



2017–2018 Minerals Yearbook

NORTH KOREA [ADVANCE RELEASE]

THE MINERAL INDUSTRY OF NORTH KOREA

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Note: In this chapter, information for 2017 is followed by information for 2018.

North Korea hosts various mineral resources, such as metallic minerals (copper, gold, iron, lead, manganese, molybdenum, nickel, silver, tantalum, tungsten, and zinc), industrial minerals (graphite, limestone, magnesite, phosphate rock, and rare earths), and mineral fuels and related materials (coal and uranium). Mineral production in North Korea was insignificant compared with the country's reserves, however, owing to its limited infrastructure, technology, and investment. In 2017, North Korea was estimated to account for about 1% of global magnesite production (excluding U.S. production) and for significant magnesite reserves. The country's mineral reserves could not be verified by outside sources owing to the confidential nature of the Government information and the country's own system of classifying reserves that did not consider economic viability (Lee, 2017, p. 263, 264, 271; Bray, 2019).

Minerals in the National Economy

The mineral industry remained important to North Korea's economy. In 2017, the country's real gross domestic product (GDP) decreased by 3.5%, which was attributed mostly to decreases in the output of the mining sector (by 11%, owing mainly to a decrease in coal production); manufacturing sector (6.9%); construction sector (4.4%); and electricity, gas, and water supply sector (2.9%). In 2017, the mining sector accounted for 11.7% of the country's nominal GDP, which was \$32.2 billion;¹ the manufacturing sector, 20.1%; and the construction sector, 8.6% (Bank of Korea, 2019).

North Korea's exports in 2017 decreased in value by 37% to \$1.77 billion from \$2.82 billion in 2016. Major mineral exports included mineral fuels (valued at \$414 million); ores, slag, and ash (\$188 million); iron and steel (\$75 million); salt, sulfur, stone, plaster, lime, and cement (\$44 million); and inorganic chemical and compounds of precious metals and rare-earth metals (\$7.5 million). Of North Korea's mineral exports, China received nearly 100% of mineral fuels; 99% of ores, slag, and ash; 79% of iron and steel; and 44% of inorganic chemical and compounds of precious metals and rare-earth metals (Statistics Korea, 2018, p. 126–129, 130–135).

North Korea's imports totaled \$3.78 billion in 2017, which was an increase from the total value of \$3.71 billion in 2016. Major mineral imports included mineral fuels (valued at \$412 million); iron and steel (\$86 million); inorganic chemical and compounds of precious metals and rare-earth metals (\$26 million); nonmetallic minerals (\$6 million); and ores, slag, and ash (\$5 million). Of North Korea's mineral imports,

¹North Korea's GDP was estimated from the prices and value-added ratios of the Republic of Korea (Bank of Korea, 2019). Values have been converted from Republic of Korea won (KRW) to U.S. dollars (US\$) at the rate of KRW1,130=US\$1.00 for 2017 and KRW1,101=US\$1.00 for 2018.

China supplied 99% of iron and steel; 98% of inorganic chemical and compounds of precious metals and rare-earth metals; and 85% of mineral fuels (Statistics Korea, 2018, p. 126–129, 130–135).

North Korea's mineral industry was dominated by coal and iron ore mining. In 2016 (the latest year for which data were available), there were 728 mines in North Korea—260 metal mines, 241 coal mines, and 227 industrial mineral mines. These mines employed a total of 1,093,700 people. According to Korea Resources Corp. (KORES), which is owned by the Government of the Republic of Korea, the operation rate of North Korea's open mines was estimated to be about 20% of mining capacity based on satellite images (Yonhap News, 2016; Lee, 2018, p. 7).

The mineral resources law (Act No. 14 of 1993 and Amendment Act No. 2979 of 2013) provides the basic guidelines for the country's mineral exploration, development, use, and reserves estimation. Coal-mining activities (exploration, development, production, supply, and use) are subject to the country's coal law (Act No. 3044 of 2009 and Amendment Act No. 2052 of 2012). Developing and producing coal from small-scale mines (for local use only) is governed by Act No. 256 of 2014. Sea-salt activities are governed by Act No. 255 of 2014 (Democratic People's Republic of Korea, 2016, p. 198, 199, 242–248, 254–260; National Intelligence Service, 2017, p. 647, 655).

