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2017 Minerals Yearbook

IRON ORE [ADVANCE RELEASE]

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Iron Ore

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In 2017, U.S. iron ore production increased by 15% to 47.9 million metric tons (Mt) of usable ore in 2017 from 41.8 Mt in 2016 (table 1). In the United States, the vertically integrated structure of iron and steel companies and long-term price contracts buffered some iron ore producers from swings in global prices; however, low-cost finished steel imports increased competition in the steel industry and reduced demand for domestic 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 2.43 billion metric tons (Gt), on a usable-ore basis, containing an estimated 1.50 Gt of iron, a 4% increase for each from that of 2016. Global iron ore production, on a usable-ore basis, was led by Australia (883 Mt), Brazil (425 Mt), China (360 Mt), India (202 Mt), and Russia (95.0 Mt), which combined accounted for 81% of global production (table 8). Global pig iron production, the primary end use of iron ore, increased slightly to 1.18 Gt in 2017 (American Iron and Steel Institute, 2018, p. 110–111). Global raw steel production increased by 4% in 2017 to 1.69 Gt (American Iron and Steel Institute, 2018, p. 113–115).

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 can be 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 U.S. Department of Labor, Mine Safety and Health Administration. Percentages in the 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 2017. 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., 2018, p. 9–13).

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 13 domestic mines and facilities that produce iron ore and 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 experienced production disruptions in the first, third, and fourth quarters owing to unexpected outages. The company planned to conduct a review of the facility for potential process and design modifications to reduce outages that have been persistent since the plant began operations in 2013 (Nucor Corp., 2018, p. 29, 32).

Michigan.—Cliffs Natural Resources Inc. changed the company's name to Cleveland-Cliffs Inc. in August 2017. The Tilden Mine, operated by Cleveland-Cliffs Inc., reported 7.8 Mt of pellet production, about the same as that in 2016 (table 2). The company continued transitioning equipment and stocks from the Empire Mine, which closed in August 2016 (Cleveland-Cliffs Inc., 2018, p. 32; table 3).

Minnesota.—In Minnesota, six iron ore facilities operated in 2017, compared with nine facilities in 2016. The operating facilities were six collocated open pit mines, concentrators, and pellet facilities. In 2017, operations in Minnesota produced 39.8 Mt of pellets, 35% more than the 29.5 Mt produced in 2016. Overall production of salable iron products in the State increased by 30% to 40.1 Mt in 2017 from 30.8 Mt in 2016 (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 was considered economically recoverable (Minnesota Department of Natural Resources, 2016).

In 2015, Magnetation LLC filed for bankruptcy, shutting down all tailings reclamation operations in Minnesota and a pelletizing plant in Indiana over the course of the following 2 years. The plants were purchased by ERP Iron Ore, LLC with plans to restart two of the reclamation facilities and the pelletizing facility; however, cost estimates provided in 2017 to bring the pelletizing facility into compliance with air pollution control and other permits would require an additional $20 million investment. At yearend 2017, no expected completion date had been announced for the Indiana facility, which must be restarted prior to restarting the mines. ERP Iron Ore announced that it was refocusing its efforts on securing the financing necessary to finalize a deal to purchase facilities and property from Essar Steel Minnesota LLC, which entered into bankruptcy proceedings in 2016, and restarting construction instead of restarting the Magnetation facilities (DePass, 2017).

Consumption

Steelmaking is responsible for the majority of iron ore consumption. It is estimated that producing 1.0 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 2017, U.S. consumption of iron ore, by gross weight, reported by the American Iron and Steel Institute (2018, p. 79), totaled 34.4 Mt, including 28.9 Mt of pellets; 4.35 Mt of sinter, briquettes, nodules, and other products; and 1.16 Mt of direct-shipping ore (table 4).

Production of pig iron, the primary phase of steelmaking in which iron ore is consumed before raw steel is produced, was 22.4 Mt in 2017, essentially unchanged from the 22.3 Mt produced in 2016. Raw steel production by basic oxygen furnaces, which accounts for nearly all pig iron consumption, was 25.8 Mt, virtually the same as the 25.9 Mt produced in 2016. Total raw steel production increased to 81.6 Mt, 4% more than the 78.5 Mt produced in 2016. Basic oxygen furnace production accounted for 31.6% of total raw steel production in 2017, compared with 33.0% in 2016 (American Iron and Steel Institute, 2018, p. 70, 75).

