

STRATEGY FOR THE SUCCESSFUL DEVELOPMENT OF THE NORTH KOREAN MINERALS SECTOR

Alan Ferrie
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Introduction | North Korea (DPRK) is blessed with the majority of the Korean Peninsula's mineral resources. There are approximately 200 minerals in North Korea which have an estimated value thirty times greater than South Korea's resources.ⁱ Deposits of coal, iron ore, magnesite, gold ore, zinc ore, copper ore, limestone, molybdenite, and graphite could potentially support large scale mining operations. North Korea's magnesite reserves are the second largest in the world and its tungsten deposits may be the sixth largest in the world.ⁱⁱ

In spite of having plentiful mineral resources, the minerals production sector in North Korea has been struggling as a result of poor central planning, a lack of modern technology and equipment, and a shortage of electricity. Minerals production in North Korea has declined significantly over the past two decades. Production in 2002 is estimated to have been between one third and one half that of 1989. According to the Bank of Korea, North Korea's gross domestic product (GDP) decreased by 0.9 percent in 2009 while the value of mining production also fell by 0.9 percent in 2009. It has been estimated that the average operation rate of existing mine facilities was below thirty percent of capacity in 2007.ⁱⁱⁱ In an attempt to reverse this decline, North Korea had allowed foreign investors to participate in selected mining projects between 1997 and 2007.^{iv}

South Korea (ROK) has limited natural resources and is heavily dependent upon its manufacturing sector. Its labor-intensive industries are also facing severe manpower shortages. South Korea is naturally very interested in transferring equipment, technology, and funds to the North Korea minerals sector.^v

North Korea's mineral resources are also of considerable interest to the Chinese market since the cost of transporting minerals from North Korea to China is significantly less expensive than transporting minerals from Australia or Brazil.^{vi}

Outline of North Korea's Mineral Resources | North Korea's mineral deposits have been estimated to be worth at least 6.1 trillion USD in 2008. This is approximately 150 times North Korea's current GDP. North Korea's mineral deposits include the world's largest reserves of magnesite (6bn tones, 2.4 trn USD), as well as coal (20bn t, 2.4 trn USD), limestone (100 bn t, 1.0 trn USD), iron or (5bn t, 270 bn USD), gold (2000 t, 54 bn USD) and zinc (21 mt 2.2 bn USD).^{vii} The mineral resources consist of gold, silver, copper, lead, zinc, iron, tungsten molybdenite, manganese, nickel, black lead, limestone, kaolin, talc, asbestos, fluorspar, barite, magnesite, anthracitic and bituminous coal, and uranium.^{viii}

The Sangnong Gold Mine has a plant with a designed capacity of 2.8 million tons per annum of gold ore. The Holdong Gold Mine had an annual production of 0.85 tons of gold, 1.7 tons of silver and 900 tons of copper concentrate in 1991.^{ix} The annual gold production capacity is approximately 5 tons in total and annual silver production is approximately 40 tons.

The Hye-San Youth Copper Mine is the largest copper mine in North Korea with a copper ore deposit of 20 million tons and the plant has a designed capacity of 1.2 million tons per annum of copper ore.^x The Mine's annual production capacity is 30 thousand tons of 30% grade copper. The Hur-Chon Copper Mine has a deposit of 15 million tons and an annual production capacity of 20 thousand tons of 40% grade copper. The Yong-Heong Copper Mine has a deposit of 12 million tons and an annual production capacity of 10 thousand tons of 40% grade copper.^{xi}

The overall size of iron ore deposits in North Korea is between 3.5 and 4.0 billion tons. Iron ore production peaked in 1985 at 9.8 million tons of 65% grade iron but declined sharply to just 2.9 million tons produced in 1998. The Moo-san Iron Ore Mine has a deposit of 1.5 to 2.0 billion tons of Magnetite (FeOFe_2O_3) containing 23% to 30% grade iron. The mine has low grade ore but it is a strip mine (open pit mine) that is known throughout the world and offers iron ore production at low cost. The production capacity of the mine is 3 million tons of 65% powered ore. The mine has been supplying its production to the Kim-Chaek Iron Manufacturing Company which has a production capacity of 2.2 million tons, accounting for 40% of North Korea's iron production of 5.4 million tons.^{xii}

The Eun-Ryul Iron Mine contains iron ore in the form of limonite ($\text{Fe}(\text{OH})_n\text{H}_2\text{O}$) with a deposit of 200 million tons of high grade (44% iron) iron ore. The Hwang-Hae Iron Manufacturer is supplied by the Eun-Ryul and the Jae-Ryong Iron Mines. The Hur-Chon Iron Ore Mine is also a commercially viable mine.^{xiii}