KORES designated five minerals as key minerals for cooperative work with North Korea: anthracite (in Pyongan Province), iron (in Hwanghae Province), lead-zinc (in the Tancheon area), limestone (in Pyongan and Hwanghae Provinces), and magnesite (in the Tancheon area). The Republic of Korea was expecting to participate in developing deposits of these minerals when North Korea opens its economy in the future (Lee, 2018, p. 11).

Production

In 2017, North Korea's production of mined tungsten increased by an estimated 520%; and mined iron, by about 10% compared with that of 2016. The production of mined copper decreased by an estimated 60%; mined zinc and silver, an estimated 33% each; anthracite and bituminous² coal, 30% each; smelted zinc, an estimated 25%; mined lead, an estimated 17%; and raw steel, 11%. Data on mineral production are in table 1.

Structure of the Mineral Industry

Mining and mineral enterprises in North Korea were primarily owned and operated by the Central Government. The Ministry of Atomic Energy Industry managed the country's nuclear

²Lignite is referred to as bituminous coal in North Korea (Korea Resources Corp., 2011, p. 5).

program; the Ministry of Chemical Industry, salt; the Ministry of Coal Industry, coal mines; the Ministry of Construction and Building-Materials Industry, cement; the Ministry of Metallurgical Industry, iron ore and magnesite mines; the Ministry of Oil Industry, petroleum; and the Ministry of Mining Industry, all other mines. The Ministry of State Natural Resources Development was also engaged in the exploration for mineral resources (Park and others, 2018, p. 103–104).

Since 2004, Chinese and other foreign companies had signed a total of 40 contracts to develop and operate facilities in North Korea, including gold deposits (10 mining sites), iron deposits (9), coal deposits (9), copper deposits (5), and other mineral deposits (7). Of these 40 contracts, only 10 mines were considered active as of 2017 (Lee, 2018, p. 9). Table 2 is a list of major mineral industry facilities.

Commodity Review

Metals

Iron Ore.—In 2017, North Korea produced 5.74 million metric tons (Mt) of iron ore and 250,000 metric tons (t) of pig iron. The country exported 1.66 Mt of iron ore (an increase of 1.3% compared with that of 2016) and 133,500 t of pig iron (an increase of 16.5%) to China (table 1; Information System for Resources of North Korea, 2018).

The open pit Musan Mine in North Hamgyong Province was North Korea's largest iron mine; it had a reserve base³ of 1.3 billion metric tons of magnetite at a grade of 24% iron. The mine had a production capacity of 11 million metric tons per year of iron ore. The actual mining operation rate was about 20% to 30% of its mining capacity owing to outdated infrastructure and power shortages. Iron concentrates from the mine were supplied to the Kim Chaek Iron and Steel Complex in North Hamgyong Province (Korea Resources Corp., 2011, p. 230, 232, 240; Lee, 2018, p. 7).

Rare Earths.—North Korea exported 25 t of rare-earth ore to China in 2013; 63 t in 2014; and 1 t in 2015. No official exports in 2016 and 2017 were reported. The Ryongpo Mine in Jongju, North Pyongan Province, and the Cheolsan Mine in Cheolsan, Pyongan Province, were known as the major rare-earth mines in North Korea. Most rare earths in North Korea occur in placer deposits. The country's annual production of rare earths was not reported (Koh and others, 2013; Information System for Resources of North Korea, 2018).

In 2013, SRE Minerals Ltd. of the British Virgin Islands formed a joint-venture company (Pacific Century Rare Earth Mineral Ltd.) with state-owned Korea Natural Resource Trading Corp. to explore and develop Jongju's rare-earth deposits. Since then, however, no further information had been reported (Schearf, 2014; Seoul Economic Daily, 2018).

