



2012 Minerals Yearbook

VIETNAM

THE MINERAL INDUSTRY OF VIETNAM

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In 2012, Vietnam ranked seventh in the production of crude petroleum in the Asia and the Pacific region. Vietnam also produced about 2.3%, 1.8%, and 1% of the world's tin, cement, and barite, respectively (Carlin, 2013; Miller, 2013; U.S. Energy Information Administration, 2013; van Oss, 2013). Other minerals produced in the country included chromium ore, coal, natural gas, lead, crude petroleum, phosphate rock, salt, and zirconium. As for major processed minerals, Vietnam produced refined copper, rolled steel, refined tin, and zinc (table 1).

Minerals in the National Economy

According to the General Statistics Office of Vietnam (2012b), the output value of the mining and quarrying sector (which included mineral fuels and nonfuel minerals) in 2012 increased by about 3.5% to an estimated \$11.2 billion¹ (in 2010 constant dollars²) from \$10.8 billion in 2011. The mining and quarrying sector made up 9.57% of the country's total estimated gross domestic product of \$116.6 billion (in 2010 constant dollars) compared with about 9.62% in 2011.

Government Policies and Programs

In 2012, the Government of Vietnam created and approved several decisions and decrees that supported the implementation of the 2010 Mineral Law and hence attracted international interest in the country's potential for mineral mining. In January 9, the Government released Directive 02/CT-TTg (Directive 02), which contains stricter provisions with respect to the exploration, mining, processing, usage, and exportation of mineral resources. Directive 02 outlines a specific licensing process for such mineral commodities as apatite, bauxite, cement, chromite, coal, copper, gold, lead and zinc, manganese, and rare earths. The new licensing provisions are compatible with the new Mineral Law and the country's master plan for the mineral industry. The master plan calls for the use and mining of minerals to be accomplished in a reasonably economical and efficient manner while maintaining technological progress and protecting cultural sites and the environment. Under Directive 02, licenses for new exploration for and mining of bauxite and alumina-related products will not be granted until the Tan Rai and Nhan Co Mines, which are located in Lam Dong and Dak Nong, are commissioned and operational. Licenses for the exploration of coal and minerals related to the manufacturing of cement will continue to be granted provided they are compliant with the country's mineral law. Directive 02

¹Where necessary, values have been converted from Vietnam dong (VND) to U.S. dollars (US\$) at the rate of VND20,693=US\$1.00 for 2012 and VND20,454=US\$1.00 for 2011.

²In 2012, the General Statistics Office of Vietnam started reporting its data at constant 2010 dollars, whereas in the past it was reported in constant 1994 dollars.

also prohibits the issuance of new licenses for the mining of placer gold, bans the exportation of unprocessed titanium ore starting on July 1, 2012, and establishes that all mining projects must be appraised by the Appraisal Council of the Ministry of Industry and Trade, the Ministry of Construction, and the Provincial or municipal committee (Mayer Brown JSM, 2012c).

In March, Decree No. 15/2012/ND-CP (Decree 15) was issued, and it went into effect on April 25. The decree designates the ministries and Government offices that are to oversee matters related to the country's mining industry. Decree 15 designates the Ministry of Industry and Trade (MIT), along with the Ministry of Natural Resources and the Environment (MONRE), as the responsible entities to coordinate provisions for the export of minerals. The MIT sets the conditions and standards for the export of most minerals, with the exception of construction materials. The export of construction materials is coordinated by the Ministry of Construction. Under the MONRE, the General Department of Geology and Minerals processes applications for mining licenses as well as applications for mine closures; the Office of the Council for Assessment of National Mineral Resources certifies the validity of mineral resource assessments (after analyzing the results of feasibility studies). In addition, the decree stipulates that the costs associated with geologic surveys performed with Government funds be reimbursed by the end user of the data. The decree regulates the selection and licensing of companies to explore for minerals in areas that are not subject to the auctioning of mining rights. The decree requests license holders to apply for an extension of the mining license, if interested, at no later than 45 days prior to the expiration of the license and to provide a report on the results of the preliminary work done on the property. In areas where the mining license is obtained through Government auction, the Government issued Decree No. 22/2012/ND-CP (Decree 22) on March 26, which regulates the conditions, procedures, and requirements governing such licenses. Decree 22 went into effect on May 15 (Mayer Brown JSM, 2012a, b).