The North Korean reserves of the nonmetallic mineral magnesite are between 3.5 and 4.0 billion tons. North Korea produced one million tons of concentrated Magnesite ore in 2005. The Daeheung Magnesite Mine has a designed capacity of 600 thousand tons per annum of magnesite ore.^{xiv}

Lead reserves are approximately 600 thousand tons (Pb 100%) and national output totals 60 thousand tons per annum while zinc reserves are between approximately 15 million and 20 million tons (Zn 100%) and national output is approximately 100 thousand tons per annum. Tungsten reserves of approximately 20 million tons (WO_3 65%) are located at the Man-Nyun Mine which accounts for half of the national reserves. The mine produces 500 thousand tons of ore per annum. The Jeongchon Graphite Mine has a designed capacity of three thousand tons per annum of graphite concentrate. In 2009, 1500 tons of 90 percent grade graphite concentrate was produced. The Apdong Tantalum Mine has a mill and hydrometallurgy plant with a designed capacity of one million tons per annum of ore. However, it has not been in operation since 1997.

Coal reserves in North Korea consist of Anthracite and Brown coal. Reserves total 14.7 billion tons with three billion tons of lignite coal (soft coal) and 11.7 billion tons of Anthracite coal. Approximately 70% of North Korea's energy is provided by coal. North Korea exports two million tons of coal per annum to China. The Jikdong Mine produces 30 thousand tons of Anthracite coal per annum while the Gogeonwon Mine has a designed capacity of one million tons of Anthracite coal per annum.^{xv}

North Korea also had deposits of Uranium ore of approximately 26 million tons. The Pyong-San Uranium Mine contains 1.5 million tons of Uranium ore with a production capacity of 10 thousand tons per annum. The Woong-gi Uranium Mine contains 10 million tons of Uranium ore with a production capacity of 19 thousand tons per annum.^{xvi}

Oil is another potential energy source for North Korea. Although hard data does not yet exist, Cantexa (a Canadian oil company) reported that one offshore deposit may contain anywhere from 5 to 40 billion barrels of oil. Samples from this deposit suggest that this is a commercially viable oil deposit. However, it will be many years before accurate data on North Korea's offshore oil reserves is available.^{xvii}

Attracting Foreign Direct Investment | The government of North Korea has recently emphasized the exploration and development of new mineral resources, especially for ferrous and non-ferrous minerals. North Korean and Chinese teams have been cooperating in the exploration of North Korea's mineral resources. The North Korean government is particularly interested in improving the productivity of their country's mines through the acquisition of foreign mining technology including mineral processing technology for oxide minerals, purification technology for raw metals and separation and purification technology for rare earth metals.^{xviii}

To achieve these goals, North Korea has stated that joint projects with foreign corporations will be encouraged. The Cheon-u Group of China and the Hyesan Copper Mine Company of North Korea have established a joint management company. The Cheon-u Group had agreed to invest about CNY 200 million and to reopen the mine. In 2010, the mine began to process 1200 tons of copper ore per day.^{xix}

Inter-Korean mining cooperation also has enormous potential for both North Korea's mineral mining aspirations as well as South Korea's desire to acquire nearby mineral commodities. South Korea is dependent upon the importation of mineral commodities due to its paucity of mineral resources. The costs of these imports have risen significantly over the past few years. The Daehung magnesite mine and the Geomdeok zinc mine are both commercially viable projects that could be utilized to kick start the process of inter-Korean mining cooperation.^{xx}

Overseas mining companies are another potential resource for North Korea. A Beijing-based market research company, China Sunny & Forecasting Information Consultant Ltd, has estimated that the amount of exploitable iron ore in North Korea will reach 10 million tons annually by 2015, up from 6 million tons this year, due to an expansion in investment by overseas companies. The British company Global Steel Holdings Ltd. has been negotiating with the North Korean government for a stake in the Musan iron ore mine.^{xxi}

With less than ten percent of North Korea's iron ore deposits having been mined, many companies in China also have their eye on these deposits. Sinosteel Corporation, China Minerals Corporation and the Shougang Tonggang Group have recently entered the iron ore market in North Korea. In 2006, the Shougang Tonggang Group entered the North Korean market in a

joint venture with a local steel factory and currently imports iron ore worth 14 million Yuan (2.2 million USD) per annum from North Korea.

