IRON ORE

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Iron ore production and consumption declined in the United States in 2001 as the result of the economic slowdown. Stocks fell by 10 million metric tons (Mt) as iron ore producers idled facilities in response to declining demand. One U.S. mine closed permanently and another would have its production capacity reduced permanently. Internationally, the consolidation in the iron ore industry, which had been in progress for several years, accelerated in 2000 and continued in 2001. World iron ore production and consumption fell slightly. Brazil was the largest producer of iron ore and China the largest consumer. Iron ore trade decreased and prices increased. Pig iron and steel production dropped.

Iron ore is essential to the economy and national security of the United States. As the basic raw material from which iron and steel are made, its supply is critical to any industrial country. Scrap is used as a supplement in steelmaking but is limited as a major feed material because the supply of high-quality scrap is limited. However, alternatives, such as direct reduced iron (DRI), were available, and their use is growing. In 2001, the steel industry accounted for more than 98% of iron ore consumption.

Iron ore is a mineral substance which, when heated in the presence of a reductant, will yield metallic iron. It almost always consists of iron oxides, the primary forms of which are the minerals magnetite (Fe_3O_4) and hematite (Fe_2O_3). Taconite, the principal iron ore mined in the United States, has a low (20% to 30%) iron content and is found in hard, fine-grained, banded iron formations. About 98% of iron ore is used in the iron and steel industry. Ore is put into a blast furnace and smelted to produce pig iron. The iron is then converted to steel by removing most of the remaining carbon.

Legislation and Government Programs

Minnesota Taconite Economic Development Fund.—In April, the Minnesota Taconite Economic Development Fund (TDEF) was ruled unconstitutional (Skillings Mining Review, 2001p). The TEDF returned to Minnesota iron-mining companies a portion of their production taxes for the purpose of reinvesting in the operations of the mines. Traditionally, the money was invested in new, more efficient equipment, technological improvements, and upgrades to processing facilities. Under the TEDF's provisions, projects could not be funded unless approved by a joint labor-management committee at the iron ore mine. A taconite producer claimed that the provision, which allowed the Steelworkers Union to veto any project they disagreed with, was unfair to management and interfered with the collective bargaining process established by the U.S. Congress. The taconite producer sought only to end labor's veto power, but a U.S. District judge threw out the entire law, stating that "the state law creating it was preempted by the Supremacy Clause of the U.S. Constitution."

Grant to Fund DRI Research.—The Natural Resources Research Institute (NRRI) at Duluth, MN, announced a total of $1.2 million in funding to evaluate the potential to produce DRI from Minnesota taconite concentrates for use in the steel industry (Skillings Mining Review, 2001a). The NRRI will design and install direct reduction and smelting equipment. The first project will involve the production of iron nuggets. The iron nugget process would use coal rather than natural gas because the cost and availability of natural gas in the Midwest is problematic. The process has the potential to produce a product that is superior to conventional DRI products or pig iron and may be a universally acceptable feedstock in the steel industry.

As a result of the struggles of the domestic iron ore mining industry, which has seen a permanent closure and numerous production cutbacks, two investigations were conducted by the Federal Government, and a number of actions were taken at the State level.

Section 232 Investigation.—On February 1, 2001, the Bureau of Export Administration (BXA), U.S. Department of Commerce, initiated an investigation on the effect of imports of iron ore and semifinished steel products on national security in accordance with section 232 of the Trade Expansion Act of 1962, as amended. The investigation was begun at the request of members of Congress representing iron-ore-producing districts in northeastern Minnesota and in the upper peninsula of Michigan. The BXA asked for comments from the public, industry, and academia. The BXA also assembled an interagency team to support the investigation. From the team, a panel was selected to hold hearings on the Mesabi Iron Range in northeastern Minnesota and on the Marquette Iron Range in the upper peninsula of Michigan. A report was issued in October that found that the national security was not threatened by imports of iron ore and semifinished steel products (U.S. Department of Commerce, 2001, p. 2).

Section 201 Investigation.—At the direction of the President, the U.S. Trade Representative requested that the U.S. International Trade Commission (ITC) launch an investigation into whether increased steel imports were causing serious injury to the U.S. steel industry. Section 201 of the Trade Act of 1974 provides authority for the President to impose restrictions on imports of any product that causes serious injury to a domestic industry following a positive investigation and determination by the ITC. At yearend, the investigation had not been concluded (Skillings Mining Review, 2001b).

Minnesota Production Tax Cut.—The State of Minnesota granted taconite producers a reduction in production taxes to 21 cents per ton (Skillings Mining Review, 2001o). Of that amount, only 7 cents per ton comes without strings attached.

The remainder is accessible to the companies through the State's TEDF. The companies are obligated to match the amount received at the rate of 50 cents of new investment money for each dollar received from the TEDF. The legislature also put on hold for 3 years the automatic escalator, a provision in the State's taconite tax laws that automatically raises production taxes every year in step with inflation, unless overt action to stop it is taken by the legislature.

Minnesota Royalties Reduced.—The Minnesota Executive Council approved a 1-year 15% reduction in the State's taconite royalties that could save the industry $1.8 million (Hohl, 2001). The State collects the royalties when mining companies extract taconite from State-owned and tax-forfeit lands. The reduction affected three of the State's six taconite operations—U.S. Steel Corporation's Minnesota Ore Operations (Minntac) (owned by US Steel Group of USX Corp.), EVTAC Mining, LLC, and National Steel Pellet Co. The other three—Hibbing Taconite Co. (Hibtac), Northshore Mining Co., and Ispat Inland Steel Co.—were unaffected because they don't mine on State land.

Production

With the permanent closure of LTV Steel Mining Co. in Minnesota in 2001 and the permanent reduction in production capacity at the Empire Mine in Michigan, announced in 2001, the American iron ore industry will have lost about 10 million metric tons per year (Mt/yr) of production capacity by the end of 2002, a 15.6 % drop.

Production fell by about 27%, the steepest decline since the catastrophic drop of 1982. A number of mines were idled during the year, and one closed permanently.

The nine taconite mining operations in Michigan and Minnesota accounted for virtually all domestic iron ore production. Seven of these operations were on the Mesabi Iron Range in northeastern Minnesota—EVTAC, Hibtac, Inland Steel Mining Co., LTV Steel Mining Co., National Steel Pellet, Northshore Mining, and Minntac. The two taconite operations on the Marquette Iron Range in the Upper Peninsula of Michigan were the Empire and the Tilden Mines.

U.S. production data for iron ore are developed by the U.S. Geological Survey (USGS) by means of the annual "Iron Ore" survey, which provided 100% of total production shown in tables 1 through 4. This information is supplemented by employment data, mine inspection reports, and information from consumers. The American Iron Ore Association (AIOA) provided data on ore shipments from loading docks on the upper Great Lakes as well as receipts at transfer docks and furnace yards nationwide. The dock and steel plant data were compiled jointly by AIOA and the American Iron and Steel Institute (AISI).

Iron ore was produced by 13 companies. One other company did not produce ore but shipped it from stockpiles. The nine taconite producers in Michigan and Minnesota accounted for 99% of domestic production. The producing companies operated 13 mining operations, 10 iron ore concentration plants, and 10 pelletizing plants. Of the two iron ore producers that did not produce pellets, one produced iron ore as a byproduct of gold mining, and the other produced direct-shipping ore, which requires minimal processing. Of the 13 mining operations, 12 were open pit and 1 was underground. Virtually all ore was concentrated before shipment, and 99% was pelletized. In 2001, combined United States and Canadian production represented 7.1% of the world output of usable ore in terms of metal content. Trends in world mine production since 1997 are shown on a country basis in table 17.

Domestic iron ore supply (production minus exports) satisfied 60% of domestic demand in 2001, compared with an average of 70% from 1990 through 2001. Domestic iron ore production, at 46.2 Mt, decreased by 26.8% from that of 2000. Productivity in the Lake Superior district, in terms of thousands of tons of usable ore produced per worker in 2001, was 9.2, a slight decrease from that of 2000. Low-grade ores of the taconite type mined in Michigan and Minnesota accounted for 99.3% of total usable ore production. U.S. production of pellets totaled 45.8 Mt. The average iron content of usable ore produced was 63.4%. Fluxed pellet's share of total pellet production has risen steadily. It rose from 42% in 1993 to 66% in 2001.

Michigan.—Michigan accounted for 26.6% of the output of usable ore in 2001. Pellets accounted for 99.4% of total production.

In February, Cleveland-Cliffs, Inc. (Cliffs) (the manager and 35% owner of the Empire Mine in the Upper Peninsula of Michigan) announced that it was implementing a reorganization and cost reduction plan that eliminated 30 salaried positions (Skillings Mining Review, 2001d). There were about 1,000 workers at the mine, about 150 of whom were salaried. Cliffs cited uncertainties related to Chapter 11 bankruptcies, the high level of foreign steel imports, and the downturn in the U.S. steel industry as factors in the decision. The other owners of the Empire Mine were Ispat Inland Steel Co., 40%, and LTV Steel Co., Inc., 25%.

Cliffs announced in November that it would permanently reduce the production capacity of the mine to about 6 Mt/yr from about 8 Mt/yr. The workforce would also be reduced by about 300. Citing the inability of the plant's older sections to economically process the ore then being mined, Cliffs expected the plan to reduce Empire's production costs by 5% to 10%. Some of Empire's difficulties stem from the fact that it has deep pits. The ore body dips at 30° to 40°, which means that the mine has a high stripping ratio (Koski, 2000; Skillings Mining Review, 2001k; Cleveland-Cliffs, Inc., 2001a§). Later in November, LTV Steel Co. (25% owner of the Empire Mine) announced that it would cease steel production (Sacco, 2001c). This meant that LTV Steel would also cease taking its share of Empire's iron ore production. In late November, Cliffs idled the Empire Mine for an indefinite period. The mine remained closed at yearend.

Cliffs agreed to purchase 45% of Tilden Mining Co. LC, raising its total ownership in the mine to 85% (Skillings Mining Review, 2001h). The equity was purchased from Algoma Steel Co. of Canada. Tilden was closed for a 6-week period during the year to adjust its production to owners' requirements (Sacco, 2001a).

Minnesota.—Minnesota produced 73.2% of the national output of usable ore in 2001. All of the State's production came from open pit mines on the Mesabi Range. LTV Steel Co. (a subsidiary of LTV Corp.) on May 24, 2000, announced its intention to close permanently the operations of LTV Steel Mining in summer 2001. LTV officials said in May they could not compete in the world steel market (Hegelson, 2001§). On

December 6, 2000, LTV announced that it would close the Hoyt Lakes plant on February 24, 2001 (Bloomquist, 2001d§). The company cited continued difficult conditions in the steel market and the need to cut costs related to its recent Chapter 11 bankruptcy filing. LTV then announced that the facility would close at the end of the first week of 2001 (Bloomquist, 2001e§[1]). LTV Steel Co. had been in operation for 43 years and had produced more than 328 Mt of iron ore. On October 30, Cleveland-Cliffs announced that the company and Minnesota Power, a local electrical power company, had completed the acquisition of LTV Steel Co. (Skillings Mining Review, 2001c). Cliffs acquired all the mining and processing facilities, and Minnesota Power acquired the 225-megawatt electric generating facility at Taconite Harbor on Lake Superior.

