

THE MINERAL INDUSTRY OF

INDIA

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India was forecast to have a slow gross domestic product (GDP) growth rate of 6% by the Confederation of Indian Industry. The budget deficit stayed around 6% of GDP and inflation was up to 6.5%. Low industrial growth of 6.5% was the result of inadequate investment in infrastructure, a slowdown in investment, and limited use of existing capacity. Export growth stood at 3%, while imports grew by 4%. The Government increased petroleum and natural gas prices to bring them closer to international prices.

The present uniform duty of 30% was imposed on all forms of copper imports, whether primary, scrap, or semifinished. The Government tax reforms committee suggested a graded duty on copper starting with 10% on waste/scrap, 20% on unwrought metal, and 30% on wrought products. A duty difference of 20% was suggested between raw materials and finished products. The copper processing industry suggested the import duty on wrought copper and copper alloys be raised from current 30% to 45% so that a duty differential of 15% was kept between wrought and unwrought copper. The country's duty on gold imports was 5%. There were nine States and commercial institutions which were exempt from needing an import license. The Government withdrew the 4% special additional duty imposed on seven imports—coking and non-coking coal, coke, ferronickel, graphite electrodes, limestone, charged nickel, and nickel oxide sinter.

India is endowed with extensive mineral resources and there is a wide variety of mineral commodities being explored, developed, and mined. The country produced some 70 mineral commodities ranging from various ores, ferrous metals, nonferrous metals, and industrial minerals, to all kinds of mineral fuels and related materials. (*See table 1.*)

The Geological Survey of India identified new diamond and gold belts with a potential for commercial extraction. Kimberlites in the Raipur district of Madhya Pradesh and in the Maddur region of Andhra Pradesh were geologic features that could host diamond resources. Four gold provinces had been defined—Attapadi and Appil-Markada belts in Kerala, Dharwar-Shimoga belt in Karnataka, Siwalik belt in a Himalayan mountain range, and in Gondwana basin in eastern India. New phosphorite deposits were discovered near the Chennai coast in India.

The Government approved 11 prospecting licenses in May. Only 36 licenses had been issued in the first 8 months of 1998 and all but 4 had been issued by the State of Rajasthan. Recipients of the licenses included Phelps Dodge Corp. of the United States, which was granted a 2,742-square-kilometer (km²) copper and associated minerals prospecting concession in the eastern State of Bihar. Metdist of the United Kingdom,

Meridian Peak Resources Corp. of Canada, and White Tiger Resources of Australia were granted three exploration licenses each. The last was awarded to Geo-Mysore Services Ltd. Rio Tinto Plc's application for a prospecting license for base metals at Ajmer, Rajasthan, also was approved. In August, the Government offered 47 oil exploration blocks for bidding.

The Government attempted to revive the financially troubled Indian Iron & Steel Co., a subsidiary of Steel Authority of India Ltd. (Sail), by including a global tender to privatize the company. (*See table 2.*) The company's Burnpur works was operating at only 38% of its 1.5-million metric-ton-per-year (Mt/yr) capacity because of a cash shortage and a lack of demand for its products. The Government planned to sell a 30% stake in aluminum producer, National Aluminium Co. Ltd. (Nalco), in 1999. Its equity in Nalco was 87.15% after selling a 12.85% stake in 1998. The Government also planned to dispose of a 49% stake in Bharat Aluminum Co. Ltd. (Balco) and had sold off 25% of its stake in Hindustan Zinc Ltd. and 27% of its stake in Hindustan Copper Ltd.

The Government continued the policy of phased dismantling of its administered pricing mechanism. Price controls on five products—aviation fuel, diesel, gasoline, kerosene, and liquefied petroleum gas (LPG)—would be retained, and seven products, including naphtha, would be regulated. Crude oil producers would be paid 75% of international prices, subject to the current floor price allowed.

The power policy includes a competitive and transparent bidding process for large projects, and simplified guidelines for technical and economic approvals by the Central Electricity Authority. No tariff would be less than 50% of the cost of producing power. Foreign companies would be given automatic approval for 100% equity ownership of power generation, transmission, and distribution projects costing up to \$355 million.

The Indian State of Orissa approved a comprehensive mining policy to open up the mining of diamonds, gemstones, and gold to foreign investors and the private sector. The State also approved startup measures to help Orissa Mining Corp. form joint ventures with foreign and domestic mining companies for diamond and gold exploitation.

Balco awarded a \$23 million project for a 40,000-metric-ton-per-year (t/yr) new cold-rolling mill to Fata Hunter of Italy. The new mill was to be commissioned by March 2000 and raise the company's capacity to 70,000 t/yr for cold-rolled products. The project also would cover a super caster of 20,000 t/yr capacity for Balco's Korba smelter (Metal Bulletin, 1998b).

After a \$413 million, 3-year modernization and expansion program, Hindalco Industries Ltd.'s aluminum smelting

capacity rose by 32,000 to 242,000 t/yr, while its alumina capacity increased by 100,000 to 450,000 t/yr (Metal Bulletin, 1998g). The company was building an aluminum alloy wheels plant in Silvassa, which would cost \$19 million and have a capacity of 300,000 wheels per year. The plant could be expanded to 500,000 wheels per year. Hindalco expressed an interest in buying 12.89% of ailing Pennar Aluminium Co. at Hyderabad for \$40.5 million. Pennar was one of the largest producers of sheets and conductors and had two aluminum rolling plants in Nagpur. Hindalco also enlisted Kaiser Engineering/Bechtel of the United States to conduct a detailed technical and economic feasibility study of its greenfield Aditya aluminum project in Orissa. The project would cost \$1.4 billion to \$2.1 billion and include a 700,000-t/yr to 1-Mt/yr alumina refinery and a 150,000 to 250,000-t/yr aluminum smelter.

Indian Aluminium Co. Ltd. (Indal) is one of the largest manufacturers of aluminum sheet products in India and a dominant domestic market supplier in standard and special grades of alumina. Indal had no objection to the acquisition of a majority stake of up to 54.6% in its equity by Alcan Aluminium Ltd. of Canada. Alcan currently holds a 34.6% interest in Indal and made an offer for an additional 20% of the equity with \$59 million in March in response to the opening offer made by India's Sterlite Industries in February (Metal Bulletin, 1998a). Later, Sterlite raised its bid to \$193 million for a majority 52% stake in Indal. The company planned to invest more than \$378 million over a 4-year period to raise capacities. Alumina capacity was to be expanded by 173% and sheet and foil rolling capacity by between 50% and 60%. Indal has a 220,000-t/yr alumina capacity at Belgaum in Karnataka and a 72,000-t/yr capacity at Muri in Bihar. The company also produced 45,000 t/yr of special alumina at the two sites. Indal's 30-year bauxite mining leases were due to expire in 1998, which might affect the supply of raw material to its Belgaum plant.

In another development, Alcan joined with Indal as equity partners (20% each) in the proposed \$1 billion Utkal alumina project. Other partners in the project are local Tata Industries Ltd. (20%) and Norsk Hydros (40%) of Norway. Construction would start by the end of 1998, and the project was expected to be commissioned by 2002. The first phase would be the construction of the 1-Mt/yr alumina refinery, and the second phase would increase its capacity to 2 Mt/yr. The project was granted a mining lease for the Baphlimali bauxite mines with estimated reserves of 198 million metric tons (Mt) (Metal Bulletin, 1998d). Also, Larsen and Taubro Ltd. planned to construct an export-oriented alumina plant and would become a minority partner in the project. The plant was designed to have a capacity of 1 Mt/yr and expected to require an investment of \$1 billion.

The State of Gujarat (12% stake) was planning to construct a \$541 million, 750,000-t/yr alumina plant in the Kutch district with U.S. investment (39%) from Ambassador Group International and Jefferies & Co. The remaining 49% was to be offered to financial institutions, banks, and the public. Reynolds Metals Co. of the United States would prepare a feasibility study for the project by the end of 1998. The project

would entail a 90-megawatt (MW) powerplant and a water desalination plant. Reynolds Aluminum would buy back the alumina for export to the Middle East for consumption in that region.

Indal's 25,000-t/yr secondary ingot plant at Taloja was producing around 1,000 metric tons per month (t/m) but increased output to 1,500 t/m in June. The company secured its domestic sources of scrap and imported some materials under the duty-free scheme. Indal might slow down its plan for expansion at Taloja until a more reasonable duty structure was in place.

Nalco, a primary aluminum producer, planned to increase its output and exports, but suffered a setback due to extensive pot failures caused by electrical problems and excessive heat. The company normally produced about 200,000 t/yr of primary aluminum. The plant at Angul has a designed capacity of 230,000 t/yr with two potlines of 240 pots each. In December, the total number of pots in operation was 344 and output of aluminum was estimated at between 155,000 metric tons (t) and 160,000 t. Nalco's current capacity at the alumina refinery is 800,000 t/yr. A \$900-million expansion program was planned to increase the aluminum smelting capacity to 345,000 t/yr, the alumina refining capacity to 1.6 Mt/yr, and the bauxite mining capacity to 4.8 Mt/yr.