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. The Poe Lock, one of four locks in the Soo Locks system, is the only lock on the Great Lakes capable of transporting large iron ore freighters. The Locks were estimated to hold the potential to add $1.3 trillion in national economic benefits if modernized, according to a study commissioned by the U.S. Department of the Treasury. The report also identified a second Poe-sized lock that would have an additional $1.7 billion economic benefit. Soo Locks maintain the capacity needed for more than 60% of the United States and Canadian fleets. The Water Resources Development Act of 1968 authorized the construction of a second lock by the U.S. Army Corps of Engineers; however, the project remained unfunded (Lake Carriers Association, 2017).

Prices

In 2017, the average unit value of iron ore in the United States was $78.54 per metric ton, a 7% increase from $73.11 per metric ton in 2016, after several years of decreasing unit values (table 1). The average unit value of exported iron ore was $73.00 per metric ton, a 10% increase from $66.43 in 2016. The average unit value of exports totaling more than 1,000 t to any single country ranged from $62.49 to $115.98 per metric ton (table 5). In 2017, the average unit value of imported iron ore was $95.91 per metric ton, a 20% increase from the revised $79.99 per metric ton in 2016. The average unit value of imports totaling more than 1,000 t from any single country ranged from $71.13 to $157.07 per metric ton (table 6).

The average monthly spot price of imported iron ore fines, 62% Fe, at the Port of Tianjin, China, rose from

$80.41 per metric ton in January to $89.44 per metric ton in February, then declined steadily to $57.48 per metric ton in June, fluctuating between $61.66 and $76.07 per metric ton throughout the second half of the year, and finished out the year at $72.25 per metric ton. In 2017, the lowest average monthly spot market price, $57.48 per metric ton in June, was 37% higher than the lowest average monthly spot price of $41.88 per metric ton in January 2016. In 2017, the highest average monthly spot market price, $89.44 per metric ton in February, was 12% higher than the highest average monthly spot price of $80.02 per metric ton in December 2016 (Index Mundi, undated).

Foreign Trade

In 2017, U.S. iron ore exports were 10.6 Mt, a 21% increase from 8.77 Mt in 2016. Pellet exports accounted for 97% (10.3 Mt) of total exports. Steel companies in Canada received the majority, about 73%, of the iron ore exported from the United States, followed by Japan with 22% (tables 1, 5). Imports in 2017 were 3.70 Mt, a 23% increase from 3.01 Mt in 2016 with the most imports coming from Brazil and Canada, accounting for 55% and 21%, respectively (table 6). Although imported iron ore supplemented domestically produced iron ore, the United States remained a net exporter in 2017 with 10.6 Mt of exports and 3.70 Mt of imports, compared with 8.77 Mt of exports and 3.01 Mt of imports in 2016 (tables 5, 6).

World Industry Structure

Production.—World iron ore production in 2017 was 2.43 Gt of usable ore containing 1.50 Gt of iron, 4% more than that in 2016. Australia remained the leading iron ore producer (883 Mt) by gross weight, followed by Brazil (425 Mt), China (360 Mt), India (202 Mt), and Russia (95.0 Mt) (fig. 1, table 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 by 7% in 2017, as indicated by increases in production of raw steel, DRI, and pig iron compared with those in 2016. China was the leading producer of pig iron and raw steel, and the Middle East and North Africa region was the leading producer of DRI (American Iron and Steel Institute, 2018, p. 110–115; Midrex Technologies, Inc., 2018, p. 7).

Trade.—Global imports of iron ore rose to 1.58 Gt in 2017, a 3.3% increase from 1.53 Gt in 2016 (World Steel Association, 2018, p. 104). The trend of year-on-year increases in global trade continued during the past 14 years. 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 2017 from 62% in 2002. China's share of global imports more than tripled during this 16-year period to 74% from 21%. Australia was the leading exporter of iron ore (57%), followed by Brazil (26%) (United Nations Commodity Trade Statistics Database, undated).

