



2006 Minerals Yearbook

ZINC

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In 2006, U.S. production of recoverable zinc was 699,000 metric tons (t), a 3% decrease from that of 2005 (table 1). The value of domestic mine production was approximately \$2.45 billion. Alaska was the dominant producing State, accounting for 88% of production. Zinc was also produced in Idaho, Missouri, Montana, New York, and Washington. Domestic exports of zinc contained in ore and concentrate increased by 5% to 825,000 t in 2006. Exports were predominantly sent to Canada (26%), the Republic of Korea (17%), and Japan and Spain (15%, each) (table 12). Imports for consumption of zinc contained in ores and concentrates rose more than 245% to 383,000 t, mostly from Peru (71%). Total U.S. refined zinc production decreased significantly as a result of the temporary shutdown of the Big River Zinc complex in Sauget, IL. Imports of refined zinc increased 27% to 851,000 t. Refined zinc was imported primarily from Canada (63%) and Mexico (12%). Domestic exports increased to 2,530 t.

Legislation and Government Programs

A U.S. stockpile of zinc for national defense purposes has been maintained for more than 60 years. In 1992, Public Law 102-484 was signed, which authorized the disposal of the entire inventory of zinc from the National Defense Stockpile (NDS). In 2006, the Defense Logistics Agency (DLA), which maintains the NDS, was authorized to sell 50,000 t of zinc (October 1, 2005, to September 30, 2006) (U.S. Department of Defense, 2006, p. 7). The stockpile inventory on December 31, 2005, was 45,100 t, while the inventory at yearend 2006 was 15,300 t, all of which was authorized for disposal.

On December 20, the U.S. Mint issued an interim rule limiting the exportation, melting, and treatment of the penny and nickel coins. High copper, nickel, and zinc prices caused the metal values of these coins to exceed their monetary values. The U.S. Mint had also received many public inquiries during the last few months of 2006 regarding the legality of melting coins. According to the U.S. Mint Director, replacing melted coins would result in significant costs to taxpayers. The final rule was issued on April 17, 2007 (U.S. Mint, 2007).

Production

Mine.—In 2006, zinc was produced at 11 mines in 6 States with Alaska being the leading zinc-producing State. Other zinc-producing States included Idaho, Missouri, Montana, New York, and Washington. Domestic mine production of recoverable zinc in 2006 decreased by 7% to 699,000 t from that of 2005 and accounted for approximately 7% of global mine production. Decreases in production of recoverable zinc occurred in Alaska, Montana, and Washington.

Teck Cominco Alaska Inc. (a subsidiary of Teck Cominco Limited, Vancouver, British Columbia, Canada) operated the Red Dog zinc-lead mine in northwest Alaska under a royalty agreement with NANA Regional Corporation, Inc., an Alaskan Native-owned corporation. Despite increased mill throughput, lower ore grades resulted in production falling to 558,000 t in 2006 from 568,000 t in 2005. Twenty-five percent of Red Dog's zinc concentrates were refined at Teck Cominco's metallurgical operations at Trail, British Columbia, Canada. Remaining concentrates were sent to Asia and Europe. All concentrates were shipped within Red Dog's 2006 shipping season despite a severe ice storm in the third quarter. Total reported ore reserves at yearend were 68.7 million metric tons (Mt) averaging 17.5% zinc. Zinc production for 2007 was projected to be the same level as that in 2006. Aggressive drill programs were proposed to find new resources at Red Dog during the next year (Teck Cominco Limited, 2007, p. 18, 57, 107).

Kennecott Greens Creek Mining Co., owned by Kennecott Minerals Company, Salt Lake City, UT (70.3%) and Hecla Mining Company, Coeur d'Alene, ID (29.7%), operated the Greens Creek Mine, a polymetallic (silver-zinc-gold-lead) massive sulfide deposit located on Admiralty Island in the Tongass National Forest near Juneau, AK. Products included gold and silver dore, as well as lead and zinc concentrates, which were sold to smelters globally. Zinc in concentrate production fell to 47,500 t, an 11% decrease from that of 2005 owing to a major rehabilitation project that reduced production levels during 2006. The mill throughput rate was expected to increase in 2007 after the rehabilitation project was complete. At yearend 2006, proven and probable reserves were estimated to be 7.0 Mt grading 10.4% zinc (Hecla Mining Company, 2007, p. 15; Rio Tinto plc., 2007, p. 25, 45, 50).

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 Company (AEL&P) to reach Greens Creek's facilities. AEL&P's hydroelectric power was expected to replace 20% to 30% of the diesel-generated power through 2008. Once AEL&P finishes constructing a new hydroelectric plant, 95% of Greens Creek's power needs were expected to be supplied by AEL&P (Hecla Mining Company, 2007, p. 15-16).

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 in 2006 were sent to Teck Cominco's metallurgical operations at Trail for processing. Zinc in concentrate production at Lucky Friday increased by 60% to 5,930 t in 2006 owing to increased mill throughput and metal recoveries. Mill upgrade activities during 2006 included increased flotation capacity, a third-stage

crushing system, a new flash cell, new column cells, and new concentrate thickeners, and in 2007 additional upgrades were expected to improve recovery rates further at the mill. In 2006, zinc recovery was 80.7%. At yearend 2006, total reserves contained 35,500 t of zinc (Hecla Mining Company, 2007, p. 13-14).

Apollo Gold Corporation's (Greenwood Village, CO) Montana Tunnels open pit gold mine, near Helena, MT, recovered approximately 1,380 t of zinc in concentrate during 2006. Zinc concentrates were sent to various smelters worldwide under annual contracts. In October 2005, the mine had closed owing to decreasing revenue and increasing operating costs; however, concentrate continued to be produced from stockpiles of ore. On May 12, 2006, production of concentrate ceased, and the mine was put under care-and-maintenance status. In August, Apollo Gold entered into a joint venture with Elkhorn Tunnels, LLC and announced plans to remediate the mine. Production was targeted to resume in late February or early March 2007 (Apollo Gold Corporation, 2007, p. 1).

In May, Hudbay Minerals Inc. (Winnipeg, Manitoba, Canada) began preproduction of zinc concentrate at the Balmat No. 4 zinc mine in upstate New York, and by yearend had produced 10,000 t of zinc in concentrate. Preproduction at Balmat ramped up more slowly than anticipated owing to difficulties in recruiting skilled labor. Balmat's concentrates were treated at the Canadian Electrolytic Zinc (CEZinc) refinery in Montreal, Quebec, Canada. Commercial production was anticipated to begin in early 2007, and annual production for the year was forecast to be about 35,000 t of zinc in concentrate. In 2008, Balmat was expected to reach full production capacity of 60,000 metric tons per year (t/yr) of zinc in concentrate. Total reserves on December 31 measured 2.1 Mt with proven reserves grading 10.1% zinc and probable reserves grading 11.4% zinc (HudBay Minerals Inc., 2007, p. 23, 30).