Sterlite Industries planned to proceed with its proposed \$705 million aluminum smelter in Orissa. The first phase involved the construction of a 125,000-t/yr aluminum smelter and a 375-MW coal-fired powerplant over 3 years. In the second phase, the smelter's capacity would be increased to 250,000 t/yr and that of the powerplant to 675 MW (Metal Bulletin, 1998p). A technical agreement with Pechiney of France, an aluminum producer, was signed. Sterlite Industries would purchase alumina from Nalco. Sterlite Industries' subsidiary, Madras Aluminium Co. Ltd., operated its smelter at over capacity to produce 25,400 t of aluminum.

In the Indian aluminum extrusion industry, Indal and Norsk Hydro of Norway took a majority stake in Orissa Extrusions, which had a capacity of around 8,000 t/yr. Hindalco increased its extrusion capacity from 10,400 to 13,000 t/yr. Total capacity of aluminum extrusions was around 143,000 t/yr and production was estimated at between 70,000 and 75,000 t/yr.

Apar Ltd. of India and Al Ghurair Group of Dubai set up a new aluminum wire rod plant in Dubai. The plant would cost \$4 million and start production in September 1999. The initial capacity would be 1,500 t/yr and be increased to 2,000 t/yr in the future. Apar was to buy back at least 25% of rod production. The companies operate similar facilities in India.

India produced about 1.4 Mt/yr of chrome ore, of which around 500,000 t were exported. The State of Orissa has more than 96% of the chromite deposits in the country. Chrome ore producer, Facor, challenged the State of Orissa's decision to appoint a contract mining agent for the Sukinda chromite deposits. The State's move had been rejected by the Ministry of Steel and Mines. The State retained 50% of the 855 hectares of the chrome ore lease area, and the balance was given to Facor, Ispat Industries, Jindal Strips, and the contract mining agent.

State-owned Hindustan Copper is producing primary copper and has copper mines and a smelter (16,000 t/yr) in Bihar in

addition to other facilities (a 45,000-t/yr smelter) in the western State of Rajasthan. At its Ghatsila smelter, the capacity will be raised from 16,000 to 25,000 t/yr (Metal Bulletin, 1998h). The Khetri smelter will be expanded to 100,000 t/yr using Outokumpu technology. Domestic production capacity was 47,000 t/yr with imports of 250,000 t/yr. Demand for refined copper was projected to rise to 847,000 t/yr by 2002. Demand growth was projected at an annual rate of 7.5% to 9% because of the country's increased power generation.

Indo-Gulf Fertilizers & Chemicals Corp. Ltd.'s new 100,000-t/yr custom copper smelter in Gujarat came into operation in late May and had achieved capacity utilization of 65%. The smelter, which employs Outokumpu technology, produced copper cathodes and was designed for a capacity expansion to 150,000 t/yr by 2001 with an additional investment of \$84 million. Capacity utilization was expected to reach 85% in 1999. Copper concentrates would come from Chile, Indonesia, and Malaysia and total 575,000 t in 1999. The company commissioned its 35-MW captive powerplant in September. Other new copper smelter projects in India included Metdist's smelter at Pipavav in Gujarat, Sterlite Industries' smelter at Tuticorin in southern India, and SWIL Ltd.'s smelter at Jhagadia in Gujarat.

SWIL's new copper smelter in Gujarat began trial production in December. The \$143 million, 50,000-t/yr plant using Boliden technology was expected to operate at between 65% and 70% in the first year of operation. Boliden Contech AB of Sweden would invest \$2.1 million in the company. Sterlite Industries' copper smelter expansion from 100,000 to 150,000 t/yr was to be completed by the end of 1999. Its smelter started operation in late 1997 and reached 90% of design capacity in October. However, a court in Madras ordered the interim closure of its Tuticorin copper smelter in Tamil Nadu in November in response to petitions filed by environmental groups. The smelter employed around 1,500 people and has a capacity of 100,000 t/yr of copper.

Binani Group finalized expansion plans and was set to invest \$100 million in its copper mining ventures in Zambia. The investment plan would cover the copper project in Muliashi North, refurbishment of a copper smelter, and the construction of a new acid plant. Copper production capacity was expected to reach 100,000 t/yr by 2002. Mining consultant Kilborn SNC Lavalin was assigned the feasibility contract of the Muliashi North project (Metal Bulletin, 1998c).

A joint venture between Finolex Cables and Essex International of the United States began operations at a new continuous casting facility in Goa. The plant would supply copper rod to Finolex for its electrical and communications wire making operations. Output from the plant was expected to reach 45,000 t/yr. Finolex is India's largest electrical cable producer.

National Mineral Development Corp. (NMDC), India's largest producer and exporter of iron ore, planned to open two new mines in the Bailadila area where it has the richest iron ore deposits in India (Metal Bulletin, 1998m). The expansion program was likely to cost \$102 million. Iron ore shipments out of the port of Visakhapatnam were temporarily disrupted in June because of equipment failures. NMDC exported about 4

Mt of Bailadila ore in 1998. The company also proposed to increase the capacities of the Kumaraswamy mines in Karnataka from their present 400,000 to 700,000 t/yr. NMDC signed a tentative deal with Sail and a Russian company to set up a pig iron plant using the Romelt process near Jagdalpur. The plant would use tailings generated by the iron ore mining operations.

The opening of the broad gauge railway line from Karnataka to Goa and the use of Panjim as a second port for iron ore exports, the main port being Mormugao, had dramatically increased the export of iron ore through Goa. Belgium, China, Italy, Japan, the Republic of Korea, the Middle East, the Netherlands, Pakistan, and Romania were destinations for Goa exports.

NMDC, Sail, and the State government of Madhya Pradesh signed a memorandum of understanding with Indian Railways to build a 182-kilometer (km), \$32 million broad gauge rail line linking the Dalli Rajhara iron ore mine, which serves the Bhilai steel plant, to a new \$177 million mining complex at Rowghat. The Dalli Rajhara reserves became exhausted and Bhilai plant needed more ore to feed its expansion program. Rowghat was reported to have reserves of 750 Mt of iron ore (Metal Bulletin, 1998o). The rail line would go farther, linking Rowghat with Jagdalpur where some NMDC mines are located.

Rio Tinto Plc (51%) and Orissa Mining Corp. (49%) would spend \$18 million to establish the viability of mining iron ore in the State of Orissa. Orissa accounted for 33% of India's iron ore reserves of 12,750 Mt (Financial Times, 1998). Orissa Mining transferred two blocks at Gandhamardan and Malangtoli with deposits of more than 800 Mt to the joint venture. Infrastructure development included the establishment of a 260-km railway link between the mines and Paradip port. One-half of the mined iron ore was to be sold abroad. The domestic market would be three new steel plants and two existing plants in Orissa.

The Government levied antidumping duties on imports of Chinese coke at the rate of \$42.50 per metric ton from May until November 1998. The present duty was at 15%. Pig iron producers imported around 1.1 Mt/yr of metallurgical coke from China. Australia and Japan were irregular suppliers. The capacity of the domestic coke industry was around 500,000 t/yr. India became an important exporter of pig iron, accounting for 5% of the total world market of 15 Mt. Most of the exports were from the Vizag steel plant and Sail's Bhilai plant. The country's pig iron capacity was around 3.3 Mt/yr. The Vizag plant suspended the production of pig iron for export in September because the price in the international market declined sharply.

Some producers of direct reduced iron (DRI) called for an increase in the import duty on ferrous scrap from 5% to 25% to avoid unwanted imports. But Essar Steel, India's largest consumer of imported scrap and producer of DRI, strongly opposed the raise. Essar imported between 300,000 and 400,000 t/yr of scrap and produced 1.73 Mt/yr of DRI.

Glencore of Switzerland might supply some of Essar's future scrap imports to the Hazira steelworks in the State of Gujarat in return for supplies of iron ore pellets from Essar's new pelletizing complex at Vizag. The pellet plant has a capacity of

3.3 Mt/yr (Metal Bulletin, 1998e). Iron ore pellets were exported to Belgium and China and consumed domestically by Ispat Industries at Dolvi in Maharashtra and Essar at Hazira in Gujarat. Essar wanted to install a beneficiation plant near the Bailadila iron ore mines in Orissa and build a 280-km slurry pipeline from mine to port. Essar also wanted to build another 4.5-Mt/yr Lurgi pelletizer at Vizag to have a total capacity of 7.8 Mt/yr of direct reduction grade pellets at a cost of \$150 million. The project would be completed in 2001. In another development, the company was planning to build a new cold-rolling mill at its complex near Hazira.

Ispat Industries' plan to build a \$300 million, 1.4-Mt/yr Bahrain-based DRI plant was delayed because of the financial situation in Asia. The Gulf Investment Corp. showed an interest in participating in the plant and the Japanese trading group, Mitsui Corp., was negotiating over a likely 20% stake. The financial situation in Thailand also caused Ispat Industries to shelve the plan to build a DRI plant there.

