



2013 Minerals Yearbook

REPUBLIC OF KOREA

THE MINERAL INDUSTRY OF THE REPUBLIC OF KOREA

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The Republic of Korea has reserves of the following metallic minerals: antimony, copper, gold, iron ore, lead, manganese, molybdenum, silver, tin, tungsten, and zinc. It also has regionally significant reserves of some industrial minerals, including limestone, silica stone (quartzite), talc, and zeolites. The country was primarily a consumer rather than a producer of ores and concentrates of ferrous and nonferrous metals, particularly copper, iron, lead, and zinc, and it satisfied the raw material requirements (mainly for metals and hydrocarbon products) of its manufacturing sector through imports. The Republic of Korea's role in the global mineral industry in 2013 was primarily as a provider of foreign direct investment (FDI) to finance joint-venture mining projects abroad.

Minerals in the National Economy

The year-on-year real rate of growth of the Republic of Korea's gross domestic product (GDP) in 2013 was 3.0% compared with 2.3% in 2012. The increased rate of growth was owing to increases in domestic and external demand. The value of the services and manufacturing sectors accounted for 59.1% and 31.1% of the GDP, respectively. Mining and quarrying activity accounted for just 0.2% of the GDP. In terms of its percentage share of the value of mineral production, limestone was by far the leading mineral commodity, accounting for 70.7% of the total, followed by silica stone (quartzite), 6.1%; iron ore, 2.5%; clays, 2.1%; and other mineral commodities, about 1% or less (Bank of Korea, 2014, p. 17, 21; Korea Institute of Geoscience and Mineral Resources, 2014a, p. 14).

The Export Import Bank of Korea (Korea Eximbank) provided services to Korean enterprises conducting international business. Korea Eximbank provided financing to Korean and (or) foreign companies with Korean equity shares that conducted exploration for, and development and production of, natural resources outside the country. In 2013, Korea Eximbank's commitments and disbursements to the natural resources sector amounted to \$4.4 billion. In December 2013, the bank provided \$1 billion worth of mixed direct loans and guarantees for development of the \$12 billion Roy Hill iron ore mining, rail, and port project in Western Australia, Australia. The project was owned by a consortium of investors, including POSCO Ltd. [formerly known as Pohang Iron and Steel Company Ltd. (12.5%)], which was majority owned by Hancock Prospecting Pty. Ltd. of Australia (Export Import Bank of Korea, 2014, p. 27).

In 2013, the Republic of Korea's outward FDI decreased to \$24.1 billion, or by 4.2% compared with that of 2012. The United States, Australia, and China combined received 43.5% of the total outward FDI. Investment in the manufacturing sector was the largest at \$9.5 billion followed by investment in the

mining sector, which was \$5.5 billion. The Republic of Korea invested \$1.7 billion in countries in the Oceania region, which accounted for the greatest share of the country's mineral sector investment. The Korea Eximbank projected a 98% increase in credit allocated to the natural resources sector in 2014 (Export Import Bank of Korea, 2014, p. 13, 27).

Government Policies and Programs

In 2013, the Ministry of Knowledge Economy (MKE) was renamed the Ministry of Trade, Industry, and Energy (MOTIE) and the administration of trade policy was transferred from the MKE to MOTIE. MOTIE's organization was the result of numerous structural reorganizations of Ministries that had taken place with the changing political administrations since the 1990s (Ministry of Trade, Industry, and Energy, 2014).

The MOTIE is the Government agency responsible for implementing the country's mineral laws and policies. The Korea Mining Act provides the basic guidelines for exploitation of the country's mineral resources. In 1967, the Government established the Korea Resources Corp. (KORES) to support the development of the domestic private-sector mineral industry, to conduct research, and to provide technical assistance for the acquisition and development of overseas mineral resources. KORES has foreign investments in 32 mineral projects in 16 countries; the projects include mining for coal (Australia), lithium and rare metals (Africa), and copper (Latin America) (Korea Resources Corp., 2014).

The Korea Institute of Geoscience and Mineral Resources (KIGAM) is the entity that developed from the Korean Geological Survey, which was founded in 1918. Divisions within KIGAM include the Geologic Environment Division, the Geological Research Division, the Mineral Resources Research Division, the Petroleum & Marine Research Division, and the R&D Tech-Biz Division (Korea Institute of Geoscience and Mineral Resources, 2014b).

