



2007 Minerals Yearbook

ZINC

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In 2007, U.S. production of recoverable zinc was 769,000 metric tons (t), a 10% increase from that of 2006 (table 1). The value of domestic mine production was approximately \$2.6 billion. Alaska was the dominant producing State, accounting for 83% of recoverable production. Zinc was also produced from mines in Idaho, Missouri, Montana, New York, Tennessee, and Washington. Domestic exports of zinc contained in ores and concentrates decreased slightly to 816,000 t in 2007. Exports were predominantly sent to Canada (33%), the Republic of Korea (19%), Japan (12%), and Spain (10%) (table 10). Imports for consumption of zinc contained in ores and concentrates decreased by 29% to 271,000 t. Total U.S. refined zinc production was estimated to have increased to 278,000 t. Imports of refined zinc decreased by 15% to 758,000 t. Refined zinc was imported primarily from Canada (74%) and Mexico (14%). Domestic exports of refined zinc increased to 8,070 t.

Legislation and Government Programs

Defense.—A U.S. stockpile of zinc has been maintained for several decades for national defense purposes. In 1992, Public Law 102–484, which authorized the disposal of the entire inventory of zinc from the National Defense Stockpile (NDS), was signed. The Defense Logistics Agency (DLA), which maintains the NDS, was authorized to sell 45,400 t of zinc during fiscal year 2007 (October 1, 2006, to September 30, 2007). Sales of zinc during the fiscal year amounted to 8,530 t. During calendar year 2007, the stockpile inventory decreased from 15,300 t (including committed and uncommitted material) to 7,730 t (including only uncommitted material), all of which was authorized for disposal (U.S. Department of Defense, 2007, p. 6, 9).

Environment.—Under the Clean Air Act, the U.S. Environmental Protection Agency (EPA) was required to promulgate national emission standards to control hazardous air pollutants (HAPs) generated by industries the agency identified as either “major” or “area” sources of the HAPs. The EPA identified 70 area sources, two of which included primary nonferrous metal production (including only beryllium, cadmium, and zinc) and secondary nonferrous metal production (including only brass, bronze, magnesium, and zinc). The EPA issued the final national emission standards for primary zinc production facilities in January and for secondary zinc production facilities in December. The standards for both types of facilities reflect the generally available control technology, which was shown to effectively control HAPs and particulate matter emissions (U.S. Environmental Protection Agency, 2007a, b).

Coinage.—Increases in copper, nickel, and zinc prices have increased the production costs of circulating coins. During

2007, the nickel and penny cost more for the Government to manufacture on a per unit basis than their respective monetary values, resulting in less seigniorage (Government revenue derived from the manufacturing of coins, calculated as the difference between the monetary value and the metal value of the coins) available for the U.S. Mint to transfer to the Treasury General Fund. In August, the “Coinage Materials Modernization Act of 2007” (H.R. 3330, S. 1986) was introduced to Congress. The proposal, sent by the U.S. Department of the Treasury and the U.S. Mint, would allow the Secretary of the Treasury to change the composition of circulating coins to less expensive materials. The penny is copper-coated zinc (97.5% zinc, 2.5% copper) and weighs 2.5 grams (g); the nickel is a cupronickel alloy (75% copper, 25% nickel) and weighs 5.0 g (U.S. Mint, 2008, p. 24).

Production

Mine.—In 2007, zinc was produced at 14 mines in 7 States with Alaska being the leading zinc-producing State. Other zinc-producing States included Idaho, Missouri, Montana, New York, Tennessee, and Washington. Domestic mine production of recoverable zinc in 2007 was 769,000 t, a 10% increase from that of 2006. The rise in production was bolstered by Glencore International AG’s reopening of the Coy, Immel, and Young Mines in Tennessee during the year. Most other U.S. zinc-producing mines also produced more zinc than in 2006. Domestic mine production data were collected by the U.S. Geological Survey (USGS) from a precious metal and base-metal voluntary survey of lode-mine production.

Alaska.—Teck Cominco Alaska Inc. (a subsidiary of Teck Cominco Ltd., Vancouver, British Columbia, Canada) operated the open pit Red Dog zinc-lead mine in northwest Alaska under a royalty agreement with NANA Regional Corporation Inc., an Alaskan Native-owned corporation. Zinc in concentrate production at Red Dog increased 3% in 2007 from that of 2006 to 575,400 t owing to improved mill recoveries and ore throughput. Approximately 25% of Red Dog’s zinc concentrates was refined at Teck Cominco’s metallurgical complex at Trail, British Columbia, Canada. Remaining concentrates were sent to Asia and Europe. During the year, Teck Cominco began monitoring natural gas test wells located near the mine. The test wells were installed as part of a shallow gas exploration program initiated by the company to investigate the feasibility of replacing the operation’s use of diesel fuel with the local natural gas resource. Total reported ore reserves at yearend were 64.2 million metric tons (Mt) averaging 17.3% zinc. Zinc production in 2008 was projected to decline to 560,000 t (Teck Cominco Ltd., 2008a, p. 14; 2008b, p. 36, 37, 74).

The Red Dog property contains several sedimentary exhalative-type ore deposits. All ore produced at Red Dog has originated from the Main Deposit, which contains enough reserves to sustain current production rates until 2012. To ensure a continuous production level at Red Dog, Teck Cominco planned to begin mining the adjacent Aqqaluk Deposit in 2010. From 2010 to 2012, ore from Aqqaluk would be blended with ore from the Main Deposit. After 2012, ore production would completely transfer to Aqqaluk, extending Red Dog's mine life 18 years to 2031. At yearend 2005, reported probable reserves at the Aqqaluk Deposit were 52.7 Mt grading 16.7% zinc (Teck Cominco Ltd., 2007b, p. 2–2, 2–3, 2–22).

Hecla Mining Co. (Coeur d'Alene, ID) held a 29.73% interest in the Greens Creek Mine through a joint-venture arrangement with Kennecott Greens Creek Mining Co. and Kennecott Juneau Mining Co. (wholly owned subsidiaries of Kennecott Minerals Co., Salt Lake City, UT). The Greens Creek unit is a polymetallic (silver-zinc-gold-lead) massive sulfide deposit located on Admiralty Island in the Tongass National Forest near Juneau. Products included gold and silver dore, as well as lead and zinc concentrates, which were sold to smelters globally. Zinc in concentrate production rose 7% in 2007 from that of 2006 to 50,800 t owing to the completion of a major rehabilitation project that had reduced production during 2006. In November, Rio Tinto plc (London, United Kingdom), owner of Kennecott Minerals, announced that it was exploring the sale of its interest in Greens Creek. At yearend 2007, total reported reserves were 7.7 Mt grading 10.18% zinc. Hecla Mining planned to continue surface and underground exploration work around the vicinity of the mine in 2008 (Hecla Mining Co., 2008b, p. 16, 31, 34; Rio Tinto plc, 2008, p. 27, 64, 69).

Historically, Greens Creek was completely powered by diesel generators located onsite. In 2006, necessary infrastructure was completed to allow hydroelectric power supplied by Alaska Electric Light and Power Co. to reach Greens Creek's facilities; however, significant amounts of hydroelectric power will not be supplied to the operation until 2009 owing to increases in power demand and low lake levels in the nearby Juneau area (Hecla Mining Co., 2008b, p. 34).

Idaho.—Hecla Mining operated the Lucky Friday Mine, an underground silver-lead-zinc mine in the Coeur d'Alene Mining District in northern Idaho. Products included silver-lead concentrate and zinc concentrate. All concentrates were sent to Teck Cominco's facility at Trail for processing. Zinc in concentrate production at Lucky Friday increased in 2007 from that of 2006 to 7,266 t. At yearend, reserves measured 1.31 Mt at 2.5% zinc (Hecla Mining Co., 2008b, p. 13–14).