Early in the year, Minntac announced that it would reduce production by as much as 450,000 metric tons (t) in January and February (Skillings Mining Review, 2001s). In October, Minntac further reduced production by idling its number four production line (Skillings Mining Review, 2001q). Also in October, Minntac moved its two-billionth long ton of material (American Metal Market, 2001b). The total included about 1.3 billion metric tons (Gt) of crude ore, about 416 Mt of waste rock, and about 296 Mt of overburden.

National Steel Pellet Co. in Keewatin, MN, laid off 25 workers in January to reduce costs (Bloomquist, 2001f§). In October, the company announced that it would close its facility for 8 weeks, beginning October 28 (Skillings Mining Review, 2001r). In December, National Steel Corporation announced its intention to sell National Steel Pellet Co. (TEX Report, 2001m).

Cliffs announced on January 4 that Northshore Mining Co. (a wholly owned mine) would reduce its iron ore production by about 700,000 t (Cleveland-Cliffs, Inc., 2001b§). The company said that one of its pellet production furnaces would shut down for about 9 months. In July, Cliffs announced that it would reduce pellet production by an additional 500,000 t (Skillings Mining Review, 2001v). Cliffs idled the mine for 8 weeks on October 14 (Skillings Mining Review, 2001t). The shutdown was then extended for another week (Skillings Mining Review, 2001u).

Cliffs, the largest North American supplier of iron ore, closed its research laboratory in Hibbing, MN, on the Mesabi iron range. The closure was part of a restructuring plan, which has as its goal a 20% to 30% reduction in personnel or 12 to 18 employees in the Technical Services Group. The closure of the laboratory, which was established in 1943, will have little impact on the company's research facility in Ishpeming, MI, a larger laboratory with broader research capabilities (Skillings Mining Review, 2001e, f).

Early in the year, EVTAC was having difficulty purchasing fire and property insurance, making it difficult for the company to obtain a loan needed to continue to operate (Lohn and Bloomquist, 2001§). EVTAC's insurance policy was to expire on February 1, 2001, and the company was rated as a high risk for fire insurance because it had experienced two fires in little more than 2 years. Without the fire insurance essential to getting a loan, EVTAC would be forced to close. Intervention by the Minnesota Department of Commerce enabled EVTAC to obtain the loan it needed (Bloomquist, 2001c§).

On January 18, Cliffs announced the closure of Hibtac for a 10-week period (Cleveland-Cliffs, Inc., 2001c§). The decision to temporarily halt pellet production was made in response to the decline in demand for iron ore. Mine operations closed for a 6-week period beginning January 28, reducing production by 900,000 t (Skillings Mining Review, 2001g). A second shutdown was scheduled for the summer. As it happened, the summer shutdown was extended to 7 weeks (Skillings Mining Review, 2001l). In late November, Hibtac laid off 18 hourly employees (Skillings Mining Review, 2001m). There had been a reduction in the number of hourly workers earlier in the year. The second reduction left the number of hourly employees at 722, down from 826 in January. On January 31, Bethlehem Steel Co., the Nation's second largest steelmaker, announced that it would sell its 70.3% of Hibtac (Skillings Mining Review, 2001j).

Missouri.—Pea Ridge Iron Ore Company, the Sullivan, MO, iron ore producer, permanently closed in September (Sullivan Independent News, 2001§). The company fell victim to low-priced iron ore imports (Pea Ridge Iron Ore Company, oral commun., 2002). Pea Ridge had the only active underground iron ore mine in the United States and was one of the few in the world. It had produced iron ore for the steel industry until January 1991 when the company ceased pellet production and began concentrating on specialty iron oxide products.

Consumption

Iron ore consumption fell by 12% to 67 Mt. Pig iron production at 42 Mt was 14% below the 10-year average of 48 Mt/yr for 1992 to 2001 and reached its lowest level since 1982. Raw steel production by the basic oxygen furnace fell to 52 Mt compared with the 10-year average (1992-2001) of 59 Mt. As would be expected, there is a very strong correlation (R squared=0.91) between the number of active blast furnaces and iron ore consumption. In the 10-year period 1992 through 2001, the number of active blast furnaces declined each year but one. In 1992 there were 43; in 2001 that number had fallen to 33. The average was 38.

The number of blast furnaces in operation during the year ranged from 27 to 37, an unusually large variation. Iron ore consumption, including agglomerates reported to the American Iron and Steel Institute (AISI) by integrated producers of iron and steel, totaled 64.7 Mt. This included 55 Mt of pellets; 9 Mt of sinter, briquettes, etc.; and 0.3 Mt of natural coarse ore. Of the ore consumed, 83.1% was of domestic origin, 6.7% came from Canada, and 10.2% came from other countries. Other materials consumed in sintering plants included mill scale, flue dust, limestone and dolomite, slag and slag scrap, and coke breeze. Other iron-bearing materials charged to blast furnaces included mill scale, slag scrap, and steel-furnace slag.

The four consumption numbers in this annual review are listed in tables 1, 6, 7, and 8. The following explains why more than one consumption number is used and how each of them is derived. The first consumption number (67.3 Mt in 2001) is in table 1 and is the sum of the quantity of ore consumed by ore type as reported by the AISI and the quantities of ore consumed in DRI production and ore consumed in nonsteel uses, as reported to the USGS; the AISI number is reported in short tons

[1]References that include a section twist (§) are found in the Internet References Cited Section.

and is converted to metric tons (American Iron and Steel Institute, 2002, p. 84). The second consumption number (61.9 Mt in 2001) is in table 6 and is the quantity of ore consumed at U.S. iron and steel plants by originating area, as reported by the AIOA; the number has been converted from long tons, as it appears in the American Iron Ore Association (AIOA) annual report, to metric tons (American Iron Ore Association, 2001, p. 22). The third consumption number (64.7 Mt in 2001) is in table 7 and is the quantity of ore consumed in U.S. iron and steel plants by type of ore as reported by the AISI; the number has been converted from short tons, as it is listed in the AISI annual report, to metric tons (American Iron and Steel Institute, 2001, table 32). The fourth consumption number (64.4 Mt in 2001) is in table 8 and is the sum of the AIOA number for consumption at U.S. iron and steel plants and two other numbers; these are the quantities of ore consumed in DRI production (1.8 Mt in 2001) and nonsteel uses (0.8 Mt in 2001) as reported to the USGS (American Iron Ore Association, 2002, p. 22). In summary, iron ore consumption for steelmaking is calculated by the AIOA and the AISI using different methods. To obtain total domestic iron ore consumption, iron ore consumption for other end uses must be added to AIOA and AISI reported consumption, thereby generating four consumption numbers.

Data on consumption and stocks of iron ore and iron ore agglomerates (pellets and sinter) at iron and steel plants were provided by the AIOA. Data on consumption of iron ore for nonsteel end uses were compiled from information gathered from USGS surveys.

Stocks

Total iron ore stocks fell by 10 Mt (37%), the largest such change since the 1950s. Of the three locations of stocks—at mines, plants, and loading docks, at receiving docks, and at consuming plants—the largest reduction (58%) was at the mines, plants, and loading docks. Iron ore producers responded to the decrease in demand by closing plants and reducing stocks.

Prices

Most iron ore prices are negotiated between buyer and seller. In 2001, 78% of domestic ore was produced by captive mines (mines producing for company-owned blast furnaces) and, therefore, did not reach the open market and cannot be said to have a price. An additional 21% of domestic production came from mines wholly or partly owned by Cliffs. Prices for that ore were also unavailable. Prices may be available for the remaining 1% of ore from mines not owned by steel companies and Cliffs, but those prices would be representative of only a tiny portion of domestic production.

The average free-on-board mine value of usable ore shipped in 2001 was $23.89 per metric ton, lower than that of 2000. This average value should approximate the average commercial selling price less the cost of mine-to-market transportation.

International iron ore prices rose in 2001. The price for Hamersley Iron Ore Pty. Ltd. and Mount Newman Mining Co. Pty. Ltd. fine ores for fiscal year 2001 (April 1, 2001, to March 31, 2002) in the Japanese market was 38.15 cents per 1% iron per long ton unit, up by 4.5% compared with that of 2000 (United Nations Conference on Trade and Development, 2002, p. 53). The price for lump ore was settled at 47.21 cents per 1% iron per long ton unit, an increase of 3.6% compared with that of 2000. The lump ore to fine ores premium for Australian ore sold to Japan, remained at 9.06 cents per 1% iron per long ton unit. There were similar price percentage decreases in Europe. Iron ore prices have declined over the long term as well. The price of Carajás fines, a grade of ore produced by Companhia Vale do Rio Doce (CVRD) and sold to Europe, when denominated in U.S. dollars and adjusted for inflation using the U.S. consumer price index for all urban consumers, fell by 32% between 1990 and 2001.

During the past 20 years, the price of Itabira fines, a grade of ore produced by Companhia Vale do Rio Doce (CVRD) and sold to Europe, varied less than 40% of the fluctuation measured annually by the Economist metals price index. This index, calculated by Economist magazine, is made up of aluminum, copper, lead, nickel, tin, and zinc prices (Companhia Vale do Rio Doce, 2001, p. 28).

Transportation

The near drought conditions that have been causing low water levels in the Great Lakes since 1998 persisted through 2001. At the beginning of the shipping season in March, Lake Superior's water level was 13 inches below its longtime March average, which forced carriers to sail light to prevent striking bottom. In Lake Michigan and Lake Huron, the water levels were 22 inches below average. On 1,000-foot vessels, each inch of forfeited draft represents the loss of 270 t of cargo (Brochu, 2001§).

Foreign Trade

Net imports responding to decreased consumption fell to 5.1 Mt in 2001 from 9.5 Mt in 2000, a decrease of 52%. Exports fell by 9% and imports by 32%. Almost all exports consisted of pellets shipped via the Great Lakes to Canadian steel companies, which are partners in U.S. taconite producers in Michigan and Minnesota. Canada's share of U.S. imports was 43%; Brazil's was 40%.

World Review

The economic slowdown that began in the United States in 2001 and spilled over into other countries became a global economic downturn (Organization for Cooperation and Development, 2002§). At the end of the summer, signs were beginning to emerge that the slump in the United States might be easing and that a return to moderate growth might be expected in early 2002. The terrorist attacks of September 11 and the associated disturbances inflicted a severe shock to the world economy.