The Convergent Research Center for Development of Mineral Research (DMR) of the Republic of Korea was established in 2015. The DMR has been developing beneficiation processes to try to extract rare-earth elements and magnesium metal from

North Korea's monazite and magnesite deposits, respectively (Convergent Research Center for Development of Mineral Research, 2017).

Industrial Minerals

Cement.—LafargeHolcim Ltd. of Switzerland sold a 36% stake in Pyongyang's Sangwon Cement Joint Venture in August 2017. Previously, in 2007, Orascom Cement of Egypt had acquired a 50% stake in Sangwon Cement for \$115 million. Lafarge S.A. of France acquired the stake as part of its 2008 purchase of Orascom Cement. Lafarge merged with Switzerland's Holcim in 2015 (Wu, 2009; North Korean Economy Watch, 2015; Global Cement, 2017).

Magnesite.—In 2017, North Korea mined 380,000 t (estimated) of magnesite. The country exported 176,600 t of magnesite and (or) magnesia to China compared with 146,900 t exported to China in 2016 (table 1; Information System for Resources of North Korea, 2018).

The Ryongyang Mine in Tancheon, South Hamgyong Province—the largest magnesite mine in North Korea—had a magnesite reserve base of 600 Mt at a grade of 45.82% magnesium oxide (MgO). The Daeheung Youth Hero Mine (in Tancheon) had a reserve base of 600 Mt at a grade of 46.77% MgO. The Ssang-ryong Mine (in Kim Chaek) had a reserve base of 80 Mt at a grade of 45.5% MgO. Mined magnesites were transported by railway to the Tancheon Magnesia plant and to the Sungjin Refractory plant (in Kim Chaek), respectively (table 2; Korea Resources Corp., 2011, p. 500–520; Convergent Research Center for Development of Mineral Research, 2017).

Mineral Fuels

Coal.—In 2017, North Korea's production of anthracite and bituminous (mainly lignite, in practice) coal each decreased by 30%, to 15.2 Mt and to 6.5 Mt, respectively. The country exported 4.8 Mt of coal (undifferentiated) to China, which was a decrease from the 22.5 Mt exported to China in 2016. The decrease in exports of coal was attributed to sanctions imposed through U.N. Security Council resolution 2321 in November 2016 after the country's nuclear test, and resolution 2371 in August 2017 after a missile test. Between April and October 2017, North Korea exported 33,028 t of anthracite coal to the Republic of Korea through ports in Russia. The Republic of Korea prosecuted three private companies for the illegal imports, which were in violation of the U.N. sanctions imposed in 2017 (Information System for Resources of North Korea, 2018; Korea Joongang Daily, 2018; VOA News, 2018).

MINERAL INDUSTRY HIGHLIGHTS IN 2018

North Korea's real GDP decreased by 4.1% in 2018, which was the greatest decrease since 1997 (6.5%). The decrease in real GDP was attributed to decreases in the value added of mining (17.8%), manufacturing (9.1%), and construction (4.4%) sectors. The value added of the electricity, gas, and water supply sector increased by 5.7% owing to an increase in thermal and hydroelectric power generation. The nominal GDP was \$32.4 billion in 2018. The contribution of manufacturing to

³Includes economic reserves, marginally economic reserves, and subeconomic resources; the "reserve base" is larger than "reserves" of either the Joint Ore Reserves Committee (JORC) or National Instrument (NI) 43–101 codes.

the GDP decreased to 18.8% in 2018 from 20.1% in 2017. The contribution of mining to the GDP decreased to 10.6% in 2018 from 11.7% in 2017 (Bank of Korea, 2019).

North Korea's exports and imports were valued at \$243 million in 2018 (a decrease from \$1.77 billion in 2017) and \$2.6 billion (a decrease from \$3.78 billion in 2017), respectively. The decrease in exports likely was due to an actual decrease and (or) to reporting omissions of trading partner(s), which was driven by the tighter U.N. sanctions (UN resolution 2375 in September 2017 and resolution 2397 in December 2017) (Statistics Korea, 2019, p. 128; United Nations Security Council, 2019).