On December 21, the MIT released Circular No. 41/2012/TT-BCT (Circular 41), which went into effect on February 4, 2013, and provides the guidelines for the export of minerals. The circular includes a list of minerals allowed to be exported, the specific quality of the material (percentage of contained mineral), and the conditions under which the minerals may be exported; the goods include metallic minerals and industrial minerals. The circular does not regulate the export of coal, natural gas, petroleum, minerals used as construction materials, and minerals used as raw materials for the production of cement. Minerals that are allowed to be exported included barite powder, bismuth ($\geq 70\%$), products processed from bauxite ores [alumina $\geq 98.5\%$ and (or) aluminum hydroxide $\geq 64\%$] and titanium ores (titanium slag grade 1 with titanium oxide content $\geq 85\%$; grade 2 with titanium oxide

content from 70% to 85%). Other minerals allowed for export include copper ($\geq 20\%$) and wolframite ($\geq 55\%$) from the Nui Phao mining and mineral processing company, fluoride (calcium fluoride $\geq 90\%$), white marble (powder and lump), nickel ore from Ban Phuc Nickel Mines LLC, and total rare-earth-oxide powder ($\geq 99\%$). Circular 41 specifies that minerals may be exported only by enterprises operating under the Enterprise Law and that are in compliance with the Commercial Law established by the country; both laws require enterprises to meet certain conditions related to the export, processing, and trade of goods with foreign partners. Parties interested in exporting minerals must comply with the conditions set out in the circular, including that the minerals must be in a processed state (to encourage domestic processing of ore) and listed as being allowed for export; that they must have a minimum percentage of mineral content in the ore; and that they must have been exploited legally in mines under a valid license or imported lawfully. All material processed for export must be accompanied by supporting documentation certifying its lawful origin and quality. The Heavy Industry Department under the MIT is the designated entity responsible for the coordination and logistics of mineral exports and is responsible for overseeing compliance with Circular 41 (General Department of Vietnam Customs, 2013).

The main law that regulates the mining industry in Vietnam is the 2010 Mineral Law, which was passed by the National Assembly of Vietnam in November 2010 and became fully effective on July 1, 2011. The new Mineral Law replaces the 1996 Mineral Law, as amended in 2005. The new law regulates geologic surveys for mineral resources, the protection of unexploited minerals, mineral exploration, mineral mining, and the management of minerals located within all the territory under the control of Vietnam. To promote sustainable development and ensure that mined products are used in a cost-effective and efficient way, the Government had begun developing mineral master plans (mineral strategies) every 10 years that include outlooks for 20 years. The plans cover such topics as the future of the country's mineral resources, as well as the promotion of sustainable socioeconomic development, national defense, and security. The master plans also ensure the protection of minerals and that the mining of minerals is executed in an environmentally friendly manner and in the most cost-effective way. The MONRE oversees and coordinates with other Ministries to prepare the mineral strategy and then submits it to the Prime Minister for approval. The Government assigned the MONRE as the authority to regulate all minerals throughout the country (Mayer Brown JSM, 2011).

Production

In 2012, the greatest increases in mineral production were for salt (by about 36.7%), titanium (36.1%), zinc slab (12.5%), zirconium (an estimated 11.4%), natural gas (10.9%), and petroleum (10.2%). Production decreased for manganese (by 75.5%), iron ore and tungsten (35.8% each), zinc ore (an estimated 26.5%), building stone (12.7%), and sand and gravel (10.8%). Data on mineral production are in table 1.

Structure of the Mineral Industry

According to the General Statistics Office of Vietnam (2011, 2012a), the number of employees working in the mining and quarrying sector in 2011 (the latest year for which data were available) was approximately 279,100, which accounted for less than 1% of the total number of employed people in the country. Investments in the mining and quarrying sector for 2012 accounted for approximately \$2.6 billion (in 2010 constant dollars), which represented about 6.9% of the total investment in the country. Table 2 is a list of major mineral industry facilities and their ownership. Many of the mineral industry facilities are Government owned.