A prefeasibility study was initiated to determine the viability of an ore body expansion at Lucky Friday. The study considered the addition of a new shaft and a new or expanded mill. Recent drilling at Lucky Friday indicated that ore-grade mineralization extended at least 610 meters (2,000 feet) deeper than the current mining level. Engineering studies were underway to examine the potential construction of an underground shaft to reach the deeper ore, which may prolong Lucky Friday's mine life to at least 2026 at current production levels. Presently, mine life extends for another 11 years to 2018 (Hecla Mining Co., 2008a, p. 14).

Montana.—Apollo Gold Corp. (Greenwood Village, CO) operated the Montana Tunnels open pit gold mine, near Helena, through a 50-50 joint venture with Elkhorn Tunnels LLC. After a period of decreasing revenue and increasing operating costs, Montana Tunnels was put under care-and-maintenance status in May 2006. In August 2006, precommercial mining activity began after Apollo Gold entered into a joint venture with Elkhorn Tunnels to remediate the mine. Mill startup followed in March 2007. Products included gold and silver dore and lead-gold and zinc-gold concentrates, which were sent via rail to Teck Cominco's operations at Trail. Approximately 10,800 t of zinc in concentrate was recovered during the 10 months of operation from March through December 2007. Reserves at yearend totaled 38.1 Mt at 0.504% zinc. Production was forecast to rise in 2008 to 15,900 t of payable zinc. A major mine plan amendment was submitted for government approval that would allow for an additional 31.8 Mt of ore for processing. The plan may add 7 years to Montana Tunnels mine life if approved (Apollo Gold Corp., 2007, p. 26; 2008a, p. 4–5; 2008b).

New York.—St. Lawrence Zinc Co. LLC [a subsidiary of HudBay Minerals Inc. (Winnipeg, Manitoba, Canada)] operated the Balmat No. 4 zinc mine in upstate New York. The Balmat property contained several reclaimed zinc mines and the Balmat No. 4 Mine. On January 1, commercial production of zinc concentrate began at Balmat, and 22,068 t of zinc in concentrate was produced for sale at the mine by yearend. Most of the zinc concentrate produced from Balmat's 5,000-metric-ton-per-day (t/d) concentrator was trucked to Xstrata plc's (Zug, Switzerland) Canadian Electrolytic Zinc refinery in Montreal, Quebec, Canada, 158 kilometers (km) away. HudBay expected ore tonnage and grade to continue to improve in 2008. Balmat's full production capacity was 60,000 metric tons per year (t/yr) of zinc in concentrate. On January 1, 2008, total reserves measured 1.89 Mt with proven reserves grading 9.5% zinc and probable reserves grading 10.8% zinc (HudBay Minerals Inc., 2008, p. 4, 45).

Tennessee.—In 2006, Asarco LLC (Tucson, AZ) sold the Coy, Immel, and Young underground zinc mines (formerly known as the Tennessee Mines Division) to Glencore (Baar, Switzerland). Mining operations had been indefinitely suspended by Asarco in November 2001 following a sustained period of low zinc prices. Historically, the three mines reportedly produced nearly 56,800 t/yr of zinc in concentrate. The Young site included a warehouse, machine shop, mill, and tailings pond. Current production capacity was 80,000 t/yr of zinc concentrate. In the past, concentrates produced at the Young mill reportedly graded nearly 63% zinc. Glencore resumed the mining operations in 2007 under the subsidiary East Tennessee Zinc Company, LLC (Asarco, Inc., 2001; Mining Engineering, 2007).

In December 2006, Strategic Resource Acquisition Corp. (SRA) (Toronto, Ontario, Canada) acquired the Middle Tennessee zinc mining complex from Mossy Creek Mining, LLC. Pasmenco Ltd. had ceased mining operations at the complex in May 2003 primarily owing to low zinc prices. Mossy Creek acquired the property in August 2003 to continue the agricultural-lime recovery business that was in place at the mines. The project, located approximately 80 km east of

Nashville, TN, included a complex of five underground zinc mines—Carthage, Cumberland, Elmwood, Gordonsville, and Stonewall—and the Gordonsville mill. The mill was being engineered to operate at a rate of 7,500 t/d; design capacity was 10,000 t/d. SRA planned to resume mining at the Gordonsville Mine in early 2008, followed by the Cumberland Mine in the second quarter of 2008, and at the Elmwood Mine in mid-2008. Once in full production, the mining complex would produce 66,700 t/yr of zinc in concentrate. SRA aligned agreements in principle with MG Rohstoffhandel GmbH (Ruhr-Zink refinery, Datteln, Germany), Nyrstar N.V. (Clarksville refinery, Clarksville, TN), and Teck Cominco Metals, Ltd. (Canada) to process the concentrate. The life of the mining operation was expected to be 6 years based on indicated mineral resources; however, mine life may be significantly extended by upgrading current inferred mineral resources (Strategic Resource Acquisition Corp., 2007, p. 5, 6, 8, 10; 2008).

Washington.—Teck Cominco American, Inc. (a subsidiary of Teck Cominco) operated the Pend Oreille zinc-lead mine in northeast Washington. In 2007, zinc in concentrate production declined from that of 2006 to 28,800 t. Reduced production was attributed to the implementation of a revised ground control plan that affected ore production and resulted in the mining of lower grade ore zones. Ore grades improved in late 2007 and were expected to continue to improve in 2008. All concentrates were trucked to Teck Cominco's operations at Trail, 80 km away. At yearend, reserves at Pend Oreille measured 2.8 Mt grading 5.6% zinc (Teck Cominco Ltd., 2008b, p. 38, 74).

Smelter.—Domestic metal production data were collected by the USGS from a voluntary survey of zinc metal and compounds production. Domestic zinc metal production data were estimated based on publicly available information to protect company proprietary data. In 2007, refined zinc was mainly produced in two States—Pennsylvania (Horsehead Holding Corp.'s Monaca facility) and Tennessee (Nyrstar's Clarksville facility). Estimated refined zinc production in 2007 was 278,000 t.

Illinois.—During 2007, the Big River Zinc electrolytic zinc refinery (BRZ) in Sauget remained under care-and-maintenance status. In May 2006, ZincOx Resources plc (Surrey, United Kingdom) acquired Big River Zinc Corp. from Korea Zinc Co., Ltd. (Seoul, Republic of Korea). According to ZincOx, BRZ was shuttered in late 2005 owing to recent nearby mine closures and the increasing cash price of high-purity zinc concentrate. In 2007, ZincOx completed prefeasibility studies on an integrated U.S. zinc and iron recycling project, which included constructing an electric arc furnace (EAF) dust recycling facility in Delta, OH, and modifying the BRZ refinery. EAF dust is a waste product generated by the recycling of steel scrap at steel minimills and can be recycled to recover zinc. The Ohio plant would treat 200,000 t/yr of EAF dust supplied by EnviroSAFE Services of Ohio, Inc. (Oregon, OH) in a rotary hearth furnace to produce 47,000 t/yr of contained zinc in a crude zinc and lead oxide concentrate. Direct reduced iron would also be produced during the process and would be melted into slag and pig iron and sold back to industry. ZincOx's long-term strategy for the project was to send the crude oxide concentrate produced from both the Ohio plant and its Aliaga recycling project in Turkey to BRZ, where it would be dissolved in a leach plant and then

purified in a solvent extraction circuit to produce zinc metal. In the interim, ZincOx planned to send the concentrate to BRZ for further purifying and then sell the upgraded material to other smelters. BRZ was designed to produce 90,000 t/yr of SHG zinc (ZincOx Resources plc, 2008, p. 10, 12).