In 2018, major mineral exports included iron and steel (valued at \$33 million); ores, slag, and ash (\$25 million); mineral fuels (\$13 million); salt, sulfur, stone, plaster, lime, and cement (\$11 million); and inorganic chemical and compounds of precious metals and rare-earth metals (\$4 million). Of North Korea's exports, China received 100% of ores, slag, and ash; 99.9% of salt, sulfur, stone, plaster, lime, and cement; 96% of iron and steel; 88% of mineral fuels; and 83% of inorganic chemical and compounds of precious metals and rare-earth metals (Statistics Korea, 2019, p. 128–136).

In 2018, North Korea's production of mined tungsten increased by 355%. The production increases for tungsten in 2017 and 2018 likely were in response to increased demand for exports to China; North Korea could increase production and export of tungsten because it had not been sanctioned by the United Nations. Major decreases in production included that of magnesite (by 82%); iron ore (43%); zinc (smelter output, 33%); raw steel (26%); coke (metallurgical, 26%); bituminous coal (mainly lignite, in practice, 17%); anthracite coal (16%); cement (15%); and mined lead (14%). Data on mineral production are in table 1.

Outlook

In the short and medium terms, the 2017 U.N. sanctions on North Korea's trade will continue to lead to reductions in North Korea's output of major minerals, such as coal, copper concentrate, and iron ore. To make up for reduced exports of other commodities, North Korea is expected to increase production and exports of tungsten, which was not sanctioned by the United Nations, as China's domestic demand remains stable or increases. Before any significant improvement in the political situation, the mineral industry will continue to face challenges owing to the lack of infrastructure, technology, and investment in the long term.

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TABLE 1
NORTH KOREA: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons, gross weight, unless otherwise specified)

Commodity ²	2014	2015	2016	2017	2018	
METALS						
Cadmium, smelter ^c	200	200	200	200	200	
Copper: ^c						
Mine, concentrates, Cu content	19,300	20,000	25,000 ^r	10,000	10,000	
Smelter:						
Primary	10,000	10,000	10,000	10,000	10,000	
Secondary	5,000	5,000	5,000	5,000	5,000	
Refinery:						
Primary	10,000	10,000	10,000	10,000	10,000	
Secondary	5,000	5,000	5,000	5,000	5,000	
Gold, mine, Au content	kilograms	2,000	2,000	1,000 ^r	1,000	1,000 ^c
Iron ore, mine:						
Gross weight	thousand metric tons	5,470 ^r	4,910 ^r	5,250 ^r	5,740	3,280
Fe content	do.	3,390 ^r	3,040 ^r	3,250 ^r	3,560	2,030
Iron and steel:						
Pig iron ^c	do.	250	250	250	250	250
Raw steel	do.	1,220	1,079 ^r	1,220	1,090	810
Lead: ^c						
Mine, Pb content		30,000 ^r	35,000 ^r	42,000 ^r	35,000	30,000
Refinery, primary		3,000 ^r	1,000 ^r	2,000 ^r	2,000	2,000
Silver, mine, Ag content ^c	kilograms	50,000	50,300	30,000 ^r	20,000	20,000
Tungsten, mine, concentrate, W content ^c		70	70	50	310	1,410
Zinc: ^c						
Mine, Zn content		32,000	26,000	30,000	20,000	20,000
Smelter, primary and secondary		30,000	20,000	20,000	15,000	10,000
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand metric tons	6,680 ^r	6,700	7,080 ^r	6,840	5,830
Graphite: ^c						
Amorphous		1,000	1,000	1,000	1,000	1,080
Crystalline flake		4,500	4,500	4,500	4,500	4,920
Magnesite ^c		400,000 ^r	320,000 ^r	350,000 ^r	380,000	70,000
Salt, sea salt ^c		70,000 ^r	70,000 ^r	100,000 ^r	100,000	100,000
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Anthracite	thousand metric tons	12,200	12,400	21,700 ^r	15,200	12,700
Bituminous ³	do.	11,400	11,600	9,320 ^r	6,500	5,420
Coke, metallurgical	do.	197 ^r	174 ^r	185 ^r	176	131 ^c

^cEstimated. ^rRevised. do. Ditto.

