



2010 Minerals Yearbook

LEAD

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In 2010, domestic lead mine production of recoverable lead was 356,000 metric tons (t), a 10% decrease compared with that of 2009. Alaska and Missouri were the dominant producing States with significantly more than one-half of total domestic mine production. Two mines in Montana and Washington that had produced lead during the first half of 2009 were closed in 2010.

Lead was produced at 9 U.S. mines that employed about 1,500 people. The value of domestic mine production was \$854 million, a 13% increase from the value of domestic mine production in 2009, despite a decline in production owing to an increase in the average price of lead in 2010. Primary lead metal was produced at a smelter-refinery in Missouri.

Secondary lead, derived principally from scrapped lead-acid batteries, accounted for 91% of refined lead production in the United States in 2010. Nearly all the secondary lead was produced by 7 companies operating 14 smelters. Domestic secondary lead production increased slightly from that of 2009.

Lead was consumed in about 76 U.S. plants to manufacture such products as ammunition; building-construction materials; covering for power and communication cable; lead oxides in ceramics, chemicals, glass, and pigments; lead sheet; solders for construction, electrical-electronic components and accessories, metal containers, and motor vehicles; and storage batteries.

World mine production of lead increased by 6%, to 4.14 million metric tons (Mt) from 3.90 Mt in 2009. The United States accounted for about 9% of global lead mine production compared with 10% in 2009 and was ranked third in the world. China and Australia were the two leading world lead producers in 2010 accounting for 45% and 15%, respectively, of global lead mine production. World production of refined lead (primary and secondary) increased by 7%, to 9.49 Mt in 2010 from 8.89 Mt in 2009. The United States was the second leading producer of refined lead in the world and accounted for 13% of global refined lead production. China produced about 44% of global refined lead production and was the leading producer of refined lead in 2010.

According to the International Lead and Zinc Study Group (ILZSG) (2011a, p. 8–9), consumption of refined lead increased by 7% to 9.56 Mt in 2010 from 8.93 Mt in 2009, following a slight decline in global lead consumption in 2009 from that in 2008. The leading refined-lead-consuming countries in 2010 were China, 44%; the United States, 15%; the Republic of Korea, 4%; and Germany, 4%. ILZSG data indicated that there was a global refined lead supply surplus of about 39,000 t by yearend 2010.

Lead-acid batteries, including starting-lighting-ignition (SLI) and industrial types, continued to be the dominant use of lead, accounting for about 90% of reported lead consumption. SLI battery shipments in North America totaled 119.6 million units

in 2010, a 9% increase from those of 2009. This total included original equipment (OE) and replacement automotive-type batteries.

Following substantial declines that took place in the second half of 2008, lead prices steadily increased during 2009 and began to approach price peaks from early 2008. In January 2010, the London Metal Exchange Ltd. (LME) average cash price for lead was \$1.07 per pound. Average monthly prices declined during the first half of the year to \$0.77 per pound in June and then increased during the second half of 2010. By yearend 2010, LME prices had increased to \$1.09 per pound, essentially the same as they were in January. The 2010 annual average LME cash price was \$0.97 per pound, an increase of 25% from that of 2009, and the North American Producer price (the weighted average, based on 1993 production figures, of the list prices of those North American primary and secondary producers quoting list prices, in addition to those producers who have switched to LME pricing) increased by about 25% from that of 2009, to \$1.09 per pound from \$0.87 per pound.

Legislation and Government Programs

In April, the U.S. Environmental Protection Agency (EPA) announced that renovations and repairs of child care facilities, houses, and schools built before 1978 (when the use of lead-based paint in housing was banned by the Federal Government) must be conducted using safe practices to protect children and pregnant women from exposure to lead-based paint. Common renovation activities that disturb lead-based paint such as cutting, demolition, and sanding can generate lead chips and dust that are potentially harmful to adults and children. The EPA's Lead Renovation, Repair, and Painting Rule, finalized in 2008, required contractors to be trained and certified in lead-safe work practices and became effective on April 22, 2010. Lead-safe work practices reduce the potential exposure associated with disturbing lead-based paint. More than 160,000 workers in the construction and remodeling industries had received training as of April. The EPA also announced advanced notice of proposed rulemaking that would apply lead-safe work practices to renovations on public and commercial buildings (U.S. Environmental Protection Agency, 2010a).

In late August, the EPA denied a petition calling for a ban on the production and distribution of lead hunting ammunition. The EPA reached this decision because it does not have the legal authority to regulate this type of product (ammunition or firearms) under the Toxic Substances Control Act (TSCA). The petition, submitted in early August by several groups, had asked the EPA to prohibit the manufacture, processing, and distribution of bullets, fishing sinkers, and lead shot under the TSCA. In November, the EPA rejected the requested ban on

the use of lead fishing sinkers. The EPA stated that lead sinkers were banned on many Federal lands and that several States had already banned or restricted the use of these products (U.S. Environmental Protection Agency, 2010b).

In early October, Doe Run Resources Corp. (St. Louis, MO) reached an agreement with the EPA, the Missouri Department of Natural Resources, and the U.S. Department of Justice to spend approximately \$65 million to correct violations of several environmental laws at 10 of its lead mining, milling, and smelting facilities in southeast Missouri. The company will pay a \$7 million civil penalty for violating several environmental regulations. The civil penalty payment was to be split evenly between the Federal and State governments. Doe Run also decided that it would shut down operations at its Herculaneum primary lead smelter by yearend 2013 instead of installing pollution control technologies that would reduce emissions. Herculaneum was the only primary lead smelter operating in the United States in 2010. The smelter was to operate with an EPA-mandated 117,935-t annual production limit until it is closed. The company also agreed to provide an initial \$8.14 million in financial assurance to guarantee cleanup work at the Herculaneum facility, \$23.7 million on upgrades at its other production facilities, and to establish a \$28 to \$33 million assurance trust fund for the continued cleanup of mining and milling facilities in Missouri (Schier, 2010; U.S. Environmental Protection Agency, 2010c).

Production

Mine.—In 2010, domestic mine production of recoverable lead was 356,000 t, a 10% decline compared with that of 2009. Lead mine production in the United States has declined by about 22% during the past 10 years owing to shutdowns and curtailments at zinc and lead mines, and no new significant domestic lead mines were opened. In 2010, there were 9 lead-producing mines operating in the United States compared with 19 lead-producing mines in 2000.

Alaska and Missouri contributed the major share of the U.S. mine output of lead. Lead mine production also was reported in Idaho. Lead-producing mines that had operated in Montana and Washington until early 2009 were closed during 2010. 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 (tables 1–4).

Teck Alaska Inc. (a wholly owned subsidiary of Teck Resources Ltd., Vancouver, British Columbia, Canada) operated the Red Dog zinc-lead mine in northwestern Alaska under a royalty agreement with NANA Regional Corp., the sole owner of the property. NANA is a corporation organized under the provisions of the Alaska Native Claims Settlement Act. During 2010, Teck reported a decrease in the production of zinc and lead contained in concentrates compared with that of 2009 owing to lower mill feed grades despite record mill throughput in 2010 at Red Dog. Production of lead in concentrate at Red Dog in 2010 decreased by about 16% to 110,000 t compared with 132,000 t of lead in concentrate in 2009. In May, Teck began mining the Aqqaluk deposit, adjacent to the main pit, where the economically recoverable mineral resources were nearly exhausted, and the first ore from Aqqaluk was processed

at the mill in August. The near-surface weathered Aqqaluk ore milled in 2010 was a lower grade than ore that was processed from the main pit in 2009. The average lead grade of ore milled during the last quarter of 2010 was 5.0% compared to 6.3% during the same period in 2009. The Aqqaluk deposit was expected to provide sufficient ore to enable zinc and lead mining operations at Red Dog to continue until 2031. Teck expected to produce 85,000 t of lead in concentrate in 2011 with approximately 66% of mill feed coming from the Aqqaluk deposit (Teck Resources Ltd., 2011a, p. 32–34; 2011b, p. 22–23).