World Review

Australia.—Production of usable iron ore in Australia was 883 Mt in 2017, 3.0% more than the 858 Mt produced in 2016. On a tonnage basis, iron ore production in Australia increased by 25 Mt in 2017, 48 Mt in 2016, 70 Mt in 2015, and 130 Mt in 2014. 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) 2017, which ended June 30, increased by 2% to 231 Mt from 227 Mt in FY 2016. Increased output was a result of strong productivity throughout the company's supply chain and additional capacity at the Jimblebar Mine in the Pilbara region in Western Australia. BHP Billiton's annual realized sales price increased to $58 per wet metric ton, up from $44 per wet metric ton in 2016 (BHP Billiton Ltd., 2017, p. 88–89, 245). Fortescue's iron ore shipments increased slightly in FY 2017 to 170 Mt, from 167 Mt in FY 2016. The company was exploring replacement options for the Firetail Mine, which was expected to be depleted within a few years (Fortescue Metals Group Ltd., 2017, p. 17–20). Rio Tinto's share of iron ore production at its operations in Australia was virtually unchanged in 2017 at 271 Mt. The Silvergrass Mine commenced operations in 2017, marking the company's 16th iron ore mine in the Pilbara region of Western Australia. The new mine produces low-phosphorous iron ore intended for product blending. Rio Tinto continued resource development projects to replenish ore reserves following mine depletion and further development operations at Yandi Oxbow, West Angelas Deposit F, and Yandi Billard South (Rio Tinto Ltd., 2017, p. 38, 39).

Brazil.—Production of iron ore in Brazil was estimated to be 425 Mt in 2017 about the same as that in 2016. Vale S.A., the leading iron ore producer in Brazil, increased production in 2017 to 367 Mt from 349 Mt in 2016 and increased its pellet production in 2017 to 50.3 Mt from 46.2 Mt in 2016 (Vale S.A., 2018, p. 34–37). In November 2015, the Fundão tailings dam experienced a catastrophic failure at the 30.5-Mt/yr Samarco Mine in Minas Gerais, jointly owned by BHP Billiton and Vale. Despite earlier plans to reopen the mine, in 2017 the company announced operations would remain suspended, and no information was provided on when it would reopen (BHP Billiton Ltd., 2017, p. 27–29).

China.—Production in China increased by 4% in 2017 to an estimated 360 Mt from 348 Mt in 2016 (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. Production of steel in China reached nearly 900 Mt, as reported by Rio Tinto, supported by strong demand in construction, infrastructure, and manufacturing. Despite higher production levels, exports of steel decreased to approximately 75 Mt in 2017, a decrease from more than 100 Mt in 2015 and 2016 (BHP Billiton Ltd., 2017, p. 88–89; Rio Tinto Ltd., 2017, p. 38–39).

India.—Iron ore production in India increased by 9% in 2017 to 202 Mt from 185 Mt in 2016. National Mineral Development Corp. Ltd. (NMDC), a state-owned iron ore mining company in India, produced 35.6 Mt of iron ore in FY 2017–18 (from April 1, 2017, through March 31, 2018).

Production capacity was 43 Mt/yr. NMDC planned to increase production capacity to 50 Mt/yr by FY 2018–19 and 67 Mt/yr by FY 2021–22 by mining additional deposits, including Bailadila Iron Ore Deposit 13 in Chhattisgarh and Sasangada in Jharkhand (National Mineral Development Corp. Ltd., 2018, p. 8–9, 36–38).

Outlook

Global consumption of iron ore was estimated to have increased by 7% in 2017 and is expected to increase slightly throughout the next decade, with steel consumption increasing by 1.6% in 2018, owing to stable economic growth rates in Asia, stable infrastructure spending in Europe and North America, and increased competition with scrap as a raw material in steelmaking. Concerns regarding an increase in national protectionism, deceleration in the economy of China and increased debt, and uncertainties with the European Union elections remain long-term risks for the iron and steel industry. Global steel demand is expected to remain steady owing to slower growth in China as global steel demand follows cyclical market trends (World Steel Association, 2017).

Rebounds in the global price of seaborne iron ore drive 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. More than 200 Mt/yr of iron ore production capacity is expected to be brought into production by the end of 2020.

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TABLE 1
SALIENT IRON ORE STATISTICS[1]

