



# 2006 Minerals Yearbook

---

## NORTH KOREA

---

# THE MINERAL INDUSTRY OF NORTH KOREA

By John C. Wu

North Korea's identified major mineral resources were coal, copper, fluor spar, gold, graphite, iron ore, lead, limestone, magnesite, pyrites, salt, silver, tungsten, and zinc. Reserves of coal, iron ore, limestone, and magnesite were large relative to other major mineral resources in the country. North Korea, however, has little reserves of crude petroleum and no known reserves of natural gas (U.S. Library of Congress, 2005; U.S. Central Intelligence Agency, 2007).

North Korea was an important producer of coal, iron ore, magnesite, and zinc in the Asia and the Pacific region. North Korea ranked third in production of magnesite in the world. Its value-added product—magnesia clinker, which is used as refractory material—was marketed worldwide (Kramer, 2007).

To cooperate on economic development between North Korea and the Republic of Korea, Korea Resources Corp. (KORES), which is a Republic of Korea state-owned natural resources development agency, reportedly had begun to work with the North Korean Government to form a partnership for joint development of such mineral resources as apatite, coal, magnesite, and zinc during 2006. According to KORES, North Korea and the Republic of Korea agreed in early 2006 to jointly develop the Komdok zinc mine and the Taehung magnesite mine in Tanchon (Dancheon), South Hamgyong Province. In addition to magnesite and zinc, North Korea and the Republic of Korea also agreed to jointly develop apatite, iron ore, molybdenum, and scheelite resources in North Korea (Korea Resources Corp., 2006).

To prevent environmental damage and protect the environment, the Law on the Assessment of Environmental Effect was enacted by the Government in February 2006. The enactment of the law indicated that the country's environmental contamination was serious. According to Corporate Social Responsibility Asia (CSR Asia), North Korea ranked virtually last in environmental sustainability in the world, despite the country's enactment of major laws for environmental protection, such as the Land Law in 1977, the Environment Protection Law in 1986, the Forestry Law in 1992, and the Law on Protection of Useful Animals in 1998. The release of industrial sludge and waste by mines and paper factories had led to pollution throughout the North Korean waterways, which included the Chongchon, the Taedong, and the Tuman rivers. Air pollution was largely owing to the country's declining economy and lack of financial resources to acquire filtration technology, which had resulted in sulfur and carbon monoxide emissions being widely released. Pollutants and toxic gases from factories had a deleterious effect on nearby agricultural collectives. The possibility of environmental improvement in the near term seems very unlikely in North Korea because of the country's increasing economic difficulties and low environmental awareness (French, 2005; Ministry of Unification of the Republic of Korea, 2006)

## Minerals in the National Economy

In 2006, the North Korean economy continued to face desperate economic conditions. The country's industrial production facilities were still in need of repair because of underinvestment and shortage of spare parts and supplies. The electric power supply had been adversely affected by the shortage of such energy sources as coal and crude oil during the past several years. As a result, the country's output of electricity and industrial products continued to decrease (Index Mundi, 2007).

The mining sector was an important sector of North Korean economy. The mining sector produced a wide variety of minerals for domestic consumption by the defense (military), manufacturing, and utility industries. Production of such minerals as coal, copper, iron ore, limestone, lead, magnesite, steel, tungsten, and zinc was essential for the country's industrial and military establishments, as well as for export to earn foreign currency. On the basis of North Korea's industrial structure in 2004 (the latest year for which data were available), the mining sector accounted for about 8.7% of North Korea's gross domestic product (GDP) (Bank of Korea, 2005).

## Production

North Korea's major 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, magnesia clinker, nitrogen fertilizer materials, pig iron, steel, and refined zinc (table 1). In 2006, most of the country's mines and mineral processing plants still operated at far below their design capacity because of outmoded equipment and outdated technology, a shortage of spare parts and energy, and a lack of capital for renovation and modernization.

Most of the country's mineral production was for consumption by the domestic industries. In mineral trade, North Korea exported some base metals, coal (anthracite), graphite, iron ore, salt, and steel products; it exported most of its magnesia clinker and zinc output to earn foreign currency to pay for the country's large imports of chemical fertilizers, crude petroleum, and some refined petroleum products. Coal and iron ore were exported mainly to China; zinc and base metals, principally to China and the Republic of Korea. Crude petroleum and fertilizers were imported mainly from China.

