



2010 Minerals Yearbook

IRON ORE

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U.S. iron ore production in 2010 increased by 87% compared with that of 2009; consumption during this same period increased by 37%. World iron ore production and consumption rose in 2010 by almost 17%. China, by far the leading consumer, also led gross tonnage production of iron ore with relatively low-grade ore. China was the leading producer of iron ore in terms of iron content, followed by Australia and Brazil (tables 1, 15). For the ninth consecutive year, world iron ore trade increased. World iron ore prices increased significantly compared with those of 2009.

Iron ore is the basic raw material for producing iron and steel. The supply of iron ore is critical to the economies of all industrialized nations. Scrap, a supplement to iron ore in steelmaking, is also an extremely important feed material, but owing to lack of supply of high-quality scrap, its use has limitations. Direct reduced iron (DRI) is an alternative to scrap, but requires iron ore for its production.

Two iron oxides—hematite (Fe_2O_3) and magnetite (Fe_3O_4)—are the primary ore minerals of iron. Taconite, the primary iron ore mined in the United States, contains hematite and magnetite in varying proportions and is found in hard, fine-grained, banded iron formations with iron content between 20% and 30%. Almost all domestic iron ore production is transformed into molten iron in blast furnaces by the iron and steel industry. Most molten iron then goes directly to a basic oxygen furnace (BOF) for conversion to steel by removing most of the residual carbon. The remainder is poured into molds to produce pig iron.

In 2010, the United States used 42.3 million metric tons (Mt) of iron ore, an increase of 11.3 Mt, or 37%, compared with that of 2009, and produced 26.8 Mt of pig iron. Pig iron production increased by more than 40% compared with that of 2009.

Raw steel production, at 80.5 Mt, increased by 36% compared with that of 2009. U.S. steel consumption increased to 80 Mt from 63 Mt in 2009. Imported iron ore supplemented domestically produced iron ore in the production of pig iron, which is used along with imported pig iron, DRI, and scrap to produce raw steel. Integrated steel mills produce steel from iron ore; minimills produce steel from DRI and scrap. In 2010, the minimill sector of the steel industry made up 61% of the U.S. raw steel production (American Iron and Steel Institute, 2011, p. 73).

Integrated steelmakers can increase steel mill product production without increasing blast furnace production by importing pig iron and semifinished steel. This permits steelmakers to avoid costly startup of less-efficient blast furnaces held in reserve and the employment of additional skilled workers. In 2010, net U.S. exports (exports minus imports) of iron ore substitutes were 9.6 Mt, while in 2009 the United States was a net exporter of 14.7 Mt of substitutes. This decrease in net exports was owing to substantial decreases

in the levels of scrap steel and semifinished steel products net exports being somewhat offset by an increase in pig iron imports. During the year, along with the 36% increase in raw steel production and a 27% increase in steel demand, iron ore consumption increased 37% from 2009 levels.

Legislation and Government Programs

In 2010, the Minnesota production tax rate to be distributed in 2011 changed for concentrates and pellets produced in 2010, increasing to \$2.380 from \$2.364 per taxable long ton. The taxable tonnage for 2010 was based on the average tonnage produced in 2008–10.

Changes affecting taconite mining and processing operations passed by the Minnesota Legislature in 2010 included a redistribution of the production tax for all 2009 production with distribution in 2010 only. This portion of the production tax established a special fund to receive \$0.28757 per long ton that would otherwise have gone into the Taconite Property Tax Relief Account. The funds from this special account were to be allocated to public works and economic development tax. Another legislative change to tax distributions allowed for transfer of funds from the Taconite Property Tax Relief Account to compensate for any shortfall in funds resulting from levy reductions (Minnesota Department of Revenue, 2010, p. 1, 6, 7, 20; 2011, p. 1, 20).

Production

The U.S. Geological Survey (USGS) develops U.S. iron ore production data through an annual “Iron Ore” survey, which is sent to iron ore mines, and those mines provided the production statistics shown in tables 1 through 4. This information is supplemented by employment data, information from consumers, and mine inspection reports. The American Iron Ore Association became a supplier-oriented organization, now known as the Iron Mining Association of Minnesota, and no longer provides data on ore shipments from loading docks on the Upper Great Lakes nor receipts at transfer docks and furnace yards nationwide. Steel plant data continues to be compiled by the American Iron and Steel Institute (AISI).

In 2010, domestic iron ore production was 49.9 Mt, 87% more than the 2009 production, which was 26.7 Mt. Michigan and Minnesota taconite mines accounted for almost all domestic iron ore production—six mines operated on the Mesabi Range in northeastern Minnesota and two on the Marquette Range in Michigan’s Upper Peninsula. Domestic iron ore supply (production minus exports) met 94% of domestic demand in 2010, an increase from 74% for in 2009.

Cliffs Natural Resources Inc. (Cleveland, OH) did not announce 2010 iron ore production for its North American operations on a mine-by-mine basis in its annual report. Mine production totaled 32.5 Mt from the Empire, Hibbing Taconite, Northshore, Tilden, and United Taconite mines in the United States and the Wabush mine in Canada. Cliffs' share of the total production from these North American operations was 25.8 Mt. Total Cliffs' North American production tonnage share for the mines it managed during the year increased by 49% compared with that of 2009, and overall iron ore sales revenue more than doubled compared with that of 2009 to \$2.92 billion (Cliffs Natural Resources Inc., 2011b, p. 60).

Michigan.—Michigan accounted for about one-quarter of U.S. usable iron ore output in 2010; nearly all of Michigan's output was pellet production. Production at the Empire and Tilden Mines, mostly magnetite and hematite flux pellets, increased by more than 50% to 12.5 Mt.

Minnesota.—Minnesota produced nearly three-quarters of the usable iron ore in the United States in 2010; nearly all of the output was pellet production. Almost all of the production from the State came from open pits on the Mesabi Iron Range, although a minor amount of the production did come from reworked tailings. Minnesota taxable production, grouped by operating company, was summarized as follows: United States Steel Corp. (Pittsburgh, PA) produced 4.9 Mt of partial flux pellets and a minor amount of fines, chips, and concentrates from its Keewatin Taconite operations and 13.2 Mt of fluxed pellet production from its Minntac operations; Hibbing Taconite Co. produced 5.8 Mt of partial fluxed (containing less than 2% flux) pellets; United Taconite Co., LLC produced 5.0 Mt of partial fluxed pellets, a minor amount of pellet chips and fines, and a minor amount of concentrates; Northshore Mining Co. produced 4.6 Mt of partial fluxed pellets and a small amount of pellet chips and fines; and ArcelorMittal Minorca Mine Inc. (Chicago, IL) produced 2.8 Mt of flux pellets and a minor amount of pellet chips and concentrates (ArcelorMittal, 2011, p. 28; Minnesota Department of Revenue, 2011, p. 21; United States Steel Corp., 2011, p. F-58).

Cliffs completed arbitration for the sales price of blast furnace pellets sold to Essar Steel Algoma, Inc. (Sault Ste. Marie, Ontario, Canada) [a subsidiary of Essar Steel Holdings Ltd. (Mumbai, India)]. The arbitrated redefinition of world prices for blast furnace pellets allowed Cliffs to use an increase greater than 95% compared with 2009 pellet prices in the established pricing formula (Cliffs Natural Resources Inc., 2010a).

Steel Dynamics, Inc. (Fort Wayne, IN) announced the production of the first iron nuggets at its Mesabi Nugget facility in Hoyt Lakes. This was the world's first commercial production of greater than 96% iron nuggets using the ITmk3 process developed by Kobe Steel Ltd. (Kobe, Japan). The plant startup completed 2 years of construction activity and was designed, at anticipated capacity, to produce 500,000 metric tons per year (t/yr) of nuggets, much of which will be feedstock to Steel Dynamics' own electric arc furnaces (EAFs) in Indiana. During the year, Steel Dynamics continued to ramp up operations at its Mesabi Nugget facility. The plant was shut down in November in order to replace refractories in the rotary hearth furnace and for equipment modifications. In 2010, 67,500 metric tons (t) of iron nuggets was produced (Steel Dynamics, Inc., 2010; 2011).