On May 19, Asarco LLC (Tucson, AZ) sold the Coy, Immel, and Young underground zinc mines (formerly known as the Tennessee Mines Division) to Glencore International AG (Baar, Switzerland). Mining operations were indefinitely suspended by Asarco in November 2001 following a sustained period of low zinc prices. The mines were again considered viable owing to zinc's high market prices. Historically, the three mines reportedly produced nearly 56,800 metric tons per year (t/yr) of zinc in concentrate. The Young site included a division warehouse, machine shop, mill (6,890 metric tons per day of capacity), and tailings pond. Glencore was expected to resume mining operations under the subsidiary East Tennessee Zinc Company, LLC (Asarco, Inc., 2001; Mining Engineering, 2007).

Teck Cominco American Inc. (a subsidiary of Teck Cominco Limited) operated the Pend Oreille zinc-lead mine in northeast Washington. In 2006, zinc in concentrate production was 34,000 t, a 24% decrease from 45,000 t in 2005. Reduced production was attributed to the implementation of a revised ground control plan. In 2007, production was projected to increase to 45,000 t of zinc in concentrate. All concentrates were sent to Teck Cominco's metallurgical operations at Trail, 80 kilometers from the mine. At yearend 2006, reserves at Pend Oreille measured 2.7 Mt grading 6.4% zinc. Reserves were substantially lowered owing to changes in mine design, revised ore grades,

and higher operating cost assumptions, offset by higher metal price projections. Teck Cominco developed a revised mine plan and reserve model for Pend Oreille as a result of a significant difference in zinc grade between the ore reserve model and mill feed. In 2007, additional drilling and exploration was expected to take place within the immediate vicinity of the mine (Teck Cominco Limited, 2007, p. 19, 107).

Smelter.—In 2006, refined zinc was mainly produced in two States—Pennsylvania (Horsehead Holding Corp.'s Monaca plant) and Tennessee (Zinifex Clarksville, Inc.). Zinifex Limited's (Melbourne, Australia) Clarksville refinery, in Montgomery County, TN, produced both Special High Grade (SHG) and Continuous Galvanizing Grade zinc metal. Concentrates were sourced from Australia, Central America, Ireland, and South America. Historically, concentrates were obtained from Pasminco Ltd.'s Gordonsville and Clinch Valley Mines in Tennessee, which were closed in 2003 and 2004, respectively. Zinc metal production rose by 5% to 121,500 t for the 2005-06 fiscal year ending June 30, 2006. A record-high level for the Clarksville refinery, the increased output was attributed to a greater availability of concentrates. By yearend 2006, half-year production fell compared with that of yearend 2005 owing to planned and unplanned maintenance. In fiscal year 2006-07, Zinifex planned to increase capacity by improving moisture control and raw material blending at the refinery (Zinifex Limited, 2007a, p. 27; 2007b).

Horsehead produced zinc and zinc-based products including zinc metal (primarily Prime Western grade and to a lesser extent, Special Special High Grade), zinc oxide, and zinc- and copper-based powders. The majority of Horsehead's feedstock was secondary material. By yearend 2007, Horsehead planned to construct and begin operating an additional kiln that would have the capacity to recycle 72,600 t/yr of electric arc furnace (EAF) dust. Horsehead also planned to increase zinc smelter production from 127,000 t/yr to 159,000 t/yr by yearend 2008 through the construction of an additional smelter furnace. The company planned to increase zinc oxide production capacity in response to an anticipated expansion of the zinc oxide market (Horsehead Holding Corp., 2007, p. 49).

In June, ZincOx Resources plc (Surrey, United Kingdom) acquired Big River Zinc Corporation (BRZ) (Sauget, IL) from Korea Zinc Co., Ltd. (Seoul, Republic of Korea). According to ZincOx, BRZ's electrolytic refinery was shuttered in early 2006 owing to recent mine closures and the increasing cash price of high-purity zinc concentrate. In early 2007, ZincOx completed prefeasibility studies on an integrated U.S. zinc and iron recycling project, which included constructing a new facility in Ohio and modifying the BRZ refinery. The facility in Ohio would treat EAF dust in a rotary hearth furnace to produce lead and zinc in an oxide concentrate (HZO) and direct reduced iron (DRI). The DRI would be melted into slag and pig iron, which would be sold back to industry. The HZO would be sent to BRZ, where it would be dissolved in a leach plant and then purified in a solvent extraction circuit to recover other valuable metals. BRZ was designed to produce 90,000 t/yr of SHG zinc, and the Ohio facility was designed to treat 200,000 t/yr of EAF dust. The refurbishment of BRZ and the construction of the Ohio

plant reportedly were expected to be completed in 2008 (ZincOx Resources plc, 2007).

Consumption

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 56% of apparent consumption. Zinc-base alloy accounted for 21% of consumption; brass and bronze, 15%; other uses, 8%.

U.S. zinc consumption declined after mid-2006 owing to a slowdown of the U.S. automotive industry and construction sector. Growing inventory levels at motor vehicle dealers and construction-related manufacturing industries led to cutbacks in production to better adjust inventory levels with sales. According to the Federal Reserve Board, motor vehicle production declined by 6.5% in 2006 from that of 2005 (Federal Reserve Board, 2006; 2007). Zinc availability in the United States increased during this time as integrated steel mills reduced crude steel output and zinc producers destocked at yearend. According to the American Iron and Steel Institute, U.S. crude steel production fell to a weekly low for the year in late November (Platts Metals Week, 2006b).

Prices and Stocks

For the third consecutive year, there was a production deficit for the global zinc market. As a result, zinc prices rose significantly. The annual average London Metal Exchange (LME) cash price for SHG zinc in 2006 was \$3,274.42 per metric ton, an increase of 129% from that of 2005. Average monthly prices generally rose throughout 2006, increasing sharply in the months of April, May, and November. Some zinc consumers in the U.S. steel industry responded to high zinc prices by raising prices for zinc coatings.