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

		2013	2014	2015	2016	2017
Iron ore, usable:						
United States:						
Production:						
Gross weight		52,800	56,100	46,100	41,800	47,900
Iron content		33,300	35,400	28,800	26,400	30,300
Shipments		53,400	55,000	43,500	46,600	46,900
Value:						
Minnesota:[2]						
Cost of mining	dollars per metric ton	12.31 r	12.36 r	10.59 r	10.35 r	9.65
Cost of beneficiation	do.	29.63 r	31.29 r	26.99 r	25.48 r	26.68
Average value of production	do.	77.46 r	80.13 r	68.47 r	62.99 r	70.03
United States:						
Reported value at mines[3]		4,610,000	4,730,000	3,750,000	3,050,000	3,760,000
Average value at mines	dollars per metric ton	87.42	84.43	81.19	73.11	78.54
Exports:						
Quantity		11,000	12,400 r	8,030	8,770	10,600
Value		1,480,000	1,350,000 r	652,000	582,000 r	775,000
Imports for consumption:						
Quantity		3,250	5,140	4,550	3,010	3,700
Value		426,000	676,000	455,000	241,000	355,000
Consumption:						
Apparent[4]		47,100	46,700	39,300	39,200	39,500
Reported		44,200	44,400	38,500	34,500	34,400
Stocks, December 31		2,350	4,460	7,860	4,660	6,120
World, production		2,190,000 r	2,330,000 r	2,310,000 r	2,340,000 r	2,430,000
Iron metallics:[4, 5]						
United States:						
Production		469	1,950	1,450	2,070	3,250
Exports:						
Quantity		(6) r	1	20 r	178	640
Value		29 r	132 r	548 r	21,600 r	155,000
Imports for consumption:						
Quantity		2,240 r	2,390	1,860 r	1,790	3,280
Value		775,000 r	854,000 r	483,000 r	355,000 r	769,000
World, production		74,900	74,600	72,600	72,800 r	87,100

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[1]Table includes data available through August 7, 2019. Data are rounded to no more than three significant digits, except average value and cost; may not add to totals shown.
[2]As reported in 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
[4]Defined as production plus imports minus exports plus adjustments for industry stock changes.
[5]Data for iron metallics may include cold pig iron, direct-reduced iron, hot-briquetted iron, iron nuggets, and solid sponge iron.
[6]Less than ½ unit.

TABLE 2
EMPLOYMENT AND PRODUCTION STATISTICS FOR IRON OPERATIONS IN THE UNITED STATES IN 2017, BY STATE[1]

(Thousand metric tons, unless otherwise specified)

District and State	Number of active operations	Number of employees[2]	Crude ore	Salable products				Shipments	Average iron content[5] (percent)
				Pellets	Iron ore, other[3, 4]	Iron metallics	Total		
Indiana[5]	1	NA	--	--	--	259	259	259	XX
Louisiana[5]	1	NA	--	--	--	1,890	1,890	1,890	XX
Michigan[5]	1	853	21,800	7,800	--	--	7,800	7,800	60.9
Minnesota	6	3,780	134,000	39,800	274	--	40,100	39,100	63.8
Texas[5]	1	NA	--	--	--	1,100	1,100	--	XX
Total or average	11	4,630	155,000	47,600	274	3,250	51,100	49,100	63.3

NA Not available. XX Not applicable. -- 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]Source: U.S. Department of Labor, Mine Safety and Health Administration. Does not include iron metallics operations.

[3]Includes all forms of usable iron ore, except pellets, including but not limited to concentrates, direct-shipping ore, fines, flux, and pellet chips.

[4]Data reported in or calculated from publicly available company annual reports or other publications.

[5]Data for iron metallics (cold pig iron, direct-reduced iron, hot-briquetted iron, iron nuggets, and sponge iron) not included.

TABLE 3
IRON OPERATIONS IN THE UNITED STATES IN 2017[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	NA	(4)
Michigan, Tilden Mine	Marquette	Cleveland-Cliffs Inc.	Iron ore pellets	do.	8.1	7.8	360
Minnesota:							
Hibbing Taconite Mine	St. Louis	do.	do.	do.	8.1	7.8	180
Keetac Mine	Itasca	United States Steel Corp.	do.	Idled through Feb. 2017	5.4	4.6	350
Minntac Mine	do.	do.	do.	Active	14.5	14.5	440
Minorca Mine	do.	ArcelorMittal S.A.	do.	do.	2.9	2.9	110
Northshore Mining	Lake and St. Louis	Cleveland-Cliffs Inc.	do.	do.	6.1	5.4	810
United Taconite Mine	St. Louis	do.	do.	do.	5.5	4.9	840
Texas, voestalpine Texas LLC	San Patricio	voestalpine Group	Hot-briquetted iron	do.	2.0	NA	(4)

do. Ditto. NA Not available.

[1]Table includes data available through August 7, 2019.