Pennsylvania.—Horsehead Holding Corp. (Monaca) produced zinc metal—primarily Prime Western Grade (PW) and to a lesser extent, Special Special High Grade (SSHG)—and zinc oxide at its electrothermic zinc smelter located in Monaca. The PW zinc was sold to hot-dip galvanizers and brass manufacturers, and the SSHG zinc was used as feed for the production of high-purity zinc alloys and powder. Feedstock for the metal production was composed entirely of secondary materials. In addition to the Monaca facility, Horsehead operated five other facilities, including four EAF dust recycling operations located in Beaumont, TX; Calumet, IL; Palmerton, PA; and Rockwood, TN, and a hydrometallurgical metals recovery facility in Bartlesville, OK. In 2007, Horsehead's total EAF dust processing capacity was approximately 561,000 t/yr. Horsehead planned to begin operating an additional kiln at its Rockwood facility in early 2008. The new kiln would have the capacity to recycle 72,600 t/yr of EAF dust, increasing Horsehead's recycling capacity by 15% and providing an additional 13,200 t/yr of contained zinc to be sent to its own smelting facility or to other zinc smelters. Other planned developments included increasing zinc oxide production capacity by converting existing equipment at the Monaca facility and constructing a fifth EAF dust recycling facility in one of the Carolinas (Horsehead Holding Corp., 2008, p. 3, 6, 7, 10, 20).

Tennessee.—Nyrstar's Clarksville electrolytic zinc refinery in Montgomery County produced Special High Grade (SHG) zinc metal and galvanizing alloys as well as a number of byproducts including cadmium metal, intermediate copper cementate, leach product, synthetic gypsum, and sulfuric acid. In 2007, feedstock was comprised of both primary (80%) and secondary materials (20%). Concentrates were partially sourced from the recently reopened zinc mines in Tennessee. Historically, the Tennessee Valley zinc operations produced a relatively pure zinc concentrate, and the shift to these concentrates contributed to an improvement in zinc recovery at the smelter compared with that of the previous year. Zinc metal production by yearend 2007 increased from that of 2006 to 121,000 t. Production during 2007 was affected by a 19-day planned shutdown to repair the refractory brick lining in the roaster. By June 2009, Nyrstar planned to construct a new oxide washing facility at Clarksville to treat various zinc oxide materials produced domestically (Nyrstar N.V., 2008a, p. 22, 29; 2008b).

Consumption

Reported consumption data were collected by the USGS from a voluntary survey of slab zinc consumption by grade and use. Galvanizing, a process in which zinc is applied as a coating to protect steel from corrosion, was the main end use of refined zinc in the United States and accounted for more than one-half of consumption. According to the American Iron and Steel Institute, U.S. net shipments of galvanized sheet and

strip totaled 16.1 Mt in 2007, a 6% decrease from that of 2006. Zinc-based alloy was estimated to have accounted for 21% of consumption; brass and bronze, 15%; other uses, 8% (American Iron and Steel Institute, 2008).

Prices and Stocks

The annual average London Metal Exchange (LME) cash price for SHG zinc in 2007 was \$3,241.54 per metric ton (147.03 cents per pound), a slight decrease from that of 2006. The annual average Platts North American producer price for SHG zinc in 2007, which was based on the LME cash price plus premium, decreased by 3% to 154.40 cents per pound (table 1). Monthly average North American SHG premiums declined during the course of the year, starting the year at nearly 12 cents per pound and falling to almost 5 cents per pound at yearend.

At yearend, stocks of SHG zinc in global LME warehouses totaled 88,475 t, a slight decrease from the closing stock level at yearend 2006. According to the International Lead and Zinc Study Group (ILZSG), global stocks (Western World) of refined zinc at yearend were approximately 545,000 t, equivalent to 4 weeks of global consumption (International Lead and Zinc Study Group, 2008b, p. 52).

World Industry Structure

According to the ILZSG, global zinc in concentrate production totaled 11.1 Mt in 2007, a 6% increase from that of the previous year. Twenty-two zinc-producing mines opened during the year adding about 872,000 t/yr of additional zinc in concentrate production capacity, and two zinc mines closed removing 44,000 t/yr of capacity. Leading producers of zinc in concentrate were China (27%), Australia (13%), and Peru (13%). On an industry basis, Xstrata (excluding Glencore) accounted for the largest share of global zinc mine production (8.3%), followed by Teck Cominco (5.8%), Glencore (5.1%), Zinifex Ltd. (4.8%), and Hindustan Zinc Ltd. (Udaipur, India, 4.7%). Global refined production rose to 11.4 Mt in 2007, a 7% increase from that of the previous year. Leading global producers of refined zinc were China (33%), Canada (7%), and the Republic of Korea (6%). Six zinc smelters opened or expanded capacity during the year adding 330,000 t/yr of zinc metal production capacity. There were no smelter closures or cutbacks (International Lead and Zinc Study Group, 2008a; 2008b, p. 37; 2008c, p. 44–47).

Global consumption of refined zinc increased by 3% from that of the previous year to 11.3 Mt. China, the leading consumer of refined zinc, accounted for 32% of global refined zinc consumption in 2007. The United States, the second leading consumer, accounted for 9% of world consumption. Of the major consuming countries, Belgium, Brazil, China, India, and Italy increased their metal consumption. France, Germany, Japan, the Republic of Korea, Taiwan, and the United States reported a decrease in consumption (International Lead and Zinc Study Group, 2008b, p. 40–41).

French investment bank Societe Generale CIB expected a 20% supply increase in the zinc market between 2006 and 2008 as a result of the mine expansions, startups, and reopenings that

were expected to take place. The bank anticipated a period of sustained surplus to set in by midyear 2007 that would lead to a buildup of concentrate stocks and a shift in treatment terms; smelter capacity was expected to remain sufficient (Platts Metals Week, 2007d).

Mergers and Acquisitions

Umicore N.V. (Brussels, Belgium) and Zinifex merged their zinc smelting and alloying assets during 2007, resulting in further consolidation within the zinc smelting industry. The resulting company, Nyrstar (Balen, Belgium), would have the capacity to produce more than 1 million metric tons per year (Mt/yr) of zinc and zinc alloys and reportedly was positioned to surpass Korea Zinc as the world's leading producer of zinc metal. The new company would allow Umicore to shift its focus towards its materials technology business and would transform Zinifex from an integrated mining and smelting business into a midtier base-metal mining company. Zinifex planned to continue to focus its mining business on zinc as well as copper, gold, lead, and silver and possibly expand into nickel (Nyrstar N.V., 2008a, p. 2, 14; Zinifex Ltd., 2007a, p. 4).

In November, Votorantim Metais (Sao Paulo, Brazil) announced that it had signed a definitive contract to purchase U.S. Zinc Corp. (based in Houston, TX), a wholly owned subsidiary of Aleris International Inc. (Beachwood, OH), for \$295 million. U.S. Zinc produces zinc oxide at facilities in Clarksville and Millington, TN, zinc metal at production facilities in Coldwater, MI, Houston, TX, and Spokane, WA, and zinc dust in Houston, TX. U.S. Zinc was also in the process of constructing a plant in Changshu, Hunan Province, China, that would produce zinc metal, oxide, and powder (Votorantim Group, 2007).

As part of Zinifex's strategy to expand its mining business, the company completed the compulsory acquisition of all outstanding common shares of the Canadian-based exploration and development company Wolfden Resources Inc. in June. Wolfden owned several projects in the Nunavut Territory in Canada, including the Izok and High Lake polymetallic (copper, gold, silver, and zinc) deposits. Wolfden became a wholly owned indirect subsidiary of Zinifex and was renamed Zinifex Canada Inc. (Zinifex Ltd., 2007b).