Production.—World iron ore production was 1,100 Mt, about the same as that of 2000 (table 17). Although iron ore production was produced in more than 50 countries, the bulk of world production came from just a few countries. The five largest producers, in decreasing order of production of gross weight of ore, were China, Brazil, Australia, Russia, and India. The United States and Canada were seventh and ninth. The top

five countries accounted for 73% of world production. China was the largest producer in gross weight of ore produced, but because its ore was of such low grade, the country's output ranked well below that of Australia and Brazil in iron content. Of the largest producing countries, South Africa experienced the highest growth, increasing 18% from production in 2000.

Consumption.—World iron ore consumption fell slightly. On a global basis, iron ore consumption is not measured directly, but there are indicators that clearly show whether consumption rose or fell. These are the production of pig iron, DRI, and crude steel, and imports of iron ore. Pig iron and DRI production are direct indicators of iron ore consumption. Crude steel production is less direct because part of a steel producing country's steel production may come from minimills, which use varying quantities of scrap rather than iron ore. Iron ore imports are not a direct indicator of iron ore consumption in any country that produces iron ore, but if there is reason to believe that a country's ore production is static, imports can be a strong indicator of consumption.

World consumption of iron ore decreased as the result of declines in pig iron production. The reductions in pig iron production in North America (-11.5%) and Europe (-5.2%) were partly offset by increases in Asia (5.2%) and the Commonwealth of Independent States (1.3%). World pig iron production at 577 Mt dropped by 0.1%. Either Japan or China, sometimes one, sometimes the other, has been the largest pig iron producing country since 1992 and probably as far back as 1980, with Japan being the larger by far in that year. In terms of shares of world production of pig iron in 1980, Japan had 17.2% compared with China's 7.5%. Their positions relative to each other changed in 1992 when Japan had 14.7%, and China, 15.2%. Their 2001 shares were 25.2% for China and 13.7% for Japan. In terms of quantity, however, Japan's output has changed little, falling from 87.0 Mt in 1980 to 78.8 Mt in 2001, a decline of 9.4%, while China's output rose from 38.0 Mt to 145 Mt, an increase of 282.4%.

World crude steel production fell by 0.9%. Among steelmaking countries that produced 15 Mt or more in 2001, China had the largest gain at 12.6%, and the United States had the largest loss at 11.5%, followed by Canada at 9.0%. China has been the world's largest steel-producing country for the past 6 years, and its share of world steel production rose during that period to 17.1% from 13.5%, having grown by 41.5%, while world production grew by 11.9%. World production from 1990 through 2001 rose to 839 Mt from 770 Mt.

Trade.—Australia and Brazil continued to increase their dominance in the global export market, with 67.5% of the total in 2001. In decreasing order of market share, Australia held 34.6%; Brazil, 32.8%; India, 7.9%; and South Africa, 5.0%. No other exporting country had as much as 5%.

Europe and Asia have long been the dominant iron-ore-importing regions. From 1980 through 2001, their combined share of world imports averaged 91.1% and was never lower than 89%. In 1980, Europe accounted for 50.5% of world imports, and Asia accounted for 40.4%. That pattern began to change in the late 1980s, and in 1991, Asia's share reached 47.7%, while Europe's share was 44.3%. In 2001, 60.1% of world imports went to Asia, while 31.6% went to Europe.

In 2001, European imports fell by 13.5% and North America's fell by 25.2%, while Asian imports rose by 9.1%. Japan continued to be the largest importing nation with 26.6% of total world imports, followed by China and the Republic of Korea. These three countries accounted for 55.8% of world iron ore imports in 2001.

Transportation.—Port Hedland in Western Australia is one of the largest bulk mineral export ports in the world. Iron ore from BHP Billiton's mines constituted the majority of trade through the port. It allows vessels of as much as 330 meters and 260 deadweight tons (dwt) to berth. Hope Downs Management Services Pty. Ltd. (HDMS), a prospective entry to the iron ore industry, had selected Port Hedland for its port facilities in its feasibility studies. The port handled 65 Mt/yr, a figure expected to grow to 90 Mt/yr in 10 years (Minerals Gazette, 2001). In 1998, a study carried out jointly by HDMS, BHP, and the port authority determined that, with the addition of new berths and loading facilities, Port Hedland's capacity could be raised to 130 Mt/yr without widening or deepening the channel approach (Metal Bulletin, 2001s). HDMS is a 50-50 joint venture between Kumba Resources (formerly Iscor Ltd.) of South Africa and Hancock Prospecting of Western Australia and is planning to develop the Hope Downs iron ore deposit in Western Australia (Metal Bulletin, 2001ac).

Mergers and Acquisitions.—The consolidation of the iron ore industry that began in 2000 continued in 2001. The major acquisitions in 2000 were the Rio Tinto hostile takeover of North Ltd. and the CVRD purchases of Mineração Socoimex S.A. (Socoimex), S.A. Mineração Trinidade-Samitri (Samitri), and one-half of the 4-Mt/yr pellet plant in Bahrain.

The purchase of North gained Rio Tinto 53% of the Robe River iron ore venture, a share of the West Angelas iron ore deposit, both in Western Australia, plus 56% of Iron Ore Company of Canada (IOC), Canada's largest iron ore producer. The CVRD purchase of Socoimex brought CVRD an iron ore mine on the CVRD-owned Vitoria Minas railroad. CVRD then purchased Samitri, which owned 51% of Samarco Mineração S.A. (Samarco) with BHP holding the remaining 49%. BHP and CVRD agreed to enter a joint venture to rationalize the Alegria Iron Ore Complex in Brazil. The companies agreed that BHP would acquire a further 1% holding in Samarco to equalize its ownership with CVRD at 50-50. Samitri and Samarco both have iron ore mining and processing facilities in the Alegria Complex in Minas Gerais State.

In April 2001, CVRD purchased Ferteco Mineração (Ferteco) SA, a Brazilian iron ore producer and pelletizer, from Thyssen Krupp Stahl AG (TKS), a German steelmaker. CVRD, based in Brazil, is the world's largest iron ore producer. CVRD paid TKS $556 million and assumed $131 million in debt for Ferteco, Brazil's third largest iron ore producer. As part of the transaction, CVRD negotiated a long-term iron ore supply contract with TKS, traditionally Ferteco's largest customer, taking 6 Mt of iron ore in 2000. Ferteco, which produced 25 Mt of ore in 2000, owns two iron ore mines, Fábrica and Feijão, and a 4-Mt/yr pellet plant in Minas Gerais State, where CVRD's southern system iron ore mines are also located. Plans for a second pellet plant and a capacity expansion to 30 Mt/yr were well advanced. Ferteco also owns 10.5% of MRS Logistica System, which until the purchase had been the only iron ore carrying railway in Brazil in which CVRD did not have a stake. Ferteco also owns 100% of the iron ore export terminal Guaíba, whose capacity was being expanded to 20 Mt/yr. The company

reportedly had 263 Mt of reserves. The acquisition of Ferteco gave CVRD shares in all of Brazil's pellet plants (Metal Bulletin, 2001l, q, k).

Early in the year, BHP and CVRD made offers for a 20% shareholding of Caemi Mineração e Metalurgica SA (Caemi), which was equivalent to 60% of Caemi's voting shares. Caemi was a Brazilian nonoperational holding company based in Rio de Janeiro that owned 84.80% of Mineração Brasileiras Reunidas SA (MBR) and 50% of Quebec Cartier Mining Co. Caemi owned 49% of MBR directly and 35.8% through Empreendimentos Brasileiros de Mineracao SA. BHP made the larger offer ($332 million) but could obtain Caemi only if Mitsui & Co. Ltd. chose not to exercise its right of first refusal.

Mitsui & Co., a Japanese iron ore trader, owned 40% of Caemi and had first-refusal rights to buy Caemi at the price offered by the winning bidder (TEX Report, 2001e). In April, Mitsui announced that the company had decided to purchase the 60% of Caemi that it did not own and sell 50% of Caemi to CVRD (TEX Report, 2001j). The European Commission (EC) antimonopoly regulators then began an investigation to determine whether competition issues existed that could have an adverse effect on European steel producers (Mining Journal, 2001f). A major portion of the iron ore imported into Europe each year comes from Brazil and Canada, and the EC was concerned that, without the divestiture of QCM, the transaction would create or strengthen a dominant position by Caemi in the iron ore market. Brazil's share of Western Europe iron ore imports rose to 45% in 2000 from 35% in 1990, while Canada's share remained steady at slightly more than 10%. To gain acceptance by the EC, Mitsui agreed to sell its 50% stake in QCM that it owned through Caemi (TEX Report, 2001f). The other 50% of QCM was owned by Dofasco Inc., a Canadian steelmaker that decided to sell its stake as well (Mining Journal, 2001e). As agreed, Mitsui bought Caemi and sold 50% of it to CVRD. Although Caemi will be run as a distinct joint venture, its acquisition completes the consolidation of Brazil's iron ore industry (American Metal Market, 2001a).

CVRD also bought the 5% of MBR owned by Bethlehem Steel for $25 million. CVRD paid $4.4 million in cash, and the remainder will be paid in the form of iron ore shipments to Bethlehem over a 9 month period (Metal Bulletin, 2001p). Caemi held 85% of MBR, and a group of Japanese steelmakers and traders owned the remaining 10%.

BHP Limited (BHP), the world's third largest iron ore producer, merged with Billiton PLC on June 29. Billiton, with major holdings in other metals, had not previously produced iron ore. BHP Billiton will be run by a unified board and management team, with headquarters in Melbourne, Australia, and a significant corporate management center in London, United Kingdom (BHP Billiton, 2001§).

When Rio Tinto purchased North Ltd., in 2000, it gained a 56.1% interest in IOC. In late 2000, Rio Tinto began an effort to acquire the 18.9% of IOC owned by the Labrador Iron Ore Royalty Income Fund through its Labrador Mining Co. subsidiary. This would bring Rio Tinto's ownership in IOC to 75%. The other 25% is owned by Mitsubishi Corp. of Japan (Skillings Mining Review, 2001y; Dow Jones Newswires, 2001§). As of April 2001, Rio Tinto had acquired 20.26% of the fund. There had been no change in their holding since then (Rio Tinto, written commun., February 5, 2002).

There also was acquisition activity in the United States, but in this case it was because financially troubled steel companies wanted to sell their shares in iron-ore-producing companies. Between 1997 and mid-2001, 18 domestic steel mills had filed for bankruptcy (Webb, 2001§). Cliffs, the leading iron ore company in North America, announced that consolidation of the North American iron ore industry would lead to a more cost-efficient industry and that the company intended to lead that consolidation (Metal Bulletin, 2001a).