Teck's Pend Oreille zinc-lead mine in northeastern Washington was placed on care-and-maintenance status in February 2009 owing to reduced metal demand and weakened zinc prices. A core group of employees remained at Pend Oreille after the shutdown to facilitate a possible restart in the future, and all regulatory and environmental requirements were being met (Teck Resources Ltd., 2011a, p. 35).

In late January, Doe Run reported that an underground equipment fire had taken place at the company's Viburnum #29 lead-zinc-copper mine. Viburnum #29 is one of six lead-producing mines that Doe Run operates along the Viburnum Trend in southeastern Missouri. According to the company, a truck fire broke out in an underground haul road, and all employees were safely evacuated from the mine with the assistance of mine rescue teams. The fire caused the Viburnum #29 mine shaft to be shut down for 2 days following the incident. The company expected that loss of output during the shutdown would be minimal. Viburnum #29 normally produced 1,800 metric tons per day of ore containing about 4% lead, 0.5% zinc, and 0.2% copper. It is the least productive of the six mines that Doe Run operated in the Viburnum region. When Viburnum #29 was reopened, Doe Run blocked off the area of the mine where the fire had taken place for a U.S. Department of Labor investigation and shifted resources to resume production from other parts of the mine (Platts Metals Week, 2010a).

In 2010, Hecla Mining Co. (Coeur d'Alene, ID) continued to operate two lead-producing mines, the Greens Creek lead, gold, silver, and zinc mine near Juneau, AK, and the Lucky Friday lead, silver, and zinc mine in the Coeur d'Alene Mining District in northern Idaho. Total production of lead in concentrate in 2010 increased by 6% to 42,600 t from 40,200 t in 2009. A 14% increase in production of lead in concentrate at Greens Creek in 2010 compared with that of 2009 offset a slight decline in production at Lucky Friday during the same time period (Hecla Mining Co., 2011, p. 31).

Primary.—Doe Run produced primary lead at a smelter-refinery facility in Herculaneum, MO. Concentrates for the smelter-refinery were provided mainly from four Doe Run mills that were supplied with ore mined from six production shafts along the Viburnum Trend in southeastern Missouri. In 2010, domestic primary lead metal production was 115,000 t, an 11% increase compared with 103,000 t in 2009. In late 2008, Doe Run temporarily closed one of two blast furnaces at its primary lead smelter owing to the decline in lead prices and unfavorable market conditions. The company continued to operate the smelter with a single furnace in 2010. In late 2010, Doe Run announced that it would be shutting down the primary

lead smelter in Herculaneum in 2013 as part of an agreement with Federal and State regulatory agencies and limiting annual refined lead production to 117,935 t until it was closed (more information can be found under the Legislation and Government Programs section).

In March, Doe Run unveiled a new primary lead processing technology that company officials estimated would reduce air, land, and water emissions by nearly 99% when compared to traditional processing methods. The new process would replace high-temperature, furnace-based lead smelting with a chemical process that could be cleaner, more efficient, and safer than smelting. Doe Run has been working with an Italian-based engineering partner, Engitec Technologies S.p.A., to develop this proprietary technology that uses a wet chemical process to selectively dissolve lead concentrate in a leaching reactor containing a solution of ferric fluoborate and then extract the lead from the solution using an electric current. The electrowinning extraction process is similar to technology currently used to extract zinc from concentrate but had not been used for producing primary lead. One of the environmental benefits of the production method is the ability to recycle the activated solution within the process indefinitely. Doe Run expected that the new processing technology would yield greater lead metal recovery rates than those achieved using current primary lead smelting methods. The company has operated a demonstration plant in southeastern Missouri since 2007 and, following the completion of a feasibility study, planned to evaluate possible site locations for a commercial-scale plant. Doe Run would need about \$150 million to fund the construction of a commercial-sized plant and had set mid-2013 as a possible startup date (Doe Run Co., The, 2010; Troszkiewicz, 2010).

Secondary.—Domestic secondary production of refined lead in 2010 increased slightly to 1.14 Mt from 1.11 Mt in 2009. Secondary lead accounted for 91% of domestic lead refinery production, unchanged from that in 2009. Lead-acid batteries continued to be the dominant source of recoverable lead scrap, accounting for 94% of all lead produced from secondary sources. The domestic secondary statistics were derived by the USGS from a combined secondary producer and consumer survey that included data from monthly and annual surveys. In 2010, 14 companies producing secondary lead, exclusive of that produced from copper-based scrap, were surveyed; 11 responded, representing about 99% of the total production of secondary lead. Of the total lead recycled in 2010, the majority was produced by 7 companies operating 14 plants in Alabama, California, Florida, Indiana, Minnesota, Missouri, New York, Pennsylvania, Tennessee, and Texas. Production and consumption for the nonrespondents were estimated by using prior-year levels as a basis (tables 1, 4–8).

An air permit that was issued in February 2010 to Johnson Controls Inc. (JCI) (Milwaukee, WI) by the South Carolina Department of Health and Environmental Control for a planned secondary lead smelter in Florence, SC, became effective in August following a brief delay. The permit had been appealed by local groups owing to potential environmental concerns associated with the new facility, but JCI was able to work with the groups and addressed these concerns. The new \$150 million

secondary smelter was expected to produce as much as 120,000 metric tons per year (t/yr) of refined lead from used lead-acid batteries when it opens in summer 2012. The Florence location was chosen by JCI owing to its proximity to three existing JCI lead-acid battery distribution and manufacturing facilities and the lack of lead smelters in that region (CRU Lead Monitor, 2010).

Consumption

Reported U.S. consumption of refined lead increased by about 11% in 2010 compared with that of 2009. A 13% increase in lead used for lead-acid storage batteries and a slight increase in consumption for casting metals offset declines in ammunition, extruded products oxides, sheet lead, and solder end-use sectors. Consumption of lead in SLI and industrial type lead-acid storage batteries represented about 90% of the total reported consumption of lead (tables 5–8). Demand for lead is heavily reliant on the lead-acid battery industry and, in turn, the automotive sector. The BCI reported that North American shipments of SLI automotive batteries in 2010 totaled 119.6 million units, a 9% increase from those in 2009. The increase in battery shipments in 2010 followed 2 consecutive years that SLI automotive battery shipments declined on a year-by-year basis. Shipments of replacement SLI batteries in 2010 totaled 105.7 million units, 7% greater than those in 2009. Replacement batteries represented 88% of all North American battery shipments in 2010. North American shipments of OE SLI batteries were 13.9 million units in 2010, an increase of 29% from those of 2009. The increase in shipments of OE batteries was attributed to increased production of new vehicles during 2010 compared with production in 2009. Total domestic vehicle production (passenger cars and light commercial vehicles) in 2010 was about 7.6 million units compared with 5.6 million units produced in 2009. In 2010, there was an estimated 239 million vehicles in operation in the United States, and the average age of the vehicle fleet on the road in the United States increased to 10.2 years, the highest level in history. Maintenance requirements of the aging fleet kept the replacement battery market stable while consumption of OE batteries increased compared with those of the previous year. During the economic downturn that began in late 2008, consumers delayed preventative vehicle maintenance, such as exchanging older batteries for new units, opting instead to wait until batteries failed before replacing them (Battery Council International, 2011, p. 23–24; CRU International Ltd., 2011, p. 162).

Exide Technologies (Alpharetta, GA) planned to close two of its three lead-acid battery facilities in Reading, PA, beginning in early June 2010. The company was planning a multiphase closure of the battery formation plant and distribution center and expected to shift those activities to Exide facilities in other States. These closures would not affect production at Exide's lead-acid battery recycling facility in Reading (Platts Metals Week, 2010b).