Ispat Industries operates a 1.2-Mt/yr Midrex DRI megamodule at Dolvi in Maharashtra. The plant was being further expanded to produce about 1.8 Mt/yr at a cost of \$6 million. A planned modification would raise the number of gas reformer tubes from 1,500 to 1,800. Midrex also was examining the possibility of developing the module to produce up to 2.2 Mt/yr in the future.

Ispat Industries cast the first slab from the meltshop at its \$1.24 billion new plant at Dolvi in the State of Maharashtra (Metal Bulletin, 1998k). Trial runs on the new hot strip mill began in February. The plant uses the Conarc steelmaking process. The company expected a yield of 96% from liquid steel to coils. The plant was designed to make hot strip 1.2 to 6 millimeters (mm) thick with the maximum width of 1,545 mm. A one-furnace, one-caster operation was envisaged for 1998. Full production at 3 Mt/yr was not expected until the new Ispat Metallics blast furnace was to come on-stream in 1999. The company's cold-rolling mill in Nagpur would take 300,000 to 400,000 t of hot-rolled coil for captive consumption. Export target was set at 60% of the total production capacity. The blast furnace was designed to produce 2 Mt/yr of hot metal and would use 70% pellet and 30% lump or sinter with imported coke.

Essar Steel was planning to raise its hot-rolled coil capacity to 3 Mt/yr by the addition of a blast furnace and other facilities. A new 1.2-Mt/yr skin-pass mill to produce hot-rolled coil from 1.6 mm to 6 mm thick began production. The plant has two slitting lines and two shearing lines. The company claimed to have a domestic market share of 20% for hot-rolled coil and to be India's largest exporter of hot-rolled coil to the Americas, Europe, the Middle East, and Southeast Asia.

Ramanasekhar Steel Ltd. (RSL) set up a \$2.6 million, 90,000-t/yr coil processing center near Chennai in southern India and acted as a consignment agent for Essar Steel. RSL also had further plans to build a \$5.9 million galvanizing and corrugating line using equipment from Japan.

Bellary Steels & Alloys Ltd. was building a new 500,000-t/yr long products plant, which was due to come on-stream in 2000, thus increasing the company's capacity to 1 Mt/yr. Concast India was contracted to provide a 4-strand continuous billet

caster. Bellary issued a letter of intent for the supply of a 400,000-t/yr wire rod rolling mill from Kvaerner Metals (Metal Bulletin, 1998i).

Tata Iron & Steel Co. planned to start production at its new \$378 million, 1.2-Mt/yr cold rolling mill in September 2000 after placing orders for the plant's equipment with Hitachi Heavy Industries and Mitsubishi Corp. of Japan. The mill was to be built adjacent to the new hot strip mill at the company's Jamshedpur works in the State of Bihar (Metal Bulletin, 1998q).

Jindal Strips, a large Indian producer of stainless steel and cold-rolled products, completed the capacity expansion of its stainless steel works to 250,000 t/yr. The company and other stainless steel producers protested against the imposition of an additional 8% import levy on nickel, which together with the old levies added up to 25%. Traders might import alloy and special steels, as they were exempt from the 8% additional duty.

Sail put up for sale the hot- and cold-rolling mills at its stainless steel strip plant at Salem in Tamil Nadu, which produced flat products. The company delayed rod and light section mills at Durgapur and the upgrade of two cold-rolling mills at Bokaro and Rourkela. It also put back investment at its mill in Bhilai and cut production at its alloy steel plant at Durgapur.

Canara Steel of India, Co-Steel Sheerness of the United Kingdom, and Gamma Engineering Ltd. of Canada planned to build a \$210 million structural shapes mill in Mangalore on the west coast of India. The new mill with a miniblast furnace would produce about 500,000 t/yr of bars, flats, angles, and other structural shapes. Financing had been arranged.

Raymond Ltd. of India pulled out of a planned joint venture with Thyssen Krupp Stahl (TKS) of Germany. TKS was to take a 74% stake in Raymond's electrical sheet production. Raymond's plant at Nashik has a 50,000-t/yr capacity for grain-oriented and nonoriented electrical sheet. It also produces 100,000 t/yr of cold-rolled close annealed strip (Metal Bulletin, 1998n).

Total capacity of charge chrome and high carbon ferrochrome in India was around 1 Mt/yr, or about 15% of world production capacity. About 29 plants with a total capacity of 230,000 t/yr were idled. Given the rise in ferrochrome prices in the world market, India could become a major producer of ferrochrome (Metal Bulletin, 1998f). Four ferroalloys producers in Orissa, Facor, Ispat Alloys, Tatas, and Nava Bharat, have a combined production capacity of 150,000 t/yr of high carbon ferrochrome and 50,000 t/yr of silicomanganese.

Binani Industries planned to set up a new 70,000 t/yr lead smelter and a new 100,000 t/yr zinc smelter in the State of Gujarat on greenfield sites. The company also planned to expand its existing zinc smelter at Alwaye in the State of Kerala from 30,000 to 40,000 t/yr in 18 months. Binani Industries had long-term contracts with Western Metals of Australia for the supply of zinc concentrates to the Alwaye smelter. The company imported about 60,000 t/yr of zinc concentrates from Australia and other countries and was in talks with Western Metals for establishing a joint venture to

secure supplies of zinc concentrates for the new smelter.

Hindustan Zinc planned to build a 60,000- to 100,000-t/yr zinc smelter near Udaipur in Rajasthan. Kvaerner Metals of Norway was awarded the \$188 million contract. A feasibility study was started in April and due to be completed in December 1998. If commissioned, the smelter would be India's fifth and increase the company's output by 40% from the current 149,000 t/yr. The first phase of the operations, bringing production to 60,000 t/yr, was expected to come on-stream in 2001 with the increase to 100,000 t/yr beginning the following year (Metal Bulletin, 1998i). The company had invested \$42 million in developing the Rampura-Agucha zinc-lead mines in Rajasthan. Hindustan Zinc's Vizag lead smelter has an installed capacity of 22,000 t/yr but was operating at around 30% capacity.

The Foreign Investment Promotion Board approved a proposal to form a joint venture between Hindustan Zinc and BHP Minerals International Exploration Inc. of Australia. The joint-venture company was to prospect for base metal deposits in Rajasthan and develop economically viable mineral occurrences.

India's secondary zinc producers, which together have a capacity of 50,000 t/yr, were fighting to have zinc skimmings, ash, and dross designated as nonhazardous secondary raw materials. Zinc ash, skimmings, and dross were currently imported into India, but only under a special license (Metal Bulletin, 1998j).

Manganese Ore India planned to produce 670,000 t of manganese ore in fiscal year 1998-99 and expand its production level to 800,000 t of ore by 2000-01. The company was to commission a \$1.3 million, 10,000-t/yr ferromanganese plant near its mines. A 23-MW powerplant was being built at a cost of \$10.6 million to supply power to the ferromanganese plant and the mines. The company also was building a second electrolytic manganese dioxide plant with a capacity of 1,200 t/yr at its Dongri Buzurg Mine at a cost of \$4.7 million and a 2,000-t/yr manganese sulfate plant at a cost of \$1.9 million.

Domestic cement production reached 80 Mt/yr. There were some 115 individual cement plants with a total capacity of 100 Mt/yr. The Birla Group of companies accounted for 24% of the country's capacity. Associated Cement Companies remained the largest individual cement producer in India with a combined capacity of 9.9 Mt/yr. Singhanian Group had a combined capacity of 7.1 Mt/yr. Seven cement projects with a total capacity of 7.8 Mt/yr were to commence commercial production by March 1999 (International Cement Review, 1998, p. 157). In 1998, total cement consumption moved up by only 3% to 75.7 Mt from the year before. Growth in demand came from housing construction and infrastructure development. Cement exports of 4.3 Mt were mainly to Bangladesh, Nepal, and other destinations including Sri Lanka and the Maldives.

Indian Rayon and Industries Ltd. planned to sell its cement division to Grasim Industries Ltd. Grasim had acquired Dharni Cement and Shree Digvijay Cement Co. Ltd. and thus would consolidate its cement operations with a capacity of 10.7 Mt/yr. Both Grasim Industries and Indian Rayon are subsidiaries of Birla Group. In another development, Tisco sold its cement

operations for \$130 million to Lafarge Group of France in order to concentrate on its core business of steel and raise funds for its expansion plan. Tisco's cement plants had a total capacity of 1.8 Mt/yr (Lafarge press release, December 21, 1998, Major development by Lafarge in India, accessed January 20, 1999, at URL <http://www.lafarge.com/htm>). Many cement manufacturers rely on imported coal as an energy source in the production of cement. The Government proposed 8% hike in import duty of coal and the cement producers would have to increase the prices of their products.

De Beers and Rio Tinto submitted tenders for licenses to explore and mine diamond occurrences in the State of Madhya Pradesh. The tenders were rejected because neither company would adhere to the conditions set by the State: a minimum 10% royalty and an 11% free carried stake in the requisite joint venture to be established to carry out the work. However, a joint venture between junior Finders Gold NL and Indian diamond merchants won the diamond exploration concession. The concession, covering 4,600 km², contains at least two known kimberlites. Exploration and mining operations would be managed by Finders which would hold a 20% contributing interest, with the right to increase to 30%. The Government and South Africa signed a protocol to cooperate in geology and mining technology, including mapping parts of India's eastern coast for offshore diamond deposits.