The annual average U.S. producer price for SHG zinc in 2006, which was based on the LME daily cash price plus a premium, increased by 137% to 158.89 cents per pound (table 1). Monthly average North American SHG premiums increased significantly during the first half of the year. The rise in North American SHG premiums was attributed to elevated freight costs, logistical issues, and supply shortages partly owing to the closure of BRZ and the temporary outage at Grupo Mexico S.A.B. de C.V.'s zinc refinery in San Luis Potosi, Mexico.

The price rise correlated to a rapid drawdown of LME inventories. Stocks of SHG zinc declined during the first 11 months of 2006 from 393,550 t in early January to 85,200 t in late November. At yearend, stocks totaled 90,500 t, the majority of which (64%) was held in New Orleans, LA. According to the International Lead and Zinc Study Group, global stocks (Western World) of refined zinc at yearend were approximately 548,000 t, equivalent to 4 weeks of global consumption (International Lead and Zinc Study Group, 2007b, p. 47).

World Industry Structure

Globally, growth in demand for zinc continued to outpace refined production in 2006, which was constrained by a

shortage of concentrates. China, the leading consumer of refined zinc, accounted for approximately 30% of global refined zinc consumption in 2006. The United States, the second leading consumer, accounted for approximately 10% of world consumption. Of the major consuming countries, Belgium, China, France, Germany, India, the Republic of Korea, and the United States increased consumption in 2006; Italy, Japan, and Taiwan decreased consumption. At a regional level, zinc consumption increased in all regions of the world, except Africa (International Lead and Zinc Study Group, 2007b, p. 40-41).

World mine production rose to 10 Mt in 2006. Leading producers of concentrate were, in descending order, China, Australia, and Peru. Global refined production rose to 10.6 Mt. The leading global producers of refined zinc were China, Canada, and the Republic of Korea.

In December, N.V. Umicore S.A. (Brussels, Belgium) and Zinifex signed a memorandum of understanding to combine their zinc smelting and alloying businesses. Their joined entities reportedly would produce 1.2 million metric tons per year (Mt/yr) of zinc and zinc alloys, resulting in the creation of the world's leading zinc metal producer. The new company would allow Umicore to shift its focus more towards its materials technology business, while expanding and diversifying Zinifex's refining and smelting business. A binding business agreement was scheduled to be signed in first quarter 2007, and the new company was expected to be formed by third quarter 2007 (Zinifex Limited, 2006).

During 2006, Canadian mining company Falconbridge Limited (Toronto, Ontario, Canada), owner of the Brunswick and Kidd Creek zinc-producing mines and the Kidd Creek refinery, was the object of several takeover proposals. In October 2005, Inco Limited (Toronto, Ontario, Canada) offered a friendly takeover bid to acquire Falconbridge, which was extended through June 30, 2006, to allow time for regulatory approval in Europe and the United States. Meanwhile, Teck Cominco and Xstrata plc (Zug, Switzerland) announced unsolicited bids to purchase Inco and Falconbridge. On June 26, Phelps Dodge Corporation (Phoenix, AZ) announced that it would purchase all outstanding shares of Inco. As part of the terms of the transaction, Phelps Dodge would also purchase up to \$3 billion of convertible subordinated notes issued by Inco to help Inco acquire Falconbridge. On November 1, however, Xstrata completed its acquisition of all outstanding shares of Falconbridge (Falconbridge Limited, 2006).

World Review

Australia.—According to the Australian Bureau of Agricultural and Resource Economics estimates, in the Australian 2005-06 fiscal year ending June 30, 2006, zinc in concentrate production increased 2% to 1.38 Mt, as a result of higher output at BHP Billiton plc's (Melbourne) Cannington Mine and Oxiana Limited's (Melbourne) Golden Grove Mine. Refined zinc production in 2005-06 decreased by 4% to 446,000 t, mostly owing to a scheduled maintenance shutdown at Zinifex's Hobart refinery (Kendall, 2006, p. 84).

The McArthur River zinc-lead mine located in the Northern Territory was operated by McArthur River Mining Pty. Ltd., a

subsidiary of Xstrata. By yearend 2005, most of the accessible underground ore had been extracted. In August 2005, Xstrata drafted an environmental impact statement outlining plans to convert the underground mine into an open pit operation. Conversion to an open pit mine would increase mill throughput from 1.6 Mt/yr to 1.8 Mt/yr of ore and allow Xstrata to continue mining at the site for an additional 25 years. The Northern Territory's Minister for Environment and Heritage initially rejected the conversion plan in February 2006, but in October the Northern Territory's Minister for Mines and Energy gave approval for the conversion. In 2006, McArthur River produced 136,000 t of zinc in concentrate, a 12% decrease from that of 2005 (McArthur River Mining Pty. Ltd., 2006; Northern Territory Government, 2006; Xstrata plc, 2007a, p. 104).

Xstrata's Mount Isa zinc operations in Queensland produced 210,000 t of zinc in concentrate in 2006. In August, Xstrata announced plans to refurbish the zinc-lead concentrator at Mount Isa by 2008. The refurbishments would increase throughput capacity by 60% above current levels to 8 Mt/yr of ore resulting in an output of 800,000 t/yr of zinc concentrate, which, according to Xstrata, would make Mount Isa the world's third leading zinc operation in 2008. Xstrata planned to increase ore production at the George Fisher and Black Star Mines to provide sufficient feed for the revamped concentrator (Xstrata plc, 2006; 2007a, p. 104).

In 2007, new mines were expected to start up. Concentrate production at Teck Cominco and Xstrata's Lennard Shelf operations located in the Kimberley region of Western Australia was expected to restart in January 2007, with shipments beginning in the second quarter. Annual production from Lennard Shelf was projected to be 75,000 t of zinc and 15,000 t of lead in concentrate during the mine life of 4 years. Reserves at the deposit were 3.0 Mt grading 7.3% zinc (Teck Cominco Limited, 2007, p. 19, 107). Jabiru Metals Limited (West Perth, Western Australia) anticipated production to begin from the Jaguar project near Leonora, Western Australia, during 2007, once construction of the concentrator was complete. Probable reserves at the deposit were 1.6 Mt grading 11.3% zinc (Jabiru Metals Limited, 2007, p. 7, 9).