Production

In 2013, the tonnage of mined and refined metals produced in the Republic of Korea generally increased compared with that of 2012. The mine output of iron ore (the leading mineral commodity produced) increased by 12% to 371,000 metric tons (t). The lead content of mined ore increased by 29% to 2,500 t in 2013, the silver content of mine production increased by 33% to 3,897 kilograms (kg), and the gold content of mine production increased by 23% to 413 kg. Primary refined lead production decreased by 19% to 227,700 t, but production of secondary refined lead increased by 11% to 200,000 t. Refined silver production was estimated to have increased by 28% to

3.2 million kilograms, whereas that of refined gold decreased by 10% to 44,366 kg. The production volume of individual industrial minerals was variable (table 1).

Structure of the Mineral Industry

The Republic of Korea's mining and quarrying sector mined small amounts of coal and ferrous and nonferrous metals and relatively larger amounts of industrial minerals. The mineral-processing sector, which consisted of the cement, ferrous and nonferrous metals, and refined petroleum industries, was, in terms of value and quantity of output, much larger than the mining and quarrying sector. Most of the mining, quarrying, and ferrous- and nonferrous-metal-processing companies were owned and operated privately and incorporated in the Republic of Korea. The larger coal mining, natural gas, petrochemical, and petroleum refining companies, however, were state owned (table 2).

Mineral Trade

The total value of the Republic of Korea's exports increased by 2.1% in 2013 compared with that of 2012 to \$559.6 billion primarily as a result of increased exports of semiconductors and wireless communication devices. Owing to dwindling fuel exports to Indonesia, the value of exports of refined petroleum products decreased by 5.9% in 2013, and exports of steel products decreased by 7.5% owing to excess global supply. In 2013, the total value of imports decreased by 0.8% to \$515.6 billion. The leading imported product to the Republic of Korea continued to be crude petroleum, which accounted for 19.3% of the total value of imports followed by chemicals, natural gas, and iron and steel products. In 2013, imports of natural gas increased by 7.3% owing to increased energy demand, but imports of crude petroleum and iron and steel products decreased by 8.3% and 6.7%, respectively. (Bank of Korea, 2014, p. 27–28; Korea Institute of Geoscience and Mineral Resources, 2014a, p. 6).

The Republic of Korea's share of exports in the global market was 3.0% in 2012 (the latest year for which data were available). The country was ranked seventh for trade totals in terms of value behind the United States, China, Germany, Japan, France, and the United Kingdom. The Republic of Korea's trade surplus in 2013 increased to \$44 billion from \$28.2 billion in 2012. The Republic of Korea recorded a trade surplus with Brazil, China, India, the Philippines, and the United States; it recorded a trade deficit with Australia, Germany, Japan, Saudi Arabia, and the United Arab Emirates. China replaced the United States as the leading recipient of the Republic of Korea's exports, and China replaced Japan as the leading provider of imports to the Republic of Korea (Statistics Korea, 2014, p. 94–96).

Commodity Review

Metals

Copper.—Production of mined copper had not been reported since 2010. The Republic of Korea relied on imports to meet the

raw material requirements for its copper refineries, which were located in Changhang and Onsan. In 2013, the country reported imports of about 1.7 million metric tons (Mt) of copper ore and concentrate and exports of about 11,200 t of refined copper. Chile was the leading supplier of imported copper ore and concentrate followed by Peru, Australia, and Indonesia; other countries also supplied copper to the Republic of Korea (Korea Institute of Geoscience and Mineral Resources, 2014a, p. 24).

Gold.—Mined production of gold increased by 23% in 2013, but gold production remained insignificant in the Republic of Korea. Nevertheless, demand for gold had been increasing in the country since 2009. In 2013, imports of refined gold increased to about 15.5 t from 12.6 t in 2012, 12.7 t in 2011, 12.0 t in 2010, and 10.9 t in 2009. Exports of refined metal decreased to 17.0 t in 2013 from 50 t in 2009. Hong Kong was the leading recipient of the Republic of Korea's refined gold exports in 2012 and 2013 followed by Singapore and Thailand. Given the strong increase in exports of semiconductors and decreased exports of refined gold, the increased demand for gold ore and concentrate appeared to have been from the manufacturing sector for the production of electronics. The production of refined gold in the Republic of Korea in recent years remained at less than 50% of the country's known capacity (Korea Institute of Geoscience and Mineral Resources, 2014a, p. 18–20).