The fertilizer industry was desperate for a significant investment to help increase its competitiveness. Indian fertilizer companies demanded Government regulations to help domestic production in competition with low-cost imports. India was the second largest consumer of fertilizer in Asia which was mostly supplied by Germany, Israel, Jordan, and Russia.

Indian Farmers Fertilizer Cooperative Ltd. commissioned its new ammonia/urea plant at Phulpur, Uttar Pradesh, which increased capacity by 726,000 t/yr to 1.22 Mt/yr at an estimated cost of \$281 million. Construction also began for increasing NPK/diammonium phosphate capacity at the Kandla plant at a cost of \$500 million. Completion was scheduled for November 1999. A third project was at its complex in Nellore, Andhra Pradesh, which would increase output of ammonia/urea by also 726,000 t/yr (Asia Fertilizer and Agrochemicals Bulletin, 1997/98).

Oman India Fertilizer Co. proceeded with a 1.4-Mt/yr urea project at Sur in Oman. The company is a joint venture among Oman Oil Co., Rashtriya Chemicals & Fertilizers Ltd., and Krishak Bharati Cooperative. The development cost was expected to be \$1.1 billion, and the project would be financed by \$825 million of debt capital. Meanwhile, the Government approved a project by Rashtriya Chemicals & Fertilizers to expand its ammonia/urea complex in Thal, State of Maharashtra by 40% at an estimated cost of \$300 million. The expansion would produce 2.55 Mt/yr of urea and the plan included a 1,350-metric-ton-per-day (t/d) ammonia unit and two urea plants with a total capacity of 2,200 t/d.

Fertilizers & Chemicals Travancore Ltd. brought its new 900-t/d naphtha-based ammonia plant at Udyogamandal, near Cochin, in Kerala on-stream in December 1997. The company also carried out a feasibility study of building a 900-t/d urea

plant and planned to build a new 900-t/d sulfuric acid plant, both at Cochin. Construction of the sulfuric acid plant was due for completion by 2000. On the other hand, Indo-Gulf Fertilizers & Chemicals Corp. Ltd. shelved its \$236 million project to double capacity at its ammonia and urea complex at Jagdispur, Bihar, because of increased naphtha prices.

Southern Magnesium & Chemicals Ltd., India's sole magnesium producer, was running at 50% of its 800-t/d rated capacity, while demand in the country was more than 1,000 t/d. The company lodged a complaint about the dumping of Chinese magnesium. The Ministry of Commerce proposed an anti-dumping duty of \$0.65 per kilogram on Chinese magnesium imports. In India, total recoverable magnesite reserves were around 233 Mt, including proven reserves of 41 Mt (Industrial Minerals, 1998b). Magnesite is low in lime and high in silica in Tamil Nadu, but high in lime and low in silica in Uttar Pradesh.

There are three large soda ash producers in India—Tata Chemicals, Gujarat Heavy Industries, and Birla VXL. They were estimated to hold around 80% of the domestic market, or approximately 1.6 Mt/yr. India's Alkali Manufacturers' Association, composed of soda ash producers, accused Sinochem of China of operating as a cartel and of unfair pricing (Industrial Minerals, 1998a). Other Chinese soda ash producers continued to export to India.

Kerala Metals & Minerals Ltd. announced plans for expansion at its Kerala titanium dioxide pigment facilities. The first part of the program was to set up its own powerplant and expand its mineral separation plant. Capacity would be raised to 120,000 t/yr at a cost of \$28 million. The final stage was to increase the production capacity of titanium dioxide pigment.

India produced about 300 Mt/yr of coal, which provided more than one-half of its energy demand—more than 70% of its electricity generation was coal-fired. Indigenous coal resources were likely to dominate India's future energy supply. Under the Government's privatization plans announced in 1993, Bengal Emta Coal Mines was the first mining company to begin operations, and its coal block was the first of 19 blocks privatized.

Mahandi Coalfields in Orissa became Coal India Ltd.'s (CIL) second largest producer and registered the highest growth among the CIL subsidiaries. Mahandi planned to produce 90 Mt/yr of coal. The State of Orissa has coal resources of 46,720 Mt and boasts the largest recoverable reserves of 20,000 Mt in the country (Mining Magazine, 1998). White Mining of the United Kingdom was awarded by CIL a turnkey project for the development of the Piparwar open pit mine and preparation plant. The project would be the largest coal mine in Bihar with 6.5 Mt/yr of raw coal and 5.5 Mt/yr of washed coal.

The Kottadih longwall underground coal project of Eastern Coalfields Ltd., a subsidiary of CIL, collapsed in August 1997 within a few months of commissioning. The project was developed in technical alliance with Coal de France International (CdeF). Eastern Coalfields planned to sue CdeF for the failure and put in a claim of \$10 million to cover the damage. The company was in financial difficulties and lacked the funds required for relaunching the underground project.

The future development of Kottadih would be on a 30-year lease under the build, operate, and transfer basis.

Reliance Industries finalized the terms of a joint venture with Elf Aquitaine of France for the construction of a second liquefied natural gas (LNG) terminal at Hazira in the State of Gujarat. Ten consortia submitted prequalification bids for Tamil Industrial Development Corp.'s integrated LNG project at the port of Ennore. The project included an LNG input terminal, regasification plant, and 2,000-MW powerplant and would be commissioned after 2003. A consortium of international companies led by CMS Energy Corp. of the United States was selected to develop, finance, build, own, and operate a \$1.6 billion, 1,886-MW powerplant, and a 2.5-Mt/yr LNG facility. The powerplant would sell all of its electricity to the Tamil Nadu State Electricity Board under a 20-year contract.

Gas Authority of India Ltd. (Gail) was to invest \$1.1 billion in developing and strengthening cross-country pipeline infrastructure in the next 5 years. Gail is a major producer of LPG with an annual domestic market share of 20%. The company would increase LPG production capacity by 80% and lay a 1,230-km pipeline to transport LPG from Gujarat to New Delhi. Gail also would join hands with private producers to generate electricity and build its own powerplants.

Unocal Corp. of the United States planned to build a natural gas pipeline at an estimated cost of \$2 billion, which would link gas supplies of 28.3 million cubic meters per day from southern Asia and Myanmar to industrial centers in West Bengal.

The Government would offer 48 new blocks for exploration in January 1999 under a new licensing policy. These blocks are in a range of areas including offshore, onshore, shallow, and deep sea. The new policy provides for payment of global prices for crude oil, a 7-year tax holiday, and exemption from customs duty on project imports.

The Government lifted price controls on several petroleum products on April 1. These products included bitumen, fuel oil, low-sulfur heavy stock, naphtha, and paraffin wax. The Government, however, continued to fix prices for products such as aviation fuel, cooking gas, diesel, gasoline, and kerosene. The State-owned Indian Oil Corp. (IOC) is the sole importer of crude oil and petroleum products. The Government intended to sell a 13% stake in IOC in which it holds 91%. The reforms in the petroleum sector called for complete decontrol by April 2000, and lower import duties on crude oil and petroleum products. When IOC's seventh oil refinery reached full capacity of 120,000 barrels per day (bbl/d) in late 1998, the company would control 620,000 bbl/d of India's total capacity of 1.3 million bbl/d (Petroleum Economist, 1998a).

Unocal Corp. of the United States planned to invest \$4 billion over a 5-year period in India's oil and gas exploration and development. The company also was buying 26% equity in Hindustan Oil Exploration Corp. Hindustan Oil was finalizing contracts with the Government for exploration blocks in Gujarat and northeastern region of the country. The Government signed production-sharing contracts for 18 exploration blocks with 16 foreign and domestic companies, including 5 from the United States.

In October, Oil and Natural Gas Corp. (ONGC) began a \$2 billion project for unenhanced oil recovery program at the offshore Bombay High Oilfield. The company expected to recover 60% of the field's oil in place. ONGC produced about 90% of India's domestic crude oil and is the largest oil and gas exploration company. Its wholly owned subsidiary, ONGC Videsh Ltd., was exploring in Vietnam where it discovered a large gas reserve.

The Public Investment Board turned down a proposal by IOC for a joint venture with Kuwait Petroleum to set up a 9-Mt/yr oil refinery in the State of Orissa. The reason was that the eastern region was not expected to have enough demand to support a new refinery of that size (Petroleum Economist, 1998b). Meanwhile, Reliance Industries still worked on its 300,000-bbl/d oil refinery in the State of Gujarat and was seeking Government approval to double the refinery's capacity. IOC would market 13.5 Mt/yr of petroleum products from refineries of Reliance and Essar.

Saudi Aramco (25%) and Royal Dutch Shell (25%) proposed a venture with the Government (50%) to form a new company active in petroleum refining, distribution, marketing, and consumer services. The company was intended to capture 25% of the petroleum products market and to secure supplies of crude oil to the Indian oil industry from Saudi Aramco. IBP, a local petroleum products marketing company, proposed an alliance with three stand-alone refinery companies to market their output. The three refiners have a combined capacity of 16.85 Mt/yr.