Mineral Trade

In 2012, total trade in Vietnam increased by about 12% to \$228.3 billion (preliminary) from \$203.7 billion in 2011. The total value of exports for 2012 was about \$114.5 billion compared with about \$97 billion in 2011 (an increase of 18%). Exports of coal decreased by 11% to about 15.2 million metric tons (Mt) from about 17 Mt in 2011; exports of crude oil increased by 12.3% to 68 million barrels (Mbbbl) from 60.6 Mbbbl in 2011. In 2012, the total value of imports increased by about 6.6% to \$113.8 billion from \$106.7 billion in 2011. Imports of steel increased by 3% to about 7.6 Mt from about 7.4 Mt in 2011; imports of copper decreased by about 5% to about 1.10 Mt from about 1.16 Mt in 2011 (General Statistics Office of Vietnam, 2012c, f, g).

Vietnam's main trading partners in 2012 were Australia, Burma, China, Germany, Hong Kong, India, Japan, the Republic of Korea, Malaysia, Taiwan, Thailand, and the United States. The United States was Vietnam's leading export partner; the United States imported \$19.7 billion in Vietnamese goods (which was equivalent to 17.2% of Vietnam's total exports), followed by Japan, which imported \$13.1 billion (11.4% of Vietnam's total exports), and China, which imported \$12.4 billion (10.8% of Vietnam's total exports). Vietnam's imports came mainly from India (which supplied 25.3% of Vietnam's total imports valued at an estimated \$28.8 billion), Hong Kong (13.7% of total imports valued at an estimated \$15.5 billion), and China (10.2% of total imports valued at about \$11.6 billion) (General Statistics Office of Vietnam, 2012d, e).

Commodity Review

Metals

Antimony.—Total antimony resources in Vietnam were estimated to be approximately 845,000 metric tons (t), which would make them some of the largest in the world. In recent years, the Government of Vietnam had been investing in prospecting for, mining, and processing antimony ore, specifically in the Chiem Hoa zone in northern Vietnam in Tuyen Quang Province; the Na Bac zone on the northeastern coast of Vietnam (includes the Provinces of Hoa Binh, Ninh Binh, and Thanh Hoa); the Quang Ninh ore zone located

in the northeastern part of the country in Quang Ninh Province; and the Yen Minh ore zone of northern Vietnam in Ha Giang Province. Exploratory studies have revealed that the Chiem Hoa zone had an estimated resource of 400,000 t of antimony. The Lang Vai Mine, which is located within the Chiem Hoa zone, also was estimated to host 139,000 t of arsenic, 103 t of silver, and 10 t of gold. The Quang Ninh ore zone had an estimated resource of about 338,000 t containing 35,000 t of antimony concentrate distributed in two deposits—the Khe Chim and the Tan Mai deposits. The Vietnam Institute of Geosciences and Mineral Resources (VIGMR) announced the start of the construction of an antimony oxide preparation plant in Quang Ninh Province. The plant, which would have a processing capacity of 200,000 to 300,000 metric tons per year (t/yr) of ore, would produce battery components, chemicals, and flame retardants (Industrial Minerals, 2013).

Bauxite and Alumina and Aluminum.—According to the Ministry of Industry and Trade, as of 2012, Vietnam imported approximately 500,000 t/yr of aluminum at a cost of about \$1 billion. Domestic consumption of aluminum was projected to increase by between 750,000 t/yr and 1 million metric tons per year (Mt/yr) by 2020, and by 1.6 to 2 Mt/yr by 2030. Domestically, aluminum is used mainly in the country's manufacturing industry. Government studies have estimated Vietnam's bauxite reserves to be between 10 and 11 billion metric tons (Gt). Most of the reserves are located in the Central Highlands of the country, of which about 4.6 Gt is located in Dak Nong Province and 2 Gt is located in Lam Dong Province (Vietnam National Coal-Mineral Industries Holding Corp. Ltd., 2013).

By yearend 2012, the Vietnam National Coal-Mineral Industries Holding Corp. Ltd. (Vinacomin) announced that the Tan Rai alumina and bauxite complex had successfully carried out the trial production of aluminum products. In addition, the Government had been investing in infrastructural upgrades, such as roads, to connect the Tan Rai plant to highways and ports to facilitate the transportation of the alumina for export. In 2012, the construction of the Tan Rai complex, which is located in the Bao Lam District in Lam Dong Province in the country's Central Highlands, was 90% completed. The project began construction in 2008 with a capital investment of \$700 million; the estimated production capacity of the plant would be 600,000 t/yr of alumina when completed. The estimated initial output for the first year after commissioning was 300,000 t of alumina, and the following year, 520,000 t. The estimated life of the project was 30 years (Vietnam National Coal-Mineral Industries Holding Corp. Ltd., 2012a–c; 2013).

