USGS
science for a changing world

2018 Minerals Yearbook

IRON ORE [ADVANCE RELEASE]

U.S. Department of the Interior
U.S. Geological Survey

September 2021

Iron Ore

By Candice C. Tuck

Domestic survey data and tables were prepared by Hoa P. Phamdang, statistical assistant.

In 2018, U.S. iron ore production increased by 3% to 49.5 million metric tons (Mt), gross weight, from 47.9 Mt in 2017 (table 1). In the United States, reduced imports of raw steel, finished steel products, and ferroalloys and increased demand for domestic steel products in 2017 and 2018 resulted in increased domestic production of iron ore. The United States ranked ninth globally in production of iron ore on the basis of usable ore and eighth by iron content (fig. 1, table 9).

Global iron ore production was 2.46 billion metric tons (Gt) of usable ore, containing an estimated 1.52 Gt of iron, a slight increase from 2.44 Gt of usable ore in 2017. Global iron ore production was led by Australia (900 Mt), Brazil (460 Mt), China (335 Mt), India (205 Mt), and Russia (96.1 Mt). Production from these countries, combined, accounted for 81% of global production (tables 8, 9). World production of raw steel increased by 7% to 1.81 billion tons (Gt) in 2018 from 1.69 Gt in 2017. Global production of pig iron increased by 6% to 1.26 Gt from 1.19 Gt in 2017 (American Iron and Steel Institute, 2019, p. 111–115).

Iron ore is the primary raw material for producing steel, an alloy critical to the economies of all industrialized nations. Two iron oxides—hematite (Fe_2O_3) and magnetite (Fe_3O_4)—are the primary iron ore minerals found in the United States. The principal form of iron ore mined in the United States contains hematite and magnetite in varying proportions, averaging 25% to 30% iron (Fe) content, and occurs in hard, fine-grained, banded iron formations also known as taconite. Magnetite is the main iron oxide recovered during concentration, although hematite tailings have become an economical alternative source of primary iron.

In the United States, low-grade iron ore is concentrated to reach, on average, the 62.5% Fe or greater benchmark required globally for steel production. The concentrates can then be agglomerated using binders to create iron ore pellets, which are more easily transported and more efficiently melted in blast furnaces. More than 98% of all domestic iron ore production is transformed into molten iron, also known as pig iron, in blast furnaces by removing residual oxygen. The pig iron then may be transferred to basic oxygen furnaces for the removal of residual carbon and conversion to steel.

Small-scale steel mills, also known as minimills, use electric arc furnaces (EAFs) to produce steel from iron metallics and recycled steel scrap. Iron metallics—cold pig iron, direct-reduced iron (DRI), hot-briquetted iron (HBI), and iron nuggets—are intermediate iron products that have become increasingly cost effective as supplements to lower grades of steel scrap when integrated into the EAF process. DRI, also known as sponge iron, is produced through solid-state reduction of iron ore to 90% to 94% Fe (about the same iron content as molten pig iron); however, DRI requires special handling owing to its high susceptibility to oxidation. HBI is a higher density, premium quality form of briquetted DRI with lower susceptibility to oxidation. Iron nuggets, also known as iron nodules, are the least reactive among iron metallics and are a premium grade of pig iron, with an average of 97% to 99% Fe and almost no gangue.

Iron ore also may be used for nonsteel applications including ballast, cement clinker production, coal washing, crushed road base material, fertilizer, dense media separation, iron oxide pigments, ferrite magnets, oil and gas well drilling, radiation shielding, water treatment, and other specialty applications. These applications represent a relatively small portion of iron ore consumption. Some applications require costly beneficiation to create high-grade products. Data for these applications are not included in the U.S. Geological Survey's (USGS's) tables for domestic iron ore consumption, exports, imports, production, shipments, or stocks, unless otherwise noted. With the exception of iron oxide pigments and cement clinker, USGS surveys do not include production or consumption of iron ore for different, nonsteel end uses.

This report includes information from surveys of domestic producers, government agency reports, company reports, and public information. Trade data in this report are from the U.S. Census Bureau. Labor statistics were based on data available from the Mine Safety and Health Administration. Percentages in this report were calculated using unrounded data and have been rounded to no more than three significant digits.

Legislation and Government Programs

Regulations, legislative initiatives, and monitoring of environmental issues regarding iron ore production continued as previously reported, with no significant changes in 2018. Environmental issues related to the production of iron ore include, but are not limited to, cross-state air pollution, effects of sulfate discharge on wild rice and associated changes to water-quality standards, greenhouse gas emissions, hazardous air pollutants, mercury discharge, regional haze, selenium discharge, sulfur dioxide and nitrogen dioxide emissions, and water conductivity as a measure of dissolved minerals (Cleveland-Cliffs Inc., 2019, p. 10–15).

Production

The USGS developed the U.S. iron ore data shown in tables 1 and 2 through an annual "Iron Ore" survey, which was sent to seven domestic mines and facilities that produce iron ore and three iron metallics for steel production, all of which responded. Company reports, employment data, mine inspection reports, and tax data supplemented the survey data received. Information on the capacity, production, and reserves of individual operations in the United States is provided in table 3.

Louisiana.—Nucor Steel Louisiana, LLC's 2.5-million-metric-ton-per-year (Mt/yr) DRI operation achieved new annual records for production and shipments, experiencing no reported outages (Nucor Corp., 2019, p. 23).

Michigan.—The Tilden Mine, operated by Cleveland-Cliffs Inc., reported 7.8 Mt of pellet production, about the same as that in 2017 (table 2).

Minnesota.—In Minnesota, six collocated open pit mines, concentrators, and pellet facilities were operational during 2018. In 2018, operations in Minnesota produced 41.7 Mt of salable iron products, 4% more than the 40.1 Mt produced in 2017 (table 2). Nonoperational deposits in Minnesota's Mesabi Range, including the former LTV Corp.'s mine and the Buhl, Kinney, McKinley, and Sherman deposits, were estimated to contain approximately 1.5 Gt of high-grade iron ore. An additional 1 Gt of iron ore in tailings ponds and stockpiles were considered economically recoverable (Minnesota Department of Natural Resources, 2016).

