



# 2013 Minerals Yearbook

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## NORTH KOREA

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# THE MINERAL INDUSTRY OF NORTH KOREA

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From its founding in 1945 until the dissolution of the Soviet Union in 1991, North Korea relied upon the Soviet Union for investment and financial aid for most of its major economic development projects. Mine production generally increased until 1990, but after that time, foreign investment in North Korea's infrastructure diminished, and supplies of equipment, materials, and energy also decreased. A major reason for the decline was that the newly organized Russian Federation strengthened its relations with the Republic of Korea and supplied less funding to North Korea, in large part because North Korea had failed to repay most of its loans from the Soviet Union.

In the 2000s, the value of bilateral trade between North Korea and Russia fluctuated, but was about \$100 million per year, which was a small fraction of the Soviet-era level of trade and far less than the value of the country's bilateral trade with China and the Republic of Korea, which were its main post-Soviet-era trading partners. Although the total value of trade (exports and imports) between North Korea and Russia increased to \$122 million, or by 66%, in 2013 compared with that of 2012, the total value of North Korea's trade with China and the Republic of Korea was \$6.5 billion and \$1.1 billion, respectively. In 2012, Russia wrote off about 90% of North Korea's debt, which was then about \$11 billion. The two countries signed an agreement in early 2014 aimed at increasing bilateral trade to \$1 billion by 2020 (Economist, The, 2014).

North Korea's primary role in the mineral industry was that of a supplier of some minerals in raw form (ores and concentrates). Mining facilities were operating at between 30% and 50% below capacity. In terms of metals, North Korea has reserves of copper, gold, iron ore, lead, magnesium, nickel, tungsten, and zinc. North Korea is thought to have sizable deposits of graphite, limestone, and magnesite. The country's industrial minerals include such rare-earth-element (REE)-bearing minerals (and the main REEs derived from them) as monazite (cerium and neodymium), bastnasite (primarily cerium), and britholite (cerium) and secondary minerals, including cerite (cerium), fergusonite (primarily yttrium), and gadolinite (cerium, lanthanum, neodymium, and yttrium) (Industrial Minerals, 2013).

## Minerals in the National Economy

North Korea's year-on-year real gross domestic product (GDP) rate of growth increased by 1.1% in 2013 compared with 1.3% in 2012. The mining and manufacturing sectors combined accounted for 35.7% of the country's GDP in 2013 compared with 35.9% in 2012, and the mining sector alone accounted for 13.6% of the GDP in 2013 compared with 14% in 2012. The annual value of mining output in 2013 increased by 2.1% owing to increased production of coal and iron ore. The value of heavy industrial and chemical manufacturing, which included the fabrication of metal products, decreased by 1.0% in 2013 (Bank of Korea, 2014, p. 1–4).

## Government Policies and Programs

The Government of North Korea and the Government of the Republic of Korea agreed to reopen the Kaesong Industrial Complex (KIC), which is a joint-venture manufacturing park located a few kilometers north of the Demilitarized Zone that divides the two countries. Business at the complex was halted in April 2013 owing to escalated political tensions. Although the KIC was not closely related to the mineral industry, about \$2.0 billion worth of goods had been produced by the KIC's 123 companies since the opening of the facility in 2005. Business at Kaesong was a source of currency for the North Korea Government. North Korean workers at Kaesong earned an average of \$134 per month, of which 45% was directed to the Government in the form of taxes (Kwon, 2013).

## Production

North Korea's mineral production included coal, copper, graphite, iron ore, lead, limestone, magnesite, salt, tungsten, and zinc. Production of processed minerals included cadmium, cement, coke, refined copper, ferroalloys, refined lead, nitrogen fertilizer materials, pig iron, crude steel, and refined zinc (table 1).