Just as Bethlehem sold its share of MBR, the financially troubled company intended to sell its 70% share of Hibtac (Bloomquist and Passi, 2001§). Cliffs announced that it would like to buy Hibtac, raising its ownership share to 85% (Bloomquist, 2001a§). Cliffs also announced the planned acquisition of Algoma Steel, Inc.'s 45% interest in the Tilden Mine. The deal would raise Cliffs' ownership in the mine to 85% from 40% (Cleveland-Cliffs, Inc., 2001d§). In the fall 2000, Cliffs purchased the 12.5% share of the Empire Mine that was owned by Wheeling-Pittsburgh Steel Corp., another steelmaker that had filed for bankruptcy protection (Singer, 2001§; Cleveland-Cliffs, Inc., oral commun., February 14, 2002).

National Steel Pellet was being marketed by National Steel Corp., 100% owner of the facility (Bloomquist, 2001b§). Minnesota Iron and Steel Co. (MIS) was seeking a $25 million loan guarantee from the State of Minnesota so that the company could acquire the additional financing needed to purchase National Steel Pellet (Webster, 2001). MIS, a Minnesota based company, was formed with the idea that it would build and operate the first fully integrated sheet steel minimill in the United States at the former Butler taconite mine near Nashwauk, MN, on the western end of the Mesabi iron range.

Acme Steel Inc., Riverdale, IL, operating under bankruptcy protection, announced its intention to sell its 15.1% share of the Wabush Mine in Canada. Acme stopped providing its share of the mine's cash requirements in August, forcing a cutback in production (Sacco, 2001b).

The majority of iron ore operations acquired in 2001 were acquired by other iron ore producers. The exception was Mitsui & Co., a Japanese trading company, which played a key role in the recent consolidation.

Mitsui became the fifth largest iron ore company in the Western World and shared ownership of mines in Australia, Brazil, Canada, and India. Benefits to iron ore producers that acquired other iron ore producers included having more power in price negotiations, reduction of operating costs through increased economies of scale, increased synergy because of the proximity of mines and railroads, and increased product diversification.

Algeria.—State-owned Enterprise National du Fer et du Phosphate (Ferphos) and global steel company Ispat International NV formed a joint-venture company, Ispat Tébessa, and took over management of Ferphos' iron ore mines as of October (United Nations Conference on Trade and Development, 2002).

Australia.—(Also discussed under "Mergers and Acquisitions"). In 1999, Broken Hill Pty. Co. Ltd. (BHP), as it was known then, undertook a number of actions to improve the competitiveness of its iron ore operations in Western Australia. The workforce was reduced by 25%, and a series of industrial

relations reforms were implemented. In November of that year, BHP introduced individual agreements designed to increase flexibility and boost productivity (Engineering and Mining Journal, 2001b). Labor unions claimed that BHP's actions were in violation of the Workplace Relations Act (Metal Bulletin, 2001e).

In January 2001, a Federal Court ruled that BHP Billiton had acted legally. The company considered this a crucial victory in its efforts to improve productivity; it said that in some areas where individual contracts were already in place, productivity improvements of as much as 20% had been achieved (Metal Bulletin, 2001f). BHP's competitors in Western Australia, iron ore producers Hamersley and Robe River, have had similar workplace agreements in place for several years.

BHP announced it had signed a letter of intent (LOI) with Pohang Iron & Steel Co. Ltd. (POSCO) of the Republic of Korea to enter into a joint venture for the development and operation of an iron ore mine at mining area C (MAC) in the central Pilbara region, Western Australia. The LOI covered a defined resource sublease, known as "C Deposit," within the broader MAC area. MAC is 37 kilometers (km) from BHP Billiton's Yandi Mine. The C Deposit reportedly contains a proven reserve of 200 Mt on the northern flank of the MAC area. Under the terms of the LOI, the BHP-managed Mt. Goldsworthy Mining Associates joint venture and POSCO, one of the world's largest steelmakers, were to undertake a feasibility study for the development of the C Deposit. The feasibility study was to examine the nature of the development and determine the level of capital expenditure associated with mine construction as well as supporting rail and port infrastructure. The studies were completed by midyear 2001, and a 63,000-t bulk sample was mined in late 2001 (BHP Billiton, written commun., February 21, 2002). The production of such a large quantity of ore ensures that the sample is representative of the deposit to be mined. Full-scale mining was expected to commence in 2003 following construction of a rail spur. Mining rates were to be ramped up gradually, in-line with market demand, and could reach 15 Mt/yr. Under the joint-venture arrangement, ownership of the C Deposit will be BHP Billiton, 65%; Posco 20%; CI Minerals Australia Pty. Ltd., 8%; and Mitsui Iron Ore Corporation, 7% (Australia's Paydirt, 2002). Mining Area C contains the largest undeveloped Marra Mamba resource in the Pilbara region (Mining Journal, 2001i; BHP Billiton, 2001§).

BHP Billiton planned to expand its Yandi lump ore production to 4 Mt/yr in mid-2002 from the 2001 rate of 1 Mt/yr (Metal Bulletin, 2001v). Prior to this, the company needed to prove the value of this new product to its steelmaking customers (BHP Billiton, written commun., February 21, 2002). This involved sending the new lump pisolite to Japanese steelmakers for tests. BHP Billiton produced and delivered 1 Mt by yearend.

Rio Tinto announced that its 100% owned subsidiary, Hamersley Iron Ore Pty. Ltd. had reached agreement with Shanghai Baosteel Group Corporation, the largest steelmaker in China, to form an unincorporated joint-venture iron ore operation in Western Australia (Metal Bulletin, 2001b). Under the agreement, Hamersley will supply Baosteel with 200 Mt/yr of ore during the 20-year life of the joint venture. Hamersley will hold a 54% equity share, with the remaining 46% held by Baosteel. The initial capital outlay will be $64 million to develop a new mine 10 km east of the Paraburdoo Mine in the Pilbara region.

Hamersley improved its rail system during the year (Engineering and Mining Journal, 2001a). The company bought three new locomotives and 238 ore cars, adding to an existing fleet of 29 locomotives and 2,400 ore cars. The equipment increased Hamersley's rail haulage capacity by as much as 7 Mt/yr without having to make longer trains. The new cars were designed to have 5% to 7% more capacity than the original Hamersley fleet design (Rio Tinto, written commun., April 8, 2002). Hamersley also ordered a major shipment of heat treated heavy rails, some of which will be used to build the rail extension to the West Angelas deposit (TEX Report, 2001g). The new hardened rails will require less maintenance and have a longer life (Rio Tinto, written commun., April 8, 2002).

Hamersley and the Robe River joint-venture partners have agreed to share rail infrastructure in the Pilbara region of Western Australia (Skillings Mining Review, 2001x). In 2000, Rio Tinto purchased North Ltd., which owned the majority of Robe River. Hamersley is a wholly owned subsidiary of Rio Tinto. Robe River has remained an independent iron ore miner in the joint venture between Rio Tinto (53%), Mitsui & Co. (33%), Nippon Steel Corp. (10.5%), and Sumitomo Metal Industries (3.5%) (TEX Report, 2001l). One of Robe River's assets was the West Angelas deposit, which Robe River planned to develop. Part of the plan was a 340-km railway from the deposit to Robe River's port at Cape Lambert. After the purchase, Rio Tinto announced its intention to build a 60-km rail link from its railway to the West Angelas deposit. Robe River's Japanese participants brought suit to have the longer railway built but later agreed to the construction of the shorter link.

As part of the agreement between Hamersley and Robe River, Pilbara Rail Co. was established. A 50-50 joint venture, Pilbara Rail will operate and maintain the rail assets of Hamersley and Robe River. Pilbara Rail will transport ore from mines in which Hamersley and Robe River have an interest and will operate both tracks, but Hamersley and Robe River will continue to own their respective rail assets. The West Angelas deposit will be linked to Hamersley's main line. In addition, the initial construction will include a track connecting the Hamersley and Robe River systems where the lines currently cross over and about 50 km of additional track on the busiest section of Hamersley's main rail line. The additional track is expected to increase the efficiency of the rail network. Once production at West Angelas has reached 15 Mt/yr, Robe River's Japanese participants will have an option to require completion of the balance of the West Angelas rail line. Robe River was expecting to ship its first ore from West Angelas early in the second half of 2002.

Portman Ltd., Australia's third largest iron ore producer after the Rio Tinto acquisition of North Ltd., increased its capacity to transport iron ore to meet the planned increase in production (Portman Ltd., 2001§). Following a dredging program, a Panamax vessel was for the first time able to be fully loaded at the port of Esperance. A cargo of 69,000 t of iron ore left the port in January on its way to Japan. Previously, Panamax vessels had been restricted to a cargo of about 50,000 t. A Panamax vessel is one of approximately 50,000 to 75,000 dwt, whose length, breadth, and drought allow it to pass through the

Panama Canal. A second phase of dredging, together with a new berth, ship loader, and conveyors was expected to allow Port Esperance to load Cape Size vessels of as much as 180,000 dwt. The rail line from the mine to the port was upgraded with rails that were expected to allow faster, heavier trains (Reynolds, 2001). The upgrade boosted Portman's rail capacity to 4 Mt/yr, with an expectation of reaching 5 Mt/yr by mid-2002 (Hing, 2002). The completion of these projects is expected to remove the infrastructure and transport constraints, which have previously limited Portman's ability to expand its Koolyanobbing operations (Engineering and Mining Journal, 2001c). Portman has increased the estimated recoverable resources at its Koolyanobbing Mine (Mining Journal, 2001h). The new total was estimated to be 95 Mt at 63% iron. Portman plans to increase its production at Koolyanobbing to 3 Mt/yr in 2002 and to 8 Mt/yr by 2004 (Metal Bulletin, 2001ab). Portman was proceeding with its plan to resume mining at its Cockatoo Island project in 2002 (TEX Report, 2001k). The project was expected to extend the life of the Cockatoo operation by approximately 3 years.

The Savage River iron ore operation in Tasmania had to reduce its pellet production during the year because of weak market conditions (Metal Bulletin, 2001ad). The owner of the operation, ABM Mining Ltd., merged with Ivanhoe Mines Ltd. late in 2000 (Metal Bulletin, 2001u). Ivanhoe agreed to acquire the Long Plains magnetite property from Pasminco Ltd. (Mining Journal, 2001g). The deposit, 8 km south of the Savage River operation, is estimated to contain 30 Mt of magnetite.