¹Table includes data available through December 17, 2019. All data are reported unless otherwise noted. Estimated data are rounded to no more than three significant digits.

²In addition to the commodities listed, ferrosilicon, nitrogen, petroleum products, phosphate rock, rare-earth, sand and gravel, silica, stone, and sulfur may have been produced, but available information was inadequate to make reliable estimates of output.

³Lignite is referred to as bituminous coal in North Korea.

TABLE 2
NORTH KOREA: STRUCTURE OF THE MINERAL INDUSTRY IN 2018

(Thousand metric tons unless otherwise specified)

Commodity	Facilities, major operating companies, and major equity owners		Location of main facilities	Annual capacity ^e
Cement	Cheonnaeri Cement Factory		Cheonnaeri County, Gangwon Province	1,000
Do.	Gomusan Cement Factory		Chongjin, North Hamgyong Province	2,000
Do.	Sangwon Cement Complex		Sangwon County, Pyongyang	2,000
Do.	Sunchon Cement Complex		Sunchon, South Pyongan Province	3,000
Coal:				
Anthracite	Duckcheon Coal Mining Complex (Ministry of Coal Industry)		Six major mines, Duckcheon, South Pyongan Province	4,000
Do.	Gangdong Coal Mining Complex (Ministry of Coal Industry)		Mines of Gangdong Youth, Pyongyang	3,000
Do.	Hamnam Coal Mining Complex (Ministry of Coal Industry)		Mines of 12.16, Dungeon, and Gowon, South Hamgyong Province	2,500
Do.	Kujang Coal Mining Complex (Ministry of Coal Industry)		Mines of Ryong-deung and Ryong-moon, North Pyongan Province	2,000
Do.	Sunchon Coal Mining Complex (Ministry of Coal Industry)		Mines of 2.8 Jikdong Youth, Chunsung Youth, Sinchang Youth, and Ryong-dae, South Pyongan Province	4,500
Lignite	Anju Coal Mining Complex (Ministry of Coal Industry)		Mines of Chungnam and Hwa-poong, Chungnam, South Pyongan Province	3,800
Do.	Saebyol Coal Mining Complex (Ministry of Coal Industry) and Northern Coal Mine Enterprise		Mines of Gogunwon, Ryongbuk Youth, 6.13, and Suksung, North Hamgyong Province	3,700
Copper, mine, Cu content	Hye-Joong Mineral Industry (Wanxiang Industrial Group, 51%, and Hyesan Youth Copper Mine, 49%)		Hyesan Youth Copper Mine, Ryanggang Province	15
Gold, mine, Au content	kilograms	Kumgang Corp. (Ministry of Mining Industry)	Soncheon Mine, Soncheon County, North Pyongan Province	3,000
Do.	do.	Ministry of Mining Industry	Unsan Mine, Unsan County, North Pyongan Province	2,600
Do.	do.	do.	Sungheung Mine, Hoechang County, North Pyongan Province	2,000
Do.	do.	do.	Daeyoudong Mine, Tongchang County, North Pyongan Province	1,000
Do.	do.	Workers' Party Bureau 39	Daebong Mine, Hyesan, Ryanggang Province	300
Graphite:				
Amorphous	Ministry of Metallurgical Industry		Wonri Mine, Gaecheon, South Pyongan Province	1
Crystalline flake	Kwangmyongsong General Corp.		Jeongchon Mine, Yon-an County, South Hwanghae Province	3
Do.	Ministry of Metallurgical Industry		Heungsan Mine, Chungdan County, South Hwanghae Province	2
Iron ore:				
Concentrate	do.		Dukhyun Mine, Uiju, North Pyongan Province	700
Ore	do.		Musan Mining Complex, North Hamgyong Province	11,000
Do.	do.		Eun-ryul Mine, Eun-ryul County, South Hwanghae Province	1,600

See footnotes at end of table.