On November 15, Vinacomin announced that it had signed a loan agreement with a consortium of banks led by Citi Vietnam to finance projects to mine bauxite and produce alumina in Lam Dong and Dak Nong Provinces. The consortium included the Bank of Tokyo-Mitsubishi UFJ Ltd., Mizuho Corp. Bank Ltd., and Sumitomo Mitsui Trust Bank Ltd., all of Japan. The agreement was valued at \$300 million and consisted of a 13-year loan that was guaranteed by the Ministry of Finance and the Agency for Export and Investment Insurance of Japan (Thomson Reuters, 2012; Vietnam National Coal-Mineral Industries Holding Corp. Ltd., 2012c).

In Dak Nong Province, Vinacomin was also building the Nhan Co bauxite mining and refinery complex, which was expected to start operations in 2014 at a cost of \$665 million. Initial output was projected to be 300,000 t/yr of alumina; the complex was projected to reach full capacity of 650,000 t/yr of alumina by 2016. The project would include an alumina refinery and a bauxite ore sorting plant. With the commissioning of the Tan Rai and the Nhan Co projects, the country was expected to produce about 1,250,000 t/yr of alumina at full capacity, of which between 600,000 and 900,000 t/yr would be sold to the Yunnan Metallurgical Group of China in a 30-year sales agreement (Thomson Reuters, 2012; Vietnam National Coal-Mineral Industries Holding Corp. Ltd., 2012a, c).

Copper.—In July 2012, Vinacomin officially updated the Sin Quyen copper mine resource estimate to 106 Mt from the previous estimate of 56 Mt. The Sin Quyen Mine, which is located in the Bat Xat District, was operated by Vinacomin's subsidiary Sin Quyen Copper Co. The Sin Quyen Mine processed 1.2 Mt/yr of ore at an average grade of 1.03% copper. During 2012, the company was waiting for Government approval to increase the Lao Cai copper complex's mining capacity to 3 Mt/yr from 1.2 Mt/yr, and also to extend the mine life to between 40 and 50 years from between 20 and 30 years. The mine originally started production in 2006. According to Vinacomin, all the copper processed in Lao Cai's copper refinery was consumed by the domestic market (Vietnam National Coal-Mineral Industries Holding Corp. Ltd., 2012d).

Gold.—Besra Gold Inc. of Canada, formerly Olympus Pacific Minerals Ltd., owns interest in several gold projects in Quang Nam Province in the Central Highlands of Vietnam. During 2012, the company discovered a high-grade gold vein in the Nui Kem deposit within the company's Bong Mieu property. After the discovery, the company refocused an ongoing 4-year underground drilling program on the Nui Kem deposit and the Ho Gan South deposit, which is part of the Bong Mieu property. The new objectives of the drilling program were to verify if the new discovery shows continuity in the mineralization between the two deposits. Gold resources in the Bong Mieu property were estimated to be about 22,000 kilograms (kg) (reported as 700,000 troy ounces). Preliminary studies revealed that the average grade in the Ho Gan South deposit was between 6 and 8 grams per metric ton (g/t) gold. Another project in the Bong Mieu premises was the Ho Ray open pit, which was under a feasibility study. The company was expected to produce about 3,000 kg of gold (reported as 100,000 troy ounces) in 2013 at the Bong Mieu property owing mainly to the company's plans to upgrade the facilities (Gold Mining Journal, 2012).