In 2018, Cleveland-Cliffs planned to transition management of the Hibbing Taconite Mine to the majority owner ArcelorMittal USA in August 2019. Reserves for the Northshore Mine were updated during 2018 to reflect an increase to 850 Mt, the largest reserves of all active U.S. iron ore mines. Facilities at Northshore were being upgraded to produce pellets of sufficient grade and composition to be used in the production of DRI or HBI. The higher grade pellets could be sold commercially or used as feedstock for the planned HBI plant under construction in Ohio. The upgrades were expected to be completed in 2019 (Cleveland-Cliffs Inc., 2019, p. 28, 30, 34).

Ohio.—In 2018, Cleveland-Cliffs began construction of a 1.9-Mt/yr HBI plant at a brownfield site in Toledo, OH. The feedstock for the plant would be sourced from Cleveland-Cliffs mines, and products were expected to be sold to EAF partners throughout the Great Lakes region. The project was expected to be complete by midyear 2020 (Cleveland-Cliffs Inc., 2019, p. 1, 4, 6).

Consumption

Steelmaking is responsible for most of the iron ore consumption. It is estimated that producing 1.0 metric ton (t) of steel requires 1.3 t of iron ore pellets, 0.4 t of coking coal, and 0.3 t of steel scrap, as well as 6.0 million British thermal units of natural gas, using blast furnaces at normal operating conditions. In 2018, U.S. consumption of iron ore, by gross weight, reported by the American Iron and Steel Institute (2019, p. 79), totaled 36.6 Mt, including 30.8 Mt of pellets; 4.69 Mt of sinter, briquettes, nodules, and other products; and 1.16 Mt of direct-shipping ore (table 4).

In 2018, U.S. raw steel production increased to 86.6 Mt, an increase of 6% from 81.6 Mt in 2017. The American Iron and Steel Institute (AISI) estimated raw steel production capacity in 2018 to be 111 Mt, a slight increase from 110 Mt in 2017. In 2018, capability utilization was 78.2% compared with 74.0% in 2017. Integrated steel producers smelted iron ore to make liquid iron in blast furnaces and used basic oxygen furnaces (BOFs) to refine the liquid iron, with some steel scrap, to produce raw liquid steel. The BOF process was used to make 27.7 Mt of steel in the United States, a 7% increase from 25.8 Mt in 2017. The use of this process increased slightly to 32.0% of total steel production in 2018 from 31.6% in 2017 (American Iron and Steel Institute, 2019, p. 70–71, 73).

Transportation

Domestically, iron ore is transported from mines to rail stations by heavy hauling trucks and by rail to port facilities on the Great Lakes or to processing facilities in North America. From ports, the ore is transported by ship across the Great Lakes and (or) through the St. Lawrence Seaway to the Atlantic Ocean. Bulk iron ore products are primarily transported by freighter across the Great Lakes, owing to cost-effective transportation rates. Production, sales, shipments, and stocks of iron ore in Minnesota and Michigan fluctuated seasonally from December through April as a result of the annual closing and reopening of the Soo Locks at Sault Ste. Marie, MI, as well as harsh weather conditions and frozen lake surfaces during winter months.

The Soo Locks, one of the four U.S. lock systems on the Great Lakes, was the primary passage for iron ore being transported from iron mines in Minnesota's Mesabi Range to steel plants in the midwestern United States. In November 2018, the U.S. Army Corps of Engineers announced that they would proceed with plans for construction of a second set of locks, similar to the Soo Locks, using multiple funding sources to begin the design and construction phases, which were authorized in 1968 and proceeded temporarily in 2009. The construction was expected to be completed in 2029 and would relieve traffic congestion at the existing Soo Locks, which were estimated to support $35 billion in economic activity (Lake Carriers Association, 2018).

Prices

In 2018, the average unit value of iron ore in the United States was $93.00 per metric ton, an 18% increase from $78.54 per metric ton in 2017, after average unit values decreased from 2014 through 2016 (table 1). The average unit value of exported iron ore was $74.94 per metric ton, a 3% increase from $72.56 in 2017. The average unit value of exports totaling more than 1,000 t to any single country ranged from $46.46 to $183.70 per metric ton (table 5). In 2018, the average unit value of imported iron ore was $101.93 per metric ton, a 6% increase from the revised $95.94 per metric ton in 2017. The average unit value of imports totaling more than 1,000 t from any single country ranged from $55.00 to $165.01 per metric ton (table 6).

The average monthly spot price of imported iron ore fines, 62% Fe, at the port of Tianjin, China, fell from $76.34 and $77.46 per metric ton in January and February, respectively, to $64.56 per metric ton in July, then increased in October and November to $73.41 and $73.26, respectively, and finished the year at $69.15 in December. The lowest average monthly spot market price, $64.56 per metric ton in July, was 12% higher than the lowest average monthly spot price of $57.48 per metric ton in June 2017. In 2018, the highest average monthly spot market price, $77.46 per metric ton in February, was 13%

lower than the highest average monthly spot price of $89.44 per metric ton in February 2017 (Index Mundi, undated).

Foreign Trade

In 2018, U.S. iron ore exports were 13.0 Mt, a 23% increase from 10.6 Mt in 2017. Pellets accounted for 98% (12.7 Mt) of total exports. Steel companies in Canada received 77% of total United States iron ore exports, followed by Japan with 17% (tables 1, 5). Imports in 2018 were 3.81 Mt, a 3% increase from 3.71 Mt in 2017, with the most imports coming from Brazil and Canada, accounting for 62% and 22%, respectively (table 6). Although imported iron ore supplemented domestically produced iron ore, the United States remained a net exporter in 2018 (tables 5, 6).

World Industry Structure

Production.—Global iron ore production was 2.46 Gt, on a usable-ore basis, containing an estimated 1.52 Gt of iron, a slight increase from 2.44 Gt of usable ore in Mt in 2017 containing an estimated 1.50 Gt of iron. Global iron ore production was led by Australia (900 Mt), Brazil (460 Mt), China (335 Mt), India (205 Mt), and Russia (96.1 Mt), which combined, accounted for 81% of global production (tables 8, 9).