Lead-acid batteries used in vehicles incorporating traditional internal combustion engines remained the backbone of global lead consumption in 2010. Many of the leading lead-acid battery producers were investing capital to research and develop battery technologies for the next generation of vehicles (partially

driven by European Union regulations aimed at substantially reducing carbon dioxide emissions in new vehicles by 2012). Battery technologies such as absorbed glass mat (AGM) were considered feasible options for use in some hybrid-electric vehicles. In AGM batteries, the electrolyte in the battery is immobilized with a highly porous and absorbent microfiber glass mat. AGM batteries typically deliver considerably longer lifespans than traditional flooded lead-acid batteries, and their design makes them a preferred battery choice for use in vehicles that have start-stop technology. Vehicles equipped with start-stop technology (sometimes called microhybrids) use automatic stop-start functionality to cut power to the engine when the vehicle idles, reducing fuel consumption and emissions by as much as 12%. This technology is attractive to automobile manufacturers because it is relatively inexpensive to add to existing vehicle designs. Battery producers were preparing to have capacity to produce appropriate lead-acid batteries, like AGM, for the introduction of vehicles equipped with start-stop technology in the United States by 2012.

The Battery Council International (BCI) reported that the sales value of industrial-type lead-acid batteries in North America increased by about 17% (\$215 million) in 2010 compared with those of 2009. The increases were reported for stationary power and motive power lead-acid batteries and were attributed to increases in unit sales coupled with greater lead prices compared with those of 2009. Overall, 2010 shipments of industrial-type lead-acid batteries were valued at about \$1.50 billion. Stationary power batteries accounted for 55% of all industrial-type battery sales, and the remaining 45% was motive power batteries. In 2010, the value of sales of motive power lead-acid batteries used in industrial vehicles (97% of motive power segment) increased by 19% from those in 2009. The majority of the motive power batteries sold in 2010 was those used in industrial trucks such as forklifts and material handling equipment. Consumption of OE motive power batteries increased in 2010 owing to an increase in sales of new industrial trucks, such as forklifts, compared with those of 2009. This was thought to be reflective of increased warehouse activity owing to economic recovery from the downturn that began in 2008. In 2010, sales of stationary power type lead-acid batteries that were used in data centers, telecommunications, and uninterruptible power systems (UPS) applications increased by 15% from sales in 2009 owing to increased corporate spending (Cullen, 2011).

Metalico Inc. (Cranford, NJ) was a leading domestic producer of nonbattery lead-based products in 2010. Metalico's lead fabricating segment produced lead sheet, shot, strips, and various extruded products at four fabricating facilities. In 2010, sales of fabricated lead products were valued at \$65.4 million, a 5% increase compared with lead fabrication sales in 2009. The change was attributed to an increase in the average sales price of fabricated lead products in 2010 compared with that of 2009, offsetting a decline in volume sold during that time period (Metalico Inc., 2011, p. 35).

Prices

The LME average cash price for lead was \$2,368 per metric ton in January 2010, but by June it had declined by 28% to \$1,703 per metric ton. Prices increased during the second half

of the year and reached an average price of \$2,412 per metric ton in December. Price increases in 2010 were not necessarily supported by the physical lead market, which was considered to be in surplus for the entire year. Stocks of refined lead held in LME warehouses increased by 42%, from 146,775 t in the beginning of January 2010 to 208,550 t by yearend 2010. Growth in the industrial sectors of many nations that typically consume significant quantities of lead, especially China and India, contributed to price increases in 2010. The loss of refined lead production capacity in China owing to temporary smelter shutdowns was another contributing factor to price increases during 2010. On an annual average basis, the LME cash and North American Producer prices in 2010 were up by \$0.195 per pound (25%) and \$0.220 per pound (25%) respectively, from the average prices of \$0.780 per pound and \$0.869 per pound, respectively, in 2009.

Foreign Trade

In 2010, imports of unwrought (refined) lead metal in pigs and bars for consumption totaled 271,000 t, an 8% increase from those of 2009. The leading source was Canada, accounting for 87% of unwrought lead metal imports. In 2010, imports from Mexico decreased by 28% to 29,400 t, and no unwrought lead was imported from Peru (a leading source of imported unwrought lead in recent years prior to plant closings). Total domestic exports of unwrought lead in 2010 was 77,700 t, essentially unchanged from that in 2009. Mexico was the leading destination for the unwrought lead exported in 2010, accounting for about 64% of all shipments. Domestic exports of lead in concentrate were 299,000 t, a 4% increase from those of the previous year. Nearly 81% of the lead in concentrate produced domestically was exported in 2010 and 96% of total lead in concentrate exports went to Canada, China, Japan, and the Republic of Korea. In 2010, lead in concentrate exports to China, Japan, and Mexico increased and exports to Canada and the Republic of Korea declined from those in 2009 (tables 10–12).

In 2010, the United States imported about 23.6 million SLI lead-acid batteries for consumption, a 9% increase from those of 2009. Mexico was the leading provider of SLI batteries, accounting for 66% of the SLI batteries imported in 2010. SLI batteries were also imported from China, Germany, the Republic of Korea, Spain, and Taiwan. The United States exported about 15.3 million spent SLI lead-acid batteries in 2010, 110% greater than those of 2009. The majority of those units (90%) were shipped to Mexico for recycling. The increase in exports of spent lead-acid batteries in 2010 reflected increased scrutiny from the EPA and U.S. Customs and Border Protection on the classification of lead-acid battery exports. The agencies had discovered that shipments of spent lead-acid batteries were frequently mislabeled and were incorrectly identified as lead waste and scrap. In 2010, more spent-lead acid batteries were correctly classified for export owing to the increased scrutiny.

World Review

World mine production of lead increased by 6% to 4.14 Mt in 2010. China was the leading producer accounting for about 45%

of the world total, followed by Australia, with 15%; the United States, 9%; Peru, 6%; and Mexico, 4% (table 13). This increase in mine production was primarily owing to increased production in Australia, China, Mexico, and Russia, offsetting decreases in Peru and the United States. In 2010, six lead-producing mines were opened, reopened, or expanded, adding 129,000 t/yr to global lead mine production capacity. The additional mine capacity was in Australia, Canada, Mexico, and Peru. No substantial lead mines were closed in 2010.

World production of refined lead (primary and secondary) increased by 7%, to 9.49 Mt in 2010 from 8.90 Mt in 2009. China was the leading producer of refined lead, accounting for 44% of world production, followed by the United States, with 13%; and Germany, 4% (table 14). A 13% increase in Chinese production of refined lead metal in 2010 compared with that of 2009 and smaller production increases in Belgium, Brazil, Canada, Germany, Japan, Kazakhstan, Mexico, Poland, Russia, Thailand, and the United States accounted for the majority of the global refined lead increase. Secondary (recycled) lead has accounted for an increasing portion of the total global lead supply during the past 11 years. Secondary lead production represented about 54% of total refined lead production worldwide in 2010 compared with 47% in 1999. In 2010, five lead smelters opened, primarily in China, adding about 388,000 t/yr of refined lead production capacity. Conversely, a lead smelter (100,000 t/yr capacity) was closed temporarily in China in late 2010 (International Lead and Zinc Study Group, 2011b, p. 5–6).

According to ILZSG, consumption of refined lead increased by 7% to 9.56 Mt in 2010 from 8.93 Mt in 2009, following a slight decline in global lead consumption in 2009 from that in 2008. The leading refined-lead-consuming countries in 2010 were China, 44%; the United States, 15%; the Republic of Korea, 4%; and Germany, 4%. Chinese consumption continued to drive global demand growth. Lead consumption throughout the remainder of Asia benefited from China's growth. This was partially offset by declining consumption in Western Europe. Chinese consumption was fueled by strong demand for automotive and stationary batteries used in backup power supply systems, telecommunication networks, and renewal energy storage applications. ILZSG data indicated that there was a global refined lead supply surplus of about 39,000 t by yearend 2010 compared with a surplus of about 57,000 t by yearend 2009 (International Lead and Zinc Study Group, 2011a, p. 8–9).