[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	2016	2017
Blast furnaces:		
Pellets	29,000	28,900
Sinter[2]	4,230	4,190
Total	33,200	33,100
Steelmaking furnaces:		
Direct-shipping ore	1,160	1,160
Sinter[2]	159	159
Total	1,320	1,320
Grand total	34,500	34,400

[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]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	2016 Quantity (thousand metric tons)	2016 Value (thousands)	2016 Unit value[3] (dollars per metric ton)	2017 Quantity (thousand metric tons)	2017 Value (thousands)	2017 Unit value[3] (dollars per metric ton)
Country or locality:[4]						
Australia	--	--	--	33	$2,670	80.79
Austria	--	--	--	21	1,620	77.00
Belgium	82	$4,150	50.63	45	2,810	62.49
Brazil	--	--	--	2	213	106.50
Canada	7,060	484,000	68.58	7,740	578,000	74.77
China	960 r	45,700 r	47.63 r	30	2,450	81.57
Germany	--	--	--	39	2,560	65.64
Japan	309 r	16,000 r	51.78 r	2,330	147,000	63.32
Korea, Republic of	(5)	19	(6)	141	8,970	63.62
Mexico	352	31,500	89.54	238	27,600	115.98
Other	9 r	1,140 r	126.22 r	1	118	118.00
Total	8,770	582,000 r	66.43 r	10,600	775,000	73.00
Type of product:						
Coarse ores	1 r	192	(6)	33	2,740	82.88
Concentrates	77 r	9,900	128.56 r	135	15,900	117.67
Fine ores	119	7,680	64.56	31	2,190	70.71
Other agglomerates	213	16,300	76.39	83	6,430	77.42
Pellets	8,360	548,000 r	65.62 r	10,300	747,000	72.36
Total	8,770	582,000 r	66.43 r	10,600	775,000	73.00

rRevised. -- Zero.
[1]Table includes data available through August 7, 2019. Data are rounded to no more than three significant digits, except "Unit value"; may not add to totals shown.
[2]Includes agglomerates, excludes roasted iron pyrites.
[3]Weighted average calculated from unrounded data by dividing total value by total tonnage.
[4]All countries and (or) localities receiving less than 1,000 metric tons of exports from the United States in 2017 included in "Other."
[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]

Country or locality and type of product[2]	2016			2017		
	Quantity (thousand metric tons)	Value (thousands)	Unit value[3] (dollars per metric ton)	Quantity (thousand metric tons)	Value (thousands)	Unit value[3] (dollars per metric ton)
Country or locality:[4]						
Argentina	87	$8,600	98.60	29	$4,560	157.07
Australia	(5)	12	147.86	24	2,740	114.25
Brazil	1,760	130,000	74.10	2,040	194,000	95.12
Canada	557	38,800	69.56	790	75,100	95.06
Chile	62	3,410	55.34	283	21,800	77.10
Peru	66	19,800	(6)	31	11,400	(6)
Russia	(5)	13	(6)	65	5,670	87.18
South Africa	82	6,070	73.65	80	5,690	71.13
Sweden	350 r	27,700	79.21	363	34,300	94.52
Other	50 r	6,290 r	126.59 r	(5)	97	(6)
Total	3,010	241,000	79.99	3,700	355,000	95.91
Type of product:						
Coarse ores	22	2,080	94.21	38	2,040	53.55
Concentrates	719	32,400	45.02	1,110	68,100	61.21
Fine ores	265	38,500	145.46	219	30,800	140.68
Other agglomerates	--	--	--	--	--	--
Pellets	2,010	168,000	83.73	2,330	254,000	108.97
Total	3,010	241,000	79.99	3,700	355,000	95.91

rRevised. -- Zero.
[1]Table includes data available through August 7, 2019. Data are rounded to no more than three significant digits, except "Unit value"; may not add to totals shown.
[2]Includes agglomerates, excludes roasted iron pyrites.
[3]Weighted average calculated from unrounded data by dividing total value by total tonnage.
[4]All countries and (or) localities with less than 1,000 metric tons of exports in 2017 included in "Other."
[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 7
U.S. IMPORTS OF IRON ORE, BY CUSTOMS DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

	2016		2017	
Customs district	Quantity	Value	Quantity	Value
Baltimore, MD	(3)	$95	14	$1,210
Charleston, SC	(3)	13	(3)	15
Chicago, IL	686	30,800	757	40,500
Columbia-Snake, OR	37	4,480	53	7,300
Detroit, MI	1	32	(3)	18
Great Falls, MT	--	--	(3)	7
Houston-Galveston, TX	104	7,430	201	14,900
Los Angeles, CA	9	989	11	1,290
Miami, FL	(3)	7	--	--
Minneapolis, MN	1	67	--	--
New Orleans, LA	2,150	195,000	2,630	288,000
New York City, NY	(3)	12	(3)	12
Norfolk, VA	(3)	12	--	--
Ogdensburg, NY	--	--	1	329
Seattle, WA	(3)	2	--	--
St. Albans, VT	--	--	19	633
Tampa, FL	23	2,230	14	1,460
Total	3,010	241,000	3,700	355,000