Magnetation, Inc. (Nashwauk) announced the start-up of its new Rev3™ separator, a high-gradient magnetic separator designed to recover high-grade hematite concentrate from fine tailings or to upgrade mined hematite ore. The separator was installed in its Plant 1 near Keewatin. Magnetation planned to install a ball mill and update the Rev3™ separator at the plant by midyear 2011, bringing capacity to 450,000 t/yr. The company also planned to construct a new 650,000-t/yr plant (Plant 2), near Taconite, by the third quarter of 2012.

Magnetation signed a long-term offtake agreement with Altos Hornos de Mexico S.A.B. de C.V. that was planned to start in January 2012. Talks were held with Cargill, Inc. that resulted in an agreement in January 2011, to explore worldwide opportunities to develop and use Magnetation's proprietary mineral processing technology (Magnetation, 2010a, b; Cargill, 2011).

Consumption

U.S. iron ore consumption increased by 37% to 42.3 Mt from 31.0 Mt in 2009 (table 1). Pig iron production, at 26.8 Mt in 2010, was more than 40% greater than the 2009 production of 19.0 Mt. Raw steel production using BOF technology, which had been at the lowest production level in more than a decade in 2009, increased by 38% to 31.2 Mt.

Consumption of iron ore, including agglomerates, reported to the AISI by producers of iron and steel totaled 41.7 Mt, including 36.0 Mt of pellets; 5.2 Mt of sinter, briquettes, and other products; and 0.4 Mt of natural coarse ore (table 6). Of the ore consumed, 85% was domestic production; 10%, imports from Canada; and 5%, imports from other countries. Other iron-bearing materials charged to blast furnaces included mill scale, slag scrap, and steel furnace slag.

The three consumption numbers used in this annual review are reported in tables 1, 6, and 7. The first consumption number (42.3 Mt in 2010), in table 1, is the sum of the ore consumed by input type reported by the AISI, the ore consumed in DRI production, and the ore consumed in nonsteel uses, as reported to the USGS (American Iron and Steel Institute, 2011, p. 81). The second consumption number (41.7 Mt in 2010), in table 6, is the ore consumed in U.S. iron and steel plants by type of ore reported by the AISI. The third consumption number is an estimate of DRI and other miscellaneous uses, which include iron ore consumed in production of cement and iron ore shipped for use in manufacturing paint, ferrites, heavy media, cattle feed, refractory and weighing materials, and for use in lead smelting are listed in table 7. The latter consumption figure was the ore consumed in DRI production (of which there was none produced in 2010) and nonsteel uses (0.62 Mt in 2010). Data on iron ore consumption in nonsteel end uses (table 7) were compiled from USGS surveys and information provided by Midrex Technologies, Inc. (2011, p. 7).

Prices

Iron ore negotiations for 2010–11 benchmark prices between Chinese steelmakers and Australian producers BHP Billiton Ltd. (Melbourne, Australia) and Rio Tinto plc (London, United Kingdom) began early in 2010. Talks were held in Singapore

owing to legal problems that developed the previous year for Rio Tinto's negotiators in China. Analysts expected ore prices to rise between 10% and 50% from those of the prior year with producers expected to hold back until Japan and the Republic of Korea had signed deals. Anticipation of the Indian Government introducing export duties on iron ore and a subsequent rise in spot iron ore prices from Indian iron ore exporters were expected to push the contract benchmark price higher for the 2010 contract. The Brazilian Government's discussion of a possible iron ore export tax to stimulate the domestic steel industry was also seen as supporting an increase in contract prices (Cavallaro, 2010; Metal Bulletin, 2010b, c).

Vale S.A. (Rio de Janeiro, Brazil) and BHP Billiton reached agreement with major steelmakers from China, Japan, and the Republic of Korea to accept quarterly ore repricing. In 2010, prices were almost two times those of the 2009 contract year (Jenkins, 2010).

April 2010 represented the end of the 40-year global benchmarking system for the sale of iron ore under an annual contract. Iron ore producers felt they had been losing out, with contract prices regularly falling below the spot market price and with some customers renegeing on contract tonnages when spot price fell below the contract price. BHP Billiton and Vale reached agreements with several customers to move to shorter-term or quarterly contracts. Rio Tinto had not reached agreements but was looking toward annual supply agreements with quarterly price adjustments. As a result of the end of the benchmarking system, publication of contract prices in Japan, listed in table 16 in previous Minerals Yearbook chapters, have been discontinued.

China reported that the change to quarterly negotiated prices would lead to continued price increases, short-run profits for iron ore suppliers, and reduced profit margins for Chinese steel mills. China placed a ban on imports of ore with less than 60% iron content—a move that should favor the big three producers (BHP Billiton, Rio Tinto, and Vale), while hampering imports of lower grade ores from India. Additionally, the China Chamber of Commerce of Metals Minerals & Chemical Importers & Exporters and the Chinese Iron and Steel Association (CISA) agreed to revoke import licenses for small traders and to restrict reselling of imported iron ore. According to Chinese sources, calls for boycotting Australian iron ore imports into China by CISA led to retaliatory export cutbacks by the big three producers. The ban on low-grade iron ore imports by China prompted a crackdown on illegal mines in India's Orissa State, thereby limiting exports of this ore to China (Karpel, 2010; Rosenquist, 2010).

By May, CISA and ArcelorMittal confirmed the end to the benchmarking system, and many steelmakers indicated that an iron ore surcharge on steel sales might result. BHP Billiton, Rio Tinto, and Vale settled annual iron ore contracts with a quarterly pricing mechanism. Vale indicated it would allow customers to select an index to use as the basis of a pricing formula. BHP and Rio Tinto did not reveal its pricing formula but indicated that quarterly prices would be based on indices from the previous quarter. In midyear, Rio Tinto changed the reference period for calculating its quarterly iron ore prices. Rio Tinto's new pricing mechanism was then more in line with that of Vale (Antonlioli, 2010; Metal Bulletin, 2010e, g).

Wuhan Iron and Steel Co. Ltd. (WISCO), China's third-leading steelmaker, secured a special price from Corporación Venezolana de Guayana (CVG) at about \$20 per metric ton below the third quarter price being charged by Vale to its Asian customers. CVG, a Venezuelan state-owned mining and metallurgical group, sold 480,000 t of iron ore in 2009 to WISCO and had an existing contract to sell WISCO more than 40 Mt of iron ore during the next 7 years (Skillings Mining Review, 2010b).

ThyssenKrupp Steel Europe responded to the new quarterly iron ore pricing mechanism by introducing a surcharge on annual steel contracts. Other European steelmakers were expected to follow suit in order to transfer their pricing risk to the customer. Upward movement of iron ore prices was expected to increase pricing risk in the short- to medium-term owing to cancellation or deferral of major iron ore mining projects caused by the economic downturn that began in late 2008 (Gleeson, 2010; Hodge, 2010).

Later in the year, supplies of contract iron ore exported to small Chinese mills reportedly were cut by BHP Billiton, Rio Tinto, and Vale. Larger Chinese mills were expected to adopt contract prices developed by Japanese and Korean mills, while smaller Chinese mills awaited a negotiated price (Metal Bulletin, 2010d).

Transportation

The Lake Carriers' Association reported that the iron ore shipments on the Great Lakes rebounded after having fallen to the lowest level in 71 years in 2009. Iron ore cargos on the Great Lakes totaled 43.7 Mt, an increase of 68% compared with those of 2009. Iron ore shipments for 2010 were slightly below the 5-year average of 2005–09. The locks at Sault Ste. Marie, MI, opened 4 days ahead of schedule, on March 21, owing to the increased need for iron ore from steel plants located on the Lower Lakes (Lake Carriers' Association, 2010; 2011).

Foreign Trade

In 2010, U.S. exports of iron ore exceeded imports by 55%, which represented only a minor percentage of domestic apparent consumption. Exports increased by more than 150%, while imports increased by two-thirds compared with 2009 figures. U.S. iron ore exports were 93% pellets (9.2 Mt), and 81% of the exports was shipped via the Great Lakes to Canadian steel companies, while 7% was shipped to China, 3% to Germany, 2% each to France and Mexico, and the rest to 13 other countries. U.S. imports totaled 6.4 Mt, of which Brazil's share increased to 8% from 5% in 2009, Canada's share decreased to 70% from 81% in 2009, and Russia's share increased to 9% from 4% in 2009 (tables 1, 8–14).