Consumption.—Raw steel and pig iron production are significant indicators of iron ore consumption; iron metallics are also indicators, although on a smaller scale. World consumption of iron ore was estimated to have increased slightly in 2018, as indicated by increases in production of raw steel, DRI, and pig iron compared with those in 2017 (table 8). China was the leading producer of pig iron and raw steel, and countries in the Middle East and North Africa region were the leading producers of DRI (American Iron and Steel Institute, 2019, p. 110–115; Midrex Technologies, Inc., 2019, p. 7).

Trade.—Global imports of iron ore were 1.52 Gt in 2018, essentially unchanged from the revised 1.54 Gt in 2017. Since 2006, China, Germany, Japan, and the Republic of Korea have accounted for more than two-thirds of global imports, with their combined share increasing to 86% in 2018 from 62% in 2002. China's share of global imports more than tripled during this 16-year period to 71% from 21%. Australia was the leading exporter of iron ore (55%), followed by Brazil (25%) (table 8).

World Review

Australia.—Production of iron ore in Australia was 900 Mt in 2018, a slight increase from 885 Mt in 2017. Three iron-ore-mining companies in Australia—BHP Billiton Ltd., Fortescue Metals Group Ltd., and Rio Tinto Ltd.—were among the four leading iron ore producers in the world and accounted for most of the iron ore produced in Australia.

BHP Billiton's iron ore production in Australia in fiscal year (FY) 2018, which ended June 30, 2018, was 238 Mt, a 3% increase from that of FY 2017. The company reported a decrease in production costs and an increase in seaborne ore prices in FY 2018 compared with those in the FY 2017. In 2018, BHP Billiton planned to improve productivity through transportation improvements at Port Hedland and a dumper car maintenance program to achieve between 241 and 250 Mt of iron ore production in FY 2019 (BHP Billiton Ltd., 2018, p. 89–90). Fortescue's iron ore shipments were 168 Mt in FY 2019, a slight decrease from 170 Mt in FY 2018. Fortescue approved the $2.6 billion Iron Bridge Magnetite Project to develop 22 Mt/yr of 67% concentrates by midyear 2022. The company continued its autonomous haulage truck project, completing conversion to a fully autonomous fleet by midyear 2020 (Fortescue Metals Group Ltd., 2019, p. 22, 29). Rio Tinto's share of iron ore production at its operations in Australia was 281 Mt in 2018, a 4% increase from 271 Mt in 2017. In December 2018, Rio Tinto launched the world's first automated heavy-haul, long-distance rail network. The company approved the Koodaideri Mine Project, a $2.6 billion, 43-Mt/yr iron ore mine and processing facility to be completed in late 2021 (Rio Tinto Ltd., 2018, p. 36–37).

Brazil.—Production of iron ore in Brazil was 460 Mt in 2018, a slight increase from 454 Mt in 2017. Vale S.A., the leading iron ore producer in Brazil, increased production in 2018 to 385 Mt, a 5% increase from 367 Mt in 2017, and increased its pellet production in 2018 to 55.3 Mt, a 10% increase from 50.3 Mt in 2017 (Vale S.A., 2019, p. 41, 43–44). In December 2018, Anglo American plc restarted operations at the Minas Rio Mine in Minas Gerais following the March 2018 discovery of leaks in a slurry pipeline that transported ore to a port in Rio de Janeiro. Repairs required the replacement of approximately 4 kilometers (2.5 miles) of pipeline (Jamasmie, 2018).

China.—China produced 335 Mt of iron ore in 2018, a 3% decrease from 345 Mt in 2017 (table 9). Increasing demand from steel producers in China for high-grade iron ore blends, primarily originating in Australia and Brazil, were driven by stricter emissions requirements from the Government of China for steel producers.

India.—Production of iron ore in India was 205 Mt, a slight increase from 202 Mt in 2017. A ruling from the Supreme Court of India canceled mining permits for all iron ore mines operating in Goa effective March 15, 2018, which included 88 mining leases (Das, 2018). NMDC Ltd. has produced iron ore at the Donimalai Mine since 1977, but the lease expired on November 3, 2018. As a condition of renewing the lease for another 20 years, the local government imposed a new 80% premium on sales from the mine. NMDC Ltd. suspended operation at that time because mining there was no longer economically feasible. The company appealed the imposition of the of the premium, but no resolution was reached by yearend (Press Trust of India, 2019). Closure of the mine was expected to cause major increases in iron ore imports to India (Kulkarni, 2018).

Outlook

The increase or decrease of gross domestic product (GDP), the broadest measure of a nation's economic activity, may be considered an indicator of the health of the steelmaking and steel manufacturing industries. These industries, worldwide and domestically, determine the demand for iron ore. The World Bank's forecasts of global GDP growth for 2019, 2020, and 2021 are 2.6%, 2.7%, and 2.8%, respectively, after 3.0% and

3.1% in 2018 and 2017, respectively. The rate of GDP growth for China is estimated to be 6.6% in 2018 and is projected to decrease to 6.2%, 6.1%, and 6.0% in 2019, 2020, and 2021, respectively. The rate of GDP growth for India is estimated to be 7.2% in 2018 and is projected to be 7.5% in 2019 and in 2020 (World Bank, The, 2019, p. 4). The U.S. Federal Reserve's projections for rate of GDP growth for the United States are 2.1% for 2019, 1.9% for 2020, and 1.8% for 2021 (Board of Governors of the Federal Reserve System, 2019).

According to the World Steel Association, world apparent steel consumption (ASC) was 1.71 Gt in 2018 and is forecast to increase slightly to 1.74 Gt in 2019 and 1.75 Gt in 2020. China's ASC is expected to increase to 843.3 Mt in 2019 and decrease to 834.9 Mt in 2020, from 835.0 Mt in 2018. ASC in India is expected to increase to 102.8 Mt in 2019 and 110.2 Mt in 2020, from 96.0 Mt in 2018. Increases in ASC are also anticipated in the Commonwealth of Independent States (to 57.0 Mt in 2019 from 56.2 Mt in 2018), the European Union (to 170.2 Mt from 169.7 Mt), and the United States (to 101.4 Mt from 100.2 Mt). Japan's ASC is expected to decrease to 64.7 Mt in 2019 from 65.4 Mt in 2018 (World Steel Association, 2019). Rebounds in the global price of seaborne iron ore could result in increased production at large-scale mines. Clean air and emissions reduction policies in China continue to drive global demand for higher grade ore, reducing the profitability of small-scale and low-grade mines and continuing the trend of idling those mines.