Iron and Steel.—In October 2012, ABB Group (an automation and power technology group of Switzerland) announced that Formosa Plastic Group of Taiwan had granted the group a contract worth about \$50 million to produce a series of substations to supply power and enhance the power transmission capacity to a new steel complex. The substations would consist of four gas-insulated switchgears that would supply power to a steel complex built by Hung Nghiep Formosa Ha Tinh Steel Corp. (Formosa Steel Complex) located in the Vung Ang Economic Zone in Ha Tinh Province, 400 km southeast of the capital city of Hanoi. The steel complex

would have the capacity to house four steel blast furnaces with a combined production capacity of 15 Mt/yr of steel, a 1,600-megawatt thermal power station, and the Son Duong deep sea port, which would be designed with an annual handling capacity of 300 Mt. The complex was also expected to produce hot-rolled steel sheets and steel bars. The project was expected to be completed by 2014 (ABB Group, 2012).

Tungsten.—On November 30, Hazelwood Resources Ltd. of Australia announced that the commissioning of the ATC Ferrotungsten project in Vietnam was programmed for February 2013. The company claimed that the ATC plant was the largest ferrotungsten plant, in terms of capacity, to be built outside of China. The plant had a designed capacity of 4,000 t/yr of ferrotungsten alloy. The company expected to start ferrotungsten production in the second quarter of 2013 (Yao, 2012).

Industrial Minerals

Cement.—In 2012, cement production decreased by 4.7% to 55.53 Mt from 58.27 Mt (revised) in 2011. The Vietnam Cement Association (VNCA) reported that in 2012, the sale of cement for domestic use was 45.5 Mt, and the sale of cement and clinker for export was 8.5 Mt. For 2013, the VNCA expected an increase in cement domestic consumption to about 49 Mt. According to the Vietnam Cement Industry Corp. (VICEM), the country had excess cement production capacity; the designed production capacity was 70 Mt/yr of cement, and in 2012, the country produced at about 80% of total capacity. The Vietnam Building Material Association (VBMA) estimated that producers incurred losses of approximately \$80 million in 2012 because of the reduction in cement prices, as producers increased exports in order to decrease the amount of surplus inventory. The Ministry of Construction encouraged local cement producers to seek export markets because cement production in the country exceeded domestic demand. Cement producers, however, have encountered some challenges in the export process, owing mainly to poor local infrastructure (which impeded the transportation of goods), the high cost of transportation, and the lack of a port facility with enough capacity to handle large shipments (table 1; World Cement, 2012; GlobalCement.com, 2013; International Cement Review, 2013).

In August, PT Semen Gresik of Indonesia announced its interest in acquiring a cement company in Vietnam to supply cement to Indonesia. No further details were released (International Cement Review, 2012).

Fluorspar.—In 2012, several fluorspar mining projects were under development, many of which were expected to be commissioned in 2013. Phu Yen Mineral Joint-Stock Co. (PYMICO), which was one of the leading fluorspar suppliers in Vietnam, invested about \$14.2 million in the construction of a fluorspar processing plant in Phu Yen Province in eastern Vietnam. The new processing plant was expected to have an estimated production capacity of 20,000 t/yr of fluorspar. PYMICO also owned the Xuan Lanh Mine, which is also located in Phu Yen Province. Another project expected to be commissioned by the end of 2013 was Masan Group's Nui Phao,

which is located in Thai Nguyen Province in northeastern Vietnam. The estimated resource for this project was 8.5 Mt of fluorspar, and the project had an estimated production capacity of 214,000 t/yr. Another fluorspar deposit in Vietnam is the Binh Duong fluorspar deposit, which is located in Nguyen Binh District, Cao Bang Province, and had proven reserves of 5,341 t. The fluorspar in the Dong Pao deposit, which is located in Lai Chau Province, is associated with such minerals as barite and rare earths; the fluorspar reserve at Dong Pao is estimated to be about 1 Mt. The Xuan Lanh fluorspar deposit is located in Phu Province in central Vietnam; the proven reserve of fluorspar at this deposit is about 277,500 t, and the probable reserve is about 105,500 t (Salwan, 2013).

Rare Earths.—During 2012, the Dong Pao Rare Earth Mine, which is located in Ban Hon Commune, Tam Duong District, Lai Chau Province, was mined by artisanal miners. The miners dug for rare-earth minerals, which they then sold to traders. The Dong Pao Mine was considered one of the largest rare-earth mines in the country; it covered an area of 11 square kilometers and had a reserve estimate of 5 Mt. The mine was operated by Lai Chau-Vietnam National Minerals Corp. (VIMICO) Rare Earth Joint Stock Co. and the Japanese Dong Pao Rare Earth Development Co. During 2012, the mine was still under development (the commissioning date was yet to be determined), when commissioned, the mine was expected to produce about 10,000 t/yr of ore. In October 2012, according to Vinacomin, the operators of the mine signed a memorandum of understanding for the exploitation and processing of rare-earth oxide from the Dong Pao Mine. The agreement could potentially lead to ore output of 720,000 t/yr (TalkVietnam.com, 2012; Vietnam National Coal-Mineral Industries Holding Corp. Ltd., 2012e).