## Structure of the Mineral Industry

North Korea's mineral industry comprised a medium-sized coal mining sector, a medium-sized industrial mineral and processing sector, and a relatively large ferrous and nonferrous metals 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. In the past 3 years, China, the Republic of Korea, and other countries had participated in joint ventures for the development and operation of coal, copper, gold, graphite, iron ore, magnesite, and molybdenum mines.

In 2006, North Korea's coal production capacity was estimated to be 25 million metric tons per year (Mt/yr). The production capacity of magnesite was estimated to be 15 Mt/yr; cement, 8 Mt/yr; iron ore, 5 Mt/yr; crude steel, 4 Mt/yr; and zinc (metal content), about 80,000 metric tons per year (t/yr). Production facilities for all the major minerals and metals were outdated and in need of upgrading or renovation. In the past 2 years, China and the Republic of Korea, had agreed to participate in various joint ventures with North Korea's mining establishments to improve operations and increase efficiency in the production of coal, copper, graphite, iron, magnesia clinker, and zinc metal.

## Commodity Review

### Metals

**Copper.**—In September 2006, state-owned China Nonferrous Metal Mining Group and Korea-China International Mining Co. of China signed an agreement with the North Korean Government for the joint redevelopment of an abandoned copper mine—the Hyesan (Hui Shan) Mine in Yanggang Province, which is located about 10 kilometers (km) from China-Korea border. The estimated ore reserves at the Hyesan Mine reportedly contained 250,000 metric tons (t) of copper. Mining equipment, materials, and supplies, along with mining technicians, was to be provided by China's Hongtongshan Mine in Liaoning Province (Associated Press, 2006).

In late December 2006, the Hebei-based Luanhe Industrial Group and another unnamed privately owned company reportedly signed an agreement with Hyesan Youth Copper Mine [Enterprise] to acquire a controlling interest (51%) of the Hyesan Youth Copper Mine [Enterprise] in Yanggang Province in the northwestern part of North Korea (North Korean Economy Watch, 2006a).

**Iron and Steel.**—China Minmetals Corporation reportedly had replaced Sinosteel Corporation as part of a consortium that was planning to invest in the Musan iron ore project in North Hamgyong (Hamgyongbuk) Province. According to the Hong-Kong-based newspaper *Ta Kung Pao*, the initial Chinese consortium was made up of Sinosteel Corporation, Tonghau Iron & Steel Group, and Yanbian Tianchi Stock Holding Company, all from Jilin Province. In November 2005, the consortium reportedly had obtained the right from the North Korean Government to develop the iron ore deposits and to mine iron ore at Musan for 50 years. The consortium planned to invest about \$867 million and to produce 10 Mt/yr of iron ore (Metals Place, 2005; North Korean Economy Watch, 2006e).

North Korea's leading steelmaker, Kim Chaek Iron and Steel Complex, which is located in Chongjin, North Hamgyong

(Hamgyongbuk) Province, reportedly suspended its operation in mid-2006. According to *Daily North Korea*, *Good Friends* newsletter (a local newsletter) reported that the iron works' equipment was severely deteriorated and that energy sources, such as coal and coke, were not being supplied to the complex (North Korean Economy Watch, 2006d).

**Zinc.**—Zinc was produced mainly from the Komdok Mine near Tanchon in South Hamgyong (Hamgyongnam) Province. In 2005, construction of two new shafts at the Komdok Mining Complex had been completed. As a result, the mine productivity improved in 2006. According to KORES, North Korea and the Republic of Korea were moving toward joint development and operation of the Komdok zinc mine near Tanchon, which contains estimated reserves of 300 Mt. KORES stated that to develop a new mine capable of producing 680,000 t/yr of zinc ore at the Komdok Mine is feasible (Korea Resources Corp., 2006).

### Industrial Minerals

**Graphite.**—The first inter-Korean development in the mineral resources sector was the Jeongchon graphite project. The development of the Jeongchon graphite mine, which cost \$10.2 million, was completed in April 2006. Mining-operation testing was delayed because of a shortage of electricity and diplomatic tension during the second half of 2006. According to KORES, test operations began in late 2006 and North Korean authorities had guaranteed a stable supply of electricity. The mine was expected to produce about 3,000 t/yr of graphite. KORES planned to ship 1,830 t/yr to the Republic of Korea in 2007 and then to ship 20% of the mine's annual production to the Republic of Korea beginning in 2008 until 2022 (Joong Ang Daily, 2006).