Iron and Steel.—In 2013, domestic iron ore production was 663,000 t compared with domestic consumption of 63.9 Mt. Australia continued to be the leading source of iron ore and concentrate, followed by Brazil and Canada. The Republic of Korea produced about 66.1 Mt of crude steel in 2013, which was a decrease of 4% from that of 2012, and accounted for 4.1% of the global total in 2013. According to the International Steel Statistics Bureau, the Republic of Korea was the only major steel-producing country where production decreased in 2013 compared with that of 2012. According to the World Steel Association, POSCO was the world's sixth-ranked steel-producing company in 2013, producing 38.4 Mt of crude steel. The Republic of Korea was the world's third-ranked steel-importing country after the United States and the countries of the European Union; its steel imports decreased by 7.9% to 18.5 Mt from 19.9 Mt in 2012. The Republic of Korea was the second-ranked importer of ferrous scrap metal after Turkey; its imports of ferrous scrap metal decreased by 9% to 9.3 Mt in 2013 from 10.1 Mt in 2012 (table 1; Korea Institute of Geoscience and Mineral Resources, 2014a, p. 32–33; International Steel Statistics Bureau, 2015; World Steel Association, 2015).

Molybdenum.—The Moland molybdenum mine was wholly owned by NMC Resource Corp. of Canada. The mine processed 303,590 t of ore with a 0.28% MoS₂ average millhead grade and a recovery rate of 92% in 2013 compared with 285,419 t of ore with a 0.28% MoS₂ average millhead grade and a recovery rate of 92% in 2012. Commercial production at the mine began in 2010. Indicated resources at the mine were 1.7 Mt grading 0.35% molybdenite, and inferred resources were 2.1 Mt grading 0.32% molybdenite. No feasibility study had been conducted at the Moland Mine nor was one scheduled, as the profitability of expanding the known extent of the deposit and upgrading the resource estimates was in question. The company

planned to maintain operations while continuing exploration activities at the site (NMC Resource Corp., 2014, p. 3).

Industrial Minerals

Calcite, Dolomite, Limestone, and Marble.—The Republic of Korea met its demand for limestone resources of between 80 million and 90 million metric tons per year (Mt/yr) almost completely from domestic production. The country, however, did trade in quantities of limestone, including exports of 149,000 t and imports of 1.6 Mt in 2013. The majority of limestone imports came from Japan. In 2013, 75% of limestone production was consumed in the production of cement, 12.1% was consumed in the manufacture of iron and steel products, and the rest was consumed by manufacturing in the chemical industry and other unspecified uses. Japan was by far the leading recipient of calcareous minerals and stone from the Republic of Korea, followed by Taiwan and China. Japan imported between about 130,000 and 140,000 t of such products from 2011 through 2013. In 2013, the Republic of Korea exported 149,003 t of limestone and other calcareous minerals and stone valued at \$6.4 million compared with 144,513 t valued at \$6.2 million in 2012 (table 1; Korea Institute of Geoscience and Mineral Resources, 2014a, p. 32–36).

Mineral Fuels and Related Materials

Coal.—Consumption of anthracite coal ranged between 10 and 12 Mt/yr from 2009 through 2013. Production increased gradually during the same timeframe from a little more than 2 Mt/yr to about 2.5 Mt/yr. Coal imports consisted primarily of bituminous coal to meet domestic demand. About 25% of bituminous coal imports in 2013 consisted of coking coal, and the remainder was thermal coal. Australia was the leading supplier of coal (40%) to the Republic of Korea followed by Indonesia (29%), Russia (12%), Canada (10%), the United States (5%), China (2%), and other countries (2%). The value of coal production's contribution to the country's GDP had decreased gradually since the early 1990s and had not accounted for more than 0.13% in a given year since that time (Korea Institute of Geoscience and Mineral Resources, 2014a, p. 50, 52–53).

Outlook

The Republic of Korea's GDP is expected to continue to depend mainly on the exportation of manufactured products, and economic growth is expected to increase gradually in the near term provided that economic recovery in other countries with advanced economies continues to remain stable or increase. No known feasibility-stage metal mining projects were in operation in 2013, and the value and output of metal mining is expected to remain unchanged in the near to medium term. International demand for the Republic of Korea's manufactured products is expected to remain stable, and the country's global presence in the mining sector is expected to expand through acquisitions, FDI, and joint-venture agreements.