Bolivia.—Construction at Apex Silver Mines Limited's (Grand Cayman, Cayman Islands, British West Indies, 65%) and Sumitomo Corporation's (Tokyo, Japan, 35%) San Cristobal silver-zinc-lead project in the Potosi District of southwestern Bolivia was 90% complete by yearend 2006. Initial commercial production was anticipated to begin in the third quarter of 2007. Production was forecast to average 225,000 t/yr of payable zinc during the first 5 years of operation and 166,000 t/yr during the entire 17-year mine life. During the first 5 years of operation, concentrates will be sold under long-term agreements to 13 smelters located in Asia, Australia, and Europe. After 5 years, the remaining output was expected to be sold on a spot basis (Apex Silver Mines Limited, 2007, p. 4, 7, 8).

Canada.—In 2006, Canada produced 594,000 t of recoverable zinc in concentrate, with the majority of concentrate from the Provinces of Manitoba, Nova Scotia, and Ontario (Natural Resources Canada, 2006). Canada was the second leading global producer of refined zinc and an important exporter of the metal to the United States. Exports of refined zinc totaled

629,000 t in 2006, of which 90% was sent to the United States. Refined metal production increased by 14% in 2006 to 824,000 t as a result of considerable rises in zinc metal output at Teck Cominco's metallurgical complex at Trail and Xstrata's Kidd Creek hydrometallurgical plant in Timmins, Ontario. Kidd Creek produced 144,000 t of refined zinc in 2006, a 21% increase from that of 2005, when production had been reduced by labor unrest. Trail produced 296,100 t of zinc, an increase of 33% from production in 2005. Zinc metal production in 2007 was forecast to be unchanged from the 2006 level (Natural Resources Canada, 2006; Teck Cominco Limited, 2007, p. 28-29; Xstrata plc, 2007a, p. 89, 104).

In 2006, several zinc properties were under development. Aur Resources' (Toronto, Ontario) Duck Pond copper-zinc mine located in central Newfoundland was anticipated to produce approximately 34,500 t/yr of zinc during a 4-year period from 2007 to 2011. Breakwater Resources Ltd.'s (Toronto, Ontario) Langlois zinc-copper-silver mine northeast of Lebel-sur-Quevillon, Quebec, was expected to produce 28,300 t of payable zinc in 2007 after commercial production begins at midyear (Breakwater Resources Ltd., 2007, p. 5-6). Preproduction of concentrate at Acadian Gold Corporation's (Halifax, Nova Scotia) Scotia zinc-lead mine began in 2006, and 2007 production was expected to range between 7,300 t/yr and 9,100 t/yr of payable zinc (Acadian Gold Corporation, 2007, p. 14). Blue Note Mining Inc.'s (Montreal, Quebec) Caribou zinc-lead mine located near Bathurst, New Brunswick, was expected to be ready for production by early in the second quarter of 2007. Production was estimated to be more than 45,400 t/yr of zinc in concentrate. During a 5-year mine life, Caribou was expected to produce approximately 216,000 t (476 million pounds) of zinc (Robertson, 2006). In 2006, Xstrata began development of the Perseverance zinc-lead deposit in northern Quebec. Production from the mine was scheduled to begin in the third quarter of 2008. During a 5-year mine life, Perseverance's output reportedly would be 228,000 t/yr of zinc concentrate (Xstrata plc, 2007b, p. 44).

China.—China produced approximately 3.1 Mt of refined zinc in 2006, a 12% increase from 2.78 Mt in 2005. The leading Chinese producers of refined zinc included, in descending order of production, Zhuzhou Smelter Group Co., Ltd. (Hunan Province), Huludao Zinc Industry Co. (Liaoning Province), and Yunnan Chihong Zinc and Germanium Co., Ltd. (Yunnan Province) (Beijing Antaike Information Development Co. Ltd., 2007). Several new startups and expansions in 2006 contributed to China's significant year-on-year increase in refined metal production. Yunnan Chihong Zinc planned to increase zinc metal output by 75% in 2006 to 140,000 t as a result of the startup of a new 100,000-t/yr smelter. The new smelter would expand the company's overall zinc production capacity to 160,000 t/yr (Mok, 2006b). Shaanxi Baoji Dongling Group began commercial production from a new 100,000-t/yr zinc ingot line, also raising overall zinc production capacity to 160,000 t/yr. The company had also planned to expand an old zinc ingot line by 50,000 t/yr in 2007 (Mok, 2006a). Huludao Zinc Industry planned to commission a new Imperial Smelting Process blast furnace in late June. The new furnace was to increase Huludao's zinc production by 60,000 t/yr and raise the

company's zinc production capacity by 18% to 390,000 t/yr, rivaling Zhuzhou as the leading producer of zinc metal in China (Metal Bulletin, 2006a). Bayanur Zijin Nonferrous Co. began producing zinc from its 100,000-t/yr smelter in late May (Metal Bulletin, 2006b).

According to the International Lead and Zinc Study Group's statistics, China consumed 3.2 Mt of refined zinc in 2006, a 5% increase from that in 2005. This is a flatter rate of increase compared with that of the previous 2 years; year-on-year consumption increased by 25% in 2004 and 13% in 2005 (International Lead and Zinc Study Group, 2007b, p. 40). Galvanizing was the main end use of zinc in China. In 2006, China produced more than 13 Mt of galvanized sheet, a 46% increase from production in 2005. Production of zinc diecastings, however, decreased 7% in 2006, which was attributed to aluminum substitution for zinc in the die-casting industry as a result of high zinc prices (Juncong, 2007).

China's imports of zinc concentrates increased 46% to 828,000 t in 2006 from that of 2005. Refined zinc imports decreased 19% to 318,000 t, while exports increased 164% to 325,000 t, switching China back to a net exporter of refined zinc metal in 2006 (China Economic Information Center, 2007).

India.—Demand for refined zinc in India had been expected to increase 8% to 10% per year as India's real gross domestic product, industrial production, and infrastructure grow at similar rates. However, consumption increased by only 5.6% during India's 2004-05 financial year and 6.1% during 2005-06. High zinc prices caused galvanizers in India to seek alternative coating materials. Currently, galvanizing accounts for 75% of India's zinc consumption; 10% was consumed in dry-cell battery manufacturing; 10%, chemicals; and 5%, die casting (Vedanta Resources plc, 2006, p. 17; Metal Bulletin.com, 2007).

In September, Hindustan Zinc Limited (a subsidiary of Vedanta Resources plc, London, United Kingdom), India's sole integrated zinc producer, announced a phase II expansion plan that included constructing a second Chanderiya zinc smelter (capacity of 170,000 t/yr of zinc) with matching increases in concentrate production at the Rampura Agucha zinc-lead mine. The zinc smelter was expected to be commissioned by 2008. The phase II expansion should raise Hindustan Zinc's refined zinc capacity to 411,000 t/yr. Ninety-six percent of Hindustan Zinc's refined zinc was sold to consumers in India (Hindustan Zinc Limited, 2006; Vedanta Resources plc, 2006, p. 17).