State-run oil refiner, Bharat Petroleum Corp. Ltd., approved construction of a 58,600-cubic-meter (m³) storage terminal for petroleum products at Mangalore in the State of Karnataka. The terminal, due to be operational in September 1999, would cost \$12.2 million. The storage capacity was to be expanded to 100,000 m³ by 2003. Seven Seas Petroleum of India agreed to a 50-50 joint venture with Itochu of Japan to import and distribute kerosene. The venture also would set up storage tank facilities for petroleum products.

Russia signed an agreement with the Government to provide two 1,000-MW light-water nuclear reactors for a \$2.6 billion plant at Kudankulam in the State of Tamil Nadu. The reactors would use low-enriched uranium imported from Russia as fuel. The Government encouraged eight large power projects that would get duty-free import of equipment and other tax concessions. It also called for \$5 billion in private investment in power transmission over the next 5 years.

Citibank of the United States was to arrange a \$359 million loan for the \$588 million, 574-MW, coal-fired Bhilai powerplant in Madhya Pradesh. The project was sponsored by Larsen and Toubro (50%), Sail (5%), and Public Service Electric & Gas (45%) of the United States and was being developed on a build-own-operate basis. Public Service Electric & Gas (30%) also expected its 330-MW gas-fired powerplant in Tamil Nadu to reach financial closure by yearend. Japan's Marubeni Corp., Energy Equity Corp., and Mosbascher Energy hold the rest of equity share.

The Government planned to build an 860-MW hydroelectric powerplant on the Cauvery River in Tamil Nadu. Other projects in the State included a 2,500-MW thermal powerplant

proposed by National Thermal Power Corp. (NTPC) and a 2,000-MW thermal powerplant proposed as a joint venture between NTPC and Neyveli Lignite Corp.

References Cited

- Asia Fertilizer and Agrochemicals Bulletin, 1997/98, IFFCO looks at its options: AsiaFAB, winter, p. 5.
- Financial Times, 1998, Rio Tinto offshoot ventures into iron ore in Orissa: Financial Times, December 3, p. 28.
- Industrial Minerals, 1998a, India imposes ban on Chinese soda ash: Industrial Minerals, no. 369, June, p. 14.
- 1998b, Indian magnesite reserves: Industrial Minerals, no. 375, December, p. 73.
- International Cement Review, 1998, India, in Global Cement report, (3d ed.): Dorking, United Kingdom, International Cement Review, 310 p.
- Metal Bulletin, 1998a, Alcan increases offer for Indal stake: Metal Bulletin, no. 8274, July 2, p. 5.
- 1998b, Balco awards Rs960m project to Fata Hunter: Metal Bulletin, no. 8279, May 21, p. 5.
- 1998c, Binani set to invest \$100m in mining ventures: Metal Bulletin, no. 8291, July 2, p. 5.
- 1998d, Construction of Utkal will begin this year: Metal Bulletin, no. 8281, May 28, p. 7.
- 1998e, Essar enters pellet export market: Metal Bulletin, no. 8304, August 24, p. 18.
- 1998f, High prices could see India restart idled capacity: Metal Bulletin, no. 8261, March 16, p. 11.
- 1998g, Hindalco reaps the benefits of modernization with improved results: Metal Bulletin, no. 8277, May 14, p. 6.
- 1998h, Hindustan Copper formulates revival strategy: Metal Bulletin, no. 8311, September 21, p. 6.
- 1998i, Indian steelmaker to build 500,000 tpy bar/rod plant: Metal Bulletin, no. 8270, April 20, p. 29.
- 1998j, Indian zinc import problems drag on: Metal Bulletin, no. 8279, May 21, p. 12.
- 1998k, Ispat Industries casts first slab at Dolvi: Metal Bulletin, no. 8273, April 30, p. 28.
- 1998l, Kvaerner wins Hindustan contract: Metal Bulletin, no. 8281, May 28, p. 9.
- 1998m, NMDC sees export shipments hit record high: Metal Bulletin, no. 8271, April 23, p. 23.
- 1998n, Raymond pulls out of electrical sheet deal with Thyssen: Metal Bulletin, no. 8296, July 20, p. 19.
- 1998o, Sail secures agreement on Bhilai ore rail link: Metal Bulletin, no. 8275, May 7, p. 23.
- 1998p, Sterlite to decide on Orissa smelter this year: Metal Bulletin, no. 8313, September 28, p. 9.
- 1998q, Tisco moves ahead with new cold rolling mill: Metal Bulletin, no. 8260, March 12, p. 31.
- Mining Magazine, 1998, CIL's second largest producer: Mining Magazine, v. 178, no. 3, March, p. 203.
- Petroleum Economist, 1998a, News in brief: Petroleum Economist, August, p. 46.
- 1998b, News in brief: Petroleum Economist, January, p. 54.

Major Sources of Information

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Major Publications

Ministry of Mines, Indian Bureau of Mines, Nagpur:

Monthly Statistics of Mineral Production,

Indian Minerals Yearbook.

Mining Engineers' Association of India, Bombay:

Indian Mining and Engineering Journal, monthly.

Balkrishna Binani, Bombay:

Minerals and Metals Review, monthly.

TABLE 1
INDIA: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/ METALS	1994	1995	1996	1997	1998
Aluminum:					
Bauxite, gross weight thousand tons	4,809	5,240	5,757 r/	6,019 r/	6,102
Alumina, Al ₂ O ₃ equivalent do.	1,456	1,650	1,780 r/ e/	1,860 r/ e/	1,890 e/
Metal, primary	472,000	536,500	530,600	484,200	541,800
Cadmium metal	216	254	271	298	300 e/
Chromium, chromite, gross weight	909,076	1,536,386	1,363,205	1,363,049	1,311,310
Copper:					
Mine output, Cu content	45,944	46,975	47,800	40,000 e/	45,000 e/
Metal, primary:					
Smelter	51,232	39,496	45,300	59,400 r/	60,000 e/
Refinery					
Electrolytic (cathode)	40,100	33,900	29,100	30,200 e/	40,200
Fire refined e/	8,900 3/	5,700	10,200	6,000	7,000
Total	49,000	39,600	39,300	36,200	47,200 e/
Gold metal, smelter kilograms	2,244	2,203	2,449	2,750 r/	2,383
Iron and steel:					
Iron ore and concentrate:					
Gross weight thousand tons	60,473	65,173	66,657	69,453 r/	72,532
Fe content do.	37,368	41,710	42,660 r/	44,400 r/	48,000 e/
Metal:					
Pig iron do.	17,808	18,626 r/	19,864	20,000 e/	21,000 e/
Direct-reduced iron do.	3,122	4,280	4,830	5,250	5,500 e/
Ferroalloys:					
Ferrochromium (including charge chrome)	247,000	303,537	261,666	286,973	345,125
Ferrochromiumsilicon e/	8,000	9,000	9,000	10,000	10,000
Ferromanganese e/	200,000	180,000	190,000	166,000 r/	138,000
Ferrosilicon e/	85,000	85,000	85,000	90,000	90,000
Silicomanganese e/	170,000	190,000	170,000	198,000 r/	188,000
Other e/	8,500	8,500	8,500	9,000	9,000
Steel, crude thousand tons	19,285	22,800	23,753	23,748	18,547
Semimanufactures e/ 4/ do.	11,000	11,000	11,000	11,000	12,000
Lead:					
Mine output, Pb content	30,500	34,000	35,000	32,000	39,300
Metal, refined:					
Primary e/	60,000	62,000	67,000	69,000	70,000
Secondary e/	21,700	28,000	27,000	24,000	25,000
Total e/	81,700	90,000	94,000	93,000	95,000
Manganese:					
Ore and concentrate, gross weight thousand tons	1,632	1,764	1,797	1,596 r/	1,557
Mn content e/ do.	620	670	680	680	610
Rare-earth metals, monazite concentrate, gross weight e/	4,600	5,000	5,000	5,000	5,000
Selenium kilograms	11,582	11,449	11,500 e/	11,500 e/	11,500 e/
Silver, mine and smelter output do.	50,207	38,064	35,601 r/	49,736 r/	52,310
Titanium concentrates, gross weight:					
Ilmenite e/	290,000 r/	290,000 r/	330,000 r/	300,000	300,000
Rutile e/	13,000 r/	14,000	15,000 r/	14,000 r/	14,000
Tungsten, mine output, W content	2	4	2	1 r/	--
Zinc:					
Mine output, concentrate:					
Gross weight	270,382	279,757	286,226	263,270 r/	261,467
Zn content	147,300	154,500	148,200	142,000	143,000 e/
Metal:					
Primary	156,400	146,500	143,600	159,000	171,900
Secondary e/	24,000	24,000	24,000	24,000	25,000
Total e/	180,400	170,500	167,600	183,000	196,900
Zirconium concentrate, zircon, gross weight e/	18,000	18,000	19,000	19,000	19,000
INDUSTRIAL MINERALS					
Abrasives, natural, n.e.s.:					
Corundum, natural kilograms	13,536 r/	1,412 r/	1,408 r/	867	1,230
Garnet	56,196	58,937	47,382	55,374 r/	138,678
Jasper	4,577	5,342	4,740	5,312 r/	6,581

See footnotes at end of table.

