

# THE MINERAL INDUSTRY OF THE REPUBLIC OF KOREA

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The growth of gross domestic product was registered at 5.6% for 1997. Exports rebounded, especially in the electronics, steel, and petrochemical sectors. In the first 8 months of the year, the trade deficit was down by \$3.9 billion, to \$10.2 billion, bringing the overall current-account deficit to \$16 billion. Inflation averaged 4.2% during the same period (Far Eastern Economic Review, 1998a). Early in 1997, labor unrest cost the country's economy in lost output. Before the currency crisis in August, several of the country's conglomerates went bankrupt and loans in default at the banks, already vast, increased. In November, the exchange rate from the Korean won to the U.S. dollar fell to 990 to 1, and the stock markets plunged owing to a sluggish economy and an ongoing fear of more corporate bankruptcies.

The country asked the International Monetary Fund for a \$57 billion bailout. At yearend 1997, foreign debts of the overseas subsidiaries of Korean companies amounted to \$32.4 billion, bringing the country's overall external liabilities to \$187 billion. The Government-initiated austerity taxes could increase prices of liquefied petroleum gas and liquefied natural gas by between 4% and 7.6% in 1998. The Government launched an effort to help private financial institutions write off \$27 billion in bad loans (Far Eastern Economic Review, 1997).

The country continued its overseas investment in resources development and smelting projects. The state-backed Korea Resources Corp. helped arrange financing for overseas resources ventures and undertook exploration programs, including field surveys. Funding applications during 1997 involved coking coal, salt, and silica mine projects in Australia and Indonesia and rare earths in Vietnam.

The two-way trade between the Republic of Korea and North Korea rose by 4.6%, to \$250 million, in 1997. The Republic of Korea exported textiles and petrochemicals worth \$60 million, and North Korea shipped gold, minerals, and other commodities worth \$190 million (Far Eastern Economic Review, 1998b).

Daewoo Group signed a letter of intent with Vietnam Minerals Corp. to develop a large bauxite mine in Dak Lak Province, central Vietnam, and to build an alumina refinery to process the bauxite ore. In September, Daewoo and Korea Resources Corp. began a feasibility study on mine development. The total cost of the project was estimated to be \$1 billion. The alumina plant was expected to produce 1 million metric tons per year (Mt/yr) for export to Europe and Southeast Asia.

LG International Corp., a part of LG Group, was negotiating with Orissa Mining Corp. of India to establish a joint venture for the development of an alumina refinery in India. LG International would conduct a feasibility study on the production capacity, capital cost, and equity structure of the proposed project (Mining Journal, 1997a).

LG Metals Corp. produced 265,000 metric tons of copper cathode in 1997 from its Onsan and Changhang facilities, up 7% from the

previous year. The company used scrap and copper concentrates and some imported anode. It also produced 80 kilograms (kg) of gold and 250 kg of silver from copper concentrates in 1997. The company added 160,000 metric tons per year (t/yr) to smelting capacity at its Onsan plant, which would then have a total capacity of 400,000 t/yr.

LG Metals acquired a 19% stake in Condestable copper mine, 100 kilometers (km) south of Lima, Peru. The balance was retained by its original French and Peruvian owners. The mine produced around 24,000 t/yr of copper concentrates, and LG Metals planned to increase output by three or four times the current level by the year 2000, if the extent of reserves in the area around the existing mine were confirmed. LG Metals was negotiating with Afko Korea Inc., an overseas resources development company, to acquire a 51% interest in a gold project in Mali. Afko Korea's subsidiary in Mali, Afko Inc., was conducting a feasibility study on the project. Afko Korea also acquired concession rights to explore and develop a deposit in Chad geologically indicated to contain gold and uranium.