Mineral Fuels

Coal.—In May, Vinacomin announced the country's coal production plan for 2012–15. During that period, the company was planning to upgrade and expand the production capacity of about 60 coal mines located in the northeastern part of the country. Vinacomin was also planning to invest in starting 28 new coal mines, which would have a collective capacity of about 2 Mt/yr of coal. By 2015, the country was expected to have the capacity to produce 55 Mt/yr of coal (Vietnam National Coal-Mineral Industries Holding Corp. Ltd., 2012f).

Crude Petroleum.—In June 2011, the operator of the Dung Quat oil refinery, Binh Son Refining and Petrochemical Co. of Vietnam, announced the company's plans to expand the capacity of the refinery at an estimated cost of up to \$2 billion. The expansion, which was expected to be commissioned by 2017, would increase the processing capacity to 200,800 barrels per day (bbl/d) from 130,500 bbl/d. The facility was designed to process crude petroleum from the Middle East and Venezuela (Tran, 2011).

In 2012, Vietnam's second refinery, the Nghi Son refinery, was still under construction. The refinery, which was located in the Nghi Son Economic Zone in northeastern Vietnam in Thanh Hoa Province, would be managed by Nghi Son Refinery & Petrochemical LLC. The 200,000-bbl/d

facility had an estimated construction cost of \$9 billion; it was expected to be commissioned by yearend 2016 and to begin commercial operations by mid-2017. The Nghi Son refinery's ownership was as follows: Idemitsu Kosan Co. Ltd. of Japan and Kuwait Petroleum International of Kuwait (35.1% each), PetroVietnam (25.1%), and Mitsui Chemicals Inc. of Japan (4.7%) (Oil & Gas Journal, 2013).

In November 2012, Vietnam Oil and Gas Group (PetroVietnam) announced that the Su Tu Trang offshore field had started gas production. The field, identified as Block 15.1, was located in the Cuu Long Basin and was operated by the Cuu Long Joint Operating Co. Data on total capacity were not available (Vu, 2012).

Natural Gas.—In April, Russian-Vietnam Joint Operating Co. (Vietgazprom) announced the start of the third round of exploratory drilling in the Bao Vang deposit, which is located on the country's continental shelf. The same deposit was drilled previously in 2009 and 2010. During 2012, in addition to the exploratory drillings, the company planned to complete a feasibility study of the Bao Vang deposit, carry out 3-dimensional seismic exploration, and determine the reserves of the deposit (OAO Gazprom International, 2012; undated).

Outlook

Since Vietnam's 2010 Mineral Law became fully effective in July 2011, the Government has been diligent in the creation and approval of decisions and decrees to support the implementation of the Mineral Law to attract international interest in the country's mining of metals and industrial minerals. As a result, the country has seen an increase in foreign investment in the mineral industry, which has resulted in new exploration drillings, resource discoveries, and expansions and commissioning of many projects in the bauxite, cement, copper, gold, and other sectors. In the near future, an increase in the production of fluorspar, and tungsten and its byproducts, is expected as projects that were under development in 2012 come online in 2013 and 2014. VNCA forecasted a steady increase in domestic consumption of cement for 2013 as a result of an increase in demand to support infrastructure projects in the country.

In the next 5 years and beyond, the production of metals and industrial minerals is expected to increase as the development of the mineral projects that started in 2011 and 2012 progress and mines and plants start being commissioned. Among these projects are the Tan Rai alumina and bauxite complex, which is expected to start production in early 2013. Other mining projects expected to be commissioned in 2013 include the Dong Pao rare-earth project, the Nhan Co bauxite mining and refinery complex, and the Nui Phao polymetallic mining project. Exports of cement are likely to increase over time, mainly because cement output is expected to continue to exceed local demand.