TABLE 1--Continued
INDIA: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/	1994	1995	1996	1997	1998	
INDUSTRIAL MINERALS--Continued						
Asbestos	29,824	25,065	23,215	25,051 r/	18,751	
Barite	497,971	421,867 r/	369,500	409,498	749,412	
Bromine, elemental e/	1,400	1,500	1,500	1,500	1,500	
Cement, hydraulic e/	thousand tons	57,000	62,000	75,000	80,000	85,000
Chalk	139,300	144,124	122,318	117,869 r/	114,109	
Clays:						
Ball clay	347,741	413,722	396,472	373,104 r/	381,479	
Diaspore	9,463	10,086	14,192	14,874 r/	10,148	
Fireclay	397,435	406,901	346,599	355,331 r/	331,729	
Kaolin:						
Salable crude	thousand tons	548	552	578	402 r/	540
Processed	do.	134	161	183	175 r/	148
Total	do.	682	713	761	577 r/	688
Other	do.	50	73	55	53 r/	60
Diamond:e/						
Gem	thousand carats	14 r/	21 r/	19	20	20
Industrial	do.	8 r/	11 r/	10	10	11
Total	do.	22 r/	32 r/	29	30	31
Feldspar	64,693	99,618	85,213	95,455 r/	104,509	
Fluorspar:						
Concentrates:						
Acid-grade	6,231	6,359	5,115	6,937 r/	--	
Metallurgical-grade	16,360	17,887	14,263	9,877 r/	785	
Total	22,591	24,246	19,378	16,814 r/	785	
Other fluorspar materials, graded	3,415	5,762	3,292	5,008 r/	5,507	
Gemstones excluding diamond:						
Agate including chalcedony pebble	639	518	467	244 r/	190	
Garnet	kilograms	533	484	627	653 r/	829
Graphite 5/	93,597	129,368	115,233	102,143 r/	143,333	
Gypsum	1,729,775	1,744,331	2,442,156	2,031,049 r/	2,191,784	
Kyanite and related materials:						
Kyanite	6,265	6,772	6,715	6,035 r/	5,169	
Sillimanite	10,378	9,687	7,521	12,299 r/	11,936	
Lime	200,000 e/	94,734	202,437	378,087 r/	298,131	
Magnesite	336,735	335,189	373,306	362,929 r/	355,033	
Mica:						
Crude	2,055	1,728	1,894	1,794 r/	1,489	
Scrap and waste	719	1,013	1,413	1,128 r/	966	
Total	2,774	2,741	3,307	2,922 r/	2,455	
Nitrogen, N content of ammonia	thousand tons	7,503	8,287	8,549	9,298	10,037
Phosphate rock including apatite	1,236,567	1,331,829	1,432,321	1,043,386 r/	1,730,334	
Pigments, mineral, natural, ocher	170,761	254,166	284,546	347,429 r/	351,704	
Pyrites, gross weight	117,033	135,547	145,922	128,571 r/	97,163	
Salt:						
Rock salt	thousand tons	3	2	2	3 r/	2
Other e/	do.	9,500	9,500	9,500	9,500	9,500
Total e/	do.	9,503	9,502	9,502	9,503 r/	9,502
Sodium carbonate e/	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	
Stone, sand and gravel:						
Calcite	67,631	71,073	64,866	49,429 r/	50,668	
Dolomite	thousand tons	3,123	3,570	3,132	2,930 r/	2,800
Limestone	do.	8,576	91,612	100,328	104,755 r/	108,920
Quartz and quartzite	do.	222	257	257	258 r/	266
Sand:						
Calcareous	do.	183	228	225 e/	225 e/	230 e/
Silica	do.	1,252	1,222	1,534	1,400 r/	1,265
Other	do.	1,700	1,654	1,379	2,688 r/	2,879
Slate	7,004	6,744	9,451	7,590 r/	10,029	
Sulfur, byproduct from fertilizer plants	14,844	22,308	9,316	9,600 r/ e/	10,000 e/	
Talc and related materials:						
Pyrophyllite	85,335	131,137	143,172	121,566 r/	79,951	
Steatite (soapstone)	398,006	469,692	472,001	417,613 r/	447,550	

See footnotes at end of table.

TABLE 1--Continued
INDIA: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/	1994	1995	1996	1997	1998	
INDUSTRIAL MINERALS--Continued						
Vermiculite	1,903	1,696	2,405	4,405 r/	4,080	
Wollastonite	68,269	90,128	76,204	97,223 r/	95,746	
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Bituminous	thousand tons	254,050	267,959	287,935	295,195 r/	298,116
Lignite	do.	19,197	22,052	22,282	23,027 r/	23,164
Total	do.	273,247	290,011	310,217	318,222 r/	321,280
Gas, natural:						
Gross	million cubic meters	16,800	17,800	19,700	20,000 r/ e/	20,500 e/
Marketable	do.	14,685	16,610	18,489	19,047 r/	19,980
Petroleum:						
Crude	thousand 42-gallon barrels	234,536	257,600 r/	240,114 r/	246,989 r/	244,854
Refinery products:						
Liquefied petroleum gas	do.	32,040	38,325	39,785 r/	40,000 e/	40,500 e/
Gasoline	do.	34,560	37,960	40,150 r/	39,000 e/	39,500 e/
Kerosene and jet fuel	do.	55,080	57,670	64,970 r/	59,000 e/	58,000 e/
Distillate fuel oil	do.	144,720	164,250	174,835 r/	166,000 e/	167,000 e/
Residual fuel oil	do.	71,280	69,715	74,460 r/	71,000 e/	70,000 e/
Other	do.	92,880	87,965	91,615 r/	89,000 e/	90,000 e/
Total	do.	430,560	455,885	485,815 r/	464,000 e/	465,000 e/

e/ Estimated. r/ Revised.

1/ Table includes data available through September 22, 1999.

2/ In addition to commodities listed, other clays (bentonite, common clays, and fuller's earth), other gemstones (aquamarine, emerald, ruby, and spinel), and uranium are produced but output is not reported; available information is inadequate to make reliable estimates of output levels.

3/ Reported figure.

4/ Excludes production from steel miniplants.

5/ India's marketable production is 10% to 20% of mine production.