European Union.—Recylex S.A. (Paris, France), a leading lead producer in Europe, reported that in 2010 its two facilities in France and subsidiary in Germany processed 149,000 t of spent lead-acid batteries, a 14% increase compared with 131,000 t in 2009. The lead-bearing materials produced by these plants were sent to the company's two smelters in Belgium and Germany. During 2010, the operating performance of the company's main smelter, in Nordenham, Germany, was significantly affected by a temporary shutdown for 3 weeks in late 2010 owing to a damaged furnace. Total refined lead production from the company's smelters in 2010 was 122,000 t, a 2% increase compared with 120,000 t in 2009 (Recylex S.A., 2011, p. 10)

Australia.—In February, Magellan Metals Pty. Ltd. [a wholly owned subsidiary of Ivernia Inc., (Toronto)] announced that it had restarted operations at its Magellan Mine in Western Australia. Mining operations at Magellan had been suspended in April 2007 owing to environmental concerns associated with the transport of lead concentrate from the mine. The company had received approval to transport sealed bags of lead concentrate from the mine to the Port of Fremantle for export. The company proceeded with ramp-up operations during the rest of 2010 and expected to reach full production capacity (85,000 t/yr) by yearend. Total production of lead in concentrate in 2010 was 44,000 t. On December 31, 2010, the company received a stop order from the Acting Minister for Environment of Western Australia relating to the transport of lead concentrate from the mine owing to environmental concerns. The company ceased all mining operations immediately upon receipt of the order and remained closed during the first quarter of 2011 (Ivernia Inc., 2011, p. 2, 5).

Canada.—Xstrata plc's (Zug, Switzerland) Brunswick underground zinc-lead mine near Bathurst, New Brunswick, was the leading producer of lead in concentrate in Canada. The mine had production capacity to process 3.40 Mt of ore containing copper, lead, silver, and zinc on an annual basis. In 2010, Brunswick Mine produced 60,000 t of lead in concentrate, down by 9% from the 66,000 t produced in 2009. In 2010, Xstrata increased reserves at Brunswick Mine to extend the mine life to 2013, beyond its previously anticipated closure in early 2010 (Xstrata plc, 2011, p. 91, 99).

In 2010, Selwyn Resources Ltd. (Vancouver, British Columbia) and joint-venture partner, Yunnan Chihong Zinc and Germanium Co. Ltd., continued an exploration, permitting, engineering, and development program at the Selwyn Project in the eastern Yukon Territory. Selwyn Chihong Mining Ltd. was formed as a joint-venture company to advance the Selwyn Project to bankable feasibility study and production. In 2010, Selwyn Chihong completed an extensive diamond drilling program in the XY Central and Don deposits to upgrade mineral resources to the measured and indicated category. It also undertook exploratory drilling in the XY West deposit to confirm the continuity and extent of the high-grade mineral resources. Approximately \$7.6 million was spent on environment and engineering studies to support the bankable feasibility study and permitting activities. The Selwyn project was one of the largest undeveloped resources of lead and zinc in the world according to the company. The latest resource estimates for the project, as of February 2009, included 16.06 Mt of indicated high-grade mineral resources, grading 4.23% lead. Selwyn's development schedule provided for initial ore production to begin in 2014 at rates that would produce about 65,000 t/yr of lead in concentrate (Selwyn Resources Ltd., 2011, p. 1–9, 13).

Teck announced that 2010 refined lead production at its metallurgical complex at Trail was 71,500 t, a slight decline from that of 2009 owing to operational issues at an oxygen plant that affected lead operations and planned maintenance activities during the fourth quarter of 2010. The required maintenance necessitated a 32-day shutdown of the lead smelter. By yearend 2010, the lead smelter had returned to full production. Teck

expected to produce 80,000 t of refined lead at Trail in 2011 (Teck Resources Ltd., 2011a, p. 34).

China.—China continued to be the leading global producer and consumer of lead in 2010. China was also the leading producer of lead-acid batteries in the world. Between 1999 and 2009, China's surging demand for lead contained in lead-acid batteries was caused by tremendous growth in the production of automobiles, electric bicycles (e-bikes), and motorcycles, increasing by 23%, 74%, and 8%, respectively. The number of e-bikes in China had grown to more than an estimated 100 million by yearend 2010. Each e-bike needed at least one lead-acid battery per year, containing about 10 kilograms of lead, to operate, which translated to about 1 Mt of lead consumed for this use in 2009. Consumption of lead in China has increased by an average of 20% per year from 1999 to 2009 and was estimated to have increased by 7% to 4.21 Mt in 2010 from 3.93 Mt in 2009. In 2010, lead consumption for automotive lead-acid batteries (OE and replacement) and e-bikes increased from that in 2009 owing to global economic recovery and continued growth in those sectors. Lead in concentrate production in 2010 was 1.85 Mt, a 16% increase from the 1.60 Mt produced in 2009. Refined lead production in 2010 was 4.20 Mt, a 13% increase from the 3.71 Mt produced in 2009. In 2010, secondary lead production accounted for 32% of total refined lead production in China, compared with 22% in 2006. Secondary lead production was expected to continue to increase and approach 50% of total refined lead output by 2015. In 2010, 38,000 t of refined lead was imported, 78% less than in 2009 (International Lead and Zinc Study Group, 2010, p. 1–14; 2011a, p. 26).

In 2010, the Chinese Government continued to eliminate smaller lead mines and smelters in an attempt to consolidate production. Lead was one of several nonferrous metals targeted by the Government for consolidation and modernization, but a multitude of lead exposure and poisoning incidents from lead smelters and lead-acid battery plants during 2009–10 had increased pressure to clean up the lead industry and increase oversight of production. Many of these incidents involved the poisoning of children living in villages near lead plants and were often publicized globally by mainstream media. In August, the Ministry of Industry and Information announced that 17 lead smelters with capacity to produce about 266,000 t/yr of refined lead were targeted for elimination. The majority of these smelters were smaller operations with substantially less than 50,000 t/yr of refined lead production capacity. These closures were part of the The National Development and Reform Commission's twelfth 5-year plan (2011–15), which proposed to limit lead smelting capacity in China to 5.5 million metric tons per year (Mt/yr) by 2015 and eliminate all outdated capacity. The plan also advocated increasing self-sufficiency for mineral commodities by developing domestic reserves and increasing overseas investments. Recycled production of lead was to account for more than 30% of annual refined lead production by 2015. The plan called for consolidation that would lead to the 10 leading producers to account for 70% of annual refined lead output by 2015. Despite the closures of smaller smelters, it was expected that new larger smelters scheduled to open would allow for continued increases in total lead metal production. In

2010, construction was ongoing at four new lead smelters that were expected to add about 360,000 t/yr of refined lead capacity by 2011. More projects were planned for 2012 to 2013 (China Metal Market—Lead, Zinc & Tin, 2010a, p. 2; 2010b, p. 18; Metal-Pages, 2010).

In October, leading lead-acid battery manufacturer JCI announced that it was investing \$118 million to build its third lead-acid battery plant in China. The company was in the process of substantially expanding its production capacity to meet the increased consumption of lead-acid batteries for automobiles and motorcycles. The new plant was scheduled to be built in Chongqing and increase JCI's lead-acid battery production capacity in China to 18 million batteries per year when completed in 2012. JCI planned to increase capacity to 30 million batteries per year by 2015. The company expected to select a location in northern China for a fourth lead-acid battery plant in late 2010 (Johnson Controls Inc., 2010).

India.—In support of its emerging industrial economy and automotive sector, mine and refined lead production increased in 2010 compared with that in 2009. Lead consumed for production of lead-acid batteries also increased. Hindustan Zinc Ltd. (HZL) (Udaipar), India's leading integrated zinc and lead producer, produced 609,000 t of mined zinc and lead in concentrate at its four active mines during the 9-month period that ended December 31, 2010, a 6% increase compared with production in the same period of 2009. Construction work continued at a new zinc and lead smelter in Rajpura Dariba that was expected to produce 100,000 t/yr of primary lead when completed in late 2011. HZL was also expanding production capacities at its Kayar, Rampura Agucha, and Sindesar Khurd zinc-lead mines for progressive commissioning from mid-2010 to 2012. Upon completion of all of these projects, HZL's total zinc and lead smelting capacity would be 1.06 Mt/yr. HZL's expanded production capacity could help satisfy some of the increased demand for lead in India, which has become reliant on imported lead during the past several years (Hindustan Zinc Ltd., 2011).