References Cited

American Iron and Steel Institute, 2019, 2018 annual statistical report: Washington, DC, American Iron and Steel Institute, 115 p.

BHP Billiton Ltd., 2018, Annual report 2018: Melbourne, Victoria, Australia, BHP Billiton Ltd., September 6, 298 p. (Accessed November 1, 2019, at https://www.bhp.com/-/media/documents/investors/annual-reports/2018/bhpannualreport2018.pdf.)

Board of Governors of the Federal Reserve System, 2019, March 20, 2019—FOMC projections materials, accessible version: Board of Governors of the Federal Reserve System, December 19. (Accessed December 21, 2019, at https://www.federalreserve.gov/monetarypolicy/fomcprojtabl20190320.htm.)

Cleveland-Cliffs Inc., 2019, 2018 annual report: Cleveland, OH, Cleveland-Cliffs Inc., 176 p. (Accessed September 1, 2019, at http://s1.q4cdn.com/345331386/files/doc_financials/annual/CLF_2018_AnnualReport.pdf.)

Das, K.N., 2018, India's top court cancels iron ore mining permits in Goa—Petitioners: Thomson Reuters [New Delhi, India], February 7. (Accessed November 1, 2019, at https://www.reuters.com/article/us-india-mining/indias-top-court-cancels-iron-ore-mining-permits-in-goa-petitioners-idUSKBN1FR0FZ.)

Fortescue Metals Group Ltd., 2019, Annual report—FY19: Perth, Western Australia, Australia, Fortescue Metals Group Ltd., August 26, 154 p. (Accessed November 1, 2019, at https://www.fmgl.com.au/docs/default-source/annual-reporting-suite/fy19-annual-report.pdf.)

Index Mundi, [undated], Iron ore monthly price: Index Mundi. (Accessed November 1, 2019, at http://www.indexmundi.com/commodities/?commodity=iron-ore.)

Jamasmie, Cecilia, 2018, Eight months and millions later, Anglo American restarts Minas Rio mine: Mining.com, December 21. (Accessed November 1, 2019, at https://www.mining.com/eight-months-billions-later-anglo-american-restarts-minas-rio/.)

Kulkarni, Mahesh, 2018, Iron ore imports to rise as Karnataka mine shuts: Deccan Herald [Karnataka, India], November 26. (Accessed November 1, 2019, at https://www.deccanherald.com/business/iron-ore-imports-set-rise-nmdc-705079.html.)

Lake Carriers Association, 2018, Army Corps will begin construction of new Soo Lock—Lake Carriers' Association is elated at official commencement of project that has stalled for more than three decades: Westlake, OH, Lake Carriers Association press release, November 21. (Accessed November 22, 2019, at https://lcaships.com/army-corps-will-begin-construction-of-new-soo-lock-lakes-carriers-association-is-elated-at-official-commencement-of-project-that-has-stalled-for-more-than-three-decades/.)

Midrex Technologies, Inc., 2019, 2018 world direct reduction statistics: Charlotte, NC, Midrex Technologies, Inc., August 6, 16 p. (Accessed November 1, 2019, at https://www.midrex.com/wp-content/uploads/Midrex_STATSbookprint_2018Final-1.pdf.)

Minnesota Department of Natural Resources, 2016, Explore Minnesota—Iron ore: Minnesota Department of Natural Resources, Division of Lands and Minerals, March, 4 p. (Accessed May 15, 2017, at https://files.dnr.state.mn.us/lands_minerals/mcc_docs/2016_explore_iron_ore.pdf.)

Nucor Corp., 2019, 2018 annual report: Charlotte, NC, Nucor Corp., 86 p. (Accessed September 1, 2019, at https://nucor.gcs-web.com/static-files/5d609996-5a8d-4810-b40a-76f894bb05b7.)

Press Trust of India, 2019, NMDC Ltd suspends iron ore-mining in Karnataka: Press Trust of India, November 20. (Accessed February 14, 2020, at http://ptinews.com/news/10190157_NMDC%20Ltd%20suspends%20iron%20ore-mining%20in%20Karnataka.)

Rio Tinto Ltd., 2018, 2018 annual report: Melbourne, Victoria, Australia, Rio Tinto Ltd., 302 p. (Accessed November 1, 2019, via https://www.riotinto.com/invest/reports/annual-report.)

Vale S.A., 2019, Form 20–F—2018: U.S. Securities and Exchange Commission, April 18, 314 p. (Accessed November 1, 2019, at http://www.vale.com/EN/investors/information-market/annual-reports/20f/20FDocs/Vale_20-F%20FY2018%20-%20final_i.pdf.)

World Bank, The, 2019, Global economic prospects—Heightened tensions, subdued investment: Washington, DC, The World Bank, June, 182 p. (Accessed November 1, 2019, at https://openknowledge.worldbank.org/bitstream/handle/10986/31655/9781464813986.pdf.)

World Steel Association, 2019, World steel short range outlook April 2019: Brussels, Belgium, World Steel Association press release, April 16. (Accessed November 1, 2019, at https://www.worldsteel.org/media-centre/press-releases/2019/worldsteel-short-range-outlook-april-2019.html.)

GENERAL SOURCES OF INFORMATION

U.S. Geological Survey Publications

Historical Statistics for Mineral and Material Commodities in the United States. Data Series 140.

Iron. Ch. in United States Mineral Resources, Professional Paper 820, 1973.

Iron Ore. Ch. in Mineral Commodity Summaries, annual.

Iron Ore. Mineral Industry Surveys, monthly.

Iron Ore (Fe). Ch. in Metal Prices in the United States Through 2010, Scientific Investigations Report 2012–5188, 2013.