Samsung Corp. won a new tender offer for the assets of the Balkhashmys copper operations in Kazakstan. The complex consists of three mines, copper and molybdenum concentrators, and a copper smelter. The company planned to invest \$700 million between 1997 and 2000 to improve metallurgical equipment, develop ore deposits, and take steps to protect the environment (Mining Journal, 1997b); in 1997, some \$169 million had been spent. Copper production from the Balkhashmys complex fell during the last 2 years. Samsung's investment was aimed at restoring the plant's capacity to 200,000 t/yr by the year 2000.

Hyundai Corp. was interested in a copper smelter project in Chile. The company was considering building a 400,000-t/yr copper smelting complex at a cost of \$300 million to \$600 million. The other option was to form a joint venture to expand existing smelting facilities.

Total crude steel output in the country was 42.55 million metric tons (Mt) in 1997. Pohang Iron & Steel Co. Ltd. (Posco) produced 26.5 Mt of crude steel. Domestic demand for steel increased slightly to 37.93 Mt. Meanwhile, Hyundai Corp. shelved its plans to build an integrated steel mill with a capacity of 6 Mt/yr at Hadong, South Kyongsang Province. Startup of the mill was originally scheduled for 2002. The Government and Posco feared that the scheme would lead to a domestic oversupply of crude steel.

Posco signed a \$821.6 million deal to acquire several operations for production of steel bars and pipes from debt (\$1.25 billion) - ridden Sammi Steel, which went bankrupt in March. One of the operations was the Changwon mill near Pusan. The deal included two steel plants with a combined production capacity of 750,000 t/yr and royalties for steel technology developed by Sammi Steel. Sammi Steel would concentrate on producing specialty steel sheets and coils with a capacity of 250,000 t/yr at Ulsan. The two unprofitable North

American specialty steel operations, Sammi Atlas in Canada and Sammi Altech in the United States, were also subject to future negotiations.

Kia Steel Co. Ltd., a special steel producer, was placed under court protection with a debt of \$1.22 billion (Metal Bulletin, 1998). Merger talks between Kia Steel and Changwon Specialty Steel, part of Sammi Steel, were proceeding at yearend. Kia Steel had a production capacity of 720,000 t/yr of carbon, alloy, and stainless steel products.

Hanbo Steel Industry Co. collapsed under the weight of \$6 billion in debts in early 1997 (Journal of Commerce, 1997). The loans amounted to some 16 times its own working capital. The Government guaranteed the completion of its parent company's eight overseas construction projects totaling \$587 million in Indonesia, Jordan, Pakistan, the Philippines, and Russia. Meanwhile, Posco assumed temporary management control of Hanbo Steel, which had spent \$6.5 billion on the construction of its 2-Mt/yr steel plant in Tangjin using Corex technology. An additional \$2.3 billion was needed to complete the project, which included such infrastructure facilities as a harbor wharf and a power-generating plant. Posco teamed up with Dongkuk Steel Mill Co. to bid \$5 billion for Hanbo Steel's unfinished steel mill and facilities that produced hot coil and cold-rolled steel plates and plants that produced steel beams and hot-rolled steel plates.

Hwan Young Steel Industries Co., an electric steel producer, filed for rehabilitation because of financial difficulties beyond its control. The repercussions of its excess capital spending and China's decreased steel imports from the company were behind the financial problem. The company had steelmaking and rolling facilities at Asan.

Korea Nickel Corp., a subsidiary of Young Poong Group, planned to expand the production capacity of its nickel plant at Onsan from 35,000 to 55,000 t/yr. The company is a joint venture between Korea Zinc, Posco, and Inco of Canada. In another development, Daewoo Corp. took a 10% stake in Dominion Mining's Yakabindie nickel project, 450 km north of Kalgoorlie, western Australia. Movable reserves were estimated to be 184 Mt of 0.52% sulfide nickel ore (Metal Bulletin, 1997).