Mexico.—In September, Goldcorp Inc. (Vancouver, British Columbia, Canada) announced that it had reached commercial production levels at its Penasquito gold-silver-lead-zinc project in the northeast corner of the State of Zacatecas. Mill throughput during the last 4 months of 2010 averaged more than 70,000 metric tons per day (t/d), with peaks reaching 105,000 t/d. Production levels were ramping up during the first three quarters of the year. In 2010, Penasquito produced 44,000 t of lead in concentrate. During an expected 22-year mine life, Peñasquito was expected to produce an annual average of about 90,700 t/yr of lead in concentrate (Goldcorp Inc., 2011, p. 8, 48).

JCI's new secondary lead smelter in Monterrey commenced operations in November. The plant was ramping up output towards its design capacity of 132,000 t/yr of refined lead. The smelter had the ability to expand to 176,000 t/yr of refined lead capacity and was expected to recycle spent lead-acid batteries from Mexico and the Southwest United States. The new plant was the company's second lead recycling facility in the Monterrey area, with an existing 120,000 t/yr refined lead capacity operation at Cienega de Flores (CRU International Ltd., 2011, p. 149).

Peru.—In the second quarter of 2009, Doe Run Peru halted operations at its La Oroya metallurgical complex, 140 kilometers east of Lima owing to environmental and financial problems that kept it from obtaining copper, lead, and zinc concentrates to process. La Oroya had the capacity to produce 120,000 t/yr of refined primary lead. Unsure of the company's financial stability following the late 2008 decline in commodity prices, banks froze credit lines that the smelter needed for working capital to purchase feed concentrates from suppliers. By yearend 2009, Doe Run owed its concentrate suppliers \$100 million and needed an additional \$150 million to complete an ongoing environmental cleanup of La Oroya in which Doe Run had already invested \$307 million. La Oroya produced 114,000 t of refined lead in 2008, the last full year that it was open. In 2010, the company was working with the Peruvian Government, the labor union representing its employees, and its creditors to formulate a plan that would allow Doe Run to restart operations at the facility and complete its environmental obligations. The company failed to comply with a 2009 requirement imposed by Peru's mining minister to acquire the necessary financing for clean up and restart of the smelter by July 24 or permanently close operations. By yearend, it was unclear if and when the smelter would restart operations (CRU Lead Monitor, 2010; Metal Bulletin, 2010).

Outlook

At its September 2011 meeting in Lisbon, Portugal, ILZSG forecast global increases in lead mine and refinery production as well as in lead consumption. Global lead mine production was expected to increase to 4.50 Mt in 2011, 8% greater than that in 2010, owing to greater output in China, India, and Mexico, which would offset projected production declines in Australia. Global refined lead metal production in 2011 was expected to increase by 7% (10.3 Mt), owing to production increases and new plants in Australia, China, Germany, India, the Republic of Korea, and Mexico. The majority of new primary and secondary refined lead capacity added in 2011 was expected to be in China (International Lead and Zinc Study Group, 2011c).

Global consumption of refined lead in 2011 was forecast to be 10.2 Mt, a 6% increase from that of 2010, according to ILZSG. The global increase in consumption was attributed to a 7% increase in use of refined lead in China owing to growth in the automotive, e-bike, and industrial battery sectors. Consumption in Europe, India, and the United States was expected to be greater in 2011 than in 2010. In North America, the BCI forecast that total shipments of SLI lead-acid batteries would increase slightly in 2011 from those in 2010. Provided that the majority of vehicles in the current fleet continue to be operated on a regular basis, the replacement SLI battery market was expected to remain stable in the near future. Shipments of OE batteries were expected to be heavily reliant on sales of new automobiles and production in North America which were expected to increase from 2010 to 2016. The BCI forecast that OE battery shipments would increase by about 15% during the time period from 2010 to 2016. Sales of industrial-type lead-acid batteries in North America were expected to increase by 8% in 2011 compared with sales of 2010 owing to increased demand for motive power and standby batteries from the business sector.

Overall, ILZSG expected that production of refined lead would exceed consumption, and the lead market would remain in surplus of about 188,000 t by yearend 2011 (Battery Council International, 2011; Cullen, 2011; International Lead and Zinc Study Group, 2011c).

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TABLE 1
 SALIENT LEAD STATISTICS¹

		2006	2007	2008	2009	2010
United States:						
Production:						
Mine, recoverable lead content: ²						
Quantity	metric tons	419,000	434,000	399,000	395,000	356,000
Value	thousands	\$715,000	\$1,180,000	\$1,060,000	\$757,000	\$854,000
Primary lead, refined content, domestic ores and base bullion	metric tons	153,000	123,000	135,000	103,000	115,000
Secondary lead, lead content	do.	1,160,000	1,180,000	1,140,000	1,110,000	1,140,000
Exports, lead content:						
Lead ore and concentrates	do.	298,000	300,000	277,000	287,000	299,000
Lead materials, excluding scrap	do.	68,500	56,500	74,800	82,000	83,500
Imports for consumption, lead content:						
Lead in base bullion	do.	539	1,990	2,740	844	602
Lead in pigs and bars	do.	331,000	263,000	309,000	251,000	271,000
Stocks, December 31, lead content:						
Primary lead	do.	W	W	W	W	W
At consumers and secondary smelters	do.	56,000 ^r	51,600 ^r	72,500	63,300	64,600
Consumption of metal, primary and secondary, lead content	do.	1,490,000	1,570,000	1,440,000	1,290,000	1,430,000
Price:						
North American Producer average, delivered ³	cents per pound	77.40	123.84	120.33	86.87	108.91
London Metal Exchange, pure lead, cash average ³	do.	58.00	117.00	94.79	77.95	97.42
World:						
Production, gross weight:						
Mine	metric tons	3,630,000 ^r	3,720,000 ^r	3,880,000 ^r	3,900,000 ^r	4,140,000
Primary refinery	do.	3,690,000 ^r	3,660,000 ^r	3,980,000 ^r	3,860,000 ^r	4,200,000
Secondary refinery	do.	4,200,000 ^r	4,420,000 ^r	4,600,000 ^r	4,860,000 ^r	5,090,000

^rRevised. do. Ditto. W Withheld to avoid disclosing company proprietary data.

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

²Lead recoverable after smelting and refining. Data in table 13 represent lead in concentrate.

³Platts Metals Week.

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

(Metric tons, lead content)

State	2009	2010
Alaska and Missouri	370,000	W
Idaho, Montana, Washington ²	24,900	W
Total	395,000	356,000

W Withheld to avoid disclosing company proprietary data; included in "Total."

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

²2010 production only in Idaho.

TABLE 3
LEADING LEAD-PRODUCING MINES IN THE UNITED STATES IN 2010, IN ORDER OF OUTPUT¹

Rank	Mine	County and State	Operator	Source of lead
1	Red Dog	Northwest Arctic, AK	Teck Alaska Inc.	Zinc-lead ore.
2	Brushy Creek	Reynolds, MO	Doe Run Resources Corp.	Lead ore.
3	Fletcher	do.	do.	Do.
4	Buick	Iron, MO	do.	Do.
5	Viburnum (#29 and #35)	Washington and Iron, MO	do.	Do.
6	Greens Creek	Juneau, AK	Hecla Mining Co.	Zinc-silver ore.
7	Lucky Friday	Shoshone, ID	do.	Silver ore.
8	Sweetwater	Reynolds, MO	Doe Run Resources Corp.	Lead ore.
9	Galena	Shoshone, ID	U.S. Silver Corp.	Silver ore.

Do., do. Ditto.

TABLE 4
LEAD RECOVERED FROM SCRAP PROCESSED IN THE UNITED STATES,
BY KIND OF SCRAP AND FORM OF RECOVERY¹

(Metric tons, lead content, unless otherwise specified)

	2009	2010
Kind of scrap:		
New scrap:		
Lead-base	20,100	22,600
Copper-base	NA	NA
Tin-base	1,530	1,530
Total	21,600	24,100
Old scrap:		
Battery-lead	1,040,000	1,070,000
All other lead-base	47,400	42,900
Copper-base	NA	NA
Total	1,090,000	1,110,000
Grand total	1,110,000	1,140,000
Form of recovery:		
As soft lead	960,000	962,000
In antimonial lead	151,000	175,000
In other lead alloys	(3)	(3)
In copper-base alloys	NA	NA
Total:		
Quantity	1,110,000	1,140,000
Value ²	thousands \$2,130,000	\$2,730,000

NA Not available.