Other

Annual Report of the Inspector of Mines, St. Louis County, MN.

Association for Iron & Steel Technology.

Iron Ore. Ch. in Mineral Facts and Problems, U.S. Bureau of Mines Bulletin 675, 1985.

Minnesota Department of Natural Resources.

Minnesota Iron Mining Association.

U.S. Department of Labor, Mine Safety and Health Administration.

TABLE 1
SALIENT IRON ORE STATISTICS[1]

(Thousand metric tons, gross weight, and thousand dollars, unless otherwise specified)

		2014	2015	2016	2017	2018
Iron ore, usable:						
United States:						
Production:						
Gross weight		56,100	46,100	41,800	47,900	49,500
Iron content		35,400	28,800	26,400	30,300	31,300
Shipments		55,000	43,500	46,600	46,900	50,400
Value:						
Minnesota:[2]						
Cost of mining	dollars per metric ton	13.84 r	11.86 r	11.59 r	10.81 r	11.79
Cost of beneficiation	do.	35.04 r	30.23 r	28.54 r	29.88 r	31.22
Average value of production	do.	89.54 r	76.68 r	70.55 r	78.43 r	90.57
United States:						
Reported value at mines[3]		4,730,000	3,750,000	3,050,000	3,760,000	4,600,000
Average value at mines	dollars per metric ton	84.43	81.19	73.11	78.54	93.00
Exports:						
Quantity		12,100 r	7,500 r	8,710 r	10,600	13,000
Value		1,320,000 r	611,000 r	574,000 r	766,000 r	972,000
Imports for consumption:						
Quantity		5,140	4,550	3,010	3,710 r	3,810
Value		676,000	455,000	241,000	356,000 r	388,000
Consumption:						
Apparent[4]		47,800 r	42,100 r	37,900 r	40,100 r	41,200
Reported[5]		44,400	38,500	34,500	34,400	36,600
Stocks, December 31		3,630 r	4,760 r	2,990 r	3,930 r	3,100
World, production		2,370,000 r	2,360,000 r	2,370,000 r	2,440,000 r	2,460,000
Iron metallics:[6]						
United States:						
Production:						
Quantity		1,950	1,450	2,070	3,250	3,560
Value[e, 7]		713,000	410,000	444,000	867,000	1,180,000
Exports:						
Quantity		4 r	61 r	195 r	1,010 r	1,050
Value		3,680 r	2,040 r	37,400 r	310,000 r	381,000
Imports for consumption:						
Quantity		2,390	1,870 r	1,790	3,520 r	3,700
Value		859,000 r	490,000 r	360,000 r	807,000 r	942,000
World, production		74,600	72,600	72,800	87,100	100,000

[e]Estimated. [r]Revised. do. Ditto.

[1]Table includes data available through April 9, 2020. Data are rounded to no more than three significant digits, except costs and average values.

[2]As reported in the Minnesota Department of Revenue's annual Mining Tax Guide.

[3]Value for iron ore as reported by mines, which may refer to price or value of shipments or production as sold on the open market or within the company.

[4]Defined as production plus imports minus exports plus adjustments for industry stock changes.

[5]Reported by the American Iron and Steel Institute as consumption of ore and agglomerated products in U.S. steel mills.

[6]Data for iron metallics may include cold pig iron, direct-reduced iron, hot-briquetted iron, iron nuggets, and solid sponge iron.

[7]Estimated based on average monthly prices of exports of direct-reduced iron from India.

TABLE 2
EMPLOYMENT AND PRODUCTION STATISTICS FOR IRON OPERATIONS IN THE UNITED STATES IN 2018, BY STATE[1]

(Thousand metric tons, unless otherwise specified)

District and State	Number of active operations	Number of employees[2]	Crude ore	Salable products		Average iron content (percent)
				Iron ore	Iron metallics	
Indiana	1	NA	--	--	262	XX
Louisiana	1	NA	--	--	1,800	XX
Michigan	1	861	23,400	7,800	--	60.9
Minnesota	6	4,000	139,000	41,700	--	64.3
Texas	1	NA	--	--	1,500	XX
Total or average	10	4,860	162,000	49,500	3,560	63.8

NA Not available. XX Not applicable. -- Zero.

[1]Table includes data available through April 9, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Source: Mining Safety and Health Administration.

TABLE 3
IRON OPERATIONS IN THE UNITED STATES IN 2018[1]

(Million metric tons, unless otherwise specified)

State and operation	County or Parish	Operator	Primary product	Status	Capacity[2]	Production[2]	Reserves[3]
Indiana, Iron Dynamics, Inc.	DeKalb	Steel Dynamics, Inc.	Hot-briquetted iron	Active	0.3	0.3	(4)
Louisiana, Nucor Steel Louisiana LLC	St. James	Nucor Corp.	Direct-reduced iron	do.	2.5	1.8	(4)
Michigan, Tilden Mine	Marquette	Cleveland-Cliffs Inc.	Iron ore pellets	do.	8.1	7.8	330
Minnesota:							
Hibbing Taconite Mine	St. Louis	do.	do.	do.	8.1	7.9	150
Keetac Mine	Itasca	United States Steel Corp.	do.	do.	5.5	5.4	340
Minntac Mine	do.	do.	do.	do.	14.8	14.4	420
Minorca Mine	do.	ArcelorMittal S.A.	do.	do.	2.9	2.8	100
Northshore Mining	Lake and St. Louis	Cleveland-Cliffs Inc.	do.	do.	6.1	5.7	850
United Taconite Mine	St. Louis	do.	do.	do.	5.5	5.3	830
Texas, voestalpine Texas LLC	San Patricio	voestalpine Group	Hot-briquetted iron	do.	2.0	1.5	(4)

do. Ditto.

[1]Table includes data available through April 9, 2020.

[2]As reported or calculated from data in company annual reports, oral communications, published online data, or U.S. Securities and Exchange Commission filings.

[3]Proven and probable reserves or equivalent, including those on owned and leased property, as reported in the company's annual public filing.

[4]Operator does not mine iron ore at this site and has no reserves.