Korea Zinc started construction of its new 170,000-t/yr, \$750-million zinc smelter near Townsville in Queensland, Australia, in May. The project was targeted to come on-stream in 1999. Sources for the smelter would be BHP's Cannington Mine, Buka Minerals Ltd.'s Lady Loretta Mine, and MIM's Mount Isa Mine, all in Queensland. The company planned to double its production capacity and add a lead smelter to the operation in the future.

Hanil Cement Manufacturing Co. maintained an output rate of 190 metric tons per hour of cement at its Chungbuk cement plant. The plant started production in March 1996.

The country's only producer of titanium dioxide pigment, Hankook Titanium Industrial Co. Ltd., imported ilmenite feedstock from Malaysia and Thailand for its sulfate plant and produced single

anatase-grade pigment for markets throughout Southeast Asia. Startup of the U.S.-based E.I. du Pont de Nemours & Co.'s new 60,000-t/yr joint-venture titanium dioxide pigment plant with Hanyang Chemical Corp. was delayed for unknown reasons.

The Republic of Korea has five oil refineries with a combined distillation capacity of 2.4 million barrels per day, cracking capacity of 214,000 barrels per day (bbl/d), and desulfurization capacity of 115,000 bbl/d. Because of strong demand for light oil products, such as diesel, gasoline, kerosene, and naphtha, cracking capacity expansion of 73,000 bbl/d and desulfurization capacity expansion of 80,000 bbl/d were planned for 2000. The proposed expansion of oil-refining capacity would transform the country from a net importer to a significant exporter of light petroleum products. Yukong Ltd. and LG Caltex Corp. dominated the petroleum industry with a combined domestic share of 67% in sales. Yukong has a refining capacity of 810,000 bbl/d. Because of the economic crisis, Hanwha Group was in talks with an international oil company for the sale of its oil-refining unit, Hanwha Energy Co. Ltd. Foreign oil companies were also interested in Hyundai Oil Refinery Co., a unit of Hyundai Group.

Hyundai Corp. signed a deal with China National Petroleum Corp. for the latter to supply 15,000 bbl/d of crude oil from Daqing Oilfield in China. It was the first short-term contract to cover a period from March to December 1997.

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Ministry of Trade, Industry, and Energy  
1, Chungang-dong, Kwach on, Kyonggi, Seoul

## Major Publications

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Korea Energy Economics Institute, Seoul: Yearbook of Energy Statistics.

TABLE 1  
REPUBLIC OF KOREA: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