Vietnam's trading of minerals with neighboring countries is highly dependent on the fluctuation of the demand for such commodities in the region, although the demand will also be dependent on the world market and the economic conditions of neighboring countries.

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TABLE 1
VIETNAM: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity ²	2008	2009	2010	2011	2012
METALS					
Antimony ore	540	664	608	714 ^r	755
Bauxite ^e	80,000	80,000	80,000	100,000	100,000
Chromium ore, gross weight ^e	55,880 ³	37,105 ³	40,000	40,000	40,000
Copper:					
Concentrate, gross weight	46,079	51,741	49,038	47,552	45,065
Concentrate, Cu content ^e	11,000 ³	11,300 ³	11,300	11,300 ^r	11,300
Metal, smelter ^e	2,200	6,000	8,000	8,000	8,000
Gold ^e kilograms	3,000	3,000	3,500	3,500	3,500
Iron and steel:					
Iron ore, Fe content	1,371,600	1,904,500	1,972,100	2,371,300 ^r	1,523,100
Metal:					
Steel, crude thousand metric tons	937 ^r	1,702 ^{r,3}	2,906 ^r	2,931 ^r	2,992 ^r
Steel, rolled do.	5,001	7,498 ^r	8,415 ^r	8,085 ^r	7,640
Lead, mine output, Pb content ^e	14,200	7,700	6,500 ^r	6,400 ^r	6,300
Manganese: ^e					
Gross weight	62,300 ³	92,200 ³	82,700	64,600	15,800
Mn content (43%)	26,800 ³	39,600 ³	35,600	27,800	6,800
Tin:					
Mine output, Sn content ^e	5,400	5,400	5,400	5,400	5,400
Metal, smelter	3,583	2,747	3,042	3,900 ^r	4,000 ^e
Titanium concentrate, gross weight ⁴	709,500	698,700	912,000	840,600 ^r	1,143,800
Tungsten, mine output, W content	--	725	1,150	1,635	1,050
Zinc: ^e					
Mine output, Zn content	42,000	38,000	36,000	34,000 ^r	25,000
Slab	16,000 ^r	17,000	16,000	16,000 ^r	18,000
Zirconium, gross weight ^{e,5}	22,000	6,800	6,900	14,000	15,600
INDUSTRIAL MINERALS					
Barite ^e	90,000 ³	75,000 ³	85,000	85,000	85,000
Cement, hydraulic thousand metric tons	40,009	48,810	55,801	58,271 ^r	55,531
Lime do.	1,619	1,584	1,454	1,500 ^e	1,500 ^e
Phosphate rock:					
Gross weight do.	2,101	2,047	2,325	2,395 ^r	2,365
P ₂ O ₅ content ^e do.	630	614	680	720	710
Salt do.	717	679	975	862 ^r	1,178
Sand and gravel, and silica sand do.	112,000	123,000	110,300	101,295 ^r	90,354
Stone, building stone do.	317,429	355,932	381,828	404,421 ^r	352,823
MINERAL FUELS AND RELATED MATERIALS					
Coal, anthracite thousand metric tons	39,777	44,078	44,835	46,611 ^r	42,383
Gas, natural, gross million cubic meters	7,499	8,010	9,402	8,480	9,403
Petroleum, crude thousand 42-gallon barrels	109,291	119,968	110,098	111,351 ^r	122,747

^eEstimated; estimated data are rounded to no more than three significant digits. ^rRevised. do. Ditto. -- Zero.

¹Table includes data available through November 19, 2013.

²In addition to the commodities listed, bentonite, construction aggregates, gemstones, granite, graphite, gypsum, kaolin clay, lignite, marble, nitrogen, pig iron, pyrite, pyrophyllite, rare earths, refractory clay, silver, and sulfur were mined, but not reported, and available information is inadequate to make reliable estimates of output.

³Reported figure.

⁴Figures based on Vietnam's inferred exports of titanium ores to China, Japan, the Republic of Korea, Malaysia, and the United States.

⁵Estimated figures based on Vietnam's inferred exports of zirconium ore to China.