During the third quarter, Teck Cominco completed its acquisition of Canadian-based copper producer Aur Resources Inc. According to Teck Cominco, the acquisition would add substantial copper assets to its mining portfolio. Through its purchase of Aur Resources, the company gained interests in the Andacollo (90%) and Quebrada Blanca (76.5%) copper mines in Chile and the Duck Pond (100%) copper-zinc mine in Canada, resulting in an addition of 90,000 t of annual copper production and 34,000 t of annual zinc production to its production profile (Teck Cominco Ltd., 2007a, p. 14).

In December, Indonesian coal producer PT Bumi Resources Tbk made an offmarket takeover offer to purchase all shares of the Australian zinc mining company Herald Resources Ltd., owner of the Dairi lead-zinc project in North Sumatra, Sumatra Province, Indonesia. However, Herald confirmed that it had been approached by other parties, and the company advised

its shareholders to take no action until the company fully considered PT Bumi's offer and made a formal recommendation (Herald Resources Ltd., 2007).

World Review

Algeria.—Henan Shaolin Water Co., a Chinese construction company, signed a memorandum of understanding with Algeria's Ministry of Energy and Mining to take control of the El Abed lead-zinc mine in Tlemcen Province. Henan Shaolin planned to construct a 2,000-t/d concentrator at the mine in the first half of 2007. The company also signed a deal with the Government to explore a lead-zinc mine in Setif Province (Metal Bulletin, 2007a).

Australia.—Xstrata continued the open pit development at the McArthur River Mine during 2007. A temporary suspension of development operations took place in May while Government approval for the plan was challenged once again; however, production was not significantly affected as the company processed stockpiled material during the intervening period. Xstrata ceased underground mining operations at McArthur River in 2006 after most of the accessible underground ore had been extracted. The conversion to open pit would extend McArthur River's mine life for 25 years. The company also planned to spend \$37 million to increase ore throughput capacity at the concentrator to 2.5 Mt/yr from 1.8 Mt/yr, increasing the rate of zinc-lead concentrate production to 430,000 t/yr. The expanded mill capacity was expected to be commissioned in the third quarter of 2008 (Xstrata plc, 2008, p. 89).

Milling operations commenced at Teck Cominco and Xstrata's jointly owned Lennard Shelf operation during the first quarter, and concentrate shipments began in the second quarter. Located in Western Australia, the operation was the site of the Pillara zinc mine, which had been on care-and-maintenance status from 2003 until 2006. A total of 21,000 t of zinc in concentrate was produced at Lennard Shelf during 2007. Production was reported to be lower than anticipated; access to the main mining area was delayed, and lower grade ores from other areas were processed as a result (Teck Cominco Ltd., 2008b, p. 38).

In January, Intec, Ltd. (North Sydney) announced that it began shipping bulk lead-silver-zinc concentrate from the Hellyer Zinc Concentrate Project in Tasmania. Intec acquired the Hellyer project in 2004, which was the site of a former underground lead-zinc mine. The company's assets included the site infrastructure, mill, and tailings dam. In 2006, Intec entered into a 50-50 joint venture with Polymetals Group Pty., Ltd. to retreat the tailings through the 1.5-Mt/yr mill to produce approximately 25,800 t/yr of zinc in concentrate. Two-thirds of this production was sold under contract to two Chinese smelters (Intec, Ltd., 2007).

In March, Perilya, Ltd. (Perth) began mining at the Beltana zinc oxide mine as part of its Flinders Project in South Australia. Two shipments of ore containing a combined total of 7,500 t of zinc were sent during the second half of 2007 to smelters in China. At yearend, ore containing 101,000 t of zinc had been stockpiled onsite (Perilya, Ltd., 2008).

In January, CBH Resources Ltd. (Sydney) completed a development plan for its Panorama zinc-copper project in Western Australia, and environmental approval was in the process of being finalized at yearend. The company planned to spend \$165 million to develop the mine and start production within the next 2 years. The mine would have the capacity to produce 47,700 t/yr of zinc in concentrate during 7.5 years (Shaw, 2007).

Development of Terramin Australia Ltd.'s (Adelaide) Angas zinc project in South Australia was on track to begin producing in mid-2008. The mine was originally set to begin producing in mid-2007; however, delays in receiving regulatory approval caused Terramin to revise its development schedule for Angas. The operation was expected to produce 30,000 t/yr of zinc in concentrate during an initial 7-year mine life (Terramin Australia Ltd., 2008, p. 4–5).

Bolivia.—The San Cristobal silver-zinc-lead mine in southwestern Bolivia commenced production in August, and the first shipments of concentrate began in September. The mine was a joint venture between Apex Silver Mines Ltd. (Denver, CO, 65%) and Sumitomo Corp. (Tokyo, 35%) and was one of the larger zinc projects to have recently been commissioned. By yearend, the mine produced 19,000 t of payable zinc in concentrate. Apex Silver planned to have San Cristobal running at full production capacity by the second quarter of 2008 and produce 235,000 t of payable zinc during the year. Mine life was expected to extend for 16 years based on existing proven and probable reserves (Apex Silver Mines Ltd., 2008, p. 2, 3).

Burkina Faso.—Ongoing construction and development of mine infrastructure continued at AIM Resources Ltd.'s (Sydney) Perkoa zinc project. The mine would produce an average of 37,100 t/yr of zinc in concentrate during 12.5 years. The company entered into offtake agreements with Boliden and Xstrata for the sale of one-third of the zinc concentrates and planned to begin shipping by early 2009 (AIM Resources Ltd., 2007).

Canada.—Acadian Mining Corp. (Halifax, Nova Scotia) began production operations at the Scotia zinc-lead mine in May, and at yearend, the mill was in the final stages of commissioning. Once the mill was fully commissioned, it would process 2,000 t/d of ore. Approximately 4,300 t of payable zinc in concentrate was produced at Scotia during 2007, about 20% short of what Acadian initially aimed to produce. Delays in reaching targeted mining areas during 2007 resulted in the mining and processing of lower grade ores. Acadian planned to produce 13,600 t of payable zinc in 2008. Offtake agreements for the sale of Scotia's concentrates were signed with MRI Trading and Trafigura AG, both headquartered in Switzerland (Acadian Mining Corp., 2008, p. 7–8).

Teck Cominco's Duck Pond copper-zinc mine in central Newfoundland achieved commercial production in April and produced 8,400 t of zinc in concentrate from August (when Teck Cominco acquired Duck Pond from Aur Resources) through yearend 2007. Duck Pond's mine life was expected to last an additional 6 years, and production in 2008 was expected to be 30,000 t of zinc in concentrate. Copper and zinc concentrates produced at the mine were sold to Xstrata under life-of-mine

concentrate sales agreements (Teck Cominco Ltd., 2008b, p. 25).

Mining operations resumed at Blue Note Mining Inc.'s (Montreal) Caribou and Restigouche zinc-lead mines during May and August. The company acquired the mothballed mines from a subsidiary of Breakwater Resources Ltd. (Toronto) in 2006. Ore originating from both mines was sent to the Caribou mill, which was commissioned in August and continued to ramp up to full production throughout the remainder of the year. Blue Note Mining entered into a multiyear agreement with Falconbridge Ltd. (Xstrata) for the sale of 50% of the zinc concentrate production. Two shipments of zinc concentrates were delivered during the year, one to Nyrstar and the other to Xstrata. Zinc in concentrate production amounted to 9,110 t for the year. Production was expected to average 54,000 t/yr of zinc in concentrate (Platts Metals Week, 2007a; Blue Note Mining Inc., 2008, p. 10).