-- 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]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)

	2016					2017						
	Production					Production					Reserves, yearend 2017	
Country or locality	Ore	Metallics	Consumption[2]	Exports[3]	Imports[3]	Ore	Metallics	Consumption[2]	Exports[3]	Imports[3]	Crude ore	Iron content
Australia	858	--	6 r	853	1	883	--	51	828	(4)	50,000	24,000
Brazil	421 r	--	43 r	374	(4) r	425 e	--	50	375 e	--	32,000	17,000
Canada	47	1	15 r	41 r	7	49	2	17	43	7 e	6,000	2,300
China	348	--	1,370 r	1	1,020	360 e	--	1,390	5	1,030 e	20,000	6,900
Germany	--	1	46 r	(4)	40	--	1	46	(4)	40 e	NA	NA
India	185	18	199 r	22	4	202	22	219	28	5	5,400	3,200
Iran	39 r	16	68 r	--	--	40	21	78	--	--	2,700	1,500
Japan	--	--	134 r	(4) r	130	--	--	125	(4)	121	40	24
Kazakhstan	36 r	--	24 r	8	(4)	39 e	--	30	9	-- e	2,500	900
Korea, Republic of	(4) r	--	76 r	(4) r	72 r	(4)	--	75	--	75 e	NA	NA
Russia	101	6	100 r	19 r	7 r	95	7	98	18 e	8	25,000	14,000
South Africa	66	1	-- r	65	(4)	81	1	12	67	(4)	1,200	770
Sweden	27	--	-- r	23	(4)	27	--	--	23 e	(4)	1,300	600
Ukraine	63	--	63 r	--	--	60	--	56	--	(4)	6,500	2,300
United States	42	2	40 r	9 r	3 r	48	3	46	11	4	2,900	760
Other	106 r	29	248 r	89 r	179 r	120	51	326	66	180 e	18,000	9,500
Total	2,340 r	73	2,430 r	1,500 r	1,470	2,430	87	2,610	1,450 e	1,390 e	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 are from the United Nations Statistics Division database.

[4]Less than ½ unit.

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

(Thousand metric tons)

Country or locality	2013	2014	2015	2016	2017
Algeria:					
Gross weight	1,067	911	944	610 r	600 e
Fe content	565	483	500	323 r	318 e
Australia:					
Gross weight	609,730	739,682	809,882	858,026 r	883,357
Fe content	377,760	457,409	500,994	531,075 r	547,027
Austria:					
Gross weight	2,323	2,437	2,783	2,777 r	2,800 e
Fe content	743	780	891	889	890 e
Azerbaijan:					
Gross weight	141	91	128	26	--
Fe content	68	44	61	12	--
Bhutan:					
Gross weight	21	19	43	28	28 e
Fe content	13	12	27	17 r	17 e
Bosnia and Herzegovina:					
Gross weight	2,122	2,128	2,123	1,752 r	1,622
Fe content	1,330 r	1,330 r	1,330 r	1,090 r	1,010
Brazil:					
Gross weight	386,270	411,183	430,836	421,358 r	425,000 e
Fe content	245,668	261,500	275,590	268,000 r	269,000 e
Canada:					
Gross weight	42,063	43,173	46,220	46,731 r	49,009
Fe content	25,200 r	25,900 r	27,700 r	28,100 r	29,400
Chile:					
Gross weight	17,109	18,866	15,448	14,619 r	15,426
Fe content	9,088	10,149	9,148	9,009 r	9,549
China:					
Gross weight	417,287	410,123	374,838	347,594	360,000 e
Fe content	258,718	254,276	232,400	215,509	223,000 e
Colombia:					
Gross weight	710	676	902	716	715 e
Fe content	426	406	541	429	429 e
Egypt:					
Gross weight	1,422	1,697	1,500	509 r	500 e
Fe content	889	1,050 r	938	318 r	310 e
Germany:					
Gross weight	413 r	456 r	--	--	--
Fe content	43 r	73 r	--	--	--
Greece:[2]					
Gross weight	2,221	2,317	2,340 r	2,209	2,284
Fe content	550	574	580 r	547 r	566
India:					
Gross weight	140,416	138,000	142,399	184,501 r	201,815
Fe content	87,060	85,560	88,287	114,000 r	125,000
Indonesia:					
Gross weight	22,353	5,951	500 r, e	-- r, e	--
Fe content	14,000	3,720	260 r	-- r	--
Iran:					
Gross weight	48,693	48,451	39,370	39,400 r	40,100
Fe content	25,300 r	25,700 r	25,800 r	25,800 r	26,300
Kazakhstan:					
Gross weight	51,689	51,541	37,270	35,794 r	39,085
Fe content	14,724	14,946	11,566	10,101 r	10,855
Korea, North:					
Gross weight	5,486	5,471	4,906	5,249 r	5,250 e
Fe content	3,401	3,392	3,042	3,254 r	3,250 e
Korea, Republic of:					
Gross weight	663 r	693 r	445 r	445 r	310
Fe content	414 r	433 r	278 r	278 r	194

See footnotes at end of table.