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

²Value based on average quoted price of common lead.

TABLE 5
U.S. CONSUMPTION OF LEAD, BY PRODUCT¹

(Metric tons, lead content)

SIC ² code	Product	2009	2010
Metal products:			
3482	Ammunition, shot and bullets	67,900	65,700
Bearing metals:			
35	Machinery except electrical	W	W
371	Motor vehicles and equipment	W	W
37	Other transportation equipment	W	W
Total		1,100	1,230
3351	Brass and bronze, billets and ingots	1,370	1,410
36	Cable covering, power and communication	(3)	(3)
15	Calking lead, building construction	(3)	(3)
Casting metals:			
36	Electrical machinery and equipment	W	W
371	Motor vehicles and equipment	W	W
37	Other transportation equipment	W	W
3443	Nuclear radiation shielding	W	W
Total		15,900	16,400
Pipes, traps, other extruded products:			
15	Building construction	1,130	990
3443	Storage tanks, process vessels, etc.	(4)	(4)
Total		1,130	990
Sheet lead:			
15	Building construction	16,300	16,000
3443	Storage tanks, process vessels, etc.	W	W
3693	Medical radiation shielding	W	W
Total		25,400	23,400
Solder:			
15	Building construction	W	W
Metal cans and shipping containers		W	W
367	Electronic components, accessories, and other electrical equipment	6,160	6,130
371	Motor vehicles and equipment	W	W
Total		6,450	6,420
Storage batteries:			
3691	Storage battery grids, post, etc.	389,000	478,000
3691	Storage battery oxides	750,000	806,000
Total storage batteries		1,140,000	1,280,000
27	Type metal, printing and allied industries	(3)	(3)
34	Other metal products ⁵	5,790	8,800
Grand total		1,260,000	1,410,000
Other oxides:			
285	Paint	W	W
32	Glass and ceramics products	W	W
28	Other pigments and chemicals	W	W
Total		10,100	9,760
Miscellaneous uses		12,200	13,700
Grand total		1,290,000	1,430,000

W Withheld to avoid disclosing company proprietary data; included in appropriate totals.

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

²SIC Standard Industrial Classification.

³Included with "Metal products: Other Metal products."

⁴Included with "Metal products: Sheet lead: Building construction" to avoid disclosing company proprietary data.

⁵Includes lead consumed in foil, collapsible tubes, annealing, galvanizing, plating, electrowinning, and fishing weights.

TABLE 6
U.S. CONSUMPTION OF LEAD IN 2010, BY STATE^{1,2}

(Metric tons, lead content)

State	Refined soft lead	Lead in antimonial lead	Lead in alloys	Lead in copper-base scrap	Total
California and Washington	25,600	1,010	1,890	--	28,500
Illinois	10,800	16,000	--	--	26,800
Iowa, Michigan, Missouri	12,100	34,500	W	--	46,600
Ohio and Pennsylvania	108,000	87,000	39,500	W	235,000
Arkansas and Texas	56,400	19,800	--	--	76,100
Alabama, Georgia, Oklahoma	28,300	5,760	W	--	34,100
Indiana, Kansas, Kentucky, Minnesota, Nebraska, Tennessee, Wisconsin	134,000	101,000	28,800	W	263,000
Connecticut, Maryland, New Jersey, New York, North Carolina, South Carolina	2,560	538	64	--	3,160
Various States	515,000	75,600	127,000	602	718,000
Total	893,000	341,000	197,000	602	1,430,000

W Withheld to avoid disclosing company proprietary data; included in "Various States." -- Zero.

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

²Includes lead that went directly from scrap to fabricated products.

TABLE 7
U.S. CONSUMPTION OF LEAD IN 2010, BY CLASS OF PRODUCT^{1,2}

(Metric tons, lead content)

Product	Refined soft lead	Lead in antimonial lead	Lead in alloys	Lead in copper-base scrap	Total
Metal products	54,900	63,600	W	W	124,000
Storage batteries	814,000	277,000	192,000	--	1,280,000
Miscellaneous ³	23,500	(4)	W	W	23,500
Total	893,000	341,000	197,000	602	1,430,000

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

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

²Includes lead that went directly from scrap to fabricated products.

³Included in "Miscellaneous" are other oxides and gasoline additives.

⁴Withheld to avoid disclosing proprietary data; included in "Storage batteries."

TABLE 8
STOCKS OF LEAD AT CONSUMERS AND SECONDARY SMELTERS
IN THE UNITED STATES, DECEMBER 31^{1,2}

(Metric tons, lead content)

Year	Refined soft lead	Lead in antimonial lead	Lead in alloys	Lead in copper-base scrap	Total
2009	33,200	19,900	W	W	63,300
2010	29,000	25,000	W	W	64,600

W Withheld to avoid disclosing company proprietary data; included in "Total."

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

²Includes stocks at primary refineries.

TABLE 9
 PRODUCTION AND SHIPMENTS OF LEAD PIGMENTS AND OXIDES IN THE UNITED STATES^{1,2}

(Metric tons and dollars)

Product	2009				2010			
	Production		Shipments ^e		Production		Shipments ^e	
	Gross weight	Lead content	Quantity (lead content)	Value ³	Gross weight	Lead content	Quantity (lead content)	Value ³
Litharge, red lead and white lead, dry	--	--	2,520	\$3,400,000	--	--	3,450	\$7,000,000
Leady oxide	784,000 ^r	745,000 ^r	NA	NA	1,050,000	996,000	NA	NA
Total	784,000 ^r	745,000 ^r	NA	NA	1,050,000	996,000	NA	NA

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

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

²Excludes basic lead sulfate to avoid disclosing company proprietary data.

³At plant, exclusive of container.

TABLE 10
 U.S. IMPORTS FOR CONSUMPTION OF LEAD PIGMENTS AND COMPOUNDS, BY KIND¹

Kind	Quantity (metric tons, lead content)	Value (thousands)
2009:		
Chrome yellow, molybdenum orange pigments, lead-zinc chromates	1,270	\$6,840
Litharge	971	2,570
Glass frits (undifferentiated)	25,800	37,400
Total	28,100	46,800
2010:		
Chrome yellow, molybdenum orange pigments, lead-zinc chromates	1,900	9,760
Litharge	1,470	5,440
Glass frits (undifferentiated)	25,300	45,900
Total	28,600	61,000

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

Source: U.S. Census Bureau.

TABLE 11
U.S. EXPORTS OF LEAD, BY COUNTRY¹

Country	2009		2010	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Ore and concentrates, lead content:				
Belgium	646	\$268	4,320	\$4,830
Canada	44,700	60,700	32,200	58,700
China	159,000	151,000	173,000	243,000
Japan	20,500	16,200	55,000	119,000
Korea, Republic of	61,100	45,400	26,300	37,600
Mexico	545	885	7,490	7,800
Other	419 ^r	157 ^r	274	140
Total	287,000	275,000	299,000	472,000
Base bullion, lead content:				
Mexico	25	99	99	371
Other	9	14	100	387
Total	34	113	199	757
Unwrought lead and lead alloys, lead content:				
Belgium	9,550	8,500	18,200	16,400
Brazil	2,200	2,440	11	8
Canada	5,390	8,780	6,670	10,400
Chile	955	1,240	336	277
China	252	232	1,290	1,980
Japan	87	1,130	515	1,930
Mexico	58,400	56,900	49,900	51,800
Other	763 ^r	822 ^r	839	1,230
Total	77,600	80,100	77,700	84,100
Wrought lead and lead alloys, lead content:				
Canada	1,370	3,090	1,540	3,520
Chile	244	942	34	115
China	165	231	200	192
Germany	24	46	257	278
Haiti	162	160	113	107
India	669	731	824	1,060
Mexico	705	1,170	947	1,160
United Kingdom	599	786	607	630
Other	373 ^r	1,140 ^r	1,070	2,120
Total	4,310	8,280	5,590	9,170
Scrap, gross weight:				
Canada	79,000	37,700	8,060	8,770
China	5,150	3,660	1,810	989
India	11,000	2,900	2,290	3,540
Korea, Republic of	31,800	21,500	20,700	15,500
Mexico	366	556	643	1,310
Pakistan	971	184	20	15
Panama	121	123	171	274
Spain	700	379	--	--
Taiwan	4,320	1,470	5,270	1,600
United Kingdom	477	105	19	32
Venezuela	493	201	45	48
Vietnam	1,530	488	210	69
Other	4,350 ^r	2,740 ^r	4,320	1,660
Total	140,000	72,000	43,500	33,800

^rRevised. -- Zero.