TABLE 2
INDIA: STRUCTURE OF THE MINERAL INDUSTRY IN 1998

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity e/
Alumina	Indian Aluminium Co. Ltd. Indian interests, 60.4% and Alcan Aluminium Ltd. (Canada), 39.6%	Belgaum Refinery, Karnataka	220
Do.	National Aluminium Co. Ltd., Indian Government, 100%	Dhamanjodi Refinery, Orissa	800
Do.	Bharat Aluminium Co. Ltd., Indian Government, 100%	Korba Refinery, Madhya Pradesh	200
Do.	Utkal Alumina International. Norsk Hydro SA (Norway), 40%; Alcan Aluminium Co. Ltd. (Canada), Indian Aluminium Co. Ltd., and Tata Industries, 20% each	Koraput Refinery, Orissa	1,000 1/
Do.	Madras Aluminium Co. Ltd. Alumix SpA (Italian Government), 27%; R. Prabhu and Associates, 24%; Tamil Nadu Industrial Investment Corp., 11%, and others, 38%	Mettur Refinery, Tamil Nadu	60
Do.	Indian Aluminium Co. Ltd. Indian interests, 60.4% and Alcan Aluminium Ltd. (Canada), 39.6%	Muri Refinery, Bihar	72
Do.	Hindalco Industries Ltd. Birla Group, 33%; foreign investors, 26%; private Indian investors, 23%; and financial institutions, 18%	Renukoot Refinery, Uttar Pradesh	450
Aluminum	Indian Aluminium Co. Ltd. Indian interests, 60.4% and Alcan Aluminium Ltd. (Canada), 39.6%	Alupuram Smelter, Kerala	20
Do.	National Aluminium Co. Ltd., Indian Government, 100%	Angul Smelter, Orissa	230
Do.	Indian Aluminium Co. Ltd. Indian interests, 60.4% and Alcan Aluminium Ltd. (Canada), 39.6%	Belgaum Smelter, Karnataka	73
Do.	do.	Hirakud Smelter, Orissa	24
Do.	Bharat Aluminium Co. Ltd., Indian Government, 100%	Korba Smelter, Madhya Pradesh	100
Do.	Madras Aluminium Co. Ltd. Alumix SpA (Italian Government), 27%; R. Prabhu and Associates, 24%; Tamil Nadu Industrial Investment Corp., 11%; and others, 38%	Mettur Smelter, Tamil Nadu	25
Do.	Hindalco Industries Ltd. Birla Group, 33%; foreign investors, 26%; private Indian investors, 23%; and financial institutions, 18%	Renukoot Smelter, Uttar Pradesh	242
Bauxite	Bharat Aluminium Co. Ltd., Indian Government, 100%	Amarkantak Mine, Madhya Pradesh	200
Do.	Indian Aluminium Co. Ltd. Indian interests, 60.4% and Alcan Aluminium Ltd. (Canada), 39.6%	Kolhapur District mines, Maharashtra	600
Do.	Gujarat Mineral Development Corp., Gujarat State Government, 100%	Kutch and Saurashtra Mines, Gujarat	500
Do.	Hindalco Industries Ltd. Birla Group, 33%; foreign investors, 26%; private Indian investors, 23%; and financial institutions, 18%	Lohardaga District mines, Bihar	750
Do.	Indian Aluminium Co. Ltd. Indian interests, 60.4% and Alcan Aluminium Ltd. (Canada), 39.6%	do.	200
Do.	National Aluminium Co. Ltd., Indian Government, 100%	Panchpatmali Hills, Koraput District mines, Orissa	2,400
Do.	Minerals & Minerals Ltd., Indian Government, 100%	Richuguta, Palamu District mines, Bihar	200
Barite	Andhra Pradesh Mineral Development Corp. Ltd. Andhra Pradesh State Government, 100%	Cuddapah District mines, Andhra Pradesh	350
Do.	Associated Mineral Corp., 100%	do.	75
Do.	Pragathi Minerals, 100%	do.	50
Do.	Shri C. M. Ram nath Reddy, 100%	do.	75
Do.	Vijaylaxmi Minerals Trading Co., 100%	do.	50
Cement	Larsen and Toubro Ltd., 100%	Awarpur Plant, Maharashtra	2,300
Do.	Century Cement, Century Textiles and Industries Ltd., a subsidiary of the Birla Group, 100%	Baikunth Plant, Madhya Pradesh	1,120
Do.	Coromandel Fertilizers Ltd. Chevron Chemical Co. (United States), 23.55%; International Minerals and Chemical Co., 20.89%; Parry and Co., 10.64%; E.I.D. Parry (India) Ltd., 6.65%; and others, 38.27%	Chilamkur Plant, Andhra Pradesh	1,000
Do.	The Associated Cement Cos. Ltd. Indian Government, 34.86% and private shareholders, 65.14%	Gagal Plant, Himachal Pradesh	1,830
Do.	Raymond Cement Works, a division of Raymond Woolen Mills Ltd. JK Singhania, principal shareholder	Gopalnagar Plant, Madhya Pradesh	1,250
Do.	Narmada Cement Co. Ltd. Chowgule and Co. Ltd., 34%; Gujarat State Government, 17.33%; and others, 48.67%	Jafrabad Plant, Gujarat	1,000
Do.	Rajashree Cement, a division of Indian Rayon and Industries Ltd., 100%	Khor Plant, Karnataka	1,020

See footnotes at end of table.

TABLE 2--Continued
INDIA: STRUCTURE OF THE MINERAL INDUSTRY IN 1998

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity e/	
Cement--Continued:	The Associated Cement Cos. Ltd. Indian Government, 34.86% and private shareholders, 65.14%	Kymore Plant, Madhya Pradesh	1,500	
Do.	Mangalam Cement Ltd., 100%	Morak Plant, Rajasthan	1,000	
Do.	Mysore Cements Ltd. Government institutions and banks, 41.13%; Corporate Trust holdings, 21.70%; and others, 37.17%	Narasingarh Plant, Madhya Pradesh	1,089	
Do.	Cement Corp. of India Ltd., Indian Government, 100%	Nayagaon Plant, Madhya Pradesh	1,330	
Do.	J.K. Cement Works, a division of JK Synthetics Ltd., 100%	Nimbahera Plant, Rajasthan	1,462	
Do.	The India Cement Co. Ltd., Indian Government, 26%; Life Insurance Corp. of India, 24%; and others, 50%	Sankarnagar Plant, Tamil Nadu	1,000	
Do.	Maihar Cement, Century Textiles and Industries Ltd., a subsidiary of the Birla Group, 100%	Satna Plant, Madhya Pradesh	1,800	
Do.	Shree Digvijay Cement Co. Ltd., 100%	Shreeniwas Plant, Maharashtra	1,060	
Do.	Lakshmi Cement, a division of Straw Products Ltd. JK Singhania, principal shareholder	Sirohi Plant, Rajasthan	1,400	
Do.	Manikgarh Cement, Century Textiles and Industries Ltd., a subsidiary of the Birla Group, 100%	Tehsil Rajura Plant, Maharashtra	1,000	
Do.	Vasavadatta Cement, Kesoram Industries Ltd., 100%	Vasavadatta Plant, Karnataka	1,000	
Do.	Vikram Cement, Grasim Industries Ltd., a subsidiary of the Birla Group, 100%	Vikram Plant, Madhya Pradesh	1,000	
Do.	Raasi Cement Ltd., Andhra Pradesh Government, 50% and Development Co. Ltd., 50%	Vishnupuram Plant, Andhra Pradesh	1,000	
Do.	The Associated Cement Cos. Ltd., Indian Government, 34.86% and private shareholders, 65.14%	Wadi Plant, Karnataka	2,180	
Chromite	Ferro Alloys Corp. Ltd., 100%	Cuttack District, Orissa	120	
Do.	Orissa Mining Corp. Ltd, Orissa Industries Ltd., 100%	do.	300	
Do.	Tata Iron & Steel Co. Ltd., 100%	do.	100	
Do.	Ferro Alloys Corp. Ltd., 100%	Dhenkanal District, Orissa	75	
Do.	Orissa Mining Corp. Ltd., Orissa Industries Ltd., 100%	do.	200	
Do.	Mysore Minerals Ltd., 100%	Hassan District, Karnataka	125	
Do.	Ferro Alloys Corp. Ltd., 100%	Kendujhar District, Orissa	75	
Do.	Orissa Mining Corp. Ltd., Orissa Industries Ltd., 100%	do.	100	
Do.	Ferro Alloys Corp. Ltd., 100%	Khammam District, Andhra Pradesh	100	
Coal, bituminous	million tons	Bharat Coking Coal Ltd., a subsidiary of Coal India Ltd., Indian Government, 100%	Bihar and West Bengal	26
Do.	do.	Central Coalfields Ltd., a subsidiary of Coal India Ltd., Indian Government, 100%	Bihar	27
Do.	do.	Eastern Coalfields Ltd., a subsidiary of Coal India Ltd., Indian Government, 100%	Bihar and West Bengal	21
Do.	do.	Mahanadi Coalfields Ltd., a subsidiary of Coal India Ltd., Indian Government, 100%	Orissa	21
Do.	do.	North Eastern Coalfields Ltd., a subsidiary of Coal India Ltd., Indian Government, 100%	Assam	640
Do.	do.	Northern Coalfields Ltd., a subsidiary of Coal India Ltd., Indian Government, 100%	Madhya Pradesh and Uttar Pradesh	24
Do.	do.	Singareni Collieries Co. Ltd., Andhra Pradesh State Government, 50% and Indian Government, 50%	Andhra Pradesh	18
Do.	do.	South Eastern Coalfields Ltd., a subsidiary of Coal India Ltd., Indian Government, 100%	Madhya Pradesh	36
Do.	do.	Western Coalfields Ltd., a subsidiary of Coal India Ltd., Indian Government, 100%	Madhya Pradesh and Maharashtra	18
Coal, lignite	do.	Neyveli Lignite Corp. Ltd., Indian Government, 100%	Tamil Nadu	17
Copper		Indo-Gulf Fertilizers and Chemicals Corp., 100%	Birla Copper Complex smelter, Dahej, Gujarat	100
Do.		Hindustan Copper Ltd., Indian Government, 100%	Indian Copper Complex mines, Ghatsila District, Bihar	31
Do.		do.	Indian Copper Complex smelter-refinery, Ghatsila District, Bihar	16
Do.		do.	Khetri Copper Complex mines, Khetrinagar Rajasthan	15
Do.		do.	Khetri Copper Complex smelter-refinery, Khetrinagar District, Rajasthan	45

See footnotes at end of table.