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TABLE 1
REPUBLIC OF KOREA: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity ²	2009	2010	2011	2012	2013
METALS					
Bismuth, metal	300	498	480	437	432
Cadmium, smelter	2,500	4,166	3,005	3,904	3,903
Copper:					
Mine output, Cu content	14	9	NA	NA	NA
Metal, refined, primary and secondary	531,701	564,600	595,447	593,500 ^r	586,000
Gold:					
Mine output, Au content kilograms	274	235	209	336	413
Metal, refined do.	53,210 ^r	57,316 ^r	50,833 ^r	49,362 ^r	44,366
Iron and steel:					
Iron ore and concentrate:					
Gross weight thousand metric tons	455	513	542	593	663
Fe content do.	255	287	303	332	371
Metal:					
Pig iron do.	27,284 ^r	36,065 ^r	42,213	41,734 ^r	41,045
Ferroalloys:					
Ferromanganese	216,400	286,259	355,047	364,800	365,000 ^c
Ferrosilicomanganese	151,100	120,779	195,650	184,700	185,000 ^c
Total	367,500	407,038	550,697	549,500	550,000 ^c
Steel, crude thousand metric tons	48,752	58,914	68,519	69,073	66,061
Lead:					
Mine output, Pb content	1,032 ^r	584 ^r	1,289 ^r	1,940 ^r	2,500
Metal, refined:					
Primary	216,918	197,900	256,851	280,000	227,700
Secondary	110,000	130,000	160,000	180,000	200,000
Molybdenum	NA	388	378	377	428
Nickel, ferronickel	21,609	20,512	19,011	20,858	28,100
Silver:					
Mine output, Ag content kilograms	NA	2,025	2,649	2,925	3,897
Metal do.	1,740,078	1,735,535	2,197,409	2,547,315	3,248,000 ^c
Zinc:					
Mine output, Zn content	2,221 ^r	385 ^r	343 ^r	1,434	1,749
Metal, primary	751,179	717,100	828,735	881,100 ^r	1,044,300
INDUSTRIAL MINERALS					
Calcite	1,305	1,435	1,880	2,025	1,095
Cement, hydraulic thousand metric tons	50,127	47,420	48,300	52,613 ^r	53,252
Clays, kaolin do.	659	764	799	515	600 ^c
Diatomaceous earth	2,440	2,200	5,150	6,000	34,000
Feldspar	622,700	496,511	384,221	360,413	343,241
Mica, all grades	27,078	36,486	31,260	25,594	25,143
Salt	382,270	222,509	372,230	308,847	421,259
Stone, sand and gravel:					
Dolomite thousand metric tons	2,383	2,567	2,697	2,474	2,610
Limestone do.	77,923 ^r	79,625 ^r	82,368 ^r	82,413 ^r	83,802
Marble do.	16	39	38	35	8
Quartzite do.	3,536	3,603	3,603	4,184	4,194
Sand, unspecified do.	65,266 ^r	51,745 ^r	57,826 ^r	57,593 ^r	46,912
Talc and related materials:					
Pyrophyllite	617,411	673,936	510,708	483,133	524,881
Talc	5,997	5,729	15,608	21,625	2,808
Zeolites	235,226	242,190	231,420	245,285	221,298

See footnotes at end of table.

TABLE 1—Continued
 REPUBLIC OF KOREA: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity ²	2009	2010	2011	2012	2013
MINERAL FUELS AND RELATED MATERIALS					
Carbon black ^e	500,000	500,000	500,000	500,000	500,000
Coal, anthracite thousand metric tons	2,519	2,084	2,250 ^{f, e}	2,519 ^f	2,500
Fuel briquets, anthracite briquets ^e do.	2,000	2,000	2,000	2,000	2,000
Petroleum, refinery products:					
Light distillates:					
Butane thousand 42-gallon barrels	18,600	14,500	14,200	13,500	13,900
Propane	10,100	10,600	11,100	124,000	120,000
Gasoline	109,500	107,400	122,400	136,700	135,900
Medium distillates:					
Jet fuel	102,900	107,700	120,900	130,900	129,700
Kerosene	35,100	39,400	37,400	31,800	30,700
Heavy distillates and residual products:					
Asphalt	28,500	29,500	24,700	25,700	30,000
Fuel oil	9,200	4,500	4,300	3,400	2,700
Residual oil	118,100	120,100	119,100	98,700	74,300
Total	432,000	433,700	454,100	564,700	537,200

^eEstimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. ^fRevised. do. Ditto. NA Not available.

¹Table includes data available through December 15, 2014.

²In addition to the commodities listed, Colombia also produced clays, coke, feldspar, gypsum, magnesite, phosphate rock, sand and gravel, secondary iron, semimanufactures, sulfur (as a byproduct of petroleum processing), thorium, and uranium, but available information is inadequate to make reliable estimates of output.