Sources: General Statistics Office of Vietnam, Statistical Yearbook, 2009–2012; World Steel Association, Steel Statistical Yearbook, 2008; World Metal Statistics, December 2009; South East Asia Iron and Steel Institute, Crude Steel Production, Annual Statistics, 2009–2011; The Barytes Association, World Barytes Production, 2008–2010; Copper Bulletin of the International Copper Study Group, 2012; International Chromium Development Association, Statistical Bulletin, 2010–2011; International Tungsten Industry Association, 2008–2012; U.S. Geological Survey Minerals Questionnaire 2011–2012.

TABLE 2
VIETNAM: STRUCTURE OF THE MINERAL INDUSTRY IN 2012

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Alumina	Vietnam National Coal-Mineral Industries Holding Corp. Ltd. (Vinacomin)	Tan Rai alumina complex in Lam Dong Province	600.
Barite	NA	Ao Sen deposit located in Son Duong District, Tuyen Quang Province	80.
Bauxite	Vietnam National Coal-Mineral Industries Holding Corp. Ltd. (Vinacomin)	Tan Rai plant, located in Bao Lam District, Lam Dong Province	600.
Cement	An Giang Cement Co.	An Giang cement plant, An Giang Province	400.
Do.	Binh Phuoc Cement Co.	Binh Phuoc cement plant, Binh Phuoc Province	2,000.
Do.	Building Materials Corp. No. 1	Fico Tay Ninh cement plant, in Tan Chau District, Tay Ninh Province	2,000.
Do.	Cement X18 Factory Co.	Cement X18 plant, Lang Son Province	100.
Do.	Chin Fon Cement Co.	Chin Fon cement plant, Ha Giang Province	1,400.
Do.	Chingfong Hai Phong Cement Corp. [Chingfong Group of Taiwan, 70%; Hai Phong Municipal Government, 15.56%; Vietnam National Cement Corp. (VICEM), 14.44%]	Min Duc cement near Hai Phong City	1,400.
Do.	Cong Thanh Cement Joint Stock Co.	Cong Thanh cement plant, Thanh Hoa Province	1,000.
Do.	Cao Ngan Cement Co.	Cao Ngan cement plant, Thai Nguyen Province	600.
Do.	Dong Banh Cement Co.	Dong Banh cement plant, Lang Son Province	1,000.
Do.	Dong Son Cement Co.	Dong Son cement plant, Thai Nguyen Province	1,500.
Do.	Dong Thanh Cement Co.	Dong Thanh cement plant, Dong Nai Province	1,000.
Do.	Ha Long Cement Co.	Ha Long cement plant, Ho Chi Minh City	2,000.
Do.	Ha Tien Kien Giang Cement Co.	Ha Tien Kien Giang cement plant, Binh Duong Province	200.
Do.	Lafarge (Vietnam) Cement	Cement grinding station in Dong Nai Province	500.
Do.	La Hien Cement Co.	La Hien cement plant, Thai Nguyen Province	600.
Do.	Langbang Cement Co.	Langbang cement plant, Quang Ninh Province	1,500.
Do.	Luckvaxi Cement Co.	Luckvaxi cement plant, Thua Thien-Hue Province	1,200.
Do.	Luck's Group (Vietnam Holdings) Co. Ltd.	Kim Dinh cement plant and Ninh Thuan grinding plant, Thua Thien-Hue Province	2,800.
Do.	Lucky Group Ltd. and Phuc Son Cement Corp.	Phuc Son cement plant, Hai Duong Province	4,000.
Do.	Mai Son Cement Co.	Mai Son cement plant, Son La Province	1,200.
Do.	Midland Construction Corp. (COSEVCO)	Song Gianh cement plant, Quang Binh Province	1,400.

See footnotes at end of table.

TABLE 2—Continued
VIETNAM: STRUCTURE OF THE MINERAL INDUSTRY IN 2012

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement—Continued	Morning Star Cement Ltd. [Holcim Group, 65%, and Vietnam National Cement Corp. (VICEM), 35%]	Cat Lai grinding plant, Hiep Phuoc grinding plant, Thi Vai grinding plant Hon Chong, Kien Giang Province	4,700.
Do.	Nghi Son Cement Corp. [Taiheiyu Cement Corp., 45.5%; Mitsubishi Materials Corp. of Japan, 19.5%; Vietnam National Cement Corp. (VICEM), 35%]	Nghi Son cement plant, Thanh Hoa Province	4,300.
Do.	