**Magnesite.**—At the 10th conference of the Inter-Korea Economic Cooperation Promotion Committee held in July 2005, the North Korea Government agreed to allow the Republic of Korea to invest in development of North Korea's underground resources of four mineral commodities—apatite, coal, magnesite, and zinc. According to KORES, North Korea and the Republic of Korea were proceeding with joint development of the Dae Hung (Taehung) magnesite mine, which has an estimated ore reserve of 3.6 billion metric tons. KORES reportedly indicated that development of a mine at Taehung capable of producing 3 Mt/yr of magnesite was feasible. KORES signed a contract with the North Korean Government during the first half of 2006 and planned to begin commercial operation of the mine by 2009 (Korea Resources Corp., 2006).

### Mineral Fuels

**Coal.**—Recoverable coal reserves in North Korea were estimated to total about 8 billion metric tons in 2006. Coal production reportedly dropped to about 23 Mt/yr in 2006 from 37.5 Mt/yr in 1985 mainly because of outdated mining equipment and technology. The country's anthracite resources are located mainly in the Provinces of South Pyongan (Pyonganam) and North Pyongan (Pyonganbuk). Bituminous coal is concentrated mostly in North Hamgyong

(Hamgyongbuk) Province and South Pyongan (Pyongannam) Province. According to an estimate in 2006, the number of coal mines in North Korea totaled about 600; 70 of those mines were anthracite mines; 30, bituminous coal mines; and more than 500, small- and medium-scale coal mines that operated in several coal-producing Provinces in the northern and southern parts of North Korea (North Korean Economy Watch, 2006c).

According to Korean Central News Agency, coal mining productivity increased in 2006 owing to improved coal mining facilities, new coal mining and transport methods, and higher labor productivity in the following facilities: the Suncheon area's Youth Coal Complex; the February 8 Jikdong Chonsong Youth Coal Mines; the Tokechon (Tokchon) Area Coal Complex, which included the Sochang Youth, the Tokechon, and the Toksong Coal Mines; the Onsong and the Kaechon Area Coal Complex; the Kujang Area Coal Complex; and the Anju and the Pukchang Area Coal Complex (North Korean Economy Watch, 2006b).

**Crude Petroleum.**—North Korea produced no crude petroleum. In recent years, about 90% of the country's crude petroleum requirements were met by imports from China. Russian oil companies also exported some crude petroleum at below world market prices to North Korea (North Korean Economy Watch, 2006c).

## Outlook

For the next 4 to 5 years, the North Korean mining sector is likely to continue to be dominated by the production of coal, iron ore, limestone, magnesite, and zinc. Because of growing demand for minerals by China and the Republic of Korea, their investment in North Korea's mining sector is expected to increase and to extend beyond their current investments in apatite, coal, copper, and iron ore into other minerals, such as gold, magnesite, molybdenum, nickel, and zinc. North Korea's real GDP is expected to grow at between 1% and 2% during the next 2 years.