North Korea is also in the process of improving their transportation infrastructure in support of their mining development initiative. For example, improvements to the Rajin Port include a 30,000 metric ton coal storage warehouse that had been recently constructed by a Chinese company at Pier 1 through which 80,000 metric tons were processed in five shipments from January to September of last year. A Swiss company is currently using Pier 3 to ship manganese and talc to foreign destinations.^{xxii} The Chong-Jin Eastern & Western Port, Heong-Nam Port, Dan-chon Port, Nam-Po Port and the Hae-Joo Port can also be utilized for the exportation of mineral resources.^{xxiii}

North Korea's educational institutions include five universities offering Geology Exploration or Mining Engineering degrees including Kim-Il-Sung University and Kim-Chaek University, both located in Pyong-Yang, which also offer courses in English. The other universities include the Chong-Jin Mines and Metals University, Sariwon Geology University and Pyong-Sung Coal Mining University.^{xxiv}

Projects in which foreign companies are likely to have the most interest are the iron mines in Moo-san and Eun-Ryul, the Sang-Nong, Gap-San and Shin-pa copper mines, the Dan-Chon Magnesite mine, the mining of limestone ore in conjunction with the construction of cement factories in North Korea, the coal mines to support both domestic requirements as well as strong external demand, the Gum-dok, Hye-san and Ruck-Yon zinc mines, the Man-Nyun tungsten mine and the exploitation of deposits of rare earth metals such as titanium, indium and cerium.

Foreign corporations may also want to consider the establishment of Special Purpose Enterprises (SPEs) to fund the development of mines in North Korea. In an effort to encourage investment in North Korea, the government of South Korea currently covers over half the cost of SPE investments into North Korea.^{xxv}

To assist in mitigating the risks associated with investments in North Korea, the use of second-hand mining equipment and facilities is worth considering. As a result of environmental regulations in some developed countries, especially in Europe, many mines have closed and the equipment is available at low cost. This equipment could be utilized in the early stages of a North Korean mining project to minimize the initial fixed costs associated with a project. If the project proceeds as expected, investments could increase incrementally. Investing in existing mines would also reduce the initial fixed costs.^{xxvi}

Deterring Foreign Direct Investment | Investing in North Korea has always been fraught with risk and uncertainty. In general, numerous issues predominate such as North Korea's inability to pay due to the shortage of hard currency, the lack of mutual trust, industry self-regulation and a well-functioning banking system, the weak North Korean infrastructure and North Korea's political instability.^{xxvii}

Problems specific to the mining industry include a shortage of equipment, an inadequate supply of energy, a lack of electric power and low quality electricity. Voltage ranges from 130

to 205 volts (220V is standard) and frequency ranges from 39 to 54 hertz (60 Hz is standard). Consequently, North Korean mines cannot operate the necessary mining equipment. The existing mining facilities operate at below 30 percent of capacity. Other deficiencies are the shortage of funds for the education of engineers and for investment in technologies. North Korea's legal provisions and sovereign risk make it difficult for foreign investors to participate in North Korea's minerals sector since most foreign investors want to establish their own companies and operate the mines independently.^{xxviii}

The track record for joint foreign mining projects in North Korea is not impressive. Foreign companies from China, Japan, the United States, and the United Kingdom have participated in 25 mining projects in North Korea. Among these projects, only five have been actualized and are presently in operation.^{xxix}

For inter-Korean projects, the track record is even worse. South Korea's first mining project began in 2001. Eight out of ten projects that have been pursued through 2010 have stopped. South Korean companies invested in only two of the mining projects. The Jenchon Graphite mine was the first investment project in North Korea. It had never operated at full capacity due to electrical shortages.^{xxx} The inter-Korean mining projects in North Korea have stopped production since 2008.

China remains North Korea's leading investment partner in mining projects. Chinese companies are the only foreign companies to have succeeded in North Korea. Chinese companies have been participating in North Korean mining projects since 2003. In 2007, the government of North Korea granted development rights for the Musan Iron Ore Mine to Tonghwa Iron and Steel Group of China under a 50 year lease agreement. However, in 2009, the agreement was terminated by the North Korean government for no reason. Tonghwa had reportedly agreed to invest about one billion dollars in the mine and had planned to produce 10 million metric tons per year of iron ore. About 240 million dollars was for the construction of roads and railways from Musan to Tonghwa.