TABLE 2--Continued
INDIA: STRUCTURE OF THE MINERAL INDUSTRY IN 1998

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity e/
Copper--Continued:	do.	Malanjkhand Copper Complex mines, Balaghar District, Madhya Pradesh	22
Do.	Sterlite Industries Ltd., 100%	Tuticorin Smelter, Tamil Nadu	100
Ilmenite-rutile ore	Kerala Minerals and Metals Ltd., Kerala State Government, 100%	Chavara, Kerala	100
Do.	Indian Rare Earths Ltd., Indian Government, 100%	do.	200
Do.	do.	Ganjam, Orissa	220
Do.	do.	Manavalakurichi, Tamil Nadu	65
Iron and steel:			
Crude steel	Visvesvaraya Iron and Steel Ltd., Karnataka State, 60% and Steel Authority of India Ltd., Indian Government, 40%	Bhadravati steel plant, Karnataka	180
Do.	Steel Authority of India Ltd., Indian Government, 100%	Bhilai steel plant, Madhya Pradesh	4,000
Do.	do.	Bokaro steel plant, Bihar	4,000
Do.	Indian Iron and Steel Co. Ltd., wholly owned subsidiary of Steel Authority of India Ltd., Indian Government, 100%	Burnpur steel plant, West Bengal	1,500
Do.	Steel Authority of India Ltd., Indian Government, 100%	Durgapur steel plant, West Bengal	1,600
Do.	Tata Iron and Steel Co. Ltd., 100%	Jamshedpur steel plant, Bihar	3,200
Do.	Steel Authority of India Ltd., Indian Government, 100%	Rourkela steel plant, Orissa	1,800
Do.	Rashtriya Ispat Nigam Ltd., 100%	Visakhapatnam steel plant, Andhra Pra	3,200
Do.	Ministeel plants, privately owned	About 180 plants located throughout India	4,700
Iron ore	National Mineral Development Corp. Ltd., Indian Government, 100%	Bailadila, Madhya Pradesh	9,000
Do.	Steel Authority of India Ltd., Indian Government, 100%	Bastar and Durg District, Madhya Pradesh	7,000
Do.	Kudremukh Iron Ore Co. Ltd., Indian Government, 100%	Kudremukh, Chikmagalur District, Karnatak	9,500
Do.	National Mineral Development Corp. Ltd., Indian Government, 100%	Donimalai, Karnataka	9,000
Do.	Chowgule & Co. Pvt. Ltd., 100%	Goa	2,500
Do.	Dempo Mining Corp. Ltd., 100%	Goa	2,500
Do.	V.M. Salgaocar & Bros. Pvt. Ltd., 100%	Goa	2,500
Do.	Steel Authority of India Ltd., Indian Government, 100%	Kendujhar District, Orissa	3,000
Do.	Tata Iron and Steel Co. Ltd., 100%	do.	2,000
Do.	Indian Iron and Steel Co. Ltd., wholly owned subsidiary of Steel Authority of India Ltd., Indian Government, 100%	Singhbhum District, Bihar	2,500
Do.	Steel Authority of India Ltd., Indian Government, 100%	do.	3,500
Do.	Tata Iron and Steel Co. Ltd., 100%	do.	3,500
Kyanite	Associated Mining Co., 100%	Bhandara District, Maharashtra	10
Do.	Maharashtra Mineral Corp. Ltd., 100%	do.	10
Do.	Bihar State Mineral Development Corp. Ltd., Bihar State Government, 100%	Singhbhum District, Bihar	10
Do.	Hindustan Copper Ltd., Indian Government, 100%	do.	22
Lead ore	Hindustan Zinc Ltd., Indian Government, 100%	Agnigundala Mine, Andhra Pradesh	72
Do.	do.	Sargipalli Mine, Orissa	150
Lead, primary	do.	Chanderiya Smelter, Rajasthan	35
Do.	do.	Tundoo Smelter, Bihar	8
Do.	do.	Visakhapatnam (Vizag) Smelter, Andhra Pradesh	22
Lead, secondary	Indian Lead Co., 100%	Thane Refinery, Mumbai, Maharashtra	25
Lead-zinc ore	do.	Rampura-Agucha Mine, Rajasthan	1,300
Do.	do.	Zawar mine group, Rajasthan	1,200
Magnesite	Burn Standard Co. Ltd., Indian Government, 100%	Salem, Tamil Nadu	150
Do.	Dalmia Magnesite Corp., 100%	do.	150
Do.	Tamil Nadu Magnesite Ltd., Tamil Nadu State Government, 100%	do.	150
Manganese ore 2/	Manganese Ore India Ltd., Indian Government, 100%	Adilabad, Andhra Pradesh	NA
Do.	Falechand Marsingdas, 100%	Andhra Pradesh	NA
Do.	Manganese Ore India Ltd., Indian Government, 100%	Balaghat, Madhya Pradesh	NA
Do.	J.A. Trivedi Bros., 100%	do.	NA

See footnotes at end of table.

TABLE 2--Continued
INDIA: STRUCTURE OF THE MINERAL INDUSTRY IN 1998

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity ^{e/}
Manganese ore 2/--Continued:	Sandur Manganese and Iron Ores Ltd., 100%	Bellary, Karnataka	NA
Do.	Manganese Ore India Ltd., Indian Government, 100%	Bhandara, Maharashtra	NA
Do.	Eastern Mining Co., 100%	North Kanara, Karnataka	NA
Do.	Mysore Minerals Ltd., 100%	do.	NA
Do.	Manganese Ore India Ltd., Indian Government, 100%	Keonjhar, Orissa	NA
Do.	Mangilah, Rungta (Pvt.) Ltd., 100%	do.	NA
Do.	Orissa Mining Corp. Ltd., 100%	do.	NA
Do.	Rungta Mines (Pvt.) Ltd., 100%	do.	NA
Do.	Serajuddin & Co., 100%	do.	NA
Do.	S. Lall & Co., 100%	do.	NA
Do.	Tata Iron and Steel Co. Ltd., 100%	do.	NA
Do.	Orissa Mineral Development Co. Ltd., 100%	Koraput, Orissa	NA
Do.	Orissa Mining Corp. Ltd., 100%	do.	NA
Do.	Mysore Minerals Ltd., 100%	Shimoga, Karnataka	NA
Do.	Aryan Mining & Trading Corp., 100%	Sundargarh, Orissa	NA
Do.	Orissa Manganese & Minerals (Pvt.) Ltd., 100%	Sundargarh, Orissa	NA
Do.	Tata Iron and Steel Co. Ltd., 100%	do.	NA
Do.	R.B.S. Shreeram Durga Prasad and Falechand Marsingdas, 100%	Vizianagaram, Andhra Pradesh	NA
Petroleum, refined products thousand 42-gallon barrels per day	Cochin Refineries Ltd., a subsidiary of Oil and Natural Gas Corp., Indian Government, 55% and private interests, 45%	Ambalamugal Refinery, Kerala	93,000
Do.	Indian Oil Corp., a subsidiary of Oil and Natural Gas Corp., Indian Government, 91% and private interests, 9%	Barauni Refinery, Bihar	66,000
Do.	Bongaigaon Refinery and Petrochemicals Ltd., a subsidiary of Oil and Natural Gas Corp., Indian Government, 100%	Bongaigaon Refinery, Assam	27,000
Do.	Indian Oil Corp., a subsidiary of Oil and Natural Gas Corp., Indian Government, 91% and private interests, 9%	Digboi Refinery, Assam	12,000
Do.	do.	Guwahati Refinery, Assam	20,000
Do.	do.	Haldai Refinery, West Bengal	61,000
Do.	do.	Koyali Refinery, Gujarat	185,000
Do.	Madras Refineries Ltd., a subsidiary of Oil and Natural Gas Corp., Indian Government, 52% and private interests, 48%	Madras Refinery, Tamil Nadu	131,000
Do.	Bharat Petroleum Corp. Ltd., a subsidiary of Oil and Natural Gas Corp., Indian Government, 67% and private interests, 33%	Mahul Refinery, Mumbai (Bombay), Maharashtra	135,000
Do.	Hindustan Petroleum Corp. Ltd., a subsidiary of Oil and Natural Gas Corp., Indian Government, 51% and private interests, 49%	do.	110,000
Do.	do.	Visakhapatnam Refinery, Andhra Pradesh	90,000
Do.	Indian Oil Corp., a subsidiary of Oil and Natural Gas Corp., Indian Government, 91% and private interests, 9%	Mathura Refinery, Uttar Pradesh	156,000
Do.	do.	Panipat Refinery, Uttar Pradesh	120,000
Phosphate rock 3/	Rajasthan State Mineral Development Corp. Ltd., Rajasthan State Government, 100%	Badgaon, Dakankotra, Kanpur, Kharbaria-ka-Guda, and Sallopat Mines, Rajasthan	NA
Do.	Pyrites Phosphates and Chemicals Ltd., 100%	Durmala and Maldeota underground mines, Uttar Pradesh	NA
Do.	Madhya Pradesh State Mining Corp. Ltd., Pradesh State Government, 100%	Hirapur and Khatamba Mines, Madhya Pradesh	NA
Do.	Rajasthan State Mines and Minerals Ltd., Rajasthan State Government, 100%	Jhamarkotra Mine, Rajasthan	NA
Do.	Hindustan Zinc Ltd., Indian Government, 100%	Maton Mine, Rajasthan	NA
Zinc	Binani Zinc Ltd., 100%	Binanipuram Smelter, Kerala	30
Do.	Hindustan Zinc Ltd., Indian Government, 100%	Chanderiya Smelter, Rajasthan	70
Do.	do.	Debari Smelter, Rajasthan	49
Do.	do.	Visakhapatnam (Vizag) Smelter, Andhra Pradesh	30

^{e/} Estimated. NA Not available.

1/ Scheduled for startup in 2002.

2/ Capacity of clusters of surface mines varies extremely, depending on demand. Estimated total capacity is 1.5 million metric tons per year.

3/ Estimated total annual phosphate rock capacity is 800,000 metric tons.