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

Source: U.S. Census Bureau.

TABLE 12
U.S. IMPORTS FOR CONSUMPTION OF LEAD, BY COUNTRY¹

Country	2009		2010	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Base bullion:				
Canada	--	--	404	\$817
Mexico	810	\$2,200	159	806
Other	34	52	38	94
Total	844	2,250	602	1,720
Pigs and bars, lead content:				
Canada	205,000	354,000	237,000	522,000
Colombia	18	29	97	159
France	267	1,080	730	2,210
Germany	11	32	7	68
Italy	--	--	240	96
Kazakhstan	3,500	4,460	--	--
Mexico	41,100	47,200	29,400	25,800
Peru	991	1,210	--	--
Russia	131	240	3,380	7,150
Other	94 ^r	125 ^r	424	805
Total	251,000	408,000	271,000	559,000
Reclaimed scrap, including ash and residues, lead content:				
Canada	785	1,900	621	1,500
China	32	26	21	5
Colombia	105	212	1,560	3,950
Mexico	348	357	402	732
Russia	18	28	--	--
United Kingdom	--	--	616	1,580
Other	46	99	515	1,120
Total	1,330	2,620	3,730	8,880
Wrought lead, all forms, including wire and powders, gross weight:				
Argentina	269	502	165	423
Canada	164	501	133	426
Egypt	20	44	100	301
Germany	709	3,740	744	4,130
Mexico	--	--	6	229
New Zealand	15	229	--	--
United Kingdom	123	216 ^r	95	322
Other	43 ^r	260	47	441
Total	1,340	5,490	1,290	6,270

^rRevised. -- Zero.

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

Source: U.S. Census Bureau.

TABLE 13
LEAD: WORLD MINE PRODUCTION OF LEAD IN CONCENTRATE, BY COUNTRY^{1,2}

(Metric tons, lead content)

Country ³	2006	2007	2008	2009	2010
Argentina	12,064	17,045	20,788	24,753 ^r	22,000
Australia	686,000	641,000	645,000	566,000	625,000
Bolivia	11,955	22,798	81,602	84,535 ^r	72,803
Bosnia and Herzegovina ^c	1,000	2,600 ^r	3,300 ^r	2,100 ^r	2,000
Brazil	15,764	24,574	24,600	24,800	25,000 ^p
Bulgaria ^c	10,000	15,000	15,000	12,000 ^r	12,000
Burma ^c	2,000	2,000	3,000 ^r	7,500 ^r	7,000
Canada	83,096	75,135	98,974	68,761	64,859 ^p
Chile	672	1,305	3,985	1,511	900 ^e
China ^e	1,330,000	1,410,000	1,500,000	1,600,000	1,850,000
Georgia ^c	400	400	400	400	400
Greece ^c	10,500	15,000	16,000	16,000	18,000
Guatemala	28	165 ^r	53 ^r	--	--
Honduras	11,775	10,215	12,545 ^r	14,471 ^r	13,000
India	69,200	77,500	87,300	92,000	95,000
Iran ^{c,4}	24,000 ⁵	25,000	26,905 ^{r,5}	30,000 ^r	30,000
Ireland ^c	62,000	54,100	50,200	43,000 ^r	45,000
Italy ^c	800	800	800	800	800
Japan	777	--	--	--	--
Kazakhstan	48,100	40,200	39,000	39,400	36,100
Korea, North ^c	13,000	13,000	13,000	13,000	13,000
Korea, Republic of	17	12	449	2,064 ^r	2,000 ^e
Macedonia	15,600	32,000	34,000 ^e	52,000	46,000
Mexico	120,450	120,000	100,725	143,838	158,206
Morocco	53,000	44,800	40,000	40,000 ^e	35,000
Namibia	11,830	10,543	14,062	20,000 ^r	20,000 ^e
Peru	313,325	329,154	345,109	302,459 ^r	261,902
Poland	97,600 ^r	79,400 ^r	87,700 ^r	80,400 ^r	70,000 ^e
Romania	6,269	1,000	-- ^e	-- ^e	-- ^e
Russia ^c	36,000	50,000	60,000	70,000	97,000
Serbia ^c	1,400 ^r	1,600 ^r	1,600 ^r	1,800 ^r	2,000
South Africa	48,273	41,857	46,440	49,149	49,715
Sweden	76,800	62,100	60,000	60,000 ^e	60,000 ^e
Tajikistan ^c	800	800	800	800	800
Turkey ^c	13,000 ^r	32,000 ^r	25,000 ^r	26,000 ^r	27,000
United Kingdom ^c	500	500	500	500	500
United States	429,000	444,000	410,000	406,000	369,000
Vietnam	14,900	19,200	14,200 ^r	7,700 ^r	7,000 ^e
Total	3,630,000 ^r	3,720,000 ^r	3,880,000 ^r	3,900,000 ^r	4,140,000

^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.

²Table includes data available through July 7, 2011.

³In addition to the countries listed, lead is also produced in Nigeria, but information is inadequate to formulate reliable estimates of output levels.

⁴Year beginning March 21 of that stated.

⁵Reported figure.

TABLE 14
LEAD: WORLD REFINERY PRODUCTION, BY COUNTRY^{1,2}

(Metric tons)

Country ³	2006	2007	2008	2009	2010
Algeria, secondary ^e	5,000	5,000	5,000	5,000	5,000
Argentina:					
Primary	12,064	11,588	13,482	12,558 ^r	12,000 ^e
Secondary	37,000	49,000	59,000	70,000 ^{r,e}	70,000 ^e
Total	49,064	60,588	72,482	82,558 ^r	82,000 ^e
Australia:					
Primary	206,000	202,000	221,000	204,000	178,000
Secondary ^e	27,000	27,000	27,000	25,000	26,000
Total	233,000	229,000	248,000	229,000	204,000
Austria, secondary	28,120	28,564	26,902	23,000 ^{r,e}	24,000 ^e
Belgium:					
Primary	-- ^r	-- ^r	-- ^r	-- ^r	--
Secondary	101,400 ^r	117,200 ^r	109,000 ^r	109,000 ^r	121,000 ^e
Total	101,400 ^r	117,200 ^r	109,000 ^r	109,000 ^r	121,000 ^e
Bolivia	318	301	473	269 ^e	-- ^e
Brazil, secondary	108,951 ^r	130,963 ^r	95,704 ^r	96,000 ^r	112,000 ^e
Bulgaria: ^e					
Primary	64,000	73,000 ⁴	73,000	70,000	68,000
Secondary	12,000	14,000 ⁴	14,000	13,000	13,000
Total	76,000	87,000 ⁴	87,000	83,000	81,000
Burma, primary	537	165	202	200 ^e	--
Canada:					
Primary	115,989	95,577	105,526	101,484	105,836 ^p
Secondary	134,475	141,111	153,549	157,370	167,042 ^p
Total	250,464	236,688	259,075	258,854	272,878 ^p
China: ^e					
Primary	2,130,000	2,140,000	2,350,000	2,480,000	2,840,000
Secondary	590,000	650,000	850,000	1,230,000	1,360,000
Total	2,720,000	2,790,000	3,200,000	3,710,000	4,200,000
Czech Republic, secondary ^e	29,000	34,000	36,000	29,000 ^r	30,000
Estonia, secondary	9,000	10,000	10,000 ^e	10,000 ^e	10,000 ^e
France:					
Primary ^e	-- ^r	-- ^r	-- ^r	-- ^r	--
Secondary	100,195	100,200	88,000	88,000 ^e	88,000 ^e
Total	100,195 ^r	100,200 ^r	88,000 ^r	88,000 ^{r,e}	88,000 ^e
Germany:					
Primary	113,760	110,934	113,200	104,900 ^r	125,000 ^e
Secondary	265,190	294,147	301,900	285,700 ^r	280,000 ^e
Total	378,950	405,081	415,100	390,600 ^r	405,000 ^e
Greece, secondary ^e	5,000	5,000	5,000	4,000	4,000
India:					
Primary	49,600 ^r	53,800 ^r	62,000	62,000 ^r	60,000 ^e
Secondary	170,000 ^r	185,000 ^r	212,000 ^r	245,000 ^r	253,000 ^e
Total	219,600 ^r	238,800 ^r	274,000 ^r	307,000 ^r	313,000 ^e
Indonesia, secondary	19,000	18,500	18,500	18,000	18,000
Iran: ^e					
Primary	25,000	25,000	20,000	20,000	20,000
Secondary	50,000	50,000	55,000	55,000	55,000
Total	75,000	75,000	75,000	75,000	75,000