| Commodity                                 | 1993       | 1994       | 1995       | 1996          | 1997       |
|---|------------|------------|------------|---------------|------------|
| <b>METALS</b>                             |            |            |            |               |            |
| Bismuth, metal e/                         | 5          | --         | --         | --            | --         |
| Cadmium, smelter e/                       | 400        | 400        | 1,665 2/   | 501 r/ 2/     | 570        |
| Copper:                                   |            |            |            |               |            |
| Mine output, Cu content e/                | 5          | 5          | 31 2/      | 3 r/ 2/       | --         |
| Metal:                                    |            |            |            |               |            |
| Smelter e/                                | 220,000    | 224,000    | 223,000    | 225,000       | 225,000    |
| Refined, primary                          | 218,000 e/ | 244,169    | 234,895    | 246,305       | 265,426    |
| Gold, metal kilograms                     | 25,000 e/  | 12,332     | 13,418     | 14,096        | 14,872     |
| Iron and steel:                           |            |            |            |               |            |
| Iron ore and concentrate:                 |            |            |            |               |            |
| Gross weight thousand tons                | 219        | 191        | 184        | 221           | 296        |
| Fe content do.                            | 122        | 107        | 103        | 124           | 166        |
| Metal:                                    |            |            |            |               |            |
| Pig iron do.                              | 22,000 e/  | 21,169     | 22,344     | 23,010        | 22,712     |
| Ferroalloys:                              |            |            |            |               |            |
| Ferromanganese                            | 100,630    | 120,020    | 118,798    | 214,000 r/    | 238,000    |
| Ferosilicon                               | 55         | --         | --         | --            | --         |
| Ferosilicomanganese                       | 81,996     | 89,023     | 97,785     | 83,000 e/     | 83,000 e/  |
| Other                                     | 2,748      | 3,084      | 3,264      | 3,500 e/      | 3,300 e/   |
| Total                                     | 185,429    | 212,127    | 219,847    | 300,500 r/ e/ | 324,300 e/ |
| Steel, crude thousand tons                | 33,026     | 33,745     | 36,772     | 38,903        | 42,554     |
| Lead:                                     |            |            |            |               |            |
| Mine output, Pb content                   | 7,409      | 2,173      | 4,064      | 5,131         | 3,632      |
| Metal, smelter                            | 88,000 e/  | 86,457     | 129,744    | 88,556        | 121,296    |
| Molybdenum, mine output, Mo content e/    | --         | 2          | -- r/      | --            | --         |
| Silver, metal kilograms                   | 214,583    | 257,498    | 299,104    | 254,386       | 267,911    |
| Tungsten, mine output, W content          | -- r/      | --         | --         | --            | --         |
| Zinc:                                     |            |            |            |               |            |
| Mine output, Zn content                   | 13,808     | 7,122      | 7,747      | 8,384         | 8,992      |
| Metal, primary                            | 272,000 e/ | 271,110    | 279,335    | 286,526       | 335,488    |
| <b>INDUSTRIAL MINERALS</b>                |            |            |            |               |            |
| Asbestos e/                               | 2,200      | 2,000      | 1,800      | 1,500         | 1,500      |
| Barite                                    | --         | 85         | 90         | 80            | 105        |
| Cement, hydraulic thousand tons           | 47,313     | 50,730     | 55,130     | 57,260 r/     | 59,796     |
| Clays, kaolin                             | 2,328,921  | 2,675,485  | 2,792,139  | 2,501,600 r/  | 2,688,489  |
| Diatomaceous earth                        | 67,324     | 82,738     | 81,303     | 69,543        | 53,538     |
| Feldspar                                  | 321,964    | 319,658    | 367,578    | 319,112       | 341,018    |
| Fluorspar, metallurgical-grade            | 50         | -- r/      | -- r/      | -- r/         | 617        |
| Graphite, all types                       | 5,910      | 4,300      | 1,938      | 1,113         | 1,083      |
| Kyanite and related materials, andalusite | 18 r/      | -- r/      | -- r/      | -- r/         | --         |
| Mica, all grades                          | 7,500 e/   | 37,470     | 43,709     | 35,923        | 34,489     |
| Nitrogen, N content of ammonia            | 386,300 r/ | 573,900 r/ | 615,800 r/ | 599,100 r/    | 508,800    |
| Salt e/                                   | 750,000    | 760,000    | 770,000    | 770,000       | 770,000    |
| Soda ash, manufactured e/                 | 310,000    | 310,000    | 310,000    | 320,000 r/    | 320,000    |
| Stone, sand and gravel:                   |            |            |            |               |            |
| Limestone thousand tons                   | 76,886     | 82,809     | 84,280     | 84,740        | 88,937     |
| Quartzite do.                             | 2,510      | 2,360      | 2,701      | 2,814         | 2,478      |
| Sand, including glass sand do.            | 1,117      | 1,452      | 1,718      | 1,690         | 1,222      |
| Sulfur, byproduct: e/                     |            |            |            |               |            |
| Metallurgy do.                            | 263        | 250        | 255        | 260           | 265        |
| Petroleum do.                             | 200        | 200        | 200        | 200           | 200        |
| Total do.                                 | 463        | 450        | 455        | 460           | 465        |
| Talc and related materials:               |            |            |            |               |            |
| Pyrophyllite                              | 644,890    | 707,951    | 789,994    | 780,062       | 994,366    |
| Talc                                      | 53,923     | 35,340     | 29,364     | 19,066        | 25,751     |

See footnotes at end of table.