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

(Thousand metric tons)

Country or locality	2013	2014	2015	2016	2017
Laos:					
Gross weight	905	1,149	235 r	115 r	110 e
Fe content	561	712	146 r	71 r	70 e
Liberia:					
Gross weight	4,698	5,744	4,530 r	1,405 r	1,930 e
Fe content	2,936 r	3,590 r	2,830 r	878 r	1,210
Malaysia:					
Gross weight	12,134	9,615	1,625	1,914 r	3,920
Fe content	7,580 r	6,010 r	1,020 r	1,150 r	2,450
Mauritania:					
Gross weight	11,975 r	13,306	11,607 r	13,268 r	13,300 e
Fe content	7,480 r	8,320 r	7,250 r	8,290 r	9,310 e
Mexico:					
Gross weight	18,840	16,628	13,462	12,090	12,100 e
Fe content	11,780	10,400	8,414	7,560 r	7,560 e
Mongolia:					
Gross weight	6,794	7,558	6,061	4,936 r	7,695
Fe content	4,076	4,535	3,637	2,960 r	4,620
Morocco:					
Gross weight	301	23	18	15	15 e
Fe content	163	12	10	5	6 e
Nepal:[3]					
Gross weight	--	--	--	1 r	(4)
Fe content	--	--	--	(4) r	(4)
New Zealand:[2]					
Gross weight	3,157	3,245	3,194	3,496	3,490 e
Fe content	1,800	1,850	1,820	1,993	1,990 e
Nigeria:					
Gross weight	2	2	6	2 r	2 e
Fe content	1 e	1 e	4 e	1 r	1
Norway:					
Gross weight	3,409	3,854	3,519	-- r	--
Fe content	2,114	2,390	2,182	-- r	--
Pakistan:					
Gross weight	253	255	439	471 r	547
Fe content	81	82	140	151 r	175
Peru:					
Gross weight	10,126	10,731	10,908	11,418	13,121
Fe content	6,788	7,193	7,321	7,663	8,806
Philippines:					
Gross weight	1,057	154	107	17 r	--
Fe content	674	98	68	11 r	--
Russia:					
Gross weight	102,157	102,019	101,049 r	101,097 r	94,967
Fe content	60,300	60,200	59,619 r	59,647 r	61,246
Sierra Leone:					
Gross weight	20,300	19,429	2,624	4,720 r, e	4,720 e
Fe content	11,900	11,300	1,500	2,700 r, e	2,700 e
South Africa:					
Gross weight	71,645	80,759	72,806	66,456	81,068
Fe content	45,700	51,500	46,424	42,000 e	51,600
Swaziland:					
Gross weight	1,259	603	--	--	--
Fe content	550	264	--	--	--
Sweden:					
Gross weight	25,300	25,700	24,500	26,900	27,200
Fe content	15,700 r	15,900 r	15,200 r	16,700 r	16,900

See footnotes at end of table.

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

(Thousand metric tons)

Country or locality	2013	2014	2015	2016	2017
Thailand:					
Gross weight	390	348	16	--	--
Fe content	242	216	10	--	--
Togo:					
Gross weight	80	89	72	60 e	60 e
Fe content	24	27	22	18 e	18 e
Tunisia:					
Gross weight	244	307	300	200 r	200 e
Fe content	127	160	156	125 r	125 e
Turkey:					
Gross weight	8,492	6,982	6,010	6,050 r	6,700 e
Fe content	5,138	4,224	3,636	4,320 r	4,050 e
Uganda:					
Gross weight	2	42	9	2 r	2
Fe content	2	27	6	1 r, e	2 e
Ukraine:					
Gross weight	70,400	68,300	66,900	62,876 r	60,498
Fe content	44,000	42,700	41,800	39,300	37,800
United States:					
Gross weight	52,800	56,100	46,100	41,800	47,900
Fe content	33,300	35,400	28,800	26,400	30,300
Uruguay:[5]					
Gross weight	10	15	12	3 r	3 e
Fe content	4	6	5	1 r	1
Venezuela:					
Gross weight	11,198	11,256	11,716	12,000 r	12,000 e
Fe content	7,000	7,000	7,300	7,500 r	7,500 e
Vietnam:					
Gross weight	4,708	5,130	5,086	5,770 r	9,570
Fe content	2,495	2,719	2,691	3,056 r	5,074
Total:					
Gross weight	2,190,000 r	2,330,000 r	2,310,000 r	2,340,000 r	2,430,000
Fe content	1,340,000 r	1,420,000 r	1,420,000 r	1,440,000 r	1,500,000

eEstimated. rRevised. -- Zero.