Japan.—Several Japanese steel mills planned to raise their zinc-coated steel capacity in late 2006 and early 2007, possibly increasing the industry's overall zinc demand by 10%. In December, Sumitomo Metal Industries, Ltd. (Osaka) finished constructing a new 360,000-t/yr galvanizing line at its Kashima Steel Works facility. Nippon Steel Corporation (Tokyo) began production at hot-dip galvanizing lines at the Kimitsu, Nagoya, and Hirohata Works facilities during its 2006 fiscal year. JFE Steel Corporation (Tokyo) planned to commission a new 600,000-t/yr continuous galvanizing line at its West Japan Works facility in early 2007 (Sumitomo Metal Industries, Ltd., 2006; Watanabe, 2006; JFE Steel Corporation, 2007; Nippon Steel Corporation, 2007, p. 2).

Mexico.—In January, Grupo Mexico S.A.B. de C.V. declared a force majeure at its zinc refinery located in the city of San Luis

Potosi after a fire occurred in the power substation. Operations restarted at 50% capacity during the second quarter of 2006 and returned to full capacity (104,000 t/yr) in October. Grupo Mexico reportedly supplies the San Luis Potosi zinc refinery with approximately 200,000 t of the 270,000 t of concentrate it produces each year (Platts Metals Week, 2006a; Southern Copper Corporation, 2007, p. A34).

Peru.—According to Peru's Ministry of Energy and Mines, 2006 production of zinc in concentrate was approximately 1.2 Mt, a marginal decrease in output from that of 2005. Peru's leading zinc producer was Volcan Compania Minera S.A.A., which owned several zinc-lead mines located in the regions of Pasco and Junin in central Peru. By yearend 2006, Volcan produced 295,200 t of zinc in concentrate, including output from its subsidiaries Empresa Administradora Chungar S.A.C. and Empresa Explotadora de Vinchos Ltda. S.A.C. (Ministerio de Energia y Minas, 2007, p. 46).

Compania Minera Antamina S.A., jointly owned by BHP Billiton (33.75%), Xstrata (33.75%), Teck Cominco (22.5%), and Mitsubishi Ltd. (10%), operated the Antamina copper-zinc mine, which is located in the north central Peruvian Andes. Mine output in 2006 totaled approximately 156,000 t of zinc. A concentrator expansion, which will increase mill throughput capacity by 10%, was approved in November and was expected to be commissioned in January 2008 (Xstrata plc, 2007a, p. 79, 105).

Portugal.—In May, EuroZinc Mining Corporation (Vancouver, British Columbia, Canada) announced plans to reopen the Aljustrel zinc-lead-silver underground mine in mid-2007 following completion of the mill refurbishment. Located in southern Portugal, Aljustrel (operated under the subsidiary Pirites Alentejanas, S.A.) was placed on care-and-maintenance status in 2005. Average production of zinc in concentrate was expected to be approximately 80,000 t/yr during a 10-year mine life (EuroZinc Mining Corporation, 2006).

Russia.—Chelyabinsk Zinc Plant OJSC (CZP) was Russia's leading producer of refined zinc in 2006, accounting for 60% of the country's zinc metal production. In an effort to increase its vertical integration, CZP acquired Nova Zinc in August. Nova Zinc operated the Akzahl lead-zinc mine in the Shetskiy District in Kazakhstan, and from 2001 to 2004, the mine produced an average of 38,000 t/yr of zinc in concentrate (Chelyabinsk Zinc Plant OJSC, 2006). In January 2007, CZP also signed a license agreement with the Russian Federal Agency for Subsoil Use to explore and develop the Amurskoye deposit in the Bredinsky District of Kazakhstan, which reportedly would produce 30,000 t of zinc in concentrate by 2010 with a further increase in production to 50,000 t in 2011 (Chelyabinsk Zinc Plant OJSC, 2006; 2007b).

In November 2005, IFC Metropol established an international mining consortium to finance the development of several lead and zinc deposits in Russia. IFC Metropol's East-Siberian Metals Corporation had already begun to develop several polymetallic ore deposits located in the Republic of Buryatia, including the Ozernoye lead-zinc deposit, the Kholodninskoye lead-zinc deposit, and the Nazarovskoye gold-zinc deposit. These deposits reportedly contain 47% of Russia's zinc reserves and 24% of its lead reserves. Financial groups from Europe,

Japan, and Russia were expected to participate in the project's development (Interfax Ltd., 2006).

Zinc consumption in Russia was expected to double in the next 5 years, according to CZP's Commercial Director. Automotive vehicle production was expected to double by 2015, and construction volumes were expected to increase by more than 50% by 2010. In 2006, Russia consumed 174,000 t of zinc, and more than 60% of this total was used to produce galvanized steel, most of which was used in Russia's automobile and construction sectors (Chelyabinsk Zinc Plant OJSC, 2007a).

Outlook

Global consumption of zinc was forecast to rise by 3% in 2007 to 11.38 Mt. In China, consumption of refined zinc was forecast to increase by 8.8% in 2007 and 12.1% in 2008 owing to strong demand from galvanizers as new galvanizing lines begin operating in 2007. Consumption was also forecast to rise in India and in Europe, primarily driven by increases from Belgium and Italy (International Lead and Zinc Study Group, 2007a).

On the supply side, global zinc mine production was forecast to rise 7.4% to 11.2 Mt owing to increases in production in Australia, Bolivia, Brazil, Canada, China, India, Ireland, Kazakhstan, Mexico, Peru, Portugal, and the United States. Zinc mine production in the United States is expected to increase during the next few years owing to several mine restarts. Glencore was expected to reopen the Coy, Immel, and Young zinc mines in eastern Tennessee by midyear 2007. Strategic Resource Acquisition Corporation (Toronto, Ontario, Canada) planned to reopen the Cumberland, Elmwood, and Gordonsville zinc mines in central Tennessee by yearend 2007. The zinc mines in eastern and central Tennessee were shut down by their previous owners owing to low zinc prices. Global refined zinc production was forecast to rise by 5.9% to 11.3 Mt. Rising refinery production will continue to be driven by increases in production from China and India (International Lead and Zinc Study Group, 2007a). Overall, the global supply deficit for refined zinc was forecast to continue into 2007. However, it was expected to narrow from that of 2006, and a supply surplus was forecast for 2008.