TABLE 1--Continued  
 REPUBLIC OF KOREA: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

| Commodity                                  | 1993                       | 1994    | 1995    | 1996       | 1997       |         |
|--|----------------------------|---------|---------|------------|------------|---------|
| <b>MINERAL FUELS AND RELATED MATERIALS</b> |                            |         |         |            |            |         |
| Carbon black                               | 300,133                    | 310,564 | 323,409 | 325,000 e/ | 330,000 e/ |         |
| Coal, anthracite                           | thousand tons              | 8,845   | 7,438   | 5,720      | 4,951 r/   | 4,514   |
| Coke e/                                    | do.                        | 5,800   | 5,700   | 5,700      | 5,800      | 5,700   |
| Fuel briquets, anthracite briquets e/      |                            | 12,000  | 11,000  | 13,000     | 12,000     | 13,000  |
| Petroleum refinery products: e/            |                            |         |         |            |            |         |
| Gasoline                                   | thousand 42-gallon barrels | 38,000  | 37,000  | 38,000     | 37,000     | 38,000  |
| Jet fuel                                   | do.                        | 9,800   | 9,800   | 9,800      | 9,900      | 9,900   |
| Kerosene                                   | do.                        | 29,000  | 30,000  | 30,000     | 31,000     | 31,000  |
| Distillate fuel oil                        | do.                        | 165,000 | 170,000 | 160,000    | 165,000    | 160,000 |
| Residual fuel oil                          | do.                        | 180,000 | 180,000 | 180,000    | 180,000    | 180,000 |
| Lubricants                                 | do.                        | 4,200   | 4,000   | 4,000      | 4,100      | 4,100   |
| Other                                      | do.                        | 17,000  | 18,000  | 19,000     | 19,000     | 20,000  |
| Refinery fuel and losses e/                | do.                        | 4,000   | 4,000   | 4,000      | 4,000      | 4,000   |
| Total e/                                   | do.                        | 447,000 | 452,800 | 444,800    | 450,000    | 447,000 |

e/ Estimated. r/ Revised.

1/ Table includes data available through June 5, 1998.

2/ Reported figure.

TABLE 2  
 REPUBLIC OF KOREA: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Thousand metric tons unless otherwise specified)

| Commodity         | Major operating companies and major equity owners   | Location of main facilities    | Annual capacity |     |
|-------------------|---|--------------------------------|-----------------|-----|
| Aluminum, primary | Aluminium of Korea Ltd.                             | Ulsan                          | 18              |     |
| Bismuth, metal    | metric tons   | Korea Tungsten Mining Co. Ltd. | Sangdong        | 135 |
| Cement            | Ssangyong Cement Industrial Co. Ltd.                | Yongwol                        | 11,500          |     |
| Do.               | Hanil Cement Manufacturing Co.                      | Chungbuk                       | NA              |     |
| Copper, metal     | LG Metals Corp.                                     | Changhang                      | 50              |     |
| Do.               | do.   | Onsan                          | 175             |     |
| Graphite          | Kaerion Graphite Ltd.                               | Kangwon                        | 25              |     |
| Do.               | Wolmyong Mining Co.                                 | do.                            | 26              |     |
| Lead, metal       | Korea Zinc Co. Ltd.                                 | Onsan                          | 135             |     |
| Nickel, metal     | Korea Nickel Corp.                                  | do.                            | 35              |     |
| Steel             | Pohang Iron and Steel Co. Ltd.<br>(Government, 35%) | Kwangyang                      | 11,400          |     |
| Do.               | do.   | Pohang                         | 9,400           |     |
| Talc              | Dongyang Talc Mining Co.                            | Chungju                        | NA              |     |
| Zinc, metal       | Korea Zinc Co. Ltd.                                 | Onsan                          | 200             |     |
| Do.               | Youngpoong Corp.                                    | Sukpo                          | 90              |     |

NA Not available.