TABLE 2
REPUBLIC OF KOREA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Bismuth, metal	metric tons	Korea Zinc Co. Ltd.	Onsan refinery	500
Cadmium	do.	do.	do.	2,100
Do.	do.	Young Poong Corp.	Sukpo refinery	2,100
Cement		Ssangyong Cement Industrial Co. Ltd.	Plants at Tonghae, Kwang Yang, Munhyung, Pukpyong, and Yeongwol	15,040
Do.		Sung Shin Cement Manufacturing Co. Ltd.	Tanyang plant	13,700
Do.		Tong Yang Major Corp.	Plants at Pukpyong and Samchok	11,580
Do.		Lafarge Halla Cement Corp.	Plants at Kwang Yang and Okkye	9,500
Do.		Hyundai Cement Co. Ltd.	Plants at Tanyang and Yongwol	8,600
Do.		Hanil Cement Manufacturing Co.	Plants at Chungbuk and Tanyang	7,200
Do.		Asia Cement Manufacturing Co. Ltd.	Plants at Daegu and Jaechon	4,600
Coal		Korea Coal Corp.	Mines at Changsung, Dogae, and Hwasoon	2,500
Copper, metal, primary		Korea Zinc Co. Ltd.	Onsan	24
Do.		LS-Nikko Copper Inc.	Changhang	60
Do.		do.	Onsan	510
Gas, natural		Korea National Oil Corp.	Ulleung Basin	NA
Gold:				
In concentrate	kilograms	Hangum Co. Ltd.	Muguk Mine, Haenam, Jeonnam (South Cholla) Province	1,600
Refined	do.	Korea Zinc Co. Ltd.	Onsan	50,000
Do.	do.	LS-Nikko Copper Inc.	do.	60,000
Graphite		Kaerion Graphite Ltd.	Kangwon	NA
Do.		Wolmyong Mining Co.	do.	NA
Indium, metal	kilograms	Korea Zinc Co. Ltd.	do.	55,000
Iron ore		NA	Mines at Sinyemi, Gangwon Province	600
Lead, metal, primary		Korea Zinc Co. Ltd.	Kangwon	300
Magnesium		Pohang Iron and Steel Co. Ltd.	Magnesium refinery plant, Gangneung City, Gangwon Province	10
Do.		do.	Magnesium metal sheet plant, Suncheon City, Jeonnam (South Jeolla) Province	3
Molybdenum	metric tons	Korea Resources Corp. (KORES)	Mine at Uljin; Smelter at Yeosu, Jeonnam (South Jeolla) Province	6,000
Do.	do.	NMC Resource Corp.	Moland Mine, at Daejang-ri, Geumseongmyeon, Jecheon-si, Chungcheongbuk-do District	900
Nickel:				
Ferronickel		Pohang Iron and Steel Co. Ltd.	Gwangyang ferronickel plant	30
Metal		Korea Nickel Corp.	Onsan nickel refinery	48
Petroleum, refinery products	thousand 42-gallon barrels per day	SK Corp.	Ulsan	817
Do.	do.	LG-Caltex Corp.	Yocheon (Yosu)	650
Do.	do.	Hyundai Oil Refinery Co.	Daesan and Incheon	589
Do.	do.	S-Oil Corp.	Onsan	520
Pyrophyllite		NA	Wan-Do, Sungsan, Hwansan, Okmesan, Dae-Do, and Chin-Do Mines in Haenam	446
Do.		NA	Nilyang, Yangsan, Kimhae, Pusan, and Kyong-Nam Mines in Dong-Nae	446
Silver:				
In concentrate	kilograms	Hangum Co. Ltd.	Haenam, Jeonnam (South Cholla) Province	3,700
Refined	metric tons	Korea Zinc Co. Ltd.	Onsan	1,700
Do.	do.	LS-Nikko Copper Inc.	do.	370

See footnotes at end of table.

TABLE 2—Continued
 REPUBLIC OF KOREA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Steel, crude	POSCO Ltd.	Kwangyang (Gwangyang) Works	15,000
Do.	do.	Pohang Works	17,400
Do.	Hyundai Steel Co. Ltd.	Inchon Plant	4,800
Do.	do.	Pohang Plant	3,200
Do.	do.	Dangjin Plant	23,000
Do.	Dongkuk Steel Mill Co. Ltd.	Inchon Works	1,450
Do.	do.	Pohang Works	3,600
Do.	Korea Iron and Steel Co. Ltd.	Masan and Changwon Works	1,200
Talc	IL Shin Industrial Co. Ltd.	Choong Ju, Chungbuk Province	160
Do.	Korea Zinc Co. Ltd.	Onsan	430
Do.	Young Poong Corp.	Sukpo	280
Zinc	Korea Zinc Co. Ltd.	Onsan refinery	560
Do.	Young Poong Corp.	Sukpo refinery	303

Do., do. Ditto. NA Not available.