## Structure of the Mineral Industry

North Korea's mineral industry included a coal mining sector, a ferrous and nonferrous metals mining and processing sector, and an industrial minerals mining and processing sector. Most of the large-scale mining and mineral processing enterprises in North Korea were owned and operated by the Central Government. Provincial and local governments owned and operated various small- and medium-scale mining and mineral-processing facilities. Companies from China, the Republic of Korea, and other countries participated in joint ventures with North Korea for the development and operation of the cement, coal, copper, graphite, iron ore, lead, magnesite, molybdenum, precious-metals, and zinc production facilities in North Korea (table 2).

## Mineral Trade

The value of North Korea's exports increased by 24% to \$3.6 billion in 2013 compared with that of 2012. Of the value in 2013, \$2.9 billion, or 81%, was received by China compared with \$3.1 billion and 82%, respectively, in 2012. Total trade between the two countries in 2013 increased by 10.4% compared with that of 2012 to \$6.5 billion. In 2013, North Korea's imports from China increased by 5.4% to \$3.6 billion, which resulted in a 25% decrease in the trade deficit. Anthracite coal was the leading mineral commodity exported from North Korea. Exports of iron ore increased by 21.3% in

2013 compared with those of 2012. Crude petroleum was the country's leading imported commodity (Hoe, 2014).

## Commodity Review

### Metals

**Gold.**—North Korea's Central Bank refined gold to provide currency for the country's leadership. The Dodd-Frank Wall Street Reform and Consumer Protection Act, which was signed into law in the United States in 2010, requires U.S. companies to investigate their supply chains and disclose whether gold, tantalum, tin, or tungsten used in their products came from mines controlled by armed groups in the Democratic Republic of the Congo (Congo [Kinshasa]). In the process, however, dozens of companies disclosed that their suppliers used gold refined by North Korea's Central Bank. U.S. legal sanctions prohibit importation of materials from North Korea even if they come from deep within a supply chain and if they are in a completely different form by the time they reach the end user. After an investigation into the reporting methods by which companies queried their suppliers, it was discovered that the reason that so many companies appeared to be sourcing gold from North Korea was owing to an error in a template that listed the Central Bank of the Democratic People's Republic of Korea, or "DPR" (North Korea) as being in the Republic of Korea (South Korea). When suppliers entered a code for a Republic of Korea smelter it was, therefore, inadvertently reported as having come from the DPR. Most companies reportedly determined that gold from North Korea did not make it into their products; however, it was impossible to know if gold from North Korea could have been sourced through suppliers from China (Schechtman, 2014).

### Industrial Minerals

**Graphite.**—According to the Industrial Minerals (IM) Data Group, North Korea has been widely reported to be among the world's top five producers of flake graphite, with output of about 30,000 metric tons per year (t/yr) in 2011. The IM Data Group, however, reported that annual production might actually be less than 10,000 t/yr. The Yeongchon Mine was the country's only graphite mine. The operation historically had a production capacity of about 75,000 t/yr, but lack of fuel, water, and processing equipment had resulted in decreased output. The IM Data Group also reported that errors in trade statistics may have been made when anthracite coal was incorrectly categorized as natural graphite because a significant portion of the amount reported as flake graphite was actually amorphous graphite (a lower purity and lower cost commodity) (table 2; Moores, 2013).

**Magnesium.**—According to the IM Data Group and the Korea Magnesia Clinker Industry Group, North Korea's production of magnesia was estimated to have decreased by about 29% to 178,000 metric tons in 2012 (the latest year for which data were available) compared with that of 2011. The decrease was owing primarily to a lack of coal supply for processing and difficulties transporting the product.

North Korea's magnesite resources, from which magnesia is produced, were estimated to be 3 million metric tons (Lismore-Scott, 2013).

**Rare Earths.**—A foreign private-equity firm formed a joint venture with Korea Natural Resources Trading Corp. of North Korea to explore the country's Jongju rare-earth deposit located 150 kilometers northwest of Pyongyang. The agreement reportedly granted the joint-venture company, known as Pacific Century Rare Earth Mineral Ltd., the right to explore and mine the deposit and construct a processing plant at the site. Reports about the rare-earth resources of, and the pending exploratory work in, North Korea generated speculation as to the potential effect of such a project in terms of China's near monopoly on the rare-earths market and North Korea's debilitated economy. In 2013, however, no information was available by which to substantiate any claims regarding the magnitude of the resources or their potential development (Industrial Minerals, 2013).