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TABLE 1
SALIENT ZINC STATISTICS¹

	2002	2003	2004	2005	2006	
United States:						
Production:						
Domestic ores, contained zinc	metric tons	784,000 ^r	768,000	739,000	748,000	727,000
Domestic ores, recoverable zinc	do.	754,000 ^r	738,000	715,000	720,000	699,000
Value, recoverable zinc	thousands	\$643,000 ^r	\$661,000	\$827,000	\$1,070,000	\$2,450,000
Refined zinc:						
From domestic and foreign ores and concentrates ^c	metric tons	192,000 ^r	185,000 ^r	194,000 ^r	195,000 ^r	113,000
From scrap ^e	do.	171,000 ^r	166,000 ^r	156,000 ^r	156,000 ^r	156,000
Total	do.	362,000 ^r	351,000 ^r	350,000 ^r	351,000 ^r	269,000
Secondary zinc ²	do.	253,000	265,000	241,000	241,000 ^r	241,000
Exports:						
Ores and concentrates, zinc content	do.	822,000	841,000	745,000	786,000	825,000
Refined (slab) zinc	do.	1,160	1,680	3,300	784 ^r	2,530
Zinc plates, sheets, strip, and foil	do.	7,200	9,430	9,770	8,760	3,780
Imports for consumption:						
Ores and concentrates, zinc content	do.	122,000	164,000	231,000	156,000	383,000
Refined (slab) zinc	do.	874,000	758,000	812,000	668,000	851,000
Zinc plates, sheets, strip, and foil	do.	1,640	1,790	2,500	3,630	2,050
Stocks of slab zinc, December 31, producer and consumer	do.	69,800 ^r	63,500 ^r	62,700 ^r	60,900 ^r	56,400
Government stockpile	do.	112,000 ^r	95,200	66,400	46,000	15,300
Consumption, refined zinc:						
Reported	do.	510,000 ^r	520,000 ^r	524,000 ^r	500,000 ^r	504,000
Apparent ³	do.	1,170,000	1,120,000 ^r	1,190,000 ^r	1,050,000 ^r	1,150,000
All classes ⁴	do.	1,420,000	1,390,000 ^r	1,430,000 ^r	1,290,000 ^r	1,390,000
Price⁵						
North American	cents per pound	38.64	40.63	52.47	67.14 ^r	158.89
London Metal Exchange, cash	do.	35.31	37.53	47.51	62.66	143.53
World:						
Production:						
Mine	thousand metric tons	8,880 ^r	9,520 ^r	9,590 ^r	9,930 ^r	10,000 ^e
Smelter	do.	9,840 ^r	9,980 ^r	10,500 ^r	10,400 ^r	10,600

^eEstimated. ^rRevised.

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 or minus 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	2005	2006
Alaska ²	628,000	618,000
Other ³	92,100	81,800
Total	720,000	699,000

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, and Washington.

TABLE 3
LEADING ZINC-PRODUCING MINES IN THE UNITED STATES IN 2006, IN ORDER OF OUTPUT

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 ore.
3	Pend Oreille	Pend Oreille, WA	Teck Cominco American Inc.	Zinc-lead ore.
4	Brushy Creek	Reynolds, MO	Doe Run Resources Corp.	Lead ore.
5	Balmat	St. Lawrence, NY	Hudbay Minerals Inc.	Zinc ore.
6	Buick	Iron, MO	Doe Run Resources Corp.	Lead ore.
7	Fletcher	Reynolds, MO	do.	Do.

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

(Metric tons)

Company	2005	2006
Big River Zinc Corp., Sauget, IL	90,000 ^r	--
Zinifex Clarksville Inc., Clarksville, TN	110,000 ^r	115,000
Total	200,000 ^r	115,000

^rRevised. -- Zero.

TABLE 5
STOCKS AND CONSUMPTION OF NEW AND OLD ZINC SCRAP IN THE UNITED STATES
IN 2006, 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	184 ^r	W	--	W	W	W
Flue dust	33 ^r	W	W	W	W	W
Galvanizer's dross	2,830	41,000	41,000	--	41,000	W
Old zinc ²	63 ^r	159	--	132	132	90
Remelt die-cast slab	53	W	--	W	W	W
Remelt zinc ³	514 ^r	W	W	--	W	514
Skimmings and ashes ⁴	739	22,900	22,900	--	22,900	W
Other ^{5,6}	262 ^r	W	W	--	W	W
Total	4,680 ^r	184,000	144,000	39,900	184,000	4,550

^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.

⁶Withheld to avoid disclosing company proprietary data.

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

(Metric tons)

Products	2005	2006
Redistilled slab zinc	113,000 ^r	104,000
Other zinc metal products ²	7,070	8,290
Zinc in chemical products	42,800 ^r	37,400
Zinc dust	5,020	4,880

^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)

	2005	2006
Type of scrap:		
New scrap:		
Zinc-base	149,000	139,000
Copper-base	154,000 ^r	154,000
Magnesium-base	163 ^r	161
Total	303,000 ^r	294,000
Old scrap:		
Zinc-base	40,100	38,400
Copper-base	10,100 ^r	8,870
Aluminum-base	482 ^r	564
Magnesium-base	8 ^r	8
Total	50,700 ^r	47,800
Grand total	354,000 ^r	341,000
Form of recovery:		
Metal:		
Slab zinc	113,000 ^r	95,200
Zinc dust	5,020	4,880
Other	2,270	1,960
Total	120,000 ^r	102,000
In brass and bronze	156,000 ^r	154,000
In other metal	4,790	6,330
In chemical products:		
Zinc oxide (lead free)	15,600	15,600
Zinc sulfate	23,100	19,900
Zinc chloride	311	--
Other zinc chemicals	3,770	1,900
Total	203,000 ^r	198,000
Grand total	323,000 ^r	300,000

^rRevised. -- Zero.

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)

	2005	2006
Refined zinc, apparent	1,050,000 ^r	1,150,000
Ores and concentrates, zinc content ^c	617	617
Secondary, zinc content ²	241,000 ^r	241,000
Total	1,290,000 ^r	1,390,000

^cEstimated. ^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 2006, BY INDUSTRY USE AND GRADE¹

(Metric tons)

Industry use	Special high grade	High grade	Prime western	Remelt and other grades	Total
Galvanizing	111,000	32,000	72,300	43,900	259,000
Zinc-base alloys	W	W	W	W	W
Brass and bronze	42,300	W	W	W	42,300
Other	162,000	37,100	3,050	--	203,000
Total	315,000	69,100	75,400	43,900	504,000

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
ZINC CONTAINED IN PIGMENTS AND COMPOUNDS PRODUCED
AND SHIPPED IN THE UNITED STATES^{1,2}

(Metric tons)

	2005 ^c		2006	
	Production	Shipments	Production	Shipments
Zinc oxide	29,500	29,500	NA	NA
Zinc sulfate	23,700 ^r	23,700 ^r	NA	NA
Zinc chloride	W	W	NA	NA

^cEstimated. ^rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data.