TABLE 2—Continued
NORTH KOREA: STRUCTURE OF THE MINERAL INDUSTRY IN 2018

(Thousand metric tons unless otherwise specified)

Commodity	Facilities, major operating companies, and major equity owners		Location of main facilities	Annual capacity ^e
Lead:				
Concentrate	General Bureau of the Tancheon Area Mining Industry (Ministry of Mining Industry)		Komduck Mine, Tancheon, South Hamgyong Province	32
Do.	Ministry of Mining Industry		Eunpa Mine, Eunpa County, North Hwanghae Province	26
Do.	do.		Seongcheon Mine, South Pyongan Province	8
Refined	Ministry of Metallurgical Industry		Moonpyong refinery, Mooncheon, Gangwon Province	32
Magnesia clinker	General Bureau of the Tancheon Area Mining Industry (Ministry of Mining Industry)		Sungjin Refractory plant, Kim Chaek, North Hamgyong Province	300
Do.	do.		Tancheon Magnesite plant, Tancheon, South Hamgyong Province	2,000
Magnesite:				
Concentrate	do.		Ryongyang Mine, Tancheon, South Hamgyong Province	300
Do.	do.		Ssang-ryong Mine, Kim Chaek, North Hamgyong Province	NA
Do.	Chosun Seungli Trading Co. (Ministry of Mining Industry)		Namgye Mine and Saeng-jang Mine, Ryanggang Province	NA
Ore	General Bureau of the Tancheon Area Mining Industry (Ministry of Mining Industry)		Daheung Youth Hero Mine, Tancheon, South Hamgyong Province	NA
Phosphate rock	Ministry of Mining Industry		Ssang-ryong Mine, Kim Chaek, North Hamgyong Province	NA
Salt, sea salt	Ministry of Chemical Industry		Guisung saltern, Oncheon County, South Pyongan Province	30
Do.	do.		Kwangryang-man saltern, Oncheon County, South Pyongan Province	NA
Do.	do.		Mamyang saltern, Sukcheon County, South Pyongan Province	NA
Do.	do.		Kwangmyongsong saltern, Kumya County, South Hamgyong Province	NA
Silver, mine, Ag content	kilograms	Ministry of Mining Industry	Sungheung Mine, Hoechang County North Pyongan Province	6,500
Do.	do.	do.	Unsan Mine, Unsan County, North Pyongan Province	6,300
Do.	do.	do.	Daeyoung Mine, Tongchang County, North Pyongan Province	1,400
Steel, raw	Ministry of Metallurgical Industry		Kim Chaek Iron and Steel Complex, Chongjin, North Hamgyong Province	2,400
Do.	do.		Hwanghae Iron Works, Songrim, North Hwanghae Province	1,500
Do.	do.		Chollima Steel Works (formerly Kangson Works), Namu District, South Pyongan Province	750
Do.	do.		September (formerly Dukhyun) Iron and Steel Complex, Uiju, North Pyongan Province	700
Tungsten, concentrate, WO ₃ content	Ministry of Mining Industry		Man-nyon Mine, Sinpyong County, North Hwanghae Province	4

See footnotes at end of table.

TABLE 2—Continued
 NORTH KOREA: STRUCTURE OF THE MINERAL INDUSTRY IN 2018

(Thousand metric tons unless otherwise specified)

Commodity	Facilities, major operating companies, and major equity owners	Location of main facilities	Annual capacity ^c
<i>Zinc:</i>			
Concentrate	General Bureau of the Tancheon Area Mining Industry (Ministry of Mining Industry)	Komduck Mine, Tancheon, South Hamgyong Province	200
Do.	Ministry of Mining Industry	Eunpa Mine, Eunpa County, North Hwanghae Province	33
Do.	do.	Seongcheon Mine, Jangrim Workers District, South Pyongan Province	10
Refined	General Bureau of the Tancheon Area Mining Industry (Ministry of Mining Industry)	Tancheon Zinc refinery, Tancheon, South Hamgyong Province	100
Do.	Ministry of Metallurgical Industry	Moonpyong refinery, Mooncheon, Gangwon Province	110

^cEstimated; estimated data are rounded to no more than three significant digits. Do., do. Ditto. NA Not available