200	17,600 e	18,000 e
Burkina Faso	64,976 r	68,804 r	81,422 r	92,731 r	99,200
Burma	6,100 e	4,800 e	6,500 e	13,100 r	13,000 e
Canada	322,605 r	275,410 r	301,210 r	305,314 r	287,119
Chile	45,094	48,071	42,870	29,008 r	26,810
China	5,118,400	4,748,900	4,710,500 r	4,300,000 r	4,170,000 e
Congo (Kinshasa)	12,737	12,675	12,587	12,337 r	1,129
Cuba	--	--	--	5,000 e	45,000 e
Dominican Republic	--	4,655	3,636	3,920 r	4,000 e
Eritrea	--	--	40,900	95,400 r	110,000 e
Finland	43,000 e	25,332	45,852	66,284	85,335
Greece	22,700 r, e, 3	14,900 r, e, 3	18,900 r, e, 3	18,300 r, 3	20,300
Guatemala	13,394	14,810	5,564 r	6,100	--
Honduras	29,509	22,992	14,579	20,436 r	28,400
India	706,000	821,617	658,000 e	820,000 r, e	750,000 e
Iran[e]	139,000	124,000	135,000 r	140,000	140,000
Ireland	282,600 e	236,300	147,800	130,580	131,742
Kazakhstan	345,200	342,500	324,800	315,900 r	303,700
Korea, North[e]	32,000	26,000	30,000	20,000 r	20,000
Korea, Republic of[3]	1,918	2,070	2,257	3,321 r	3,656
Kosovo	5,500	3,986	4,800 r	4,500 r	4,500 e
Macedonia[e, 3]	31,600 r	29,200 r	24,900 r	24,200 r	30,400
Mexico	659,878	694,544	661,646 r	671,444 r	690,895
Mongolia	46,600 e, 3	44,800 e, 3	45,900 r	41,000 r, e, 3	44,000 e, 3
Montenegro	14,400	14,136	16,226	15,950 r	21,335
Morocco[e]	45,000 3	53,000 r, 3	42,000 r, 3	51,000 r, 3	51,000
Namibia	173,665 r	123,529 r	124,749 r	132,584 r	118,435
Nigeria[e]	7,000	7,000 r	9,700 r	6,800 r	6,800
Pakistan	--	--	7,700 r, e, 3	19,500 r, e, 3	27,000 e, 3
Peru	1,315,215	1,421,218	1,337,081	1,473,073 r	1,474,674
Poland	70,000	65,000	61,000	50,000 r	43,000
Portugal	67,378	66,871	69,526	71,356	95,000 e
Russia[4]	229,000 r	246,100 r	243,800 r	280,000	300,000 e
Saudi Arabia	17,350	18,757	2,550	15,219	20,000 e
Serbia	6,200	4,000	6,300	12,000	10,000 e
South Africa	26,141	29,040	26,695	30,778 r	30,000 e
Spain	26,756	41,765 r	76,342 r	70,451 r	70,000 e
Sweden	221,882	246,983	258,264	250,960	234,321
Tajikistan	48,000	50,000	72,000	91,000 r	83,000
Thailand	39,140	34,738	34,500	1,460 r	--
Turkey	212,000 r, e, 5	174,000 r, e, 5	202,000	150,000 r, e, 5	190,000 e, 5
United States	831,000	825,000	805,000	774,000	824,000
Uzbekistan[e]	25,000 r	25,000 r	30,000 r	30,000 r	30,000
Vietnam[e]	17,000	15,000	12,000	12,000 r	12,000
Total	13,500,000 r	13,300,000 r	12,300,000 r	12,200,000 r	12,500,000

See footnotes at end of table.

TABLE 9—Continued

ZINC: WORLD MINE PRODUCTION, BY COUNTRY OR LOCALITY[1]

[e]Estimated. [r]Revised. -- Zero.

[1]Table includes data available through September 11, 2019. All data are reported unless otherwise noted. Totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.

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

[3]Data derived from reported production of zinc concentrates.

[4]May not include production from some small-scale mining operations.

[5]Estimated based on reported exports of zinc ores and concentrates.