TABLE 4
CONSUMPTION OF IRON ORE AT U.S. IRON AND STEEL PLANTS, BY TYPE OF PRODUCT[1]

(Thousand metric tons)

Type of product	2017	2018
Blast furnaces:		
Pellets	28,900	30,800
Sinter[2]	4,190	4,530
Total	33,100	35,300
Steelmaking furnaces:		
Direct-shipping ore	1,160	1,160
Sinter[2]	159	159
Total	1,320	1,320
Grand total	34,400	36,600

[1]Table includes data available through April 9, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes briquettes, nodules, and other forms.

Source: American Iron and Steel Institute.

TABLE 5
U.S. EXPORTS OF IRON ORE, BY COUNTRY OR LOCALITY AND TYPE OF PRODUCT[1, 2]

Country or locality and type of product[3]	2017 Quantity (thousand metric tons)	2017 Value (thousands)	2017 Unit value[4] (dollars per metric ton)	2018 Quantity (thousand metric tons)	2018 Value (thousands)	2018 Unit value[4] (dollars per metric ton)
Country or locality:						
Canada	7,680 r	$570,000 r	74.18 r	10,100	$777,000	77.33
Germany	39	2,560	65.88 r	165	7,660	46.46
Japan	2,330	147,000	63.31 r	2,160	129,000	59.64
Mexico	238	27,500 r	115.69 r	590	57,500	97.51
Peru	--	--	--	2	390	183.70
Other	273 r	18,800 r	69.02 r	1	329	(5)
Total	10,600	766,000 r	72.56 r	13,000	972,000	74.94
Type of product:						
Coarse ores	33	2,660 r	80.59 r	(6)	28	(5)
Concentrates	83 r	7,470 r	89.84 r	68	10,000	146.04
Fine ores	31	2,180 r	71.05 r	1	293	(5)
Other agglomerates	83	6,430	77.24	230	9,150	39.83
Pellets	10,300	747,000	72.36 r	12,700	953,000	75.17
Total	10,600	766,000 r	72.56 r	13,000	972,000	74.94

rRevised. -- Zero.
[1]Table includes data available through April 9, 2020. Data are rounded to no more than three significant digits, except unit values; may not add to totals shown.
[2]All countries and (or) localities receiving less than 1,000 metric tons of exports from the United States in 2018 included in "Other."
[3]Includes agglomerates; excludes roasted iron pyrites.
[4]Weighted average calculated from unrounded data by dividing value by tonnage.
[5]Less than ½ unit.
[6]Value thought to be erroneous based on individual country value(s) in excess of normal value range; included in "Total."

Source: U.S. Census Bureau.

TABLE 6

U.S. IMPORTS OF IRON ORE, BY COUNTRY OR LOCALITY AND TYPE OF PRODUCT[1, 2]

Country or locality and type of product[3]	2017			2018		
	Quantity (thousand metric tons)	Value (thousands)	Unit value[4] (dollars per metric ton)	Quantity (thousand metric tons)	Value (thousands)	Unit value[4] (dollars per metric ton)
Country or locality:						
Argentina	29	$4,560	158.72 r	28	$1,920	68.00
Australia	24	2,740	114.00 r	42	4,690	111.52
Brazil	2,040	194,000	95.14 r	2,370	251,000	105.68
Canada	793 r	75,500 r	95.12 r	853	78,500	92.08
Chile	283	21,800	77.22 r	96	7,710	80.52
Mauritius	--	--	--	6	303	55.00
Peru	31	11,400	(5)	31	1,730	56.20
Russia	65	5,670	87.44 r	134	16,700	124.52
South Africa	80	5,690	70.71 r	62	6,350	101.87
Sweden	363	34,300	94.52	163	16,200	99.47
Venezuela	--	--	--	16	2,610	165.01
Other	(6)	97	(5)	1	270	(5)
Total	3,710 r	356,000 r	95.94 r	3,810	388,000	101.93
Type of product:						
Coarse ores	38	2,040	53.19 r	13	1,220	94.26
Concentrates	1,120 r	68,700 r	61.42 r	1,090	69,300	63.64
Fine ores	219	30,800	140.87 r	229	19,900	86.93
Other agglomerates	--	--	--	(6)	5	39.93
Pellets	2,330	254,000	108.97	2,470	297,000	120.23
Total	3,710 r	356,000 r	95.94 r	3,810	388,000	101.93

rRevised. -- Zero.

[1]Table includes data available through April 9, 2020. Data are rounded to no more than three significant digits, except unit values; may not add to totals shown.

[2]All countries and (or) localities receiving less than 1,000 metric tons of exports from the United States in 2018 included in "Other."

[3]Includes agglomerates; excludes roasted iron pyrites.

[4]Weighted average calculated from unrounded data by dividing value by tonnage.

[5]Value thought to be erroneous based on individual country value(s) in excess of normal value range; included in "Total."

[6]Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 7
U.S. IMPORTS OF IRON ORE, BY CUSTOMS DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Customs district	2017		2018	
	Quantity	Value	Quantity	Value
Baltimore, MD	14	1,210	7	688
Buffalo, NY	--	--	(3)	142
Charleston, SC	(3)	15	--	--
Chicago, IL	757	40,500	924	52,400
Cleveland, OH	--	--	1	167
Columbia-Snake, OR	53	7,300	65	7,240
Dallas-Fort Worth, TX	--	--	(3)	4
Detroit, MI	(3)	18	17	1,240
Great Falls, MT	(3)	7	(3)	73
Houston-Galveston, TX	206 r	15,400 r	153	15,100
Los Angeles, CA	11	1,290	--	--
New Orleans, LA	2,630	288,000	2,620	309,000
New York City, NY	(3)	12	(3)	26
Ogdensburg, NY	1	329	(3)	45
St. Albans, VT	19	633	(3)	128
Tampa, FL	14	1,460	12	1,160
Total	3,710 r	356,000 r	3,810	388,000

rRevised. -- Zero.
[1]Table includes data available through April 9, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes agglomerates; excludes roasted iron pyrites.
[3]Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 8
SALIENT IRON STATISTICS FOR SELECTED COUNTRIES OR LOCALITIES[1]

(Million metric tons, gross weight)