World Industry Structure

Consumption.—Although not a direct measure, imports of iron ore and production of crude steel, DRI, and pig iron can be used as guides to indicate whether global iron ore consumption rises or falls. DRI and pig iron production are likely to be more direct indicators of iron ore consumption than crude steel production because, to varying degrees in each country, part of

steel production comes from scrap consumption in minimills. Iron ore net imports cannot be used as a straightforward indicator of a change in iron ore consumption in countries that produce iron ore unless a country's own ore production remains constant. World consumption of iron ore was estimated to have increased as indicated by increases in pig iron (12%) and DRI (5%) production compared with 2009 levels. Of the nine countries that accounted for 2% or more of world pig iron production in 2010, four of the countries showed negative growth, including the United States, comparing 2010 production with each country's average pig iron production from 2006 through 2010. The growth rates compared with the 5-year average (2006–10) for these countries were as follows: India, 22%; China, 18%; the Republic of Korea, 6%; Germany, 3%; Japan, 1%; Russia, 0.6%; Ukraine, 8%; the United States, 13%; and Brazil, 18%. Whereas in 2009, only two (China and India) of the five leading producing countries of pig iron showed an increase in pig iron production compared with that of 2008, all countries showed an increase in production in 2010 compared with that of previous year—China, 7%; India, 14%; Japan, 23%; the Republic of Korea, 14%; and Russia, 11%.

Interest in mine development continued to increase in 2010 owing to a recovery from the global economic downturn that began in 2008, as producers positioned themselves to take advantage of expected continuing high levels of consumption driven by Chinese economic growth. With new iron ore production capacity becoming available through existing producers, world supply of iron ore was expected to be adequate at least through 2013. A potential large increment of iron ore supply may come into the market in 2015 and beyond from new producers in West Africa and Brazil (Gray, 2011, p. 20–21).

World crude steel production increased to 1.4 billion metric tons (Gt) from 1.2 Gt in 2009. Seven countries produced more than 35 Mt of crude steel each and combined accounted for almost 75% of world production in 2010. Of those countries, China produced about 53 Mt more crude steel in 2010 than in 2009 and the United States and Japan each produced 22 Mt more. Combined production from the others (Germany, India, the Republic of Korea, and Russia) was 33 Mt more in 2010 than in 2009. Annual world crude steel production, excluding China, increased by more than 130 Mt in 2010. Between 2001 and 2010, China, Germany, India, Japan, the Republic of Korea, Russia, and the United States accounted for more than two-thirds of combined world crude steel production. China's 2010 production was almost 65% greater than its average for the 10-year period, while that of the United States was 10% less than its average for the 10-year period (United Nations Conference on Trade and Development, 2011, p. 124–126).

Production.—World iron ore production of 2.6 Gt, gross weight, increased by 17% from 2009 production levels. Annual world production has exceeded 1 Gt, gross weight, each year since it first reached that level in 1995, and has exceeded 2 Gt since 2007. Australia's and Brazil's combined share of world production by gross weight from 2006 through 2010 averaged 32%. In 2010, iron ore was produced in 41 countries, with production exceeding 1 Mt, gross weight, in 27 of those countries. World DRI production increased to 70.4 Mt, which was 9% greater than that of 2009 (Midrex Technologies, Inc., 2011).

Trade.—World iron ore imports of 1.05 Gt rose by 12% compared with 2009 levels. Following large year-on-year increases in imports for the past 8 years (21% in 2002, 33% in 2003, 40% in 2004, 32% in 2005, 19% in 2006, 17% in 2007, 16% in 2008, and 42% in 2009), China posted a slight decline in iron ore imports to 619 Mt in 2010 from 630 Mt in 2009. Since 2001, four countries, China, Germany, Japan, and the Republic of Korea, have accounted for more than two-thirds of world iron ore imports. China's share more than tripled during this 10-year period to 59% from 19%. Germany's share of imports in that period decreased to 4% from 8%, Japan's share decreased to 13% from 26%, and the Republic of Korea's share decreased to 5% from 9%.

World iron ore exports of 1.07 Gt increased by 11% compared with 2009 levels. Australia's and Brazil's combined share of world iron ore exports increased slightly to 67% in 2010 compared with their revised share in 2009. Five countries accounted for more than 83% of world iron ore exports. In decreasing order of market share, Australia held 38%; Brazil, 28%; India, 9%; South Africa, 5%; and Canada, 3% (United Nations Conference on Trade and Development, 2011, p. 107–110).

According to The TEX Report (2011a–c), China, the world's leading importer of iron ore, imported 619 Mt of iron ore in 2010. The leading exporters of nonagglomerated ore to China were South Africa (56%), Australia (43%), Brazil (21%), India (16%), and Iran (2%), with the remainder shared among more than 30 countries. Russian iron ore exports to China in 2010 decreased by 27% compared with those of 2009, while those to the United States increased fourfold during the same period. The European Union (EU) increased iron ore imports in 2010 by 48% compared with those of the previous year.

Mergers and Acquisitions.—ArcelorMittal and BHP Billiton discussed the possibility of combining iron ore assets in Liberia and Guinea, but later announced that these discussions had been terminated. The discussions included BHP Billiton's 41.3% share of the Nimba project and exploration leases in Guinea, as well as four leases in Liberia. The merger of assets would have included ArcelorMittal's five Liberian leases and rights to upgrade an existing railway and Panamax port (BHP Billiton Ltd., 2010a; Hotter, 2010).

Cliffs completed the acquisition of Wabush Mines from the two other joint-venture partners—U.S. Steel Canada (Hamilton, Ontario, Canada) (a subsidiary of U.S. Steel) and ArcelorMittal Dofasco (Hamilton, Ontario, Canada) (a subsidiary of ArcelorMittal). The Wabush Mines acquisition included mine, rail, concentrating, pelletizing, and port operations in Newfoundland and Labrador, and Quebec Provinces, Canada. The \$88-million purchase increased Cliffs' ownership in the operations to 100% from 26.8%. Wabush Mines has a production capacity of 5.6 million metric tons per year (Mt/yr) and about 70 Mt of iron ore reserves (Cliffs Natural Resources Inc., 2009; 2010b).

Mitsubishi Corp. (Tokyo, Japan) acquired 25% of the shares in Compañía Minera del Pacífico (CMP) S.A. [the mining subsidiary of Compañía de Acero del Pacífico S.A. (Santiago, Chile)]. Mitsubishi funded a \$400 million capital increase for CMP for a total acquisition cost of \$924 million. CMP has several Chilean iron ore mines, plants, and ancillary facilities,

as well as mineral rights to several iron ore deposits in Chile (Gardner, 2010).

In April, some analysts expressed the opinion that the proposed merger of BHP Billiton and Rio Tinto appeared to be unlikely. Problems with competition commissions in Australia, China, and the EU hampered proceedings. A reevaluation of the equalization payment to Rio Tinto for the merger indicated that payments may be undervalued. There was a \$275 million penalty to either party if they cancelled the agreement, did not recommend the transaction to shareholders, or did not uphold exclusivity provisions of the agreement. In October, BHP Billiton and Rio Tinto agreed to dissolve the proposed joint venture of their Western Australian iron ore assets (BHP Billiton Ltd., 2010b; Tredway, 2010a).

In August, Xstrata Plc (Zug, Switzerland) made a \$383 million offer for all the shares in Sphere Minerals Ltd. (West Perth, Australia). Sphere Minerals owned three iron ore properties in Mauritania—Guelb el Aouj (joint venture with the State-owned producer), Askaf, and Lebtheinia. Sphere Minerals had planned to develop the Askaf deposit in stages—2 Mt/yr beginning in 2012 and ramping up to 6 Mt/yr in 2016 (Tredway, 2010b).

World Review

Afghanistan.—The Government of Afghanistan decided to rebid the 1.8-Gt Hajigak iron ore deposit about 100 kilometers (km) west of Kabul. Rumors about the initial bid concerning lack of transparency, low interest, and the exclusion of a downstream integrated steelmaking facility option were all factors in the decision to rebid the project (Skillings Mining Review, 2010a).

Australia.—Development of iron ore and other mineral reserves reportedly may have been threatened by imposition of a resources super-profits tax. BHP Billiton estimated that such a 40% federal tax would increase its overall tax burden to 57% from 43%. Several companies indicated that such a tax increase would cause them to cancel projects or move investments overseas. BHP Billiton, Fortescue Metals Group Ltd. (East Perth, Australia), and Rio Tinto placed Australian projects on hold to evaluate the effects of the new taxes on project economics (Creagh, 2010; Metal Bulletin, 2010f).