### Outlook

There is no expectation of significant development in North Korea's mineral industry in the near- to mid-term owing to international sanctions, political tensions, lack of infrastructure, lack of investment, and a high level of sovereign risk. Annual GDP rates of growth had fluctuated by only about 1% or less since 2009 and were not expected to vary by more than that in the near term. Foreign investment in exploration or mining in North Korea was speculative, and reports about interest in the country's rare-earth-oxide resources were focused on deposits that are enriched in light rare-earth oxides rather than the more valuable heavy rare-earth oxides that are in relatively limited supply and high demand. Exploration into North Korea's carbonate-hosted REE-bearing minerals may reveal resources of heavy rare earths; however, there is no indication that this exploration work has generated any industry-compliant resource estimates, and North Korea itself reportedly did not have the ability to conduct such exploration or to quantify the resources.

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TABLE 1  
NORTH KOREA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES<sup>1,2</sup>

(Metric tons unless otherwise specified)

Commodity <sup>3,4</sup>	2009	2010	2011	2012	2013
<b>METALS</b>					
Cadmium metal, smelter	200	200	200	200	200
Copper:					
Mine output, Cu content	3,700 <sup>r</sup>	4,600 <sup>r</sup>	7,000 <sup>r</sup>	6,600 <sup>r</sup>	6,200
Metal, primary and secondary:					
Smelter	15,000	15,000	15,000	15,000	15,000
Refinery	12,000 <sup>r</sup>	12,000 <sup>r</sup>	12,000 <sup>r</sup>	12,000 <sup>r</sup>	12,000
Gold, mine output, Au content	2,000	2,000	2,000	2,000	2,000
Iron and steel:					
Iron ore and concentrate, marketable:					
Gross weight	1,800 <sup>r</sup>	2,000 <sup>r</sup>	2,500 <sup>r</sup>	2,500 <sup>r</sup>	3,000
Fe content	550 <sup>r</sup>	600 <sup>r</sup>	750 <sup>r</sup>	750 <sup>r</sup>	900
Metal:					
Pig iron	250 <sup>r</sup>	250 <sup>r</sup>	250 <sup>r</sup>	250 <sup>r</sup>	250
Ferroalloys, unspecified	10	22 <sup>r</sup>	21 <sup>r</sup>	25 <sup>r</sup>	28
Steel, crude	1,300	1,300	1,300	1,300	1,300
Lead:					
Mine output, Pb content	22,000 <sup>r</sup>	26,000 <sup>r</sup>	32,000 <sup>r</sup>	38,000 <sup>r</sup>	59,000
Metal, primary and secondary:					
Smelter	9,000 <sup>r</sup>	9,000 <sup>r</sup>	9,000 <sup>r</sup>	9,000 <sup>r</sup>	9,000
Refinery	4,000 <sup>r</sup>	3,000 <sup>r</sup>	3,000 <sup>r</sup>	3,000 <sup>r</sup>	3,000
Silver, mine output, Ag content	50 <sup>r</sup>	50 <sup>r</sup>	50 <sup>r</sup>	50 <sup>r</sup>	50
Tungsten, mine output, W content	100 <sup>r</sup>	110 <sup>r</sup>	110 <sup>r</sup>	100	65
Zinc:					
Mine output, Zn content	29,000 <sup>r</sup>	38,000 <sup>r</sup>	34,000 <sup>r</sup>	35,000 <sup>r</sup>	36,000
Metal, primary and secondary	26,000 <sup>r</sup>	36,000 <sup>r</sup>	30,000 <sup>r</sup>	31,000 <sup>r</sup>	32,000
<b>INDUSTRIAL MINERALS</b>					
Cement, hydraulic	6,400	6,400	6,400	6,400	6,400
Fluorspar	12,500	12,500	12,500	12,500	12,500
Graphite	10,000 <sup>r</sup>	10,000 <sup>r</sup>	10,000 <sup>r</sup>	10,000 <sup>r</sup>	10,000
Magnesia	250,000 <sup>r</sup>	250,000 <sup>r</sup>	250,000 <sup>r</sup>	178,000	180,000
Nitrogen, N content of ammonia	100	100	100	100	100
Phosphate rock, P <sub>2</sub> O <sub>5</sub> equivalent	300,000	300,000	300,000	300,000	300,000
Salt, all types	500,000	500,000	500,000	500,000	500,000
Sulfur	42	42	42	42	42
Talc, soapstone, pyrophyllite	50,000	50,000	50,000	50,000	50,000
<b>MINERAL FUELS AND RELATED MATERIALS</b>					
Coal, anthracite	36,000	41,000	41,000	41,492 <sup>5</sup>	42,000
Coke	2,000	2,000	2,000	2,000	2,000