Country or locality	2017					2018						
	Production					Production					Reserves, yearend	
	Ore	Metallics	Consumption[2]	Exports[3]	Imports[3]	Ore	Metallics	Consumption[2]	Exports[3]	Imports[3]	Crude ore	Iron content
Australia	885 r	--	8 r	828	(4)	900	--	8	850 e	1	50,000	24,000
Brazil	454 r	--	51 r	375 e	--	460	--	51	390	--	32,000	17,000
Canada	50 r	2	14 r	43	8 r	52	2	14	48	10	6,000	2,300
China	345 r	--	1,350 r	6 r	1,080 r	335	--	1,390	5 e	1,080 e	20,000	6,900
Germany	--	1	51 r	(4)	42 r	--	1	50	(4)	41	NA	NA
India	202	22	152 r	28	5	205	28	169	18	16	5,400	3,200
Iran	34 r	21	29 r	20 r	--	36	26	37	--	--	2,700	1,500
Japan	--	--	141 r	--	121	--	--	139	--	120 e	40	24
Kazakhstan	37 r	--	7 r	10 r	(4) r	42	--	6	10	(4)	2,500	900
Korea, Republic of	(4)	--	85 r	--	72 r	(4)	--	85	--	73	NA	NA
Mexico	19	6	16	(4)	2	22	6 e	17	(4)	3	NA	NA
Russia	95	7	104 r	21 r	9 r	96	8 e	103	19	8	25,000	14,000
South Africa	75 r	1	9 r	67	1 r	74	1	10	64	1	1,200	770
Sweden	32 r	--	6 r	24 r	(4)	36	--	5	24	(4)	1,300	600
Ukraine	61 r	--	36 r	37 r	(4)	60	--	37	37	(4)	6,500	2,300
United States	48	3	45 r	11	4	50	4	48	13	4	2,900	760
Other	101 r	45 r	245 r	154 r	210 r	91	24	217	98	167	18,000	9,500
Total	2,440 r	87	2,350 r	1,560 r	1,540 r	2,460	100	2,390	1,540	1,520	170,000	84,000

eEstimated. rRevised. NA Not available. -- Zero.
[1]Table includes data available through August 7, 2019. Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Calculation based on the production of direct-reduced iron reported by Midrex Technologies, Inc. and pig iron reported by the American Iron and Steel Institute.
[3]Data, where available, are sourced from the United Nations Comtrade database. Estimates were made to supplement missing or erroneous data.
[4]Less than ½ unit.

TABLE 9
IRON ORE: WORLD PRODUCTION, BY COUNTRY OR LOCALITY[1]

(Thousand metric tons)

Country or locality	Usable ore					Iron content				
	2014	2015	2016	2017	2018	2014	2015	2016	2017	2018
Algeria	911	944	826 r	497 r	497	483	500	438 r	318	317
Argentina	197	197	94	25	25 e	118	118	56	15	15 e
Australia	739,682	809,882	858,026	885,357 r	900,385	457,409	500,994	531,075	548,297 r	557,427
Austria	2,437	2,783	2,777	2,982 r	2,804	780	891	889	954 r	897
Azerbaijan	91	128	26	--	--	44	61	12	--	--
Bhutan	19	43	28	33 r	32	12	27	17	20 r	20
Bosnia and Herzegovina	2,128	2,123	1,752	1,622	1,380	1,330	1,330	1,090	1,010	863
Brazil	411,183	430,838 r	421,358	453,704 r	460,000	261,500	275,590	268,184 r	288,771 r	292,778
Canada	43,173	46,220	46,731	50,300 r	52,387	25,900	27,700	28,100	30,200 r	31,500
Chile	18,866	15,448	14,619	15,426	14,013	10,149	9,148	9,009	9,549	8,942
China	438,860 r	396,899 r	365,573 r	345,472 r	334,790	273,849 r	247,665 r	228,118 r	215,989 r	209,311
Colombia	676	902	716	713 r	572	406	541	429	428 r	344
Egypt	1,697	1,500	509	565 r	500	1,050	938	318	353 r	312
Eswatini	603	--	--	--	--	264	--	--	--	--
Germany, concentrate	456	-- r	--	--	--	73	--	--	--	--
Greece[2]	2,317	2,340	2,209	2,284	2,280 e	574	580	547	566	566 e
India	138,000	142,399	184,501	201,815	204,531	85,560	88,287	114,000	125,000	126,000
Indonesia, iron sand	3,162 r	3,056 r	2,574 r	1,967 r	760	1,770 r	1,710 r	1,440 r	1,100 r	426
Iran	51,544 r	48,427 r	45,890 r	33,967 r	36,435	33,800 r	31,800 r	30,100 r	22,200 r	23,900
Kazakhstan	51,541	37,270	35,794	38,728 r	41,877	14,946	11,566	10,101	10,812 r	11,700
Korea, North	5,470 r	4,910 r	5,250 r	5,740 r	5,700 e	3,390 r	3,040 r	3,250 r	3,560 r	3,500 e
Korea, Republic of	693	445	445	311 r	383	388 r	249 r	249 r	174 r	214
Laos	1,149	235	115	250 r	240 e	712	146	71	155 r	150 e
Liberia	5,744	4,530	1,405	1,934	3,934	3,590	2,830	878	1,210	2,460
Malaysia	9,615	1,625	1,914	3,920	3,354	6,010	1,020	1,150	2,450	2,090
Mauritania	13,306	11,607	13,268	11,714 r	10,711	8,320	7,250	8,290	7,320 r	6,694
Mexico	16,500 r	21,400 r	19,200 r	18,600 r	22,300	10,400	13,462 r	12,090 r	11,713 r	14,021
Mongolia	7,558	6,061	4,936	7,695	6,225	4,535	3,637	2,960	4,620	3,740
Morocco	23	18	15	100 r	100	12	10	5	55 r	55
Nepal[3]	--	--	1	(4)	--	--	--	(4)	(4)	--
New Zealand, iron sand[2]	3,245	3,194	3,496	3,496 r	3,496	1,850	1,820	1,990 r	1,990	1,990
Nigeria	2	6	2	-- r	--	1	4	1	-- r	--
Norway	3,854	3,519	--	--	--	2,390	2,182	--	--	--
Pakistan	255	439	471	616 r	690	82	140	151	197 r	221
Peru	10,731	10,908	11,418	13,121	14,200	7,193	7,321	7,663	8,806	9,534
Philippines	154	107	17	--	--	98	68	11 r	--	--
Russia, concentrate	102,019	101,049	101,097	94,967	96,063	60,200	59,619	59,647	56,031 r	56,700
Sierra Leone	20,946 r	18,000 r	4,108 r	6,985 r	923	12,100 r	10,400 r	2,380 r	4,050 r	535
South Africa	80,759	72,806	66,456	74,857 r	74,264	51,500	46,000 r	43,000 r	47,600 r	47,200
Sweden	25,700	24,500	26,900	31,764 r	35,774	15,900	15,200	16,700	16,900	22,200
Thailand	348	16	--	--	--	216	10	--	--	--
Togo	89	72	60 e	60 e	60 e	27	22	18 e	18 e	18 e
Tunisia	307	285 r	285 r	240 r	300	192 r	178 r	178 r	150 r	188
Turkey	11,887 r	7,761 r	7,137 r	9,992 r	9,550	7,190 r	4,700 r	4,320	6,050 r	5,777
Uganda	42	9	2	2	11	27	6	1	2	7
Ukraine	68,300	66,900	62,876	60,574 r	60,321	42,700	41,800	39,300	37,900 r	37,700
United States	56,100	46,100	41,800	47,900	49,500	35,400	28,800	26,400	30,300	31,300
Uruguay[3]	15	12	3	3	3	6	5	1	1	1
Venezuela	11,256	11,716	12,000	4,005 r	2,474	7,035 r	7,323 r	7,500	2,500 r	1,550
Vietnam	5,130	5,086	5,770	5,515 r	5,471	2,719	2,691	3,056	2,920 r	2,890
Total	2,370,000 r	2,360,000 r	2,370,000 r	2,440,000 r	2,460,000	1,450,000 r	1,460,000 r	1,470,000 r	1,500,000 r	1,520,000