BHP Billiton announced full-year production figures for 2010. BHP Billiton's share of salable quantities of iron ore (wet) were as follows (Australia, unless otherwise specified)—Area C Joint Venture (JV) (85% owned), 39.5 Mt; Goldsworthy JV (85% owned), 1.5 Mt; Mount Newman JV and Jumblebar (85% owned), 37.2 Mt; Samarco (Brazil) (50% owned), 11.7 Mt; and Yandi JV (85% owned), 38.2 Mt. BHP Billiton's share of total world mine production was 128 Mt, a 9% increase from that of 2009 (BHP Billiton Ltd., 2010c, p. 4; 2011a, p. 4).

BHP Billiton continued work on its Rapid Growth Project 5 (RPG5) which would facilitate ongoing development of port, rail, and Jumblebar Mine infrastructure. RPG 5, a \$4.80 billion project with engineering 99% complete and construction 89% complete by yearend 2010, was expected to add 50 Mt/yr to system capacity by the second half of 2011 (BHP Billiton Ltd., 2011b).

Rio Tinto announced full-year production figures for 2010. Rio Tinto's share of salable quantities of iron ore plus pellets were as follows (Australia, unless otherwise specified)—Channar (60% owned), 6.6 Mt; Eastern Range, 9.2 Mt; Hamersley, 112.7 Mt; Hope Downs (50% owned), 15.9 Mt; Iron Ore Co. of Canada (IOC) (Canada; 58.7% owned), 8.6 Mt; and Robe River (53% owned), 31.6 Mt. Rio Tinto's share of total world mine production was 184.6 Mt, an 8% increase from that of 2009 (Rio Tinto plc, 2011).

Rio Tinto's Pilbara region iron ore production reported a substantial increase mainly resulting from the 2010 startup of the Mesa A/Warramboe Mine. Rio Tinto approved \$200 million in funding to prepare for the expansion of its iron ore operations in Western Australia. The initial funding was for dredging contracts to establish an additional 1.8 km, four-berth jetty and wharf at Cape Lambert as part of its overall plan. The broader plan included the expansion of the mines in the Pilbara and development of additional port capacity at Dampier and Cape Lambert in order to expand iron ore operating capacity to 330 Mt/yr by 2016 (Rio Tinto plc, 2010a, p. 2, 9).

After losing a court case, Fortescue Metals agreed to pay Zodiac Maritime Agencies Ltd. (London, United Kingdom) \$78 million for suspending a charter contract for the transport of iron ore in 2008. This attempt to lock in shipping rates for its Western Australian iron ore at much lower levels than originally contracted brought Fortescue's total damage payments to shipping companies to \$151 million (Mining Journal, 2010a).

The Australian Competition Tribunal ruled on June 30 that third-party access to Rio Tinto's Hamersley and BHP Billiton's Newman rail lines was not in the public interest (Australian Journal of Mining, 2010).

China's Sinosteel Midwest Corp. and the Karara joint venture between China's Anshan Iron and Steel Group and Australia's Gindalbie Metals Ltd. (Perth) agreed to share infrastructure and mine services. The sharing of facilities was expected to enhance project economics and develop synergies between the Karara iron ore project and Sinosteel's Koolanooka/Blue Hills project in Western Australia. Sinosteel expected to begin operation of a 1.5-Mt/yr hematite mine before the end of February. The Ansteel-Gindalbie joint venture expected to begin production at Karara in 2011 (Mining Journal, 2010c).

Brazil.—A strong rebound from the low levels of production of iron ore and pellets in 2009 was reported by Brazil's Vale. In 2010, Vale's reported iron ore production was 307.8 Mt (includes Vale's 50%-joint venture in Samarco)—an increase of 29% compared with that of 2009. Vale's share of salable quantities of iron ore was as follows, in decreasing order of tonnage—Southeastern System, 116.9 Mt; Carajás, 101.2 Mt; Southern System, 74.7 Mt; Samarco, 10.8 Mt; and the newly created Midwestern System (comprised of Corumbá and Urucum), 4.2 Mt. Vale pellet production in 2010 was 49.0 Mt (includes Vale's 50%-joint venture in Samarco and Vale's 50.89% ownership in Hispanobras)—more than doubling the company's pellet production of 2009. The breakdown of salable quantities of iron ore pellets was as follows, in decreasing order of pellet production—Samarco, 10.8 Mt; Nibrasco, 9.0 Mt; Tubarão I and II, 5.4 Mt; Vargem Grande, 5.2 Mt; Kobrascos,

4.7 Mt; São Luís, 4.5 Mt; Fábrica, 3.8 Mt; Itabasco, 3.6 Mt; and Hispanobras, 1.9 Mt (Vale S.A., 2011, p. 2–3).

MMX Mineração e Metálicos S.A. (Rio de Janeiro) announced plans to invest \$2.9 billion to increase iron ore production at its Serra Azul and Bom Sucesso Mines in southeastern Minas Gerais State. The planned increases would significantly lower production costs at the Serra Azul Mine (Millard, 2010).

Canada.—IOC [owned jointly by Labrador Iron Ore Royalty Income Fund (15.1%), Mitsubishi Corp. (26.18%), and Rio Tinto (58.72%)] produced 2.8 Mt of iron ore concentrates and 11.9 Mt of iron ore pellets. ArcelorMittal Mines Canada (formerly Québec Cartier Mining Co.) produced 15.1 Mt of iron ore concentrates and pellets. Wabush Mines Ltd. (owned by Cliffs as of December 31, 2010), which no longer publicly reports production by individual mining entities, had produced 2.7 Mt of iron ore pellets in 2010; Bloom Lake Partnership [owned 75% by Consolidated Thompson Iron Mines Ltd. (Montreal, Quebec) and 25% by WISCO Ltd. (a wholly owned subsidiary of WISCO)] produced 3.0 Mt of iron ore (ArcelorMittal, 2011, p. 30; Cliffs Natural Resources Inc., 2011a, p. 7; Labrador Iron Ore Royalty Corporation, 2011, p. 4).

The board of directors of IOC approved a new investment of \$400 million to increase annual iron ore concentrate capacity in 2012 to 22 Mt from 18 Mt. The original project expansion was canceled in 2008 owing to the global economic downturn. The revised total project cost for the IOC first stage expansion was \$497 million, of which some costs had been spent prior to the earlier suspension of the project (Rio Tinto plc, 2010b). IOC's overall production was affected by the increased pellet to concentrate ratio during the second quarter. The lower total tonnage produced resulted from the weight loss in transforming concentrate to higher value pellets (Rio Tinto plc, 2010d, p. 3).

Consolidated Thompson shipped its first iron ore concentrate—165,000 t, to WISCO in China—from its Bloom Lake Mine in northeastern Quebec. The shipment was made from Consolidated Thompson's new port facilities at Pointe Noire in Sept Iles, Quebec. Consolidated Thompson planned to ship 8 Mt/yr from the mine, which has the potential to expand to 16 Mt/yr capacity. Consolidated Thompson entered into an offtake agreement with a subsidiary of SK Group (Seoul, Republic of Korea) to purchase 1 Mt/yr of iron ore concentrates for a 10-year period (Consolidated Thompson Iron Mines Ltd., 2010a, b).

Labrador Iron Mines (LIM) Holdings Ltd. (Toronto, Ontario) announced that construction on the James iron ore mine in the Province of Quebec was nearly complete. Mine production was scheduled to begin in April 2011 and more than 2 Mt of direct-shipping ore was expected to be mined in 2011. LIM expected plant construction to be completed during the first quarter of 2011 (Labrador Iron Mines Holdings Ltd., 2010).

Guinea.—Rio Tinto signed a memorandum of understanding with Aluminum Corporation of China Ltd. (Beijing, China) (Chinalco) that would establish a joint venture to develop and operate the Simandou iron ore project (Simandou blocks 3 and 4). With an investment of \$1.35 billion, Chinalco would obtain a 44.65% interest in the project (Rio Tinto plc, 2010a, p. 2–3). In late July, Rio Tinto signed a binding agreement with Chinalco

to establish a joint venture to develop and operate the project. The mine was expected to begin operation within 5 years and was expected to produce 95 Mt/yr at full capacity. In early August, Rio Tinto approved \$170 million in further funding for the Simandou iron ore project. Funding was for mine, rail, and port infrastructure work and was additional to the \$650 million already spent on exploration, community development, and evaluation studies (Rio Tinto plc, 2010c).