Brazil.—(Also discussed under "Mergers and Acquisitions"). CVRD was investing $15.4 million on building a new pier at the port of Ponta de Madeira that would raise its capacity to 56 Mt/yr and an additional $27 million on expanding stockyard facilities (Metal Bulletin Monthly, 2001). This includes the construction of a new pier (No. 3) that will be capable of handling vessels of as much as 200,000 dwt (Mining Journal, 2001c). CVRD also was expanding mining and beneficiation facilities at Carajás. This follows the development of a new deposit, N5E, and will raise Carajás production capacity by 30%. Investments include a third in-pit crusher, power increases for conveyors, and an expansion in screening capacity. These expansions are necessary to provide feed for the 6-Mt/yr pelletizing plant being built at the port and to handle the increased output (Metal Bulletin, 2001n). The plant was expected to begin production in June 2002.

Electrical consumption in Brazil is growing at a rate of 4.8% per year, and new generating capacity will be needed to avoid power disruption (Mining Journal, 2001d). However, the combination of droughts, the faltering restructuring of the Brazilian electricity-generating sector, and the incomplete privatization of Federal/State-owned power generation equipment raise the specter that Brazilian electrical-power supplies may become unreliable in the future. Energy prices rose by 27% in Brazil in 2000 (Kinch, 2001). In fact, the situation during 2001 was such that CVRD leased 55 large generators to maintain iron ore production because Brazil was rationing power (Metal Bulletin, 2001o). The generators were installed at the company's iron ore mines in Minas Gerais State, including recently acquired Ferteco, and at the port of Tubarão in Espirito Santo State. The Carajás mine and railway and the port of São Luis (Ponta de Madeira) did not require generators because the power cuts were not in force in northern Brazil. Because CVRD's operations consume so much electrical power, about 4% of Brazil's output, the company has embarked on a major investment program to achieve at least partial self-sufficiency in the area to keep its operating costs down. Toward that end, CVRD was involved in a number of projects. The company earmarked $177 million for 2001 and $1.1 billion during the next 5 years for hydroelectric energy-generating facilities. The company was involved in eight hydroelectric powerplant projects (TEX Report, 2001b). Additionally, CVRD was analyzing two thermoelectricity projects. The decision to go ahead with these projects will depend on natural gas price levels.

CVRD was in the process of divesting its iron ore transporting subsidiary Docenave (TEX Report, 2001d). As of October, 6 of the fleet of 15 had been sold. The company stated that, as shipping has become a highly competitive business, there was no longer an economic advantage in possessing its own fleet (Metal Bulletin, 2001m).

CVRD signed an agreement with Shanghai Baosteel Group Corp., China's largest steelmaker, to form a 50-50 joint-venture company named Baovale Mineracao S.A. (Metal Bulletin, 2001j). The joint venture will develop an 8-Mt/yr iron ore mine at Agua Limpa at Santa Barbara in Minas Gerais State. The agreement calls for Baovale to supply 6 Mt/yr to Baosteel for 20 years. The deal represents an estimated revenue for CVRD of $2 billion during the 20-year period (Skillings Mining Review, 2001i). CVRD also believes that the agreement may open further opportunities, in particular the possibility of purchasing Chinese coal using the ships that deliver the iron ore (Mining Journal, 2001b). CVRD spent $3 million to increase the capacity of the Gongo Soco Mine (formerly owned by Socoimex) to 8.4 Mt/yr from 7 Mt/yr (Metal Bulletin Monthly, 2001).

Ferteco was in the early stages of ordering equipment for a second pellet plant (Metal Bulletin, 2001r). However, plans for a new plant were put on hold pending a review by Ferteco's new owner, CVRD (Companhia Vale do Rio Doce, written commun., February 25, 2002).

Mineraçoes Brasileiras Reunidas S.A. (MBR) was expanding its capacity to produce and ship ore (Metal Bulletin, 2001c). The company was expanding the production capacities of the Tamanduá and Capitão de Mato Mines, which will replace the Aguas Claras and the Mutuca Mines. At Capitão de Mato, MBR was installing a new crushing plant, and at Vargem Grande, a new beneficiation plant. The first line in the beneficiation plant was completed in 2001. This line was processing ore from the Capitão de Mato Mine (Mineraçoes Brasileiras Reunidas S.A., written commun., March 20, 2002). The second line, to be completed in 2002 to 2003, will process ore from the Tamanduá Mine. Each line will have a production capacity of 8 Mt/yr of ore. One reason for having two lines is that the two mines have different mineralogy. The completion of the second line will increase MBR's beneficiation capacity to 32 Mt/yr. The company would then have three beneficiation centers, one at Vargem Grande, close to the Andaime terminal, and the others at Pico and Mutuca.

The new beneficiation plant was located at Vargem Grande because it was one of few flat areas in the mountainous region and was close to the Andaime rail terminal. The beneficiation

center will have a conveyor system connecting it to the terminal. MBR is part owner of and has invested more than $70 million in the MRS Logistica railway that moves the company's iron ore to MBR's port on Guiaba Island. A new rail car dumper and a third stacker are being added at a cost of $30 million, which would raise the capacity to 32 Mt/yr from 28 Mt/yr. The railway increased its capacity to 67 Mt/yr in 2000 from 45 Mt/yr and was expected to reach about 80 Mt/yr in 2001 (Metal Bulletin, 2001c).

MBR closed the Mutuca Mine; the Mutuca processing plant will continue to operate in 2002 and 2003 with ore from the Tamanduá Mine and, thereafter, with ore from the Capão Mine (Caemi Mineração e Metalurgica SA, 2001, p. 13).

Canada.—All three eastern Canada iron ore producers, which combined produced 99% of that country's ore, were affected by the recent consolidations and/or steelmaker bankruptcy problems. In 2000, Rio Tinto purchased 56% of IOC. In 2001, 50% of QCM was bought by a joint-venture enterprise that has stated that it would sell its share of QCM. The other 50% owner of QCM also stated that it wanted to sell its share. A 15% owner of Wabush Mines, Newfoundland, was in Chapter 11 bankruptcy protection and intended to sell its share.

IOC announced on September 28 that it was suspending the reconditioning of its pellet plant in Sept-Iles, Quebec, because of deteriorating market conditions (Metal Bulletin, 2001t). The reconditioning project involved bringing back into production a plant that had been mothballed for 19 years. The plant was to have come online in mid-2002 with production of 4.5 Mt/yr. However, IOC continued to move ahead in other areas. The company was expanding the production capacity of its concentrator in Labrador to 21.6 Mt/yr from 17.5 Mt/yr. This will enable it to provide feed not only to the Labrador City pellet plant but also to the reconditioned pellet plant in Sept-Iles. Once the concentrator expansion project is finished, the Labrador City pellet plant capacity will increase to more than 13 Mt/yr. In its mining area near Labrador City, IOC closed two pits during the year and planned to close another in the first half of 2002. From that point, IOC will operate just two pits, the Humphrey main and the Luce, a new pit first worked in 1999. Crude ore production should continue in the two pits at a rate of as much as 43 Mt/yr until 2008 to 2009, when the Humphrey pit is expected to close. IOC would become a one-pit operation at that point, allowing it to reduce production costs. IOC was also conducting an exploration program whose goal is to increase IOC's proven and probable reserves to 3 Gt from the current figure of 1.4 Gt. Deposits close to current mining operations but also as far away as the Quebec border were being studied. Additional reserves would allow IOC to maintain or expand its level of product diversification.

QCM resumed operations on April 30, after a 39-day period in which its workers were locked out (Skillings Mining Review, 2001n). The lockout began in March after difficult negotiations on the revision of a labor contract. The new 4-year agreement between the United Steelworkers of America and QCM, which was to run from March 1, 2001, to February 28, 2005, brought new measures regarding work rules.

Another stoppage took place in August when QCM ceased its mine and rail activities for a 3-week period, this time to reduce unusually high stocks of concentrates. Still another closure was planned for about 4 weeks beginning January 21, 2002. Despite the closures, QCM continued to invest in its operations (Jones, 2001b). Ten new locomotives costing $10 million were ordered. They were expected to begin operating in April 2002.

The pit walls at Paul's Peak, QCM's primary pit at the Mount Wright Mine, were being pushed back (widened) to allow access to deeper ore reserves. QCM's 50% owner Caemi, which was purchased by Mitsui and CVRD, will sell QCM to comply with EC regulations. More information can be found in the "Mergers and Acquisitions" section. The other 50% owner, Dofasco Inc., a Canadian steel mill, announced its intention to sell its share (Skillings Mining Review, 2001w).

Wabush Mines, the third of the three eastern Canada iron ore producers, had to reduce pellet production by about 25% for the year after two key customers stopped accepting ore (Jones, 2001a). One customer, Acme Steel, was under Chapter 11 bankruptcy protection, while the other, Duferco Clabecq S.A. in Belgium, shut down its blast furnace.

China.—Based on pig iron production, China became the world's largest iron-ore-consuming country in 1992, when its output exceeded that of Japan by about 3 Mt. Japan had been the largest pig iron producer that year. In 2001, China and Japan maintained their relative positions, and China's margin had increased to 67 Mt. China accounted for one-quarter of world pig iron production in 2001, more than the combined shares of the next two largest producing countries. China became the world's largest steel producing country in 1996 when it produced 2 Mt more than Japan, which had been the largest producing country. In 2001, that margin grew to 46 Mt even though Japan's production that year was 4 Mt higher than in 1996.

China's steel production capacity will continue to grow, and most of that production capacity will be based on blast furnaces (Hogan, 1999, p. 44). As an example, Shanghai Baosteel (officially Baogang) Group Corporation is constructing a blast furnace that is expected to become operational in 2004 to 2005 (TEX Report, 2001i). There has been little investment in electric arc furnace capacity; thus it is unlikely that, in the near future, there will be a significant change from integrated production to minimills (Metal Bulletin, 2001g). Each of the country's large integrated steelmakers is striving to increase production capacity (Paxton, 2001a). With steel production capacity outstripping domestic iron ore production, Chinese mills are becoming increasingly reliant on the high-quality iron ore being offered by Australian and Brazilian producers (Paxton, 2001b).

According to one report, a key factor in the development in Chinese mineral demand was political (Mining Journal, 2001a). Successive Chinese leaders have sought to discourage the wholesale migration from the country's rural heartland to its industrial centers on the coasts. To achieve this, they embarked on a massive program to encourage more balanced economic development. These investment programs consumed vast quantities of metals and boosted Chinese imports of iron ore and other mineral commodities and metals. Demand was also fueled by very large construction projects such as the three gorges dam and the facilities for the 2008 Olympics as well as inland waterway systems and new railways (Metal Bulletin, 2001i).