In 2006, Breakwater Resources began producing concentrate at the reopened Langlois zinc-copper mine in northwest Quebec. The company continued to improve the quality of the concentrate as the mill was fine tuned during the first two quarters, and by midyear, the company announced Langlois had achieved commercial production. The mine produced 28,300 t of zinc in concentrate by yearend 2007 (Breakwater Resources Ltd., 2008, p. 23).

China.—According to Antaika, China produced an estimated 3.7 Mt of zinc metal in 2007, a 17% increase from that of 2006. An additional 200,000 t/yr of zinc smelting capacity was added in 2007; most of this capacity came onstream during the first half of the year. From 2000 to 2006, the country's zinc metal production capacity grew significantly at an average rate of 13% per year and was estimated to have reached 4.3 Mt/yr by the end of that period. Looking forward, at least four producers planned to increase their lead and zinc smelting capacity further to more than 400,000 t/yr by 2010—Yuguang Gold and Lead Group expected to reach 700,000 t/yr; Zhuzhou Smelter and Zhongjin Lingnan, 500,000 t/yr each; and Huludao Zinc, 450,000 t/yr. As a result of China's increased production and production capacity, the country's net exports of refined zinc were expected to increase (Mok, 2007b; China Metal Market, 2008).

Zhuzhou Smelter Group Co., Ltd. (Hunan Zhuye Torch Metals Co., Ltd.), China's leading producer of zinc, planned to produce 406,000 t of refined zinc in 2007, a 10% increase from that of 2006 owing to the restart of idled capacity in mid-2006. During the year, construction began on a new 100,000-t/yr production line, which would be commissioned in 2008. The smelter had the capacity to produce 380,000 to 400,000 t/yr of zinc in 2007, and by the end of 2010, total zinc capacity was estimated to reach 500,000 t/yr. The company was a subsidiary of Hunan Nonferrous Metals Holding Group Co., Ltd., which had an additional 50,000 t/yr of zinc production capacity at its Hsikwangshan antimony smelter (China Metal Market, 2007; Teo, 2007b).

Huludao Zinc Industry Co. planned to produce 333,000 t of zinc in 2007, a 10% increase from that of the previous year as a result of a new furnace that was commissioned in 2006. Production capacity reportedly was 390,000 t/yr (Metal Bulletin, 2007b).

Yunnan Chihong Zinc & Germanium Co. planned to construct a 100,000-t/yr lead and zinc smelter in Hulun Buir City, Inner Mongolia, on the condition that the company would be able to identify at least 2 Mt of zinc and lead reserves around the region of Hulun Buir. Yunnan Chihong signed an agreement with the government of Hulun Buir City in April for the rights to explore 1,000 square kilometers of land for nonferrous metals (Teo, 2007a).

In March, the National Development and Reform Commission published a new set of criteria for the domestic lead and zinc industry. As outlined by the standards, all new zinc smelting projects must have a minimum capacity of 100,000 t/yr, and new lead-zinc mines must have a capacity of 30,000 t/yr with at least a 15-year mine life. Medium-sized mines must have a minimum production capacity of 300,000 t/yr. At yearend 2005, China had approximately 411 lead-zinc mines and 466 lead-zinc smelters. The new standards were developed to eliminate outdated production machinery and to better regulate excess smelter capacity in the country (Platts Metals Week, 2007b).

The Shanghai Futures Exchange (SHFE) began trading zinc in March to allow more arbitrage and hedging opportunities for domestic industries, according to a Chinese news source. Similar to the purity of zinc traded on the LME, zinc traded on the SHFE must be 99.995% pure. The SHFE also traded aluminum, copper, fuel oil, gold, and natural rubber and considered trading fuel ethanol, nickel, and steel rods (Mok, 2007c).

In late May, the Ministry of Finance announced that all exports of refined zinc of less than 99.99% purity would be subject to a 10% export tax effective June 1. This represented an increase from the existing 5% export tax (Mok, 2007a).

India.—As part of Hindustan Zinc's phase 2 expansion project, the company commissioned a second 170,000-t/yr hydrometallurgical zinc smelter at its Chanderiya lead-zinc smelter complex in Udaipur. The company was also in the process of completing an 88,000-t/yr zinc debottlenecking project at the Chanderiya complex (80,000 t/yr) and Debari zinc smelter (8,000 t/yr), which, once completed, would bring Hindustan Zinc's overall metal (lead and zinc) production capacity to 754,000 t/yr. The company recently announced a phase 3 expansion project, which included constructing a 210,000-t/yr hydrometallurgical zinc smelter and a 100,000-t/yr lead plant at the Rajpura Dariba mine site; the company's mine production would also be significantly expanded as well (Hindustan Zinc Ltd., 2008, p. 24, 26).

Three major galvanized coil steel manufacturers in India—Bhushan Steel Ltd., JSW Steel Ltd., and Uttam Galva Steels Ltd.—planned to reduce their zinc consumption by increasing the use of aluminum in their coatings in order to reduce costs. All three companies planned to modify their galvanizing lines to use a 55% aluminum-based zinc-aluminum alloy. Bhushan Steel had already begun galvanizing with the new zinc-aluminum coating, and the other two companies were in the process of modifying their equipment. JSW Steel said that it would take 2 to 3 years to modify its coating lines to account for the time needed to market the new product (Nair, 2007).

Korea, Republic of.—Korea Zinc planned to produce 435,300 t of zinc during 2007 at its zinc refinery in Onsan, a slight increase from that produced in 2006. The company expected their production to rise owing to a greater availability of concentrates during the year. In July, Korea Zinc completed the construction of its first fumer plant at Onsan to treat zinc-bearing residues. Once operational, the fumer plant would increase zinc production capacity at the refinery to 450,000 t/yr from 430,000 t/yr. In November, Korea Zinc began constructing a second fumer plant that would have the capacity to treat 120,000 t/yr of zinc residue. A trial run for the second plant was scheduled for December 2009 (Korea Zinc Co., Ltd., 2007, p. 20; Platts Metals Week, 2007c).

Peru.—Zinc mine production in Peru rose significantly from last year, mostly as a result of the continued production ramp up at the Antamina copper-zinc mine (jointly owned by BHP Billiton, Mitsubishi Corp., Teck Cominco, and Xstrata). Compania Minera Milpo began producing at the Cerro Lindo polymetallic project around midyear. The company invested \$64 million in the project, and annual production at the mine was expected to amount to 146,000 t of zinc concentrate, 39,000 t of copper concentrate, and 14,800 t of lead concentrate (Kinch, 2007).

Votorantim Metais planned to invest \$500 million in its Cajamarquilla zinc refinery to raise zinc production capacity to 320,000 t/yr from 130,000 t/yr within the next 2 years. The expansion project would increase the company's zinc smelting capacity to 640,000 t/yr. Votorantim reportedly was the world's fifth leading producer of zinc and planned to position itself as the third leading producer with other smelter capacity expansions underway (Reuters, 2007; Votorantim Group, 2008, p. 8).

Philippines, The.—Operations at Lafayette Mining Ltd.'s Rapu Rapu polymetallic mine recommenced in February following a suspension in late 2006 when a super typhoon damaged parts of the site infrastructure. Full-scale commissioning of the base-metals plant continued through the third quarter; the company noted that several technical issues had hampered the plant's operating performance. Rapu Rapu had the capacity to produce 14,000 t/yr of zinc in concentrate (Lafayette Mining Ltd., 2007a, p. 1–20; b).