## References Cited

- Associated Press, 2006, The Mining News—Chinese company to develop North Korea mine: Associated Press, September 21. (Accessed November 9, 2006, at <http://www.theminingnews.org/news.cfm?newsID=2300>.)
- Bank of Korea, 2005, Gross domestic product of North Korea in 2004: Bank of Korea press release, May 31, 2005, 8 p. (Accessed June 6, 2007, at [http://www.bok.or.kr/contents\\_admin/infor\\_admin/eng/home/pree/pree/infor/NKGDP20042.doc](http://www.bok.or.kr/contents_admin/infor_admin/eng/home/pree/pree/infor/NKGDP20042.doc).)
- French, Paul, 2005, North Korea's environmental disaster: Hong Kong, Corporate Social Responsibility Asia Weekly 2005, v. 1, week 15, p. 2-3.
- Index Mundi, 2007, Korea, North economy profile 2006—Economy overview: Index Mundi, 5 p. (Accessed January 10, 2007, at [http://www.indexmundi.com/north\\_korea/economy\\_profile.html](http://www.indexmundi.com/north_korea/economy_profile.html).)
- Joong Ang Daily, 2006, Graphite mine in North open in 2007: Joong Ang Daily, December 27, 2007, 1 p. (Accessed January 10, 2007, at [http://www.nkeconwatch.com/category/miningiron\\_ore](http://www.nkeconwatch.com/category/miningiron_ore).)
- Korea Resources Corp., 2006, Present state of the development of mineral resources in North Korea: Korea Resources Corp., February.
- Kramer, D.A., 2007, Magnesium compounds: U.S. Geological Survey Mineral Commodity Summaries 2007, p. 98-99.
- Metals Place, 2005 (November 1), China's Tonghua Steel to develop North Korea's largest iron ore deposit: Metals Place, 1 p. (Accessed April 6, 2006, at <http://metalsplace.com/metalsnews/?a=2804>.)
- Ministry of Unification of the Republic of Korea, 2006, Major development—The enactment of the law on the assessment of environment effects in North Korea: Ministry of Unification of the Republic of Korea, 1 p. (Accessed March 30, 2006, at <http://www.unikorea.go.kr/en/ENK/ENK0201R.jsp>.)
- North Korean Economy Watch, 2006a (December 24), Chinese firms acquire managerial control of large North Korean copper mine: Yonhap, December 24, 1 p. (Accessed January 10, 2007, at <http://www.nkeconwatch.com/category/mining/copper>.)
- North Korean Economy Watch, 2006b (December 26), Coal production goes up in DPRK: Korea Central News Agency [Seoul, the Republic of Korea] December 26, 1 p. (Accessed June 25, 2007, at <http://www.nkeconwatch.com/category/energy/coal>.)
- North Korean Economy Watch, 2006c (August 23), DPRK's reform and Sino-DPRK economic cooperation, Analysis by Li Dunqui—DPRK's Energy and Mineral Resources: Nautilus Institute, 9 p. (Accessed January 10, 2007, at <http://www.nkeconwatch.com/category/energy/coal>.)
- North Korean Economy Watch, 2006d (July 11), Kim Cheak Iron and Steel Complex operations suspended: Daily NK, 1 p. (Accessed January 10, 2007, at <http://www.nkeconwatch.com/category/steel>.)
- North Korean Economy Watch, 2006e (November 1), The political economy of Chinese investment in North Korea—Muson: Asian Survey, November/December, v. 46, no. 6, p. 898-916. (Accessed June 26, 2007, at <http://www.nkeconwatch.com/category/dprk-organization/state-offices/muson-mine>.)
- U.S. Central Intelligence Agency, 2007, North Korea, in World factbook 2007: U.S. Central Intelligence Agency. (Accessed June 21, 2007, at <https://www.cia.gov/library/publications/the-world-factbook/geos/kn.html>.)
- U.S. Library of Congress, 2005 (May), Country Profile—North Korea, mining and minerals: U.S. Library of Congress. (Accessed June 21, 2007, at [http://lcweb2.loc.gov/frd/cs/profiles/North\\_Korea.pdf](http://lcweb2.loc.gov/frd/cs/profiles/North_Korea.pdf).)

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

(Metric tons unless otherwise specified)

Commodity <sup>3</sup>	2002	2003	2004	2005	2006
METALS					
Cadmium metal, smelter	200	200	200	200	200
Copper:					
Mine output, Cu content	12,000	12,000	12,000	12,000	12,000
Metal:					
Smelter, primary and secondary	15,000	15,000	15,000	15,000	15,000
Refinery, primary and secondary	15,000	15,000	15,000	15,000	15,000
Gold, mine output, Au content kilograms	-- <sup>r</sup>	-- <sup>r</sup>	2,000 <sup>r</sup>	2,000 <sup>r</sup>	2,000
Iron and steel:					
Iron ore and concentrate, marketable:					
Gross weight thousand metric tons	4,100	4,430	4,580	5,000	5,000
Fe content do.	1,150	1,260	1,300	1,400	14,000
Metal:					
Pig iron do.	800	900	900	900	900
Ferroalloys, unspecified do.	10	10	10	10	10
Steel, crude do.	1,030	1,090	1,070	1,070	1,070
Lead:					
Mine output, Pb content	10,000	12,000 <sup>r</sup>	13,000 <sup>r</sup>	13,000 <sup>r</sup>	13,000
Metal:					
Smelter, primary and secondary	10,000	12,000 <sup>r</sup>	13,000 <sup>r</sup>	13,000 <sup>r</sup>	13,000
Refinery, primary and secondary	6,000	7,000	9,000	9,000	9,000
Silver, mine output, Ag content	20	20	20	20	20
Tungsten, mine output, W content	600	600	600	600	600
Zinc:					
Mine output, Zn content	60,000	60,000	62,000	67,000	67,000
Metal, primary and secondary	65,000	65,000	67,000	72,000	72,000
INDUSTRIAL MINERALS					
Barite	-- <sup>r</sup>	-- <sup>r</sup>	-- <sup>r</sup>	-- <sup>r</sup>	--
Cement, hydraulic thousand metric tons	5,320	5,540	5,630	5,700	5,700
Fluorspar	12,000	12,000	12,000	12,500	12,500
Graphite	25,000	25,000	30,000	30,000 <sup>r</sup>	30,000
Magnesium:					
Magnesite, crude thousand metric tons	1,200 <sup>r</sup>	1,200 <sup>r</sup>	1,000 <sup>r</sup>	1,000 <sup>r</sup>	1,000
Magnesia clinker (dead burned magnesia) do.	100	100	100	100	100
Nitrogen, N content of ammonia do.	300,000	300,000	300,000	300,000	300,000
Phosphate rock	500,000	500,000	500,000	500,000	500,000
Salt, all types	500,000	500,000	500,000	500,000	500,000
Sulfur thousand metric tons	42	42	42	42	42
Talc, soapstone, pyrophyllite	50,000	50,000	50,000	50,000	50,000
MINERAL FUELS AND RELATED MATERIALS					
Coal:					
Anthracite thousand metric tons	17,000	16,000	16,300	16,500	16,000
Lignite do.	7,000	6,300	6,500	7,000	6,500
Total do.	24,000	22,300	22,800	23,500	22,500
Coke do.	2,000	2,000	2,000	2,000	2,000