To produce more steel, China will need more iron ore. The country has large reserves of iron ore, but the ores have an average iron content of only 33%, and must be concentrated so

that they have an iron content of 60% or more. An average of 3.8 to 4 t of crude iron ore is required to produce 1 t of pig iron (Chinese Institute of Geology and Minerals Resources Information, 1993, p. 99). Almost certainly, most of China's iron ore production is extracted from taconite deposits of the Lake Superior type (United Nations, 1970, p. 128). In China, these low-grade deposits are known as the Anshan type (Yuqi, Yiming, and Wenwei, 1995, p. 1; Cox and Singer, 1986, p. 228). The low-grade ore known as taconite requires extensive processing, which is labor- and energy-intensive and is, therefore, expensive.

A study by the State Administration for the Metallurgical Industry (Sami) concluded that, to ensure a stable supply of iron ore, China should invest further in overseas iron ore mines to raise the proportion of imports from Chinese joint-venture mines to 50% from 12%. China is producing less ore and importing more. Chinese iron ore production peaked in 1997 at 268 Mt and has declined each year since then. Numerous mines exploiting small and/or low-grade deposits have been shut down as a result of the rationalization of the Chinese steel industry, which still consists of many small units. Iron ore imports have been steadily increasing. In 1999, China imported 55 Mt of ore, in 2000, 70 Mt, and in 2001, 92 Mt. Chinese iron ore imports are expected to reach 135 Mt/yr by 2005 (Poppinga, 2002, p. 5). China accounted for 65% of the growth of world iron ore imports for the 10-year period from 1992 through 2001 (United Nations Conference on Trade and Development, 2002, p. 5).

To increase imports from Chinese joint-venture mines, Shanghai Baosteel formed joint ventures with major iron producers in Australia and Brazil, and Chinese provincial government officials were considering a third, this one in Russia. Russian and Chinese interests were considering a joint venture to develop an iron ore deposit in the Russian Far East (Metal Bulletin, 2001h). Officials representing the Province of Heilongjiang explored the Kimkan deposit with the goal of creating a new Chinese-owned mining company to develop the resource. The deposit is in Russia's Jewish Autonomous Republic, close to the border of Heilongjiang. The company would mine an estimated 1 Mt/yr of iron ore primarily to supply the Silin Metallurgical Works in the Chinese city of Yichun. Previous Chinese overseas investments in iron ore were China Metallurgical Import & Export Corp.'s 40% ownership of the Channar Mine in Australia and Shougang Corp.'s 100% ownership of the Marcona Mine in Peru.

To be able to handle the expected increase in iron ore imports, China was constructing new ports and improving and increasing the capacity of others. Baosteel constructed a large (10 Mt/yr) port facility (Paxton, 2001a). The company completed test unloading at its new $210 million port on Majishan Island close to the mouth of the Yangtze River. This project will be followed by other port upgrades in the next few years to meet soaring demand for imported iron ore. The new terminal will be capable of handling 250,000 dwt vessels and will be less costly to operate than Beilun, the port that Baosteel had been using. Beilun could handle vessels of only 150,000 dwt, was congested, and charged Baosteel for its use. Because Majishan, in its first phase, is reserved solely for Baosteel, China must increase port capacity elsewhere. One of the most important areas will be along the Yangtze River, where there are steel works hindered by river navigation problems. A channel at the mouth of the Yangtze is being deepened to allow fully loaded 100,000 dwt vessels to travel upstream with the goal of building one or two specialized berths close to the mills. Existing port facilities in the coastal areas in the south of the country (Guangdong Province, etc.), where most of the steel industry is located, are also being improved and expanded (United Nations Conference on Trade and Development, 2002). The increase in the use of imported ore has moved from coastal areas inland as inland steel mills have begun replacing domestic ore with imported ore (TEX Report, 2001a). Increases in capacity are underway in many ports, including Beilun, Qingdao, Shekou, Xingang, and Yantai. The high transport costs from domestic iron ore mines, most of which are located in China's inland northern and western provinces, make using ore from those mines expensive.

India.—Kudremukh Iron Ore Co. Ltd.'s (KICOL) 30-year mining lease expired in 1999 (Metal Bulletin, 2001x). Since then, the company has operated under temporary leases. The Indian Government recommended extending the lease for 20 years, subject to approval from the Supreme Court (Metal Bulletin, 2001f). KICOL was planning to open a new iron ore mine and beneficiation plant at Ongole in the Prakasam district of Andhra Pradesh State (Metal Bulletin, 2001y). The goal of the new mine is to produce 1.5 to 2.0 Mt/yr of concentrate for export. Part of the project is developing a port to handle the exports. The mine site is just 18 km from the coast.

National Mineral Development Corp. (NMDC) plans to raise its iron ore mining capacity to 30 Mt/yr from 17 Mt/yr by 2006 (Metal Bulletin, 2001aa). Developing Bailaidila's 10 and 11A deposits in Chattisgahr State will add 5 Mt/yr. Another 3 Mt/yr will be added at Donimalai in the Bellary Hospet district, which was expected to begin operation in 2004 to 2005. An additional 5 Mt/yr will come from the Bailadila 11B deposits, which will be developed along with deposit 14 and was expected to begin operation in 2005 to 2006.

Iran.—Gol-e-Gohar Iron Ore Co. [a 51% subsidiary of National Iranian Steel Co. (Nisco)] received seven bids for the construction of a $150 to $200 million 4-Mt/yr pelletizing plant (Metal Bulletin, 2001z).

Mauritania.—Société Nationale Industrielle et Minière (SNIM) and Perth, Australia-based Sphere Investments Ltd. entered into an agreement to form a joint venture to develop the Guelb el Auoj iron ore deposits about 35 km from SNIM's current mining operations (TEX Report, 2001c).

South Africa.—In November, Iscor Ltd. split into two independent companies (TEX Report, 2001h). The new Iscor Ltd. retained the steelmaking operations, and the new mining entity became Kumba Resources Ltd.

Current Research and Technology

Cliffs and Kobe Steel Co. entered into memoranda of understanding with Mesabi Nugget LLC on the construction and operation of a demonstration plant in northeastern Minnesota aimed at developing new ironmaking technology through the use of Kobe's ITmk3 process (Metal Bulletin, 2001w). In addition to Cliffs and Kobe, participants include Steel Dynamics Inc., Ferrometrics Inc., the Iron Range Resources and Rehabilitation Board of Minnesota (IRRRB), and the State of Minnesota. The first step in the process is to form solid "green" pellets from a

mixture of iron ore fines and pulverized coal. The pellets are then fed into a rotary hearth furnace and heated to 1,300° C to 1,450° C. In that temperature range the pellet are reduced to elemental iron, causing the pellet and the molten iron to separate from the slag.

Outlook

The domestic iron ore industry is totally dependent on the steel industry for sales. This dependence is not expected to change in the near future. Information about steel industry trends is provided in the "Outlook" section in the Iron and Steel chapter of the 2000 USGS Minerals Yearbook. For the near term, growth of the U.S. iron ore industry is tied to the growth of the integrated steelworks along the Great Lakes. Significant expansion in the domestic iron ore industry may be possible if one or more direct-reduction processes prove to be economic for existing and potential Great Lakes producers. If this occurs, then the iron ore industry can supply the rapidly expanding minimill sector of the U.S. steel industry. Steel alloy products require lower residual element content than can be readily achieved with scrap. This indicates a role for imported DRI in the coastal regions of the United States, while domestically produced DRI would be competitive further inland where cheaper power is available. However, no matter how spectacular DRI growth is during the next decade, it will not be able to replace more than a fraction of the world's blast furnace production. The blast furnace is expected to remain the mainstay of the iron and steel industries in most developed countries during the next 25 years.

The fortunes of the international iron ore industry will depend to a large degree on the continuing growth in iron ore consumption in China. The available evidence indicates that iron ore consumption will continue to grow and increasingly more of that consumption will be satisfied by imports.

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TABLE 1
SALIENT IRON ORE STATISTICS 1/

(Thousand metric tons and thousand dollars unless otherwise specified)

	1997	1998	1999	2000	2001
United States, iron ore (usable, less than 5% manganese): 2/					
Production	62,971	62,931	57,749	63,089	46,192
Shipments:	62,800	63,200	58,500	61,000	50,600
Quantity					
Value	$1,860,000	$1,970,000	$1,550,000	$1,560,000	$1,210,000
Average value at mines dollars per metric ton	$29.60	$31.14	$26.47	$25.57	$23.89
Exports:	6,340	6,000	6,120	6,150	5,610
Quantity					
Value	$235,000	$245,000	$243,000	$246,000	$229,000
Imports for consumption:	18,500	16,900	14,300	15,700	10,700
Quantity					
Value	$547,000	$517,000	$399,000	$420,000	$293,000
Consumption (iron ore and agglomerates)	79,500	78,200	75,100	76,500	67,300
Stocks, December 31:					
At mines, plants and loading docks 3/	4,860	6,020	5,710	9,150	3,800
At receiving docks 4/	2,880	4,080	2,770	2,860	1,960
At consuming plants	20,200	20,500	17,900	16,800	12,300
Total 5/	27,900	30,600	26,400	28,800	18,000
World, production 6/	1,070,000 r/	1,050,000 r/	1,020,000 r/	1,080,000 r/	1,060,000 e/

e/ Estimated. r/ Revised.
1/ Data are rounded to no more than three significant digits, except "Production;" may not add to totals shown.
2/ Direct-shipping ore, concentrates, agglomerates, and byproduct ore.
3/ Excludes byproduct ore.
4/ Transfer and/or receiving docks of Lower Lake ports.
5/ Sum of stocks at mines, consuming plants, and U.S. docks.
6/ Gross weight.

TABLE 2
EMPLOYMENT AT IRON MORE MINES AND BENEFICIATING PLANTS, QUANTITY AND TENOR OF ORE PRODUCED, AND AVERAGE OUTPUT PER WORKER HOUR IN THE UNITED STATES IN 2001, BY DISTRICT AND STATE 1/

			Production (thousand metric tons)				Average per worker hour (metric tons)		
District and State	Average number of employees	Worker hours (thousands)	Crude ore	Usable ore	Iron contained (in usable ore)	Iron content natural (percent)	Crude ore	Usable ore	Iron contained
Lake Superior:									
Michigan 2/	1,410	3,190	36,800	12,300	7,560	61.4	11.55	3.86	2.37
Minnesota	3,600	7,320	117,000	33,800	21,700	64.1	16.05	4.62	2.96
Total or average	5,010	10,500	154,000	46,100	29,200	63.4	14.68	4.39	2.78
Other States 3/	3	6	78	83	49	58.3	12.78	13.65	7.96
Grand total or average	5,020	10,500	154,000	46,200	29,300	63.4	14.68	4.39	2.78

1/ Data are rounded to no more than three significant digits, except "Average per worker hour, crude ore" and "Average per worker hour, usable ore;" may not add to totals shown.
2/ Does not include professional or clerical workers at mines of plant or maintenance shop nor research lab workers.
3/ Includes California and South Dakota.