Portugal.—Lundin Mining Corp. (Toronto, Ontario) began treating ores at the Neves-Corvo copper-zinc mine in 2006, and in January 2007, the company announced that the mill was operating at the designed production performance level. The mine produced 24,200 t of zinc in concentrate during the year. Lundin Mining also continued to develop the Aljustrel zinc mine 40 km northwest of Neves-Corvo during 2007. Concentrate production began at Aljustrel in December, and the mine was expected to reach full production capacity (80,000 t/yr of zinc in concentrate) during the first quarter of 2009 (Lundin Mining Corp., 2008, p. 12, 16).

Outlook

Global zinc mine and refined metal production were expected to increase next year. Consumption was expected to rise, as well, but at a more modest rate, potentially leaving the market in a supply surplus. Increased mine production would be driven

by expansions in Latin America, as well as increased output in China, India, Iran, and Kazakhstan. A rise in metal production would be driven by increased output in China and India. An increase in global consumption would continue to be driven by increased consumption in China, and to a lesser extent, Brazil and India. China's continued growth in demand would be supported by the increased production of galvanized products—especially those used in transportation (highway barriers) and communication (galvanized iron towers) infrastructure.

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TABLE 1
SALIENT ZINC STATISTICS¹

		2003	2004	2005	2006	2007
United States:						
Production:						
Domestic ores, contained zinc	metric tons	768,000	739,000	748,000	727,000	803,000
Domestic ores, recoverable zinc	do.	738,000	715,000	720,000	699,000	769,000
Value, recoverable zinc	thousands	\$661,000	\$827,000	\$1,070,000	\$2,450,000	\$2,620,000
Refined zinc:						
At primary smelters ^c	metric tons	185,000	194,000	195,000	113,000	121,000
At secondary smelters ^c	do.	166,000	156,000	156,000	156,000	157,000
Total	do.	351,000	350,000	351,000	269,000	278,000
Secondary zinc ²	do.	232,000 ^r	245,000 ^r	241,000	246,000 ^r	165,000
Exports:						
Ores and concentrates, zinc content	do.	841,000	745,000	786,000	825,000	816,000
Refined (slab) zinc	do.	1,680	3,300	784	2,530	8,070
Zinc plates, sheets, strip, and foil	do.	9,430	9,770	8,760	3,780	4,310
Imports for consumption:						
Ores and concentrates, zinc content	do.	164,000	231,000	156,000	383,000	271,000
Refined (slab) zinc	do.	792,000 ^r	868,000 ^r	700,000 ^r	895,000 ^r	758,000
Zinc plates, sheets, strip, and foil	do.	1,790	2,500	3,630	2,050	2,160
Stocks of slab zinc, December 31, producer and consumer	do.	73,800 ^r	73,000 ^r	71,100 ^r	70,200 ^r	62,700
Government stockpile	do.	104,000 ^r	71,800 ^r	45,100 ^r	15,300	7,730
Consumption, refined zinc:						
Reported	do.	520,000	524,000	500,000	564,000 ^r	484,000
Apparent ³	do.	1,120,000	1,190,000	1,050,000	1,150,000	1,000,000
All classes ⁴	do.	1,390,000	1,430,000	1,290,000	1,400,000 ^r	1,170,000
Price⁵						
North American	cents per pound	40.63	52.47	67.14	158.89	154.40
London Metal Exchange, cash	do.	37.53	47.51	62.66	148.53 ^r	147.03
World production:						
Mine	thousand metric tons	9,530 ^r	9,600 ^r	9,930	10,300 ^r	10,900
Smelter	do.	10,100 ^r	10,600 ^r	10,400	10,800 ^r	11,500

^cEstimated. ^rRevised. do. Ditto.

¹Data are rounded to no more than three significant digits, except prices; may not add to totals shown.

²Zinc in metal products and compounds derived directly from scrap; refined secondary zinc is listed separately in the table.

³Domestic production plus net imports, plus adjustments for Government and industry stock changes.

⁴Apparent consumption of refined zinc plus reported consumption of zinc in metal products and compounds derived directly from ore, concentrate, or scrap.

⁵Special High Grade.

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

(Metric tons)

State	2006	2007
Alaska ²	618,000	641,000
Other ³	81,800	128,000
Total	699,000	769,000

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Data based, in part, on publicly available information.

³Includes production from Idaho, Missouri, Montana, New York, Tennessee, and Washington.

TABLE 3
LEADING ZINC-PRODUCING MINES IN THE UNITED STATES IN 2007, IN ORDER OF OUTPUT¹

Rank	Mine	County and State	Operator	Source of zinc
1	Red Dog	Northwest Arctic, AK	Teck Cominco Alaska Inc.	Zinc-lead ore.
2	Greens Creek	Juneau, AK	Kennecott Greens Creek Mining Co.	Zinc-silver ore.
3	Pend Oreille	Pend Oreille, WA	Teck Cominco American Inc.	Zinc-lead ore.
4	East Tennessee Zinc Complex ²	Jefferson and Knox, TN	Glencore International AG	Zinc ore.
5	Balmat	St. Lawrence, NY	Hudbay Minerals Inc.	Do.
6	Montana Tunnels	Jefferson, MT	Apollo Gold Corp.	Gold ore.
7	Brushy Creek	Reynolds, MO	Doe Run Resources Corp.	Lead ore.

Do. Ditto.

¹The mines on this list accounted for more than 90% of U.S. mine production in 2007.

²Coy, Immel, and Young Mines.

TABLE 4
SLAB ZINC CAPACITY OF PRIMARY ELECTROLYTIC ZINC PLANTS
IN THE UNITED STATES

(Metric tons)

Company	2006	2007
Big River Zinc Corp., Sauget, IL	--	--
Nyrstar Clarksville Inc., Clarksville, TN	115,000	125,000
Total	115,000	125,000

-- Zero.

TABLE 5
STOCKS AND CONSUMPTION OF NEW AND OLD ZINC SCRAP IN THE UNITED STATES
IN 2007, BY TYPE OF SCRAP¹

(Metric tons, zinc content)

Type of scrap	Stocks,		Consumption			Stocks, December 31
	January 1	Receipts	New scrap	Old scrap	Total	
Diecastings	130 ^r	W	--	W	W	W
Flue dust	33 ^r	W	W	W	W	W
Galvanizer's dross	10 ^r	--	--	--	--	--
Old zinc ²	74 ^r	--	--	--	--	74
Remelt die-cast slab	15	W	--	W	W	W
Remelt zinc ³	-- ^r	W	W	--	W	138
Skimmings and ashes ⁴	741 ^r	4,010	4,510	--	4,510	W
Other ⁵	198 ^r	W	W	--	W	W
Total	1,200 ^r	64,600	48,400	16,700	65,100	767

^rRevised. W Withheld to avoid disclosing company proprietary data; included with other. -- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Includes engraver's plates and rod and die scrap.

³Includes new clippings.

⁴Includes slab and die-cast skimmings.

⁵Includes chemical residues and solutions, electrogalvanizing anodes, fragmented diecastings, and steelmaking dust.

TABLE 6
PRODUCTION OF ZINC PRODUCTS FROM
ZINC-BASE SCRAP IN THE UNITED STATES¹

(Metric tons)

Products	2006	2007
Redistilled slab zinc	95,200 ^r	67,300
Other zinc metal products ²	8,290	6,380
Zinc in chemical products	37,400	24,300
Zinc dust	4,880	1,390

^rRevised.

¹Data are rounded to no more than three significant digits.

²Includes electrogalvanizing anodes, remelt die-cast slab, and other metal alloys.