Sources: British Geological Survey; Bulgarian Association of the Metallurgical Industry; Chamber of Mines (Namibia); Chilean Copper Commission; China Nonferrous Metals Industry Association; company reports; Department of Industry and Science (Australia); Department of Mineral Resources (South Africa); Department of Statistics of Kazakhstan; Geological Survey of Finland; International Lead and Zinc Study Group; Istanbul Minerals & Metals Exporters' Association; Korea Institute of Geoscience and Minerals Resources; Lao Department of Mines; Mineral Resources Authority of Mongolia; Mines and Geosciences Bureau (Philippines); Ministry of Energy and Mines (Peru); Ministry of Energy, Mines, Water, and the Environment (Morocco); Ministry of Industry, Energy, and Tourism (Spain); Ministry of Mines [Congo (Kinshasa)]; Ministry of Natural Resources and Ecology (Russia); National Department of Mineral Production (Brazil); National Institute of Statistics and Census (Argentina); National Institute of Statistics and Geography (Mexico); National Statistical Service of the Republic of Armenia; Natural Resources Canada; Polish Geological Institute; U.S. Geological Survey.

TABLE 10

ZINC: WORLD SMELTER PRODUCTION, BY COUNTRY OR LOCALITY[1, 2]

(Metric tons, gross weight)

Country or locality	2014	2015	2016	2017	2018
Algeria, primary	6,976 r	7,086 r	5,000 e	-- r	--
Argentina, primary	29,122	30,000 e	--	--	--
Australia, primary	481,573	489,030	464,176	462,095 r	493,199
Belgium, primary	262,000	260,000	236,000	249,000	275,000
Brazil, primary	246,120	270,715	284,457	245,200 r	246,400
Bulgaria, primary	76,293	75,095	75,811	73,715 r	75,150
Canada, primary	649,217	683,118	691,389	598,438 r	696,591
China, primary	5,610,000	5,910,000 r	5,900,000 r	5,850,000 r	5,680,000
Finland, primary	302,024	305,717	290,599	284,992	295,029
France, primary	171,000	169,000	149,000	166,000	155,000
Germany:					
Primary	140,000	138,600 r	134,400 r	137,500 r	138,000 e
Secondary	28,000	30,400 r	33,600 r	36,500 r	37,000 e
Total	168,000	169,000 r	168,000	174,000 r	175,000 e
India, primary	705,707	821,617	611,814	799,877 r	720,000 e
Iran, undifferentiated	145,000	138,000	135,000 r	140,000	130,000
Italy, primary and secondary	154,982	158,214	188,897 r	203,697 r	195,000 e
Japan:					
Primary	458,481	457,786	438,560 r	436,656 r	441,651
Secondary	124,540	108,833	95,129	87,263 r	79,459
Total	583,021	566,619	533,689 r	523,919 r	521,110
Kazakhstan, primary and secondary	324,946	323,848	325,820 r	331,018 r	328,764
Korea, North, primary and secondary e	30,000	20,000	20,000	15,000	10,000
Korea, Republic of, primary	900,943	934,949	1,012,763	970,455	988,695
Mexico, primary	320,924	326,642	321,159	327,003	336,300
Namibia, primary	118,665	71,818	88,650	83,768	67,122
Netherlands, primary	290,000	291,000	283,000	248,000	268,000
Norway, primary	165,600	162,878	170,541	172,086	190,570
Peru, primary	336,454	335,422	341,518	312,339 r	333,667
Poland, primary	154,000	161,000	123,800	122,900 r	123,000 e
Romania, primary and secondary	90	200	300	800	--
Russia, primary and secondary	223,311	229,602	254,709	264,989	265,000 e
Spain, primary	491,331	493,765	495,016	500,253 r	505,079
Thailand, primary	70,100	74,121 r	72,813	30,018 r	--
United States:					
Primary	110,000	124,000	111,000	117,000	101,000
Secondary e	70,000	48,300	15,000	15,000	15,000
Total	180,000	172,000	126,000	132,000	116,000
Uzbekistan, primary e	66,000	73,000	85,000	93,000	90,000
Vietnam, primary e	12,000	10,000	10,000	10,000	10,000
Grand total	13,300,000 r	13,700,000	13,500,000 r	13,400,000 r	13,300,000
Of which:					
Primary	12,200,000 r	12,700,000 r	12,400,000 r	12,300,000 r	12,200,000
Secondary	223,000 r	187,000 r	144,000 r	139,000 r	131,000
Undifferentiated	878,000 r	870,000 r	925,000 r	956,000 r	929,000

e Estimated. r Revised. -- Zero.

[1] Table includes data available through September 12, 2019. All data are reported unless otherwise noted. Grand totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.

[2] Wherever 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 was unreported and insufficient data were available to estimate the distribution of the total, that total was left undifferentiated (primary and secondary). To the extent possible, this table reflects metal production at the first measurable stage of metal output.