TABLE 3
CRUDE IRON ORE MINED IN THE UNITED STATES IN 2001,
BY DISTRICT, STATE, AND MINING METHOD 1/ 2/

(Thousand metric tons unless otherwise specified and exclusive of ore containing 5% or more manganese)

District and State	Number of mines	Open pit	Underground	Total quantity
Lake Superior:				
Michigan	2	36,800	--	36,800
Minnesota	8	117,000	--	117,000
Total	10	154,000	--	154,000
Other States	3	78	--	78
Grand total	13	154,000	--	154,000

-- Zero.
1/ Excludes byproduct ore.
2/ Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 4
USABLE IRON ORE PRODUCED IN THE UNITED STATES IN 2001,
BY DISTRICT, STATE, AND TYPE OF PRODUCT 1/

(Thousand metric tons and exclusive of ore containing 5% or more manganese)

District and State	Direct shipping ore	Concentrates	Agglomerates 2/	Total
Lake Superior:				
Michigan	79	--	12,200	12,300
Minnesota	232	33	33,500	33,800
Total	311	33	45,800	46,100
Other States 3/	78	5	--	83
Grand total	389	38	45,800	46,200

-- Zero.
1/ Data are rounded to no more than three significant digits; may not add to totals shown.
2/ Data may include pellet chips and screenings.
3/ Includes California and South Dakota.

TABLE 5
SHIPMENTS OF USABLE IRON ORE FROM MINES IN THE UNITED STATES IN 2001 1/ 2/

(Exclusive of ore containing 5% or more manganese)

	Gross weight of ore shipped (thousand metric tons)				Average iron content,	
District and State	Direct shipping ore	Concentrates	Agglomerates	Total	natural (percent)	Value (thousands)
Lake Superior:						
Michigan	38	--	13,300	13,300	61.7	W
Minnesota	222	103	37,300	37,300	63.9	$855,000
Total reportable or average	260	103	50,200	50,500	6.3	855,000
Other States 3/	95	5	--	101	53.5	W
Total withheld	--	--	--	--	--	353,000
Grand total or average	356	108	50,200	50,600	63.3	1,210,000

W Withheld to avoid disclosing company proprietary data. -- Zero.
1/ Includes byproduct ore.
2/ Data are rounded to no more than three significant digits; may not add to totals shown.
3/ Includes California and South Dakota.

TABLE 6
CONSUMPTION OF IRON ORE AT U.S. IRON AND STEEL PLANTS 1/ 2/

(Thousand metric tons)

	Iron ore originating areas					
	U.S. ores		Canadian ores			
Year	Great Lakes	Other U.S.	Great Lakes	Other Canada	Foreign ores	Total
2000	57,900	--	343	5,920	6,520	70,700
2001	51,400	--	213	3,950	6,310	61,900

-- Zero.
1/ Excludes dust, mill scale, and other revert iron-bearing materials added to sinter.
2/ Data are rounded to no more than three significant digits; may not add to totals shown.

Source: American Iron Ore Association.

TABLE 7
CONSUMPTION OF IRON ORE AT U.S. IRON
AND STEEL PLANTS, BY TYPE OF PRODUCT 1/ 2/

(Thousand metric tons)

Type of product	2000	2001
Blast furnaces:		
Direct-shipping ore	345	249
Pellets	61,800	55,200
Sinter 2/	10,600	9,090
Total	72,800	64,600
Steelmaking furnaces:		
Direct-shipping ore	40	20
Pellets	21	13
Sinter 2/	184	144
Total	245	177
Grand total	73,000	64,700

1/ Data are rounded to no more than three significant digits; may not add to totals shown.
2/ Includes briquettes, nodules, and other.

Source: American Iron and Steel Institute.

TABLE 8
U.S. CONSUMPTION OF IRON ORE, BY END USE 1/ 2/

(Thousand metric tons and exclusive of ore containing 5% or more manganese)

Year	Blast furnaces	Steel furnaces	Sintering plants 3/	Miscella-neous 4/	Subtotal integrated iron and steel plants 5/	Direct-reduced iron for steelmaking 6/	Nonsteel end uses 7/	Total
2000	64,400	49	6,190	--	70,700	2,340	1,150	74,100
2001	57,300	35	4,560	--	61,900	1,800	756	64,400

-- Zero.
1/ Data are rounded to no more than three significant digits; may not add to totals shown.
2/ Includes agglomerates.
3/ Excludes dust, mill scale, and other revert iron-bearing materials.
4/ Sold to nonreporting companies or used for purposes not listed.
5/ Data from American Iron Ore Association.
6/ U.S. Geological Survey estimates based on production reports compiled by Midrex Corp.
7/ 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 9
U.S. EXPORTS OF IRON ORE, BY COUNTRY OF DESTINATION 1/ 2/

(Thousand metric tons and thousand dollars)

Country	2000		2001	
	Quantity	Value	Quantity	Value
Canada	6,120	244,000	5,560	227,000
Other	25	1,890	51	1,840
Total	6,150	246,000	5,610	229,000

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

Source: U.S. Census Bureau.

TABLE 10
U.S. EXPORTS OF IRON ORE, BY TYPE OF PRODUCT 1/ 2/

Type of product	2000			2001		
	Quantity (thousand metric tons)	Value (thousand dollars)	Unit value 3/ 4/ (dollars per metric ton)	Quantity (thousand metric tons)	Value (thousand dollars)	Unit value 3/ 4/ (dollars per metric ton)
Concentrates	51	1,730	34.05	74	1,140	15.42
Coarse ores	(5/)	3	102.20	1	101	100.92
Fine ores	25	811	32.93	22	694	32.07
Pellets	5,870	235,000	39.90	5,490	226,000	41.26
Briquettes	(5/)	13	21.62	(5/)	8	683.42
Other agglomerates	201	8,050	40.04	21	883	42.85
Roasted pyrites	3	184	72.55	1	32	39.75
Total	6,150	246,000	39.95	5,610	229,000	40.90

1/ Data are rounded to no more than three significant figures, except unit value; may not add to totals shown.
2/ Includes agglomerates.
3/ Unit values shown are calculated from unrounded data.
4/ Weighted average calculated from unrounded data by dividing total value by total tonnage.
5/ Less than 1/2 unit.

Source: U.S. Census Bureau.

TABLE 11
U.S. IMPORTS OF IRON ORE, BY COUNTRY AND TYPE OF PRODUCT 1/ 2/

Country and type of product	2000			2001		
	Quantity (thousand metric tons)	Value (thousand dollars)	Unit value 3/ 4/ (dollars per metric ton)	Quantity (thousand metric tons)	Value (thousand dollars)	Unit value 3/ 4/ (dollars per metric ton)
Australia	755	6,180	8.19	576	4,840	8.41
Brazil	6,090	150,000	24.68	4,260	104,000	24.44
Canada	7,990	238,000	29.79	4,530	133,000	29.47
Chile	135	2,620	19.44	711	17,400	24.42
Peru	40	590	14.75	71	1,030	14.49
Sweden	250	7,930	31.71	70	2,570	36.77
Venezuela	349	11,200	32.15	87	6,500	74.70
Other	78	3,600	46.17	350	23,300	66.45
Total	15,700	420,000	26.80	10,700	293,000	27.51
Concentrates	311	6,630	21.32	598	13,200	22.02
Coarse ores	3	104	34.97	28	786	28.02
Fine ores	5,090	97,100	19.10	4,050	84,000	20.74
Pellets	9,670	302,000	31.23	5,500	181,000	32.83
Briquettes	--	--	--	65	6,000	92.48
Other agglomerates	611	14,300	23.43	397	8,050	20.27
Roasted pyrites	6	309	48.60	7	330	44.38
Total	15,700	420,000	26.80	10,700	293,000	27.51

-- Zero.
1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
2/ Includes agglomerates.
3/ Unit values shown are calculated from unrounded data.

TABLE 11--Continued
U.S. IMPORTS OF IRON ORE, BY COUNTRY AND TYPE OF PRODUCT 1/ 2/

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

Source: U.S. Census Bureau.

TABLE 12
U.S. IMPORTS OF IRON ORE IN 2001, BY COUNTRY AND TYPE OF PRODUCT 1/ 2/

(Thousand metric tons)

Country of origin	Concentrates	Coarse ores	Fine ores	Pellets	Other agglomerates 3/	Roasted pyrites	Total
Australia	--	--	576	--	--	--	576
Brazil	161	--	2,740	1,360	--	--	4,260
Canada	139	--	200	3,810	381	--	4,530
Chile	246	--	448	--	16	--	711
Peru	--	--	71	--	--	(4/)	71
Sweden	50	--	20	--	--	--	70
Venezuela	--	22	--	--	65	--	87
Other	1	6	2	334	--	7	350
Total	598	28	4,050	5,500	462	7	10,700

-- Zero.
1/ Data are rounded to no more than three significant digits; may not add to totals shown.
2/ Includes agglomerates.
3/ Includes briquettes.
4/ Less than 1/2 unit.

Source: U.S. Census Bureau.

TABLE 13
AVERAGE UNIT VALUE FOR SELECTED IMPORTS OF IRON ORE IN 2001 1/

Type of product	Country of origin	Average unit value 2/ (dollars per metric ton gross weight)
Concentrates	Canada	17.21
Fine ores	Australia	8.41
Do.	Brazil	22.56
Pellets	do.	28.80
Do.	Canada	31.30

1/ Includes agglomerates.
2/ Weighted averages of individual customs values.

Source: U.S. Census Bureau.

TABLE 14
U.S. IMPORTS OF IRON ORE, BY CUSTOMS DISTRICT 1/ 2/

(Thousand metric tons and thousand dollars)

	2000		2001	
Customs district	Quantity	Value	Quantity	Value
Baltimore	4,220	90,400	3,720	79,800
Charleston	202	6,550	94	5,390
Chicago	2,170	47,100	1,330	33,300
Cleveland	909	26,700	630	20,000
Detroit	1,480	47,700	905	29,300
Mobile	3,390	108,000	673	33,100
New Orleans	3,110	88,600	2,940	81,800
Philadelphia	114	3,130	80	2,590
Tampa	--	--	154	4,530
Other	84	1,920	130	3,270
Total	15,700	420,000	10,700	293,000

See footnotes at end of table.

TABLE 14--Continued
U.S. IMPORTS OF IRON ORE, BY CUSTOMS DISTRICT 1/ 2/

-- Zero.
1/ Data are rounded to no more than three significant digits; may not add to totals shown.
2/ Includes agglomerates.

Source: U.S. Census Bureau.