eEstimated. rRevised. -- Zero.

[1]Table includes data available through September 25, 2019. All data are reported unless otherwise noted. Totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.

[2]Production includes alternative iron ore source as follows: Greece (nickeliferous iron ore) and New Zealand (titaniferous magnetite beach sands).

[3]Production is based on fiscal year, with a starting date of the year shown, as follows: Nepal (July 16) and Uruguay (April 1).

[4]Less than ½ unit.

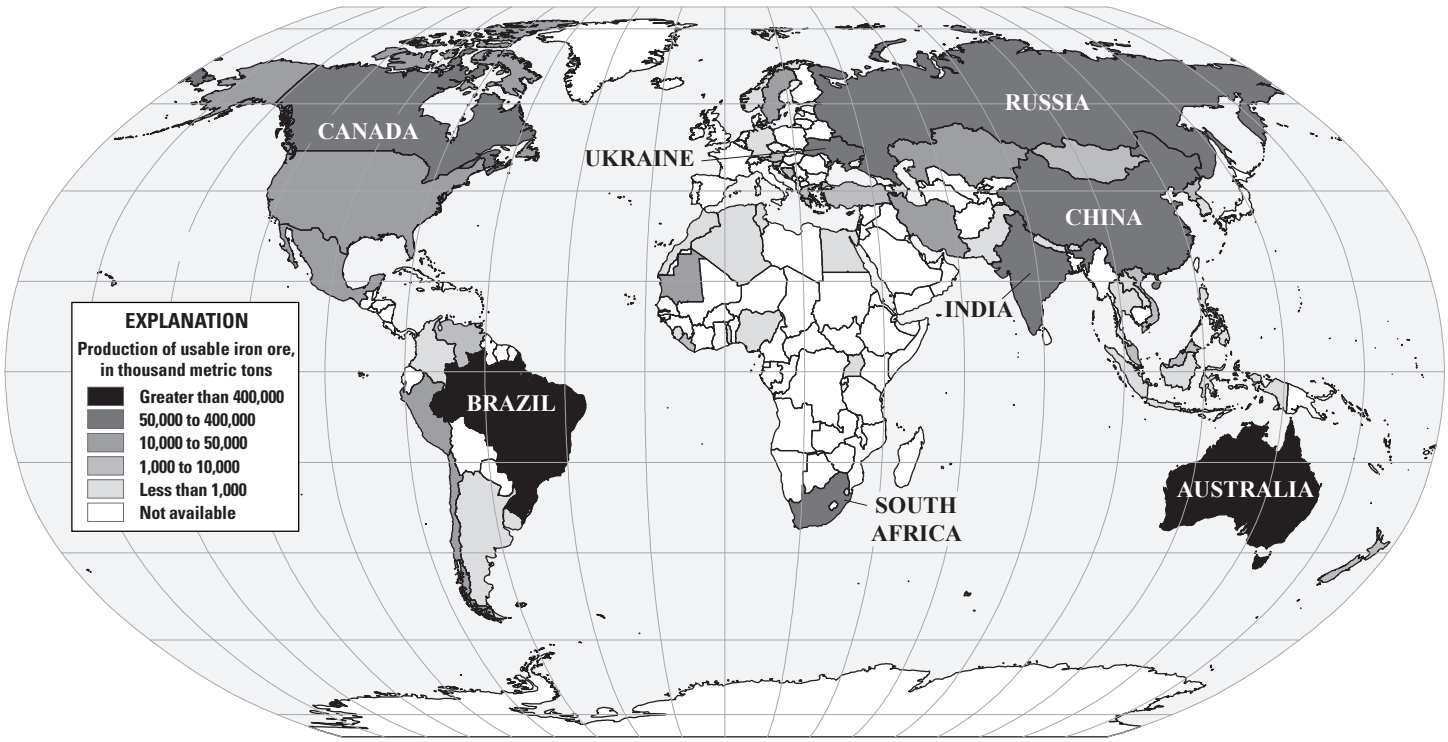

Figure 1. Global production of usable iron ore (gross weight) in 2018.