<sup>r</sup>Revised. do. Ditto.

<sup>1</sup>Estimated data are rounded to no more than three significant digits.

<sup>2</sup>Table includes data available through December 9, 2014.

<sup>3</sup>In addition to the commodities listed, crude construction materials, such as sand and gravel and other varieties of stone, and refined petroleum products and rare-earth-based products are produced, but available information is inadequate to make reliable estimates of output.

<sup>4</sup>Because of the lack of official reported data, most of the mineral commodity production numbers have been estimated for the past 5 years.

<sup>5</sup>Reported figure.

TABLE 2  
NORTH 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 <sup>c</sup>
Cement		Sunchon Cement Complex	Pyongnam Province	3,000
Do.		Sangwong Cement Complex	Kangwon Province	2,500
Do.		Gomusan Cement Factory	Hambuk Province	2,000
Do.		Cheonnaeri Cement Factory	Hamnam Province	1,000
Coal		Anju Coal Mining Complex and Sunchon Coal Mining Complex	Pyongbuk and Pyongnam Provinces	9,500
Do.		Saebjol Coal Mining Complex and Northern Coal Mine Enterprise	Hambuk Province	6,000
Copper, mine output, Cu content		Hyesan Youth Copper Mine (owned by Wanxiang Industrial Group, 51%, and Huizhong Mineral Industry, 49%)	Yanggang Province	15
Gold, mine output, Au content	kilograms	Kumsan Joint Venture Co.	Hambuk Province	530
Do.	do.	Daebong Mine	Yanggang Province	150
Graphite		Yeongchon Graphite Mine (Joint venture of Korea Resources Corp. and the Government of North Korea)	Hwangnam Province	75
Iron ore, concentrate, gross weight		Ministry of Metal and Machinery, Department of Mines, Musan Iron Ore Mine Complex	Hambuk Province	10,000
Do.		Unryul Mine	Hwangnam Province	1,000
Lead:				
In concentrate		Korea Zinc Industrial Group	Hwangnam Province	60
Refined		do.	Kangwon Province	32
Magnesite, concentrate, gross weight		Korea Magnesite Clinker Industry Group (KMCIG)	Hambuk and Hamnam Provinces	2,500
Magnesite clinker		Korea Magnesite Clinker Industry Group (KMCIG) and Quintermina AG	Hambuk and Hamnam Provinces	1,200
Steel, crude				
Do.		Kim Chaek Iron and Steel Complex (Ministry of Metal and Machinery)	Hambuk Province	2,400
Do.		Hwanghae (Hwanghai) Iron Works	Hambuk Province	1,500
Do.		Kangson Works	Hwanbuk Province	960
Do.		Chollima Steel Works	Pyongnam Province	760
Zinc:				
In concentrate		Korea Zinc Industrial Group	Hamnam and Hwangnam Provinces	80
Refined		do.	Hamnam and Kangwon Provinces	100

<sup>c</sup>Estimated; estimated data are rounded to no more than three significant digits. Do., do. Ditto.