TABLE 15
U.S. IMPORTS OF PELLETS, BY COUNTRY 1/

(Thousand metric tons and thousand dollars)

Country	2000		2001	
	Quantity	Value	Quantity	Value
Brazil	2,060	63,500	1,360	39,300
Canada	7,000	218,000	3,810	119,000
Norway	--	--	24	653
Peru	38	526	--	--
Sweden	197	6,180	--	--
Venezuela	349	11,200	--	--
Other	25	2,280	310	21,600
Total	9,670	302,000	5,500	181,000

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

Source: U.S. Census Bureau.

TABLE 16
SELECTED PRICES FOR IRON ORE IN THE JAPANESE MARKET

(Free on board shipping port basis. Cents per dry long ton of iron, unless otherwise specified)

Country and producer	Ore types	April 1-March 31	
		Fiscal year 2000	Fiscal year 2001
Australia:			
Hamersley Iron Pty. Ltd. and Mount Newman Mining Co. Pty. Ltd.	Lump ore	36.84	38.03
Do.	Fines	27.79	28.98
Robe River Iron Associates	do.	22.15	23.10
Savage River Mines Ltd.	Pellets	44.50	45.28
Brazil:			
Companhia Nipo-Brasileira de Pelotizacao (Nibrasco)	do.	47.03	47.85
Companhia Vale do Rio Doce (Carajas)	Fines	25.41	26.48
Companhia Vale do Rio Doce (Itabira)	do.	24.91	25.98
Do.	Lump ore	27.45	28.34
Mineraçoes Brasileiras Reunidas S.A.	do.	27.27	28.15
Do.	Fines	25.39	26.48
Samarco Mineracâo S.A.	Pellet feed	20.92	21.82
Canada, Iron Ore Co. of Canada (Carol Lake)	Concentrates	24.16	25.20
Chile:			
Minera del Pacifico S.A. (El Algarrobo)	Pellets	43.82	44.59
Minera del Pacifico S.A. (El Romeral)	Fines	19.29	20.12
India:			
Minerals and Metals Trading Corp. (Bailadila)	Lump ore	35.53	36.87
Do.	Fines	26.67	27.82
Peru, Empresa Minera del Hierro del Peru S.A.	Pellet feed	18.94	19.75
South Africa:			
South African Iron and Steel Industrial Corp. Ltd. cents per dry metric ton	Lump ore	29.83	30.79
Do. do.	Fines	21.13	22.04

Source: Trust Fund Project on Iron Ore Information, Iron Ore 2001.

TABLE 17
IRON ORE: WORLD PRODUCTION, BY COUNTRY 1/ 2/

(Thousand metric tons)

Country 5/	Gross weight 3/					Metal content 4/				
	1997	1998	1999	2000	2001 e/	1997	1998	1999	2000	2001 e/
Algeria	1,637	1,783	1,336	1,645 r/	1,500	800 e/	900	680	830 r/	760
Australia	157,766	155,731	154,268	167,935	181,553 6/	97,901	99,419	95,223	104,226	112,592 6/
Austria	1,800 e/	1,797	1,752	1,800 e/	1,800	490 e/	500	500	500 e/	575
Azerbaijan e/	2 r/	7 r/	-- r/	NA	NA	1 r/	4 r/	-- r/	NA	NA
Bosnia and Herzegovina e/	150	150	150	150	150	50	50	50	50	50
Brazil	184,970	197,500	194,000	210,000 r/	210,000	122,184	124,210	124,000	125,000 e/	125,000
Bulgaria	479	462	466	500 e/	600	320 e/	277 e/	280	300 e/	350
Canada 7/	37,277	37,808	33,900	33,740 r/	29,341 p/ 6/	24,914	24,082	21,650 r/	22,744 r/	17,186 p/ 6/
Chile	8,738 r/	9,112 r/	8,345 r/	8,729 r/	8,800	5,461 r/	5,694 r/	5,215 r/	5,455 r/	5,900
China e/ 8/	268,000	247,000 r/	237,000	223,000 r/	220,000	88,400 r/	81,200 r/	78,200 r/	73,500 r/	72,600
Colombia	640	530	576 r/	660 r/	660	350	295	317 r/	363 r/	363
Egypt	2,744	3,001	2,700 e/	2,500 e/	2,500	1,400	1,500	1,350	1,250 e/	1,250
France e/	523	250	250	--	--	150	75	35	--	--
Germany	201	200	100	--	--	28	28	14	--	--
Greece e/ 9/	NA	NA	1,600	1,500	1,500	NA	NA	600	575	575
Guatemala	5 r/	5 r/	11 r/	16 r/	15	3 r/	3 r/	7 r/	11 r/	10
India	69,453	72,532	70,220	75,950 r/	79,200 6/	44,400	48,000	44,940	48,600 r/	50,700 6/
Indonesia	516	560	584 r/	489 r/	469 6/	280 e/	310 e/	320 r/	269 r/	258
Iran 10/	12,750	10,536	10,776	11,000 e/	11,000	6,300	5,200	5,300	5,400	5,400
Japan	4	2	1	1	1 6/	2	1	1	1	(11/) 6/
Kazakhstan	12,600	8,693	9,091	16,160	14,140 6/	7,100	4,900	5,200	9,200 e/	8,000
Kenya	NA	NA	NA	1	1	NA	NA	NA	(11/) e/	(11/)
Korea, North e/	10,000	10,000	7,000	7,000	7,000	4,700	4,700	3,000	3,000	3,000
Korea, Republic of	500	486	410	336	195	280	272	229 r/	188	109
Macedonia e/	15	15	15	15	15	9	9	9	9	9
Malaysia	269	376	337	259 r/	376 6/	172	243	216	168 r/	241 6/
Mauritania	11,700	11,400	10,400 r/	10,400 r/	10,400	7,605	7,410	7,475	7,500 e/	7,500
Mexico 12/	10,466	10,557	11,475 r/	11,325 r/	11,500	6,280	6,334	6,885 r/	6,795 r/	6,900
Morocco	12	9	7	6	6	8	6	4	4	4
New Zealand 13/	2,478	2,120	2,303	2,692 r/	1,600	740 e/	635 e/	691 r/	808 r/	480
Nigeria e/	50	--	--	--	--	17	--	--	--	--
Norway	770	637	520	543 e/	500	462	382	355	369	340
Peru	4,439	4,439	4,230	4,231	4,200	2,850 r/	2,850 r/	2,715	2,688	2,700
Portugal 14/	18 e/	16	16	15 e/	15	7 e/	7	7	6 e/	5
Romania e/	756 r/	459 r/	131 r/	-- r/	--	170	85	71	-- r/	--
Russia	70,900	72,343	81,311	86,630	82,500	40,900	41,700	46,900	50,000	48,000
Serbia and Montenegro e/	110	100	50	50	--	34	31	15	15	--
Slovakia	453	479	479	477 r/	470	200	215	200	200 e/	200
South Africa 15/	33,225	32,948	29,508	33,707	34,757 6/	20,600 e/	20,400 e/	18,442	21,570 r/	22,240 6/
Spain	--	--	--	--	--	--	-- r/	--	--	--
Sweden	21,893	20,930	18,558	20,560	19,500 6/	13,912	12,977	11,506	12,747 r/	12,090 6/
Tanzania	91	--	--	--	--	29 e/	--	--	--	--
Thailand	44	91	123	(11/) r/	--	22 e/	46 e/	61	(11/) r/	--
Tunisia	252	220	219	182	180	137 e/	119	120	98	97
Turkey	5,986	5,885	4,846 r/	4,076 r/	3,932 6/	3,239	3,200 e/	2,600 r/	2,200 r/	2,100

See footnotes at end of table.

TABLE 17--Continued
IRON ORE: WORLD PRODUCTION, BY COUNTRY 1/ 2/

(Thousand metric tons)

Country 5/	Gross weight 3/					Metal content 4/				
	1997	1998	1999	2000	2001 e/	1997	1998	1999	2000	2001 e/
Uganda:										
Limonite	NA	NA	3	(11/)	2	NA	NA	2 e/	1 e/	2
Other	2	(11/) e/	(11/)	2	3	2 e/	(11/) e/	(11/) e/	2 e/	2
Ukraine	53,000 e/	50,758	47,769	55,883	54,650 6/	29,200 e/	28,000	26,200	30,600 e/	30,000
United Kingdom	1	1	1 r/	1	1	1 e/	1	1	1 e/	1
United States	62,971	62,931	57,749	63,089	46,200 6/	40,022	39,724	36,530	39,703	29,300 6/
Venezuela	18,503	16,553	14,051	17,353	17,500	12,245	11,014	9,292	11,100	11,100
Zimbabwe	479	372	599	451	361 6/	240 e/	190 e/	300 e/	226 e/	184
Total	1,070,000 r/	1,050,000 r/	1,020,000 r/	1,080,000 r/	1,060,000	585,000 r/	577,000 r/	558,000 r/	588,000 r/	578,000

e/ Estimated. p/ Preliminary. r/ Revised. NA Not available. -- Zero.

1/ Table includes data available through July 16, 2002.

2/ World totals, U.S. data (for year 2001), and estimated data are rounded to no more than three significant digits; may not add to totals shown.

3/ Insofar 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.

4/ Data 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.

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

6/ Reported figure.

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

8/ China'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 Fe content of 33%, whereas other countries report production of usable ore. Source: Mineral Resources of China, Chinese Institute of Geology and Mineral Resources Information, Iron Ore Section 2, China Building Materials Industrial Press, 1993, p. 99.

9/ Nickeliferous iron ore.

10/ Data are for year beginning March 21 of that stated.

11/ Less than 1/2 unit.

12/ Gross weight calculated from reported iron content based on grade of 60% Fe.

13/ Concentrates from titaniferous magnetite beach sands.

14/ Includes manganiferous iron ore.

15/ Includes magnetite ore as follows, in thousand metric tons: 1997--2,564; 1998--2,211; 1999--2,200; 2000--2,854; and 2001--2,552.

TABLE 18
IRON ORE: WORLD PELLETIZING CAPACITY, BY CONTINENT AND COUNTRY IN 2001

	Rated capacity (million metric tons, gross weight)
North America:	
Canada	27.6
Mexico	13.7
United States	58.7
Total 1/	100.0
South America:	
Argentina	2.0
Brazil	41.5
Chile	4.4
Peru	6.4
Venezuela	9.9
Total 1/	64.3
Europe:	
Belgium	0.7
Netherlands	4.4
Norway	1.4
Russia	34.0
Sweden	16.4
Turkey	1.0
Ukraine	32.0
Total 1/	89.9
Africa:	
Liberia	3.0
South Africa	0.6
Total 1/	3.6
Asia:	
Bahrain	4.0
China	20.0
India	11.5
Iran	9.0
Japan	3.0
Kazakhstan	8.4
Total 1/	55.9
Oceania, Australia	4.2
Grand total 1/	318.0

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

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