Vale acquired a majority stake in its own Simandou iron ore project (Simandou blocks 1 and 2) in Guinea for an estimated \$2.5 billion. Vale acquired 51% of BSG Resources Ltd. (St. Peter Port, United Kingdom), which holds iron ore concessions in the Simandou Sul region (Fick, 2010). Vale entered into an agreement with the Liberian Government to develop infrastructure for the transport and export of iron ore from its Simandou project in Guinea (note that this project is different from Rio Tinto's Simandou project in Guinea). Vale planned to establish a 50-Mt/yr iron ore mine at Simandou by 2014, with production planned to begin between 10 Mt/yr and 15 Mt/yr in 2012. The estimated cost for the project was more than \$5 billion (Metal Bulletin, 2010h).

Iran.—Annual iron ore and iron ore concentrate exports were increased by 270% compared with those of fiscal year 2009. In the fiscal year ending April 20, 2010, its exports of iron ore and concentrates were 1.19 Mt, of which more than 97% was delivered to China (Metal Bulletin, 2010i).

Liberia.—ArcelorMittal restarted a planned \$1.5 billion iron ore mine startup that had been delayed since 2009 owing to the downturn of the global economy. ArcelorMittal planned to make its first iron ore shipment from the Nimba Mine in 2011; construction and development work started during 2010 (Reuters, 2010).

Oman.—Vale agreed to sell 30% of Vale Oman Pelletizing Company LLC (VOPC) to Oman Oil Company S.A.O.C., which is wholly owned by the Government of Oman. The VOPC pelletizing plant was scheduled to begin production in 2011 with a production capacity of 9 Mt/yr of direct reduction pellets (Vale S.A., 2010; 2011).

Saudi Arabia.—London Mining plc (London, United Kingdom) released an updated feasibility study for the Wadi Sawawin iron ore project in northwest Saudi Arabia. London Mining estimated that capital expenditures for the 5-Mt/yr project would total \$2 billion, which would include power and desalinization plants. Operating costs were estimated to be \$47.4 per metric ton of DRI pellets produced. The project was a 50–50 joint venture between London Mining and Saudi-based National Mining Co. Further feasibility work was planned to raise the resource estimate and to increase annual capacity to 10 Mt/yr of DRI pellets (Mining Journal, 2010b).

South Africa.—After announcing plans to increase the price of iron ore sold to ArcelorMittal South Africa Ltd. (Amsa), Kumba Iron Ore Ltd. (Pretoria, South Africa) (a subsidiary of Anglo American plc) conceded to an interim iron ore pricing agreement with prices, \$70 per ton for the Amsa inland steel mills and \$50 per ton for Amsa's Saldanha steel facility, remaining unchanged into 2012. It appeared that Amsa, which controlled 70% to 80% of South Africa's domestic steel industry, was able to obtain the agreement by warning that it

might close its Saldanha steel plant, 40 km north of Cape Town. Amsa lost control of a 21.4% stake in minerals rights to the Sishen iron ore mine earlier in 2010 when it failed to convert its mineral rights to the mine (Metal Bulletin, 2010a; Anglo American plc, 2011).

Sweden.—Luossavaara-Kiirunavaara Aktiebolag's (LKAB) (Luleå) iron ore pellet production increased to 22.1 Mt from 14.7 Mt in 2009. Pellet production was most of the total, although 3.2 Mt of fines and minor special products were produced, a slight increase in production of this material from 3.0 Mt in 2009. LKAB announced Kiruna's proven ore reserves to be 579 Mt at 48.7% iron content, and probable ore reserves of an additional 79 Mt at 46.2% iron content. The company reported Malmberget's proven ore reserves to be 270 Mt at 42.5% iron content, and reserves at the newly opened Gruvberget Mine to be 10 Mt at 53.2% iron content. LKAB announced plans for three new open pit mines in the Svappavaara area and new strategy to increase mine production to 37 Mt/yr within 5 years (Luossavaara-Kiirunavaara Aktiebolag, 2011, p. 5–6, 19).

Outlook

Although a small portion of the production recovery for U.S. iron ore has been inventory building, iron ore production has returned to tonnages seen before the 2008–09 economic downturn, and steel production also has been recovering from the downturn. Most U.S. iron ore production is sold directly to the domestic steel industry, although a large amount of domestic ore is shipped to Canada, and small amounts are generally exported to other countries. Neither the domestic dependence nor the pattern of exports to Canada is expected to change in the near future, although changes in ownership of some steel plants have led to minor changes in the countries from which iron ore is imported. For example, with the sale by Severstal of the Sparrow's Point (Baltimore, MD) steel plant, it is expected that iron ore imports currently received from Russia and the Ukraine will be sourced either from Brazil or Canada.

Trends in the steel industry are provided in the "Outlook" section in the Iron and Steel chapter of the 2010 USGS Minerals Yearbook, volume I, Metals and Minerals. The development of projects, using new and existing direct reduction technology being developed in northern Minnesota, was expected to encourage growth of the U.S. iron ore industry within the next few years, as developments such as Steel Dynamics' Mesabi Nugget project comes to full production and Essar Steel's Minnesota Iron project is built.

China's gross domestic product is expected to maintain a greater than 8% annual growth rate through 2015 with significant growth potential in the intensity of steel use in the interior regions of the country (Brooks, 2011, p. 9–10). It is expected that rising exports from other countries will displace some of the high cost Chinese ore exports through 2015, with pellet and lump ore gaining market share with respect to sinter fines. Brazil's MMX is an example of one of the many smaller companies planning to take advantage of growth potential with plans to increase production fourfold during the next 5 years (Bou-Habib, 2011, p. 5–7, 33). Larger companies and entire regions have plans in place to also take advantage of

this potential growth for the next several years. Brazil's Vale anticipates doubling its 2010 production of run-of-mine iron ore by 2017, and projections for Canada's iron ore production indicate that iron ore production in that country may double by 2014 (Palmiere, 2011, p. 5; Valadao, 2011, p. 5).

With the collapse of iron ore benchmark prices in 2010, two pricing mechanisms are developing—an iron ore index, such as IODEX, and a historic basis, such as the previous quarter minus 1 month (3-month basis). The historic basis, which averages prices for a 3-month period, does not reflect actual pricing during short time periods when there is high price volatility. Index prices are now being considered that will extend iron differential pricing to all grades, lump, and pellets; establish alumina and silicon differentials; and use formulas to model price escalators (Browne, 2011, p. 19).

New developments in DRI technology, as well as growth in the DRI market share, would allow the iron ore industry to become a major supplier to an expanding DRI sector, as well as to existing customers—the integrated steel plants. Coastal U.S. steel producers already rely on imported DRI to supply a quality raw-material input to help meet steel alloy purity specifications, which cannot be obtained solely using traditional scrap. However, even in the event of strong global DRI growth during the next decade, DRI would be able to replace only a small portion of the world's blast furnace production. Although no new "greenfield" pig iron facilities have been built in the United States in the past 30 years, and owing in part to the continued slow growth in the DRI market, the blast furnace, with its need for an assured supply of iron ore, is expected to remain the mainstay of the iron and steel industry in the immediate future.

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TABLE 1
SALIENT IRON ORE STATISTICS¹

(Thousand metric tons and thousand dollars unless otherwise specified)

	2006	2007	2008	2009	2010	
United States, iron ore, usable, less than 5% manganese: ²						
Production	52,700	52,500	53,600	26,700	49,900	
Shipments:						
Quantity	52,700	50,900	53,600	27,600	50,600	
Value	2,840,000	3,040,000	3,770,000	2,560,000	5,000,000	
Average value at mines	dollars per metric ton	53.88	59.64	70.43	92.76	98.79
Exports:						
Quantity	8,270	9,310	11,100	3,920	9,950	
Value	636,000	718,000	1,240,000	356,000	1,090,000	
Imports for consumption:						
Quantity	11,500	9,400	9,250	3,870	6,420	
Value	611,000	543,000	918,000	376,000	703,000	
Consumption, iron ore and agglomerates	58,200	54,700	51,900	31,000	42,300	
Stocks, December 31, at mines, plants and loading docks:	1,650	2,090	4,070	5,060	3,470	
Additional stocks, December 31:						
Crude ore at mines and plants ⁴	1,140	749	947	580	734	
Unagglomerated concentrates for pelletizing plants	1,260	1,550	1,320	896	949	
World, production ⁵	1,830,000 ^r	2,040,000	2,210,000	2,230,000 ^r	2,590,000 ^e	

^eEstimated. ^rRevised.