Failed projects involving non-Chinese foreign companies include the Japanese Nagagawa Company which completed mine surveys of the Holdong Gold Mine and the Unsan gold Mine in 1986. Both projects had been terminated without any tangible results. In 1995, the American company Mobile completed a mine survey of the Unsan Gold Mine but this project was abandoned. In 1999, the American company Kegel had planned an exchange program of magnesite for grains but the project was halted due to antiquated infrastructure. In 2000, American company ORO had agreed to establish a joint venture company for mineral marketing and mine investment but this project was also terminated without any results. The United Kingdom's Ericon Company and the Dancheon mining bureau in North Korea had also agreed to establish a joint management company. Ericon was to invest 400 million Euros in a mine, magnesium plant and the Dancheon Port. However, once again, this project was terminated without any result.^{xxxi}

Policy Changes Required | Based upon the experience of South Koreans companies, the government of North Korea seems to be focused on three main factors when assessing foreign direct investment in the country's mineral sector. North Korea is promoting large scale

investments involving the transfer of mining technologies to North Korea and support for infrastructure development.^{xxxii} These goals are rational and would result in many benefits for North Korea. Many policy changes, however, are still required to enable North Korea to successfully attain its development goals.

The fact that the only successful projects involving foreign companies in the mining sector have all been associated Chinese companies leaves North Korea in a very vulnerable position. China is essentially acting as a monopsony with respect to North Korean minerals production. By limiting themselves to only one buyer, North Korea has no chance of ever selling its minerals at world market prices. About 70 percent of Chinese investments in North Korea are comprised of energy and mineral resources. The Chinese are buying North Korea's coal at much lower prices than the international market price.^{xxxiii} It is not difficult to determine why, then, that China imported 816,700 tons of North Korean anthracites between January and July of 2011, nine times more than the previous year. Anthracites comprised 46.3 percent of all of the exports to China. With the international price of coal on the rise and the operation of hydroelectric power plants in decline, China's dependence upon thermoelectricity is growing.^{xxxiv}

As a result of international sanctions and a freeze on trade with South Korea, North Korea has engaged in natural resource trading with China to bring in hard currency. As a result of the massive amounts of coal exported to China to earn foreign currency, North Korea has been burdened with a serious energy shortage affecting the operations of factories and mining operations including, ironically, North Korea's coal mining industry.^{xxxv}

For the same reason, iron ore exports to China were 2.1 million tons in 2010. This was an increase of 86.7 percent over 2009. It can be assured that the iron ore was also sold at prices far lower than the world market price.

Selling valuable minerals at prices far below world market prices is not the road to prosperity. North Korea will need to change its policies in order to attain its goals. North Korea desperately needs to expand the market for its products. There are many companies throughout the world that would jump at the opportunity to invest in the North Korean minerals sector under the correct circumstances.

Holding an international auction for one of North Korea's mines under conditions similar to that which exist in Australia, for example, would be a good starting point for North Korea. The development of infrastructure could be incorporated into the project plan. In order to obtain the best possible deal for North Korea, it would be prudent to invite all potential buyers to the auction. If South Korean companies were to be excluded from the auction, it is unlikely that North Korea would receive the optimal offer since South Korean companies would likely be the highest bidders. Once a contract is signed, it would be critical for North Korea to honor the contract terms to the letter in order to establish a precedent for future mining contracts.

If North Korea does honor the contract and the mining operation is successful, it is probable that the foreign mining company will earn profits higher than industry norms--due to the fact that considerable risk and uncertainty will have been incorporated into their bid. The North Korean government must understand that allowing the foreign mining company to earn an

above average profit should not be regarded as exploitation. On the contrary, it will send a signal to mining companies around the world that North Korea is now open for business. Just as Western corporations are currently falling over one another to invest in China, the same scenario could develop in the North Korean mining industry.

Kim Jung Un has the opportunity to transform North Korea into a prosperous nation just as Deng Xiaoping lifted China out of Mao Zedong's dark ages. To execute a successful transition, the North Korean government must adhere to international standards and honor all of its contracts for the development of North Korea's mining industry. Otherwise, the government of North Korea will not be leaving the economic "critical care ward."

Alan Ferrie is an international economics analyst based in Puget Sound, Washington.

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ⁱⁱⁱ "The Mining Industry of North Korea", Choi Kyung-soo, Aug 4, 2011.

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^v "Northeast Asian Economic Cooperation: Assessment and Prospects of the Greater Tumen Initiative", Chung Mo Koo, Hyun Hoon Lee, Donna Yoo, Aug 10, 2011.

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^{vii} "Response to: Status and Future of the North Korean Mineral Sector", Aidan Foster-Carter, Feb 10, 2011.

^{viii} Ibid, Edward Yoon

^{ix} Ibid, Choi Kyung-soo

^x Ibid

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^{xv} Ibid, Choi Kyung-soo, Aug 4, 2011

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^{xxxi} Ibid

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^{xxxv} Ibid.