TABLE 7
ZINC RECOVERED FROM SCRAP PROCESSED IN THE UNITED STATES, BY TYPE OF SCRAP AND FORM OF RECOVERY¹

(Metric tons)

	2006	2007
Type of scrap:		
New scrap:		
Zinc-base	139,000	68,400
Copper-base	154,000	139,000
Magnesium-base	632 ^r	19
Total	294,000	207,000
Old scrap:		
Zinc-base	38,400	19,900
Copper-base	8,990 ^r	9,410
Aluminum-base	564	759
Magnesium-base	18 ^r	9
Total	47,900 ^r	30,100
Grand total	342,000 ^r	237,000

^rRevised.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 8
U.S. CONSUMPTION OF ZINC¹

(Metric tons)

	2006	2007
Refined zinc, apparent	1,150,000	1,000,000
Ores and concentrates, zinc content ^e	617	732
Secondary, zinc content ²	246,000 ^r	165,000
Total	1,400,000 ^r	1,170,000

^eEstimated. ^rRevised.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Excludes secondary slab zinc and remelt zinc.

TABLE 9
U.S. REPORTED CONSUMPTION OF ZINC IN 2007, BY INDUSTRY USE AND GRADE¹

(Metric tons)

Industry use	Special	High	Prime	Remelt	Total
	high grade	grade	western	and other grades	
Galvanizing	104,000	67,100	40,300	92,700	304,000
Zinc-base alloys	W	W	W	--	W
Brass and bronze	39,700	W	W	--	39,700
Other	98,500	13,600	28,700	--	141,000
Total	242,000	80,700	69,000	92,700	484,000

W Withheld to avoid disclosing company proprietary data. -- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 10
U.S. EXPORTS OF ZINC ORES AND CONCENTRATES, BY COUNTRY¹

	2006		2007	
	Quantity (metric tons, zinc content)	Value (thousands)	Quantity (metric tons, zinc content)	Value (thousands)
Argentina	14	\$8	--	--
Australia	47,400	50,400	--	--
Belgium	85,600	105,000	45,500	\$53,200
Canada	212,000	384,000	268,000	485,000
China	6,360	19,300	40,300	85,200
Colombia	--	--	1	6
Congo (Brazzaville)	--	--	9,140	5,720
Costa Rica	--	--	1	6
Cote d'Ivoire	49	28	--	--
Dominican Republic	1	12	16	56
El Salvador	9	29	4	11
Finland	36,500	38,700	31,700	65,900
France	25	167	(2)	3
Germany	32,600	34,700	44,900	22,800
Greece	--	--	9,140	2,310
Guyana	6	23	29	123
India	--	--	2	13
Israel	1	10	5	3
Italy	20,400	21,700	33,900	20,200
Jamaica	3	15	2	19
Japan	121,000	129,000	101,000	107,000
Korea, Republic of	141,000	142,000	152,000	218,000
Netherlands	--	--	10	35
Norway	--	--	8	4
Panama	--	--	3	31
Saudi Arabia	--	--	24	49
Spain	123,000	137,000	80,200	105,000
Trinidad and Tobago	3	22	1	4
United Kingdom	15	8	--	--
Venezuela	--	--	17	110
Total	825,000	1,060,000	816,000	1,170,000

-- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 11
U.S. EXPORTS OF ZINC COMPOUNDS¹

	2006		2007	
	Quantity (metric tons, gross weight)	Value (thousands)	Quantity (metric tons, gross weight)	Value (thousands)
Zinc chloride	1,510	\$1,920	1,700	\$2,320
Zinc compounds, n.s.p.f. ^{2, 3}	1,740	3,750	5,830	9,750
Zinc oxide	28,800	47,900	34,900	64,200
Zinc sulfate	42,800	22,500	398	708

¹Data are rounded to no more than three significant digits.

²Not specifically provided for.

³Includes zinc sulfide (Schedule B 2830.20.1000 and 2830.20.2000), chromates of zinc or of lead (Schedule B 2841.20.0000), and lithopone and other pigments and preparations based on zinc sulfide (Schedule B 3206.42.0000).

Source: U.S. Census Bureau.

TABLE 12
U.S. IMPORTS FOR CONSUMPTION OF ZINC COMPOUNDS¹

	2006		2007	
	Quantity (metric tons, gross weight)	Value (thousands)	Quantity (metric tons, gross weight)	Value (thousands)
Lithopone	4,560	\$2,940	3,380	\$2,600
Zinc chloride	1,260	1,780	685	3,110
Zinc compounds, n.s.p.f. ^{2, 3}	31 ^r	78 ^r	93	242
Zinc hydrosulfite	539 ^r	1,480 ^r	1,180	3,530
Zinc oxide	125,000	243,000	117,000	299,000
Zinc sulfate	44,400	34,100	31,900	34,300

^rRevised.

¹Data are rounded to no more than three significant digits.

²Not specifically provided for.

³Includes zinc sulfide (HTS 2830.20.1000 and 2830.20.2000), and chromates of zinc or of lead (HTS 2841.20.0000).

Source: U.S. Census Bureau.

TABLE 13

ZINC: WORLD MINE PRODUCTION (ZINC CONTENT OF CONCENTRATE AND DIRECT SHIPPING ORE UNLESS NOTED), BY COUNTRY^{1,2}

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

Country	2003	2004	2005	2006	2007
Algeria	2,796	231	4,463	4,412 ^r	--
Argentina	29,839	27,220	30,227	29,808 ^r	30,000 ^e
Armenia ^c	3,000	3,000	3,000	2,932 ³	2,585 ³
Australia	1,479,000	1,334,000	1,367,000	1,362,000 ^r	1,518,000
Bolivia	145,490 ^r	147,430 ^r	159,502 ^r	172,747 ^r	214,053 ^p
Bosnia and Herzegovina ^c	300	300	300	902 ^{r,3}	4,485 ³
Brazil	152,822	158,962	171,434	185,000 ^r	194,000 ^p
Bulgaria ^c	18,800 ^r	15,500	17,500	13,476 ^{r,3}	12,206 ³
Burma	127 ⁴	196 ⁴	78 ⁴	46 ^r	10
Canada	788,063	791,373	666,654	637,956 ^r	622,945
Chile	33,051	27,635	28,841 ⁴	36,238 ^r	36,453
China	2,030,000	2,390,000	2,550,000	2,840,000 ^r	2,900,000 ^e
Congo (Kinshasa)	7,911 ^r	8,027 ^r	7,588 ^r	16,831 ^r	17,000 ^e
Finland	39,000	37,000	41,000	35,700	39,000
Georgia ^c	400	400	400	400	400
Greece	3,000	--	--	13,800	15,900
Honduras	43,766	41,413	42,698	37,646	29,211
India ^c	306,400	347,100	477,200	535,500 ^r	572,300
Iran ^c	110,000	121,000	167,000 ^r	164,000 ^r	170,000 ^e
Ireland	419,000	438,000	429,000	425,756 ^r	400,898
Japan	44,574	47,781	41,452	7,169	--
Kazakhstan	393,500 ^r	361,400 ^r	364,300 ^r	404,600 ^r	386,000
Korea, North ^c	60,000	62,000	67,000	67,000	67,000
Korea, Republic of	-- ^e	14	77 ^r	16 ^r	2,034
Laos	850	950	3,410	1,100	1,100 ^e
Macedonia	4,000	--	--	21,672 ^r	61,933
Mexico	413,991	426,360	476,307	432,347 ^r	426,509
Mongolia	--	--	11,400	50,450	70,000
Morocco	69,200	74,600	75,000	73,000	77,300
Namibia ⁵	60,500	66,028 ⁴	68,000 ^e	55,000 ^{r,e}	50,000 ^e
Peru	1,372,790	1,209,006	1,201,671	1,201,794	1,444,354
Philippines	--	--	--	--	7,364
Poland	153,900	140,300	117,200	126,000 ^r	125,000
Portugal	--	--	--	7,505	24,353
Romania	22,081	23,599	13,784	8,052 ^r	849
Russia ^c	159,000	179,000	180,000	190,000	185,000
Saudi Arabia	3,000 ^e	1,500 ^e	-- ^r	983 ^r	716
Serbia	2,200 ^{e,6}	1,300 ⁶	900 ⁶	2,100 ^r	2,200 ^e
South Africa	41,400	32,001 ^r	32,112	34,444	31,061 ^p
Spain	15,100 ^e	--	--	--	--
Sweden	185,884 ^r	197,034 ^r	215,691 ^r	210,029 ^r	214,576
Thailand	37,100 ^{r,e}	43,400 ^r	47,250 ^r	39,700 ^r	33,700 ^e
Tunisia	36,000 ^e	29,011	15,889	--	--
Turkey	33,600 ^r	34,000 ^r	36,000 ^r	60,000 ^r	75,000 ^e
United States	768,000	739,000	748,000	727,000	803,000
Vietnam ^c	45,000	45,000 ^r	48,000	45,000 ^r	46,000
Total	9,530,000 ^r	9,600,000 ^r	9,930,000	10,300,000 ^r	10,900,000

See footnotes at end of table.