<sup>r</sup>Revised. --Zero.

<sup>1</sup>Estimated data are rounded to no more than three significant digits; may not add to totals shown.

<sup>2</sup>Table includes data available through July 6, 2007.

<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 earths presumably are produced, but available information is inadequate to make reliable estimates of output.

TABLE 2  
NORTH KOREA: STRUCTURE OF THE MINERAL INDUSTRY IN 2006

(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	Sunchon, Pyongannam Province	3,000
Do.	Samgwong Cement Complex	Samgwong, Kangwon Province	2,000
Do.	Gomusan Cement Factory	Cheongjin, Hamgyongbuk Province	2,000
Do.	Cheonnaeri Cement Factory	Cheonae, Hamgyongnam Province	1,000
Coal	Anju Coal Mining Complex and Sunchon Coal Mining Complex	Anju, Kaechon, Pukchang, Sunchon, and Tokechon, all in Pyongannam Province	9,500
Do.	Saebyo Coal Mining Complex	Saebyo, Hamgyongbuk Province	6,000
Copper, mine output, Cu content	Hyesan Youth Copper Mine	Hyesan, Yanggang Province	13
Gold, mine output, Au content	kilograms Gumsan (Kumsan) Joint Venture Co.	Sierra near Changjin northwest of Hamgyongbuk Province	530
Graphite	Yeongchon Graphite Mine Joint venture of Korea Resources Corp. and North Korean Government	Yeongchon, Yonan County, South Hwanghae Province	3
Iron ore, concentrate, gross weight	Ministry of Metal and Machines Industry, Department of Mines, Musan Iron Ore Mine Complex	Near the town of Musan, Hamgyongbuk Province	10,000
Do.	Unryul Mine	Unryul, Hwanghaenam Province	1,000
Lead:			
In concentrate	Korea Zinc Industrial Group	Komdok, near Tanchon, Hamgyongnam Province	20
Refined	do.	Munpyong, Kangwon Province	32
Magnesite, concentrate, gross weight	Korea Magnesia Clinker Industry Group	Dae Hung and Ryong Yang, Hamgyongnam Province; Paek Bai near Kim Chaeck, Hamgyongbuk Province	2,500
Magnesia clinker	do.	Tanchon and Dae Hung, Hamgyongnam Province; Song Jin, Hamgyongbuk Province	1,150
Steel, crude	Ministry of Metal and Machines Industry:		
Do.	Kim Chaeck Iron Works	Chongjin, Hamgyongbuk Province	2,400
Do.	Hwanghae (Hwanghai) Iron Works	Songnim, Hamgyongbuk Province	1,500
Do.	Kangson Works	Kangson, Hwanhaebuk Province	960
Do.	Chullima Steel Works	Nampo, Pyungnam Province	760
Zinc:			
In concentrate	Korea Zinc Industrial Group	Komdok near Tanchon and Sankok near Kowon, Hamgyongnam Province; Nakyong, Hwanhaenam Province	80
Refined	do.	Munpyong, Kangwon Province; Tanchon, Hamgyongnam Province	100

<sup>c</sup>Estimated; estimated data are rounded to no more than three significant digits