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

²Direct-shipping ore, concentrates, agglomerates, and byproduct ore.

³Excludes byproduct ore.

⁴Crude ore stocks and unagglomerated concentrates for pelletizing plants removed. Marketable stocks only.

⁵Gross weight.

TABLE 2
EMPLOYMENT AT IRON ORE MINES AND BENEFICIATING PLANTS, QUANTITY AND TENOR OF ORE PRODUCED, AND AVERAGE OUTPUT PER WORKER HOUR IN THE UNITED STATES IN 2010, BY DISTRICT AND STATE¹

District and State	Number of mines	Average number of employees	Worker hours (thousands)	Production				Average quantity per worker hour (metric tons)		
				Crude ore (thousand metric tons)	Usable ore (thousand metric tons)	Iron contained in usable ore (thousand metric tons)	Iron content natural (percent)	Crude ore	Usable ore	Iron contained
Lake Superior:										
Michigan ²	2	1,340	3,080	37,600	12,500	7,570	60.5	12.20	4.06	2.46
Minnesota	7	3,380	7,010	128,000	37,400	23,700	63.4	18.21	5.33	3.38
Total or average	9	4,720	10,100	165,000	49,900	31,300	62.7	16.38	4.94	3.10
Other States ³	4	58	123	12	12	7	54.0	0.10	0.10	0.05
Grand total or average	13	4,780	10,200	165,000	49,900	31,300	62.7	16.18	4.89	3.06

¹Data are rounded to no more than three significant digits, except "Average per worker hour, crude ore" may not add to totals shown.

²Does not include professional or clerical workers at mines, pelletizing plants, maintenance shops, or research lab workers.

³Includes California and South Dakota.

TABLE 3
USABLE IRON ORE PRODUCED IN THE UNITED STATES IN 2010, BY DISTRICT,
STATE, AND TYPE OF PRODUCT^{1,2}

(Thousand metric tons)

District and State	Direct			Other		Total
	shipping ore	Concentrates	Sinter	agglomerates ³		
Lake Superior:						
Michigan	--	--	--	12,500		12,500
Minnesota	--	310	79	37,000		37,400
Total	--	310	79	49,500		49,900
Other States⁴						
	--	12	--	--		12
Grand total	--	322	79	49,500		49,900

-- Zero.

¹Excludes ore containing 5% or more manganese.

²Data are rounded to no more than three significant digits; may not add to totals shown.

³Data may include pellet chips, screenings, and sinter.

⁴Includes California and South Dakota.

TABLE 4
SHIPMENTS OF USABLE IRON ORE FROM MINES IN THE UNITED STATES IN 2010^{1,2}

District and State	Gross weight of ore shipped (thousand metric tons)					Average iron content, natural (percent)	Value (thousands)
	Direct	Other			Total		
	shipping ore	Concentrates	Sinter	agglomerates			
Lake Superior:							
Michigan	--	--	--	11,900	11,900	60.5	W
Minnesota	--	310	75	38,400	38,800	63.4	W
Total reportable or average	--	310	75	50,200	50,600	62.7	\$5,000,000
Other States³							
	--	12	--	--	12	54.0	584
Grand total or average	--	322	75	50,200	50,600	62.7	5,000,000

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

¹Includes byproduct ore. Excludes ore containing 5% or more manganese.

²Data are rounded to no more than three significant digits; may not add to totals shown.

³Includes California and South Dakota.

TABLE 5
IRON ORE-PRODUCING MINES IN THE UNITED STATES IN 2010

State and mine	County	Operator	Source of iron ore
California:			
Baxter Mine	San Bernardino	Hahm International Inc.	Quarried ore.
Dredge 21	Yuba	Cal Sierra Development Inc.	Dredged sands.
Silverlake Mine	San Bernardino	Hahm International Inc.	Quarried ore.
Michigan:			
Empire	Marquette	Cliffs Natural Resources Inc.	Magnetite taconite ore.
Tilden	do.	do.	Hematite-magnetite taconite ore.
Minnesota:			
Hibbing Taconite	Saint Louis	do.	Magnetite taconite ore.
Keewatin Taconite	do.	United States Steel Corporation	Do.
Mesabi Chief Plant	do.	Magnetation, Inc.	Hematite tailings.
Minntac	do.	United States Steel Corporation	Magnetite taconite ore.
Minorca	do.	ArcelorMittal	Do.
Northshore	do.	Cliffs Natural Resources Inc.	Do.
United Taconite	do.	do.	Do.
South Dakota, CF & I Pit	Lawrence	Pete Lien & Sons Inc.	Quarried ore.
Do., do. Ditto.			

TABLE 6
CONSUMPTION OF IRON ORE AT U.S. IRON
AND STEEL PLANTS, BY TYPE OF PRODUCT¹

(Thousand metric tons)

Type of product	2009	2010
Blast furnaces:		
Direct-shipping ore	--	--
Pellets	26,200	36,000
Sinter ²	3,720	5,090
Total	29,900	41,100
Steelmaking furnaces:		
Direct-shipping ore	327	408
Sinter ²	91	136
Total	417	544
Grand total	30,300 ^r	41,700

^rRevised. -- Zero.

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

²Includes briquettes, nodules, and other.

Source: American Iron and Steel Institute.

TABLE 7
U.S. CONSUMPTION OF IRON ORE FOR
DIRECT-REDUCED IRON AND NONSTEEL END USES^{1,2}

(Thousand metric tons)

Year	Direct-reduced		Total
	iron for steelmaking ³	Nonsteel end uses ⁴	
2006	360	867	1,230
2007	375	699	1,070
2008	390	734	1,120
2009	--	603	603
2010	--	616	616

-- Zero.

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

²Includes agglomerates. Excludes ore containing 5% or more manganese.

³U.S. Geological Survey estimates based on production reports compiled by Midrex Corp.

⁴An estimate, which includes iron ore consumed in production of cement and iron ore shipped for use in manufacturing paint, ferrites, heavy media, cattle feed, refractory and weighing materials, and for use in lead smelting.

TABLE 8
U.S. EXPORTS OF IRON ORE, BY COUNTRY OF DESTINATION^{1,2}

(Thousand metric tons and thousand dollars)

Country	2009		2010	
	Quantity	Value	Quantity	Value
Belgium	194	\$18,600	107	\$14,900
Canada	3,060	276,000	8,110	896,000
China	99	5,800	725	51,800
Colombia	20	1,210	9	899
Finland	--	--	35	3,440
France	179	17,200	236	33,000
Germany	234	22,400	341	47,700
Mexico	70	8,730	188	15,900
Serbia	--	--	44	5,980
Singapore	(3)	5	5	31
South Africa	53	5,050	--	--
Spain	--	--	156	21,800
Sweden	6	427	--	--
Other ⁴	7 ^r	498 ^r	2	210
Total	3,920	356,000	9,950	1,090,000

^rRevised. -- Zero.

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

²Includes agglomerates.

³Less than ½ unit.

⁴Includes all countries with less than 5,000 metric tons of exports from the United States in 2009 and 2010. This represents 16 countries in 2009 and 7 countries in 2010.

Source: U.S. Census Bureau.

TABLE 9
U.S. EXPORTS OF IRON ORE, BY TYPE OF PRODUCT^{1,2}

Type of product	2009			2010		
	Quantity (thousand metric tons)	Value (thousands)	Unit value ^{3,4} (dollars per metric ton)	Quantity (thousand metric tons)	Value (thousands)	Unit value ^{3,4} (dollars per metric ton)
Concentrates	123	\$7,850	63.84	391	\$30,200	77.20
Coarse ores	4	182	45.50	259	13,500	52.21
Fine ores	25	1,560	62.52	78	9,990	128.09
Pellets	3,760	346,000	92.10	9,220	1,040,000	112.61
Briquettes	3	259	86.33	5	31	6.20
Other agglomerates	(5)	22	80.00	1	82	82.00
Roasted pyrites	1	71	71.00	1	104	104.00
Total	3,920	356,000	90.97	9,950	1,090,000	109.70

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

²Includes agglomerates.