TABLE 13—Continued

ZINC: WORLD MINE PRODUCTION (ZINC CONTENT OF CONCENTRATE AND DIRECT SHIPPING ORE UNLESS NOTED), BY COUNTRY^{1,2}

^eEstimated. ^pPreliminary. ^rRevised. -- Zero.

¹World totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.

²Table includes data available through July 1, 2008.

³Reported figure.

⁴Data are for fiscal year ending March 31 of the following year.

⁵Does not include ores sent to solvent extraction-electrowinning plant.

⁶Montenegro and Serbia formally declared independence in June 2006 from each other and dissolved their union.

TABLE 14
ZINC: WORLD SMELTER PRODUCTION, BY COUNTRY^{1,2}

(Metric tons)

Country ³	2003	2004	2005	2006	2007
Algeria, primary and secondary	34,900	36,800	32,000	32,000 ^e	30,000 ^e
Argentina:					
Primary	39,221	35,300	37,227 ^r	42,584 ^r	42,600 ^e
Secondary	3,139	2,837 ^r	2,997 ^r	3,407 ^r	3,400 ^e
Total	42,360	38,137 ^r	40,224 ^r	45,991 ^r	46,000 ^e
Australia:					
Primary ⁴	553,000	473,000	457,300	463,000 ^r	502,000 ^e
Secondary ^c	60,000 ^r	65,000 ^r	75,000 ^r	85,000 ^r	82,000
Total	613,000 ^r	538,000 ^r	532,300 ^r	548,000 ^r	584,000 ^e
Belgium, primary and secondary ^c	244,000	263,000	257,000	251,000 ^{r,5}	241,000 ⁵
Brazil:					
Primary	262,998	265,987	267,374	272,438 ^r	265,126
Secondary ^c	-- ^r	-- ^r	-- ^r	-- ^r	--
Total	262,998 ^r	265,987 ^r	267,374 ^r	272,438 ^r	265,126
Bulgaria, primary and secondary	86,800	101,500 ^r	92,500 ^r	85,900 ^r	95,000 ^e
Canada, primary	761,199	805,438	724,035 ^r	824,464 ^r	802,135
China, primary and secondary ^c	2,320,000	2,720,000	2,780,000	3,170,000	3,710,000
Czech Republic, secondary ^c	250	250	250	250	250
Finland, primary	265,900	284,500	292,000	282,200	305,500
France, primary and secondary	268,000	268,408 ^r	267,524 ^r	120,000 ^r	115,000 ^e
Germany, primary and secondary	388,131	382,020	344,891	342,566 ^r	335,000
India:					
Primary	253,900	238,400	266,200	420,900 ^r	416,800
Secondary ^c	24,000	24,000	23,000	23,000	23,000
Total	277,900	262,400	289,200	443,900 ^r	439,800
Iran	78,428	109,400	120,000 ^{r,e}	140,000 ^{r,e}	150,000 ^e
Italy, primary and secondary	123,000 ^e	118,000 ^r	121,000	109,000	109,000 ^e
Japan:					
Primary	532,704	534,830	536,768	505,532	501,135
Secondary	153,411	132,417	138,453	148,717	96,515
Total	686,115	667,247	675,221	654,249	597,650
Kazakhstan, primary and secondary	316,731 ^r	357,090 ^r	364,821 ^r	364,821 ^r	358,226
Korea, North, primary and secondary ^c	65,000	67,000	72,000	72,000	75,000
Korea, Republic of, primary	644,218	668,666	644,828	662,521	685,694
Laos	-- ^r	-- ^r	-- ^r	--	--
Macedonia, primary and secondary ^c	15,000	--	--	--	--
Mexico, primary	320,364	316,864	327,205	279,734 ^r	321,932
Namibia ⁶	47,436	119,200	132,800	129,900 ^r	150,105
Netherlands, primary	223,000 ⁷	223,950 ^r	224,549 ^r	238,274 ^r	224,838
Norway, primary	142,000	139,000	148,000	160,700	157,000 ^e
Peru, primary	202,076	195,692	163,603	175,250	162,375
Poland, primary and secondary	154,200 ^r	155,500 ^r	137,300 ^r	134,000 ^r	140,000 ^e
Portugal, secondary ^c	3,000	3,000	2,000	-- ^r	--
Romania, primary and secondary	48,000 ^{r,e}	52,746 ^r	57,000 ^e	43,705 ^r	58,342
Russia, primary and secondary ^c	253,000	240,000	220,000	240,000	260,000
Serbia, primary and secondary	62 ⁸	4,000 ^{r,8}	6,000 ^{r,8}	4,000 ^r	4,000 ^e
Slovakia, secondary ^c	-- ^r	-- ^r	-- ^r	-- ^r	--
South Africa, primary	113,000	105,000	104,000	90,000	101,000
Spain, primary and secondary	519,000	525,000	501,000	503,000 ^r	479,000

See footnotes at end of table.

TABLE 14—Continued
ZINC: WORLD SMELTER PRODUCTION, BY COUNTRY^{1,2}

(Metric tons)

Country ³	2003	2004	2005	2006	2007
Thailand, primary	113,686	115,100	101,186	96,469 ^r	98,877
United Kingdom, primary and secondary	16,600	--	--	--	--
United States: ^c					
Primary	185,000	194,000	195,000	113,000	121,000
Secondary	166,000	156,000	156,000	156,000	157,000
Total	351,000	350,000	351,000	269,000	278,000
Uzbekistan, primary ^c	60,000	60,000	35,030 ⁵	45,000 ^r	71,800 ⁵
Grand total	10,100,000 ^r	10,600,000 ^r	10,400,000	10,800,000 ^r	11,500,000
Of which:					
Primary	4,670,000	4,660,000	4,520,000 ^r	4,670,000 ^r	4,780,000
Secondary	410,000 ^r	384,000 ^r	398,000 ^r	416,000 ^r	362,000
Undifferentiated	4,980,000 ^r	5,520,000 ^r	5,510,000 ^r	5,740,000 ^r	6,310,000

^cEstimated. ^rRevised. -- Zero.

¹World 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). To the extent possible, this table reflects metal production at the first measurable stage of metal output. Table includes data available through July 1, 2008.

³In addition to the countries listed, Israel also produces small amounts of secondary zinc, but available information is inadequate to make reliable estimates of output levels.

⁴Excludes zinc dust.

⁵Reported figure.

⁶Special high-grade electrowon cathodes from Anglo American plc's Skorpion solvent extraction-electrowinning plant.

⁷Sales.

⁸Montenegro and Serbia formally declared independence in June 2006 from each other and dissolved their union.