¹Excludes leaded zinc oxide, lithopone, and zinc chloride.

²Data are rounded to no more than three significant digits.

TABLE 11
 REPORTED SHIPMENTS OF ZINC CONTAINED
 IN ZINC OXIDE, BY INDUSTRY^{1,2}

(Metric tons)

	2005 ^c	2006
Ceramics	418	NA
Chemicals	5,320	NA
Paints	1,840	NA
Rubber	21,000	NA
Other ³	975	NA
Total	29,500	NA

^cEstimated. NA Not available.

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

²In addition, zinc contained in zinc oxide was imported as follows: 2005—87,776 and 2006—100,421; distribution cannot be distinguished by industry.

³Includes agriculture and photocopying.

TABLE 12
 U.S. EXPORTS OF ZINC ORES AND CONCENTRATES, BY COUNTRY¹

	2005		2006	
	Quantity (metric tons, zinc content)	Value (thousands)	Quantity (metric tons, zinc content)	Value (thousands)
Australia	48,800	\$31,400	47,400	\$50,400
Belgium	35,900	23,600	85,600	105,000
Bulgaria	21,300	13,700	--	--
Canada	178,000	142,000	212,000	384,000
China	19	12	6,360	19,300
Finland	33,500	21,600	36,500	38,700
Gambia, The	15,200	9,800	--	--
Germany	17,700	11,400	32,600	34,700
Italy	38,400	24,700	20,400	21,700
Japan	136,000	48,600	121,000	129,000
Korea, Republic of	177,000	97,900	141,000	142,000
Spain	84,000	51,800	123,000	137,000
Other	921	685	128	326
Total	786,000	477,000	825,000	1,060,000

-- Zero.

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

Source: U.S. Census Bureau.

TABLE 13
U.S. EXPORTS OF ZINC COMPOUNDS¹

	2005		2006	
	Quantity (metric tons, gross weight)	Value (thousands)	Quantity (metric tons, gross weight)	Value (thousands)
Zinc chloride	1,860	\$2,310	1,510	\$1,920
Zinc compounds, n.s.p.f. ^{2,3}	2,670 ^r	3,190 ^r	1,740	3,750
Zinc oxide	14,600	23,600	28,800	47,900
Zinc sulfate	2,820	1,870	42,800	22,500

^rRevised.

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 14
U.S. IMPORTS FOR CONSUMPTION OF ZINC COMPOUNDS¹

	2005		2006	
	Quantity (metric tons, gross weight)	Value (thousands)	Quantity (metric tons, gross weight)	Value (thousands)
Lithopone	6,390	\$4,930	4,560	\$2,940
Zinc chloride	723	1,250	1,260	1,780
Zinc compounds, n.s.p.f. ^{2,3}	3,280 ^r	6,490 ^r	3,420	6,670
Zinc hydrosulfite	177	309	123	428
Zinc oxide	109,000	127,000	125,000	243,000
Zinc sulfate	31,100	16,600	44,400	34,100

^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 15

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	2002	2003	2004	2005	2006 ^e
Algeria	8,576	2,796	231	4,463	5,000
Argentina	37,325	29,839	27,220	30,227 ^r	30,300
Australia	1,469,000 ^r	1,479,000 ^r	1,334,000 ^r	1,367,000 ^r	1,380,000 ³
Bolivia	141,558	144,985	145,906	158,582	175,000
Bosnia and Herzegovina ^c	300	300	300	300	300
Brazil	136,339	152,822	158,962	171,434 ^r	176,000
Bulgaria ^c	14,900	12,000	15,500 ^r	17,500 ^r	17,300
Burma	138 ⁴	127 ⁴	196 ⁴	78 ^{r,4}	100
Canada	916,220 ^r	788,063 ^r	791,373 ^r	666,654 ^r	710,000 ^P
Chile	36,161	33,051	27,635	28,841 ^{r,4}	31,725 ³
China	1,550,000	2,030,000	2,390,000	2,550,000 ^r	2,600,000
Congo (Kinshasa)	828 ^r	--	5,067 ^r	15,000 ^{r,e}	15,000
Ecuador ^c	-- ^r	-- ^r	--	--	--
Finland	35,000	39,000	37,000	41,000	35,700 ³
Georgia ^c	400	400	400	400	400
Greece	33,000	3,000	--	--	13,800 ³
Honduras	46,339	43,766	41,413	42,698	37,646 ³
India ^c	234,300	306,400	347,100 ^r	477,200 ^r	420,800 ³
Iran ^c	120,000	110,000	121,000	125,000	130,000
Ireland	252,700	419,000	438,000	429,000	425,700 ³
Japan	42,851	44,574	47,781	41,452	7,169 ³
Kazakhstan	390,000	395,000	360,000	400,000	400,000
Korea, North ^c	60,000	60,000	62,000	67,000	67,000
Korea, Republic of	99	-- ^c	14 ^r	80 ^r	80
Macedonia	10,000	4,000	--	--	21,700
Mexico	446,104	413,991	426,360 ^r	476,307 ^r	480,000
Mongolia	--	--	--	11,400	50,450 ³
Morocco	90,487	69,200	74,600	75,000	73,000
Namibia	42,685	60,500 ⁵	66,028 ^{4,5}	68,000 ^{r,e,5}	68,000 ⁵
Peru	1,232,997 ^r	1,372,790	1,209,006	1,201,671	1,201,794 ³
Poland	152,200	153,900	140,300	117,200	135,600 ³
Portugal	--	--	--	--	7,505 ³
Romania	21,200	22,081	23,599 ^r	13,784 ^r	9,600
Russia ^c	130,000 ³	159,000	179,000	180,000	190,000
Saudi Arabia ^c	3,000	3,000	1,500	1,500	1,500
Serbia and Montenegro ⁶	6,900	2,200 ^{r,e}	1,300 ^r	900 ^r	1,100
South Africa	64,580	41,400	32,310	32,112	34,444 ^P
Spain	69,926 ^r	15,100 ^{r,e}	--	--	--
Sweden	148,600	188,000	199,000	216,000	192,400 ³
Thailand	33,600 ^r	37,100 ^{r,e}	43,400 ^r	42,570	45,000
Tunisia	35,692	36,000 ^{r,e}	29,011 ^r	15,889 ^r	--
Turkey	43,000	40,000	39,000	48,000	50,000
United States	784,000 ^r	768,000	739,000	748,000	727,000 ³
Vietnam ^c	42,000	45,000	40,000 ^r	48,000 ^r	48,000
Total	8,880,000 ^r	9,520,000 ^r	9,590,000 ^r	9,930,000 ^r	10,000,000