See footnotes at end of table.

TABLE 14—Continued
LEAD: WORLD REFINERY PRODUCTION, BY COUNTRY^{1,2}

(Metric tons)

Country ³	2006	2007	2008	2009	2010
Ireland, secondary ^e	22,000	22,500	22,500	19,000 ^r	20,000
Israel, secondary	25,000	25,000	27,000	22,000 ^{r,e}	25,000 ^e
Italy:					
Primary	34,600	45,000	47,800	15,000 ^e	15,000 ^e
Secondary	155,900	165,000	164,000	134,000 ^e	134,000 ^e
Total	190,500	210,000	211,800	149,000 ^e	149,000 ^e
Japan:					
Primary	108,271	104,527	107,005	96,974 ^r	98,000
Secondary	171,743 ^r	171,795	172,454	150,871 ^r	160,000
Total	280,014 ^r	276,322	279,459	247,845 ^r	258,000
Kazakhstan, primary and secondary	115,974	117,641	105,766 ^r	80,994 ^r	103,110
Kenya, secondary ^e	1,000	1,000	1,000	500 ^r	800
Korea, North, primary and secondary ^e	9,000	9,000	9,000	9,000	9,000
Korea, Republic of:					
Primary	163,379	195,022	244,137	222,461 ^r	200,000 ^e
Secondary ^e	56,000	60,000	60,000	60,000	60,000
Total	219,379	255,022	304,137	282,461 ^r	260,000 ^e
Malaysia, secondary ^{e,5}	73,000	73,000	73,000	70,000	71,000
Mexico:					
Primary ⁶	102,498	102,000 ^e	89,838	100,361	100,000
Secondary ^e	110,000	110,000	110,000	110,000	110,000
Total	212,498	212,000 ^e	199,838	210,361	210,000
Morocco: ^e					
Primary	38,000	45,000	45,000	45,000	45,000
Secondary	3,000	3,000	3,000	3,000	2,500
Total	41,000	48,000	48,000	48,000	47,500
Netherlands, secondary ^e	18,000	17,000	17,000	17,000	17,000
New Zealand, secondary ^e	7,000	7,000	9,000	13,000	9,000
Nigeria, secondary ^e	5,000	5,000	5,000	5,000	5,000
Pakistan, secondary ^e	3,100	3,000	3,000	2,900 ^r	2,900
Peru, primary	120,311	116,774	114,259	26,082 ^r	--
Philippines, secondary ^e	30,000	34,000 ^r	34,000 ^r	40,000 ^r	40,000
Poland: ^e					
Primary	26,200	37,200	38,000 ^r	30,000 ^r	35,000
Secondary	56,600	67,000	70,200 ^r	70,400 ^r	77,000
Total	82,800	104,000	108,000 ^r	100,000 ^r	112,000
Portugal, secondary ^e	3,000	3,000	3,000	3,000	3,000
Romania: ^e					
Primary	29,130 ^{r,4}	34,368 ^{r,4}	34,000	9,000 ^r	8,000
Secondary	5,000	5,000	5,000	5,000	3,000
Total	34,100	39,400 ^r	39,000	14,000 ^r	11,000
Russia, primary and secondary ^e	78,000	94,000	80,000	73,000	89,000
Saudi Arabia, secondary ^e	38,000	38,000	38,000	38,000	38,000
Serbia, primary and secondary	2,676 ^r	1,273 ^r	929 ^r	900 ^{r,e}	900 ^e
Slovenia, secondary ^e	15,000	15,000	15,000	14,000	14,000
South Africa, secondary	67,000	59,000	62,000	55,000 ^e	58,000 ^e
Spain, secondary	129,000 ^r	128,000 ^r	125,000 ^r	125,000 ^r	125,000 ^e

See footnotes at end of table.

TABLE 14—Continued
LEAD: WORLD REFINERY PRODUCTION, BY COUNTRY^{1,2}

(Metric tons)

Country ³	2006	2007	2008	2009	2010
Sweden: ^e					
Primary	26,000	26,000	26,000	26,000	26,000
Secondary	40,000	40,000	40,000	40,000	35,000
Total	66,000	66,000	66,000	66,000	61,000
Switzerland, secondary ^e	9,600 ⁴	9,000	8,000	8,000	8,000
Taiwan, secondary	55,000	55,000	55,000	40,000	35,000
Thailand, secondary	61,160	73,159	73,303	55,504 ^r	70,000 ^e
Tunisia, secondary ^e	-- ^r	-- ^r	-- ^r	-- ^r	--
Turkey, secondary ^e	6,000	6,000	6,000	6,000	6,000
Ukraine, secondary ^e	7,000 ^r	7,000 ^r	7,000 ^r	7,000 ^r	7,000
United Arab Emirates, secondary ^e	2,000	2,000	2,000	2,000	2,000
United Kingdom:					
Primary	174,700 ^r	119,000 ^r	139,000 ^r	135,000 ^r	150,000
Secondary	144,000	144,000 ^r	144,000	144,000	144,000
Total	318,700 ^r	263,000 ^r	283,000 ^r	279,000 ^r	294,000
United States:					
Primary	153,000	123,000	135,000	103,000	115,000
Secondary	1,160,000	1,180,000	1,140,000	1,110,000	1,140,000
Total	1,310,000	1,300,000	1,280,000	1,210,000	1,250,000
Venezuela, secondary ^e	30,000	30,000	30,000	30,000	30,000
Zambia, secondary ^e	1,000	1,000	1,000	1,000	1,000
Grand total	8,100,000 ^r	8,300,000 ^r	8,770,000 ^r	8,890,000 ^r	9,490,000
Of which:					
Primary	3,690,000 ^r	3,660,000 ^r	3,980,000 ^r	3,860,000 ^r	4,200,000
Secondary	4,200,000 ^r	4,420,000 ^r	4,600,000 ^r	4,860,000 ^r	5,090,000
Undifferentiated	206,000	222,000	196,000	164,000 ^r	202,000

^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.

²Table includes data available through July 7, 2011. Data included represent the total output of refined lead by each country, whether derived from ores and concentrates (primary) or scrap (secondary), and include the lead content of antimonial lead but exclude, to the extent possible, simple remelting of scrap.

³In addition to the countries listed, Colombia, Egypt, El Salvador, Iraq, and Trinidad and Tobago produced secondary lead, but output is not officially reported; available general information is inadequate for the formulation of reliable estimates of output levels.

⁴Reported figure.

⁵Metal Reclamation Industries' secondary lead smelter is receiving some primary mine concentrates from the Magellan Mine (Australia). The ore minerals are lead oxides and can be smelted at a secondary smelter.

⁶Includes lead content in antimonial lead.