³Unit values shown are calculated from unrounded data.

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

⁵Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 10
U.S. IMPORTS OF IRON ORE, BY COUNTRY AND TYPE OF PRODUCT^{1,2}

Country and type of product	2009			2010		
	Quantity (thousand metric tons)	Value (thousands)	Unit value ^{3,4} (dollars per metric ton)	Quantity (thousand metric tons)	Value (thousands)	Unit value ^{3,4} (dollars per metric ton)
Country:						
Brazil	188	\$13,100	69.65	506	\$65,400	129.28
Canada	3,140	323,000	102.70	4,490	471,000	105.04
Chile	203	16,100	79.14	131	15,500	118.08
Finland	6	367	61.17	--	--	--
Mexico	55	4,610	83.73	138	12,400	89.55
Peru	34	1,670	49.03	16	1,370	85.50
Russia	136	8,240	60.60	606	69,900	115.35
South Africa	43	2,980	69.23	--	--	--
Sweden	31	3,190	102.74	54	7,240	134.07
Trinidad and Tobago	--	--	--	120	17,200	142.14
Ukraine	--	--	--	95	13,700	143.78
United Kingdom	8	1,630	203.75	--	--	--
Venezuela	21	825	39.29	251	28,600	113.98
Other ⁵	8	226 [†]	28.25 [†]	12	615	51.25
Total	3,870	376,000	96.97	6,420	703,000	109.59
Type of product:						
Concentrates	283	22,300	78.95	652	78,600	120.50
Coarse ores	16	2,330	145.50	36	4,160	115.61
Fine ores	466	34,900	74.91	628	76,000	121.02
Pellets	3,100	315,000	101.90	5,100	544,000	106.77
Briquettes	4	159	39.75	4	178	44.50
Other agglomerates	3	104	34.67	--	--	--
Roasted pyrites	6	367	61.17	1	4	4.00
Total	3,870	376,000	96.97	6,420	703,000	109.59

[†]Revised. -- Zero.

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

²Includes agglomerates.

³Unit values shown are calculated from unrounded data.

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

⁵Includes all countries with less than 5,000 metric tons of imports to the United States in 2009 and 2010. This represents 3 countries in 2009 and 6 in 2010.

Source: U.S. Census Bureau.

TABLE 11
U.S. IMPORTS OF IRON ORE IN 2010, BY COUNTRY AND TYPE OF PRODUCT^{1,2}

(Thousand metric tons)

Country of origin	Concentrates	Coarse ores	Fine ores	Pellets	Briquettes and other agglomerates	Roasted pyrites	Total
Brazil	295	(3)	135	76	--	--	506
Canada	(3)	--	394	4,090	--	--	4,490
Chile	131	--	--	--	--	--	131
Mexico	117	--	21	--	--	--	138
Peru	--	--	16	--	--	--	16
Russia	--	--	--	606	--	--	606
Sweden	--	--	54	--	--	--	54
Trinidad and Tobago	(3)	--	--	120	--	--	120
Ukraine	--	--	--	95	--	--	95
Venezuela	108	36	--	107	--	--	251
Other ⁴	--	--	7	--	4	1	12
Total	652	36	628	5,100	4	1	6,420

-- Zero.

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

²Includes agglomerates.

³Less than ½ unit.

⁴Includes all countries with less than 5,000 metric tons of imports to the United States. This represents six countries.

Source: U.S. Census Bureau.

TABLE 12
AVERAGE UNIT VALUE FOR SELECTED IMPORTS OF IRON ORE IN 2010¹

Type of product	Country of origin	Average unit value ² (dollars per metric ton, gross weight)
Concentrates	Brazil	123.95
Do.	Chile	117.92
Do.	Mexico	77.11
Do.	Venezuela	160.75
Fine ores	Brazil	135.35
Do.	Canada	114.89
Do.	Mexico	160.49
Do.	Sweden	135.00
Pellets	Brazil	138.90
Do.	Canada	104.09
Do.	Russia	115.36
Do.	Trinidad and Tobago	143.08
Do.	Ukraine	143.08
Do.	Venezuela	65.52

Do. Ditto.

¹Includes agglomerates.

²Weighted averages of individual customs values.

Source: U.S. Census Bureau.

TABLE 13
U.S. IMPORTS OF IRON ORE, BY CUSTOMS DISTRICT^{1, 2}

(Thousand metric tons and thousand dollars)

Customs district	2009		2010	
	Quantity	Value	Quantity	Value
Baltimore, MD	781	\$67,400	1,980	\$200,000
Charleston, SC	6	151	--	--
Chicago, IL	637	45,000	569	74,700
Cleveland, OH	1,860	213,000	2,740	300,000
Columbia-Snake, OR	--	--	21	3,370
Detroit, MI	--	--	(3)	11
El Paso, TX	--	--	55	3,000
Houston-Galveston, TX	38	3,510	76	10,500
Los Angeles, CA	(3)	1	--	--
Minneapolis, MN	--	--	(3)	3
Mobile, AL	28	2,270	179	24,500
New Orleans, LA	465	41,400	788	87,200
New York, NY	--	--	(3)	4
Nogales, AZ	3	175	--	--
Norfolk, VA	--	--	1	42
Ogdensburg, NY	18	325	8	169
Philadelphia, PA	6	367	--	--
Port Arthur, TX	8	1,630	3	348
Seattle, WA	28	513	--	--
St. Albans, VT	--	--	(3)	13
Total	3,870	376,000	6,420	703,000

-- Zero.

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

²Includes agglomerates.

³Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 14
U.S. IMPORTS OF PELLETS, BY COUNTRY¹

(Thousand metric tons and thousand dollars)

Country	2009		2010	
	Quantity	Value	Quantity	Value
Brazil	38	\$3,510	76	\$10,500
Canada	2,900	303,000	4,090	426,000
Peru	5	283	--	--
Russia	136	8,240	606	69,900
Trinidad and Tobago	--	--	120	17,200
Ukraine	--	--	95	13,700
Venezuela	21	825	107	7,020
Total	3,100	315,000	5,100	544,000

-- Zero.

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

Source: U.S. Census Bureau.

TABLE 15
 IRON ORE: WORLD PELLETIZING CAPACITY,
 BY CONTINENT AND COUNTRY IN 2010¹

	Rated capacity, gross weight (million metric tons)
North America:	
Canada	27.5 ^e
Mexico	15.0 ^e
United States	57.4 ^r
Total	99.9
South America:	
Brazil	56.0 ^e
Chile	5.3
Peru	3.5
Venezuela	11.8 ^e
Total	76.6
Europe and Central Eurasia:	
Kazakhstan	8.4 ^e
Netherlands	4.4 ^e
Russia	31.4 ^e
Slovakia	0.4
Sweden	24.2 ^r
Turkey	1.5 ^e
Ukraine	33.5 ^e
Total	103.8
Asia:	
Bahrain	11.0 ^r
China	110.0 ^{e,r}
India	20.7 ^r
Iran	12.3 ^e
Japan	3.0 ^e
Total	157.0
Oceania, Australia	4.3 ^e
Grand total	441.6

^eEstimated ^rRevised.

¹Data may not add to totals shown because of independent rounding.

Sources: International Iron and Steel Institute; United Nations Commission on Trade and Development, Trust Fund on Iron Ore Information; U.S. Geological Survey.