^cEstimated. ^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, 2007.³Reported figure.⁴Data are for fiscal year ending March 31 of the following year.⁵Does not include ores sent to solvent extraction-electrowinning plant.⁶In June 2006, Montenegro and Serbia formally declared independence from each other and dissolved their union. Mineral production data for 2006, however, still reflect the unified country.

TABLE 16
ZINC: WORLD SMELTER PRODUCTION, BY COUNTRY^{1,2}

(Metric tons)

Country ³	2002	2003	2004	2005	2006 ^c
Algeria, primary and secondary	33,900	34,900	36,800	32,000	32,000
Argentina:					
Primary	38,699	39,221	35,300	37,460 ^r	42,000
Secondary	3,098	3,139	3,000	3,000	3,000
Total	41,797	42,360	38,300	40,460 ^r	45,000
Australia:					
Primary ⁴	567,000	553,000	473,000	457,300 ^r	490,000
Secondary ^c	6,000 ^r	6,000 ^r	6,000 ^r	6,000 ^r	6,000
Total	573,000 ^r	559,000 ^r	479,000 ^r	463,300 ^r	496,000
Belgium, primary and secondary ^c	260,000	244,000	263,000	257,000	219,800 ⁵
Brazil:					
Primary	247,692	262,998 ^r	265,987	267,374 ^r	268,000
Secondary ^c	7,000	7,000	7,000	7,000	7,000
Total	254,692	269,998 ^r	272,987	274,374 ^r	275,000
Bulgaria, primary and secondary	83,000	86,800	102,000	95,000	70,000
Canada, primary	793,410	761,199	805,438 ^r	722,951 ^r	730,000 ^p
China, primary and secondary ^c	2,100,000	2,320,000	2,720,000	2,780,000 ^r	3,100,000
Czech Republic, secondary ^c	200	250	250	250	250
Finland, primary	235,300	265,900	284,500	292,000	282,200 ⁵
France, primary and secondary ^c	350,000	268,000 ^r	268,000	210,000 ^r	210,000
Germany, primary and secondary	378,561	388,131	382,020	334,891 ^r	300,000
India:					
Primary	231,400	253,900	238,400	266,200 ^r	370,900 ⁵
Secondary ^c	24,000	24,000	24,000	23,000	23,000
Total	255,400	277,900	262,400	289,200 ^r	393,900 ⁵
Iran	82,571	78,428	109,400	140,000	150,000
Italy, primary and secondary	176,000	123,000 ^c	130,000	121,000	109,000
Japan:					
Primary	547,183	532,704	534,830	536,768	505,532 ⁵
Secondary	126,723	153,411	132,417	138,453	148,717 ⁵
Total	673,906	686,115	667,247	675,221	654,249 ⁵
Kazakhstan, primary and secondary	286,300	279,000	316,500	356,907	300,000
Korea, North, primary and secondary ^c	65,000	65,000	67,000	72,000	72,000
Korea, Republic of, primary	605,990	644,218	668,666	644,828	662,521 ⁵
Laos	1,345	3,069	2,000	87,379	--
Macedonia, primary and secondary ^c	56,000	15,000 ^r	-- ^r	-- ^r	--
Mexico, primary	302,122	320,364	316,864 ^r	327,205 ^r	350,000
Mongolia	--	--	--	-- ^r	--
Namibia ⁶	35	47,436	119,200	132,800	133,000
Netherlands, primary ^{c, 7}	203,000	223,000	225,000	228,000	221,500 ⁵
Norway, primary	145,000	142,000	139,000	148,000	160,700 ⁵
Peru, primary	172,688	202,076	195,692	163,603	175,250 ⁵
Poland, primary and secondary	158,900	153,300	153,000	155,000	150,000
Portugal, secondary ^c	3,000 ^r	3,000 ^r	3,000 ^r	2,000 ^r	2,000
Romania, primary and secondary	51,600	52,000	55,000	57,000	41,000
Russia, primary and secondary ^c	244,000	253,000	240,000	220,000	240,000
Serbia and Montenegro, primary and secondary ⁸	1,478	62	5,000 ^r	2,500 ^r	3,200
Slovakia, secondary ^c	1,000	1,000	1,000	1,000	1,000
South Africa, primary	111,000	113,000	105,000 ^r	104,000 ^r	90,000 ⁵
Spain, primary and secondary	488,000	519,000	525,000	501,000 ^r	500,000
Thailand, primary	105,148	113,686	115,100	101,186	91,220 ⁵
United Kingdom, primary and secondary	99,600	16,600	--	--	--

See footnotes at end of table.

TABLE 16—Continued
ZINC: WORLD SMELTER PRODUCTION, BY COUNTRY^{1,2}

(Metric tons)

Country ³	2002	2003	2004	2005	2006 ^c
United States: ^e					
Primary	192,000 ^r	185,000 ^r	194,000 ^r	195,000 ^r	113,000
Secondary	171,000 ^r	166,000 ^r	156,000 ^r	156,000 ^r	156,000
Total	362,000	351,000	350,000	351,000	269,000
Uzbekistan, primary ^e	80,000 ^r	60,000 ^r	60,000 ^r	35,030 ^{r,5}	35,000
Grand total	9,840,000 ^r	9,980,000 ^r	10,500,000 ^r	10,400,000 ^r	10,600,000
Of which:					
Primary	4,580,000 ^r	4,670,000 ^r	4,660,000 ^r	4,530,000 ^r	4,590,000
Secondary	342,000 ^r	364,000 ^r	333,000 ^r	337,000 ^r	347,000
Undifferentiated	4,920,000	4,950,000 ^r	5,490,000 ^r	5,550,000 ^r	5,630,000

^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.

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, 2007.

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.

⁸In June 2006, Montenegro and Serbia formally declared independence from each other and dissolved their union. Mineral production data for 2006, however, still reflect the unified country.