[1]Table includes data available through October 18, 2018. 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

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

[3]Production is based on fiscal year, with a starting date of July 16 of the year shown.

[4]Less than ½ unit.

[5]Production is based on fiscal year, with a starting date of April 1 of the year shown.

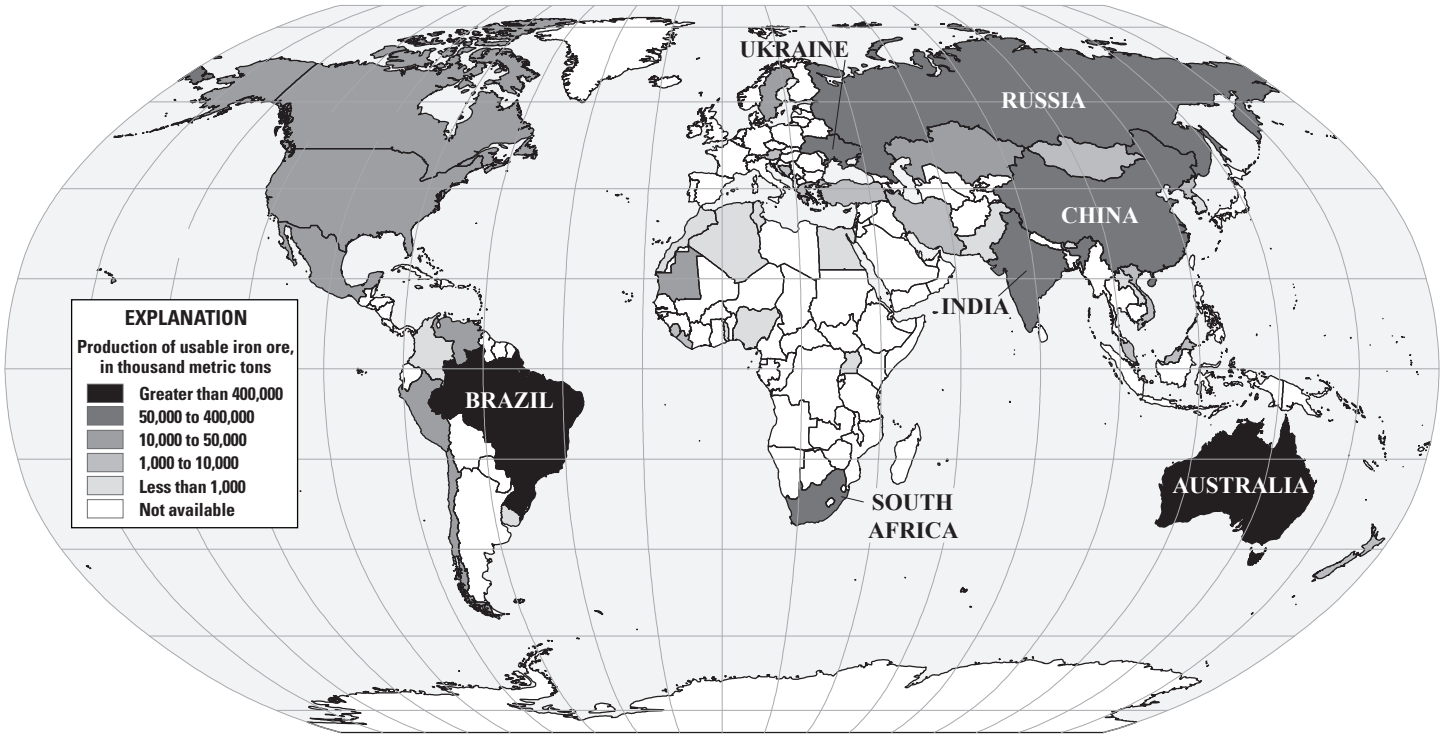

Figure 1. Global production of usable iron ore (gross weight) in 2017.