TABLE 16
IRON ORE: WORLD PRODUCTION, BY COUNTRY^{1,2}

(Thousand metric tons)

Country ⁵	Gross weight ³					Metal content ⁴				
	2006	2007	2008	2009	2010 ^e	2006	2007	2008	2009	2010 ^e
Algeria	2,340	1,982	2,077	1,307 ^r	1,469 ⁶	1,180	1,030 ^r	1,050	700 ^r	786
Australia	275,000	299,000	342,000	394,000	433,000	171,000	194,000	209,000	228,000	271,000
Austria	2,093	2,153	2,033	2,002 ^r	2,050 ⁶	669	689	650	641 ^r	658 ⁶
Azerbaijan	11	18	28	--	--	6 ^e	9 ^e	14 ^e	--	--
Bosnia and Herzegovina	1,888 ^r	1,614 ^r	1,482 ^r	1,615 ^r	1,600	793 ^r	678 ^r	622 ^r	678 ^r	672
Brazil	317,800	354,674	350,984 ^r	310,000 ^r	370,000 ⁶	211,020	235,504	233,000 ^r	199,200	240,000
Canada ⁷	33,543	32,744	32,102 ^r	31,704 ^r	37,001 ^{p,6}	21,341	20,751 ^r	20,300 ^r	20,000 ^{r,e}	23,300
Chile	8,628	8,818	9,316	8,242 ^r	9,130 ⁶	5,235	5,379	5,670	5,006	5,852 ⁶
China ^{e,8}	601,000	707,000	824,000	880,000	1,070,000	198,000	233,000	270,000	280,000	332,000
Colombia	644	624	473 ^r	281 ^r	77 ⁶	360 ^r	341 ^r	300 ^r	154 ^{r,e}	42
Cuba	8	3	--	--	--	4 ^e	2 ^e	--	--	--
Egypt ^e	1,600	665 ^r	773 ^r	1,780 ^r	1,000	800	335 ^r	390 ^r	890 ^r	500
Germany ⁹	416 ^r	422	455	364 ^r	390	44	44	48 ^e	38 ^r	41
Greece ^{e,10}	1,500	1,500	1,500	1,500	1,500	575	575	575	570	570
Guatemala	7	31	(11)	5	2 ⁶	2 ^r	6 ^r	(11) ^r	1 ^r	(11)
India	177,000 ^r	207,000 ^r	215,000 ^r	225,000 ^{r,e}	230,000	113,000 ^r	126,000 ^r	138,000 ^r	144,000 ^{r,e}	147,000
Indonesia	88	61	65 ^e	45 ^r	46 ⁶	50	35	37 ^e	25 ^r	26
Iran ^{e,12}	26,244 ⁶	31,538 ⁶	32,000	26,000 ^r	28,000	13,000	15,000	15,000	12,000 ^r	13,000
Kazakhstan	22,263	23,834	21,486 ^r	22,281 ^r	24,229 ⁶	12,700	13,600	12,200 ^r	12,700 ^r	13,800 ⁶
Kenya ^e	(11) ^r	(11) ^r	(11) ^r	(11) ^r	(11)	(11) ^r	(11) ^r	(11) ^r	(11) ^r	(11)
Korea, North ^e	5,040	5,130	5,136 ⁶	5,300 ^r	5,300	1,400	1,400	1,488 ⁶	1,500 ^r	1,500
Korea, Republic of	227	291	366	455 ^r	513 ⁶	155	163	205	274 ^r	308
Macedonia ^e	10	--	-- ⁶	--	--	6	--	-- ⁶	--	--
Malaysia	667	802	982	1,470 ^r	3,466 ⁶	380 ^e	457 ^e	560 ^e	838 ^{r,e}	1,976 ⁶
Mauritania	10,658	11,817	10,950 ^r	10,270 ^r	11,000	6,928 ^r	7,280 ^r	7,120 ^r	6,680 ^r	7,150
Mexico ¹³	10,983	10,916	11,688	11,677 ^r	13,998 ⁶	6,590	6,550	7,013	7,007 ^r	8,400
Mongolia	180	265	1,387	1,379 ^r	3,203 ⁶	116	170	888	883 ^{r,e}	2,051 ⁶
Morocco	9 ^r	9 ^{r,e}	9 ^{r,e}	31 ^r	45 ⁶	5 ^r	5 ^{r,e}	5 ^{r,e}	16 ^r	23 ⁶
New Zealand ¹⁴	2,146	1,723	2,020	2,092 ^r	2,439 ⁶	1,220 ^e	982 ^e	1,200 ^e	1,200 ^{r,e}	1,400
Nigeria ^e	88 ⁶	58 ⁶	62 ⁶	50	50	32	21	23	16	16
Norway	620	620	668	711	712	420	400 ^e	430 ^e	460 ^e	460
Pakistan ¹⁵	130	207	250	270 ^e	290	65	104	125 ^e	135 ^e	145
Peru	7,138	7,614	7,823	6,698	9,160	4,862	5,186	5,244	4,490 ^r	6,140
Portugal ^{e,16}	14	14	14	14	14	10	10	10	10	10
Romania	123	45	--	--	--	40	11	--	--	--
Russia	102,000	105,000	99,900	92,000	101,000	59,100 ^e	60,800 ^e	57,800 ^e	53,200 ^e	58,500
Slovakia	583	570	392	-- ^r	--	198	194	133	-- ^r	--
South Africa ¹⁷	41,326	42,083	48,983	55,313	58,709 ⁶	26,000	26,500 ^r	30,800 ^r	34,800 ^r	37,300
Sweden	23,300 ^e	24,700 ^e	23,800	17,700	25,300	15,000 ^e	16,000 ^e	14,280	11,500	16,400
Thailand	264	1,555	2,029 ^r	1,401 ^r	1,400	132	779	855	800 ^{r,e}	800
Tunisia	214	180	211 ^r	151 ^r	165 ⁶	112 ^e	94	110 ^r	79 ^r	86 ⁶
Turkey	3,785	4,849	4,697 ^r	4,170 ^r	4,500	2,000 ^e	2,600	2,500 ^e	2,200 ^{r,e}	2,400
Ukraine	74,000	77,900	72,688 ^r	66,476	78,171 ⁶	40,700 ^e	42,800 ^e	40,000 ^e	36,600 ^{r,e}	43,000
United Kingdom	(11)	(11) ^e	(11)	--	--	(11)	(11) ^e	(11)	--	--
United States	52,700	52,500	53,600	26,700	49,900 ⁶	33,300	33,100	33,800	16,600	31,300 ⁶
Venezuela ^e	22,100	20,700	20,650 ⁶	14,900	14,000	14,500	13,600	13,600	9,800	9,200

See footnotes at end of table.

TABLE 16—Continued
 IRON ORE: WORLD PRODUCTION, BY COUNTRY^{1,2}

(Thousand metric tons)

Country ⁵	Gross weight ³					Metal content ⁴				
	2006	2007	2008	2009	2010 ^c	2006	2007	2008	2009	2010 ^c
Vietnam ^e	1,020 ⁶	1,060	1,000	1,000	1,000	510 ⁶	530	530	530	530
Zimbabwe ^e	104 ⁶	100	50	-- ⁶	--	52	50	25	-- ⁶	--
Total	1,830,000 ^r	2,040,000	2,210,000	2,230,000 ^r	2,590,000	964,000 ^r	1,070,000	1,130,000	1,090,000 ^r	1,280,000

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

¹Estimated data and world totals are rounded to no more than three significant digits; may not add to totals shown.

²Table includes data available through July 22, 2011.

³Insofar as availability of sources permit, gross weight in this table represent the nonduplicative sum of marketable direct-shipping iron ores and iron ore concentrates; iron agglomerates produced from imported iron ores have been excluded under the assumption that the ore from which such materials are produced has been credited as marketable ore in the country where it was mined.

⁴Data represent actual reported weight of contained metal or are calculated from reported metal content. Estimated figures are based on latest available iron content reported, except for the following countries for which grades are U.S. Geological Survey estimates: Azerbaijan, Kazakhstan, North Korea, and Ukraine.

⁵In addition to the countries listed, Uganda may also produce iron ore, but definitive information on output levels, if any, is not available.

⁶Reported figure.

⁷Series represented gross weight and metal content of usable iron ore (including byproduct ore) actually produced, natural weight.

⁸China's gross weight iron ore production figures are significantly higher than that of other countries, because China reports crude ore production only with an average iron content of 33%, whereas other countries report production of usable ore.

⁹Iron ore is used domestically as an additive in cement and other construction materials but is of too low a grade to use in the steel industry.

¹⁰Nickeliferous iron ore.

¹¹Less than 1/2 unit.

¹²Data are for year beginning March 21 of that stated.

¹³Gross weight calculated from reported iron content based on grade of 60% iron.

¹⁴Concentrates from titaniferous magnetite beach sands.

¹⁵Pakistan iron ore is based on a July-to-July fiscal year and 50% of production is used from each reported year.

¹⁶Includes manganiferous iron ore.

¹⁷Includes magnetite ore as follows, in thousand metric tons: 2006—3,830; 2007—3,781; 2008—3,987; 2009—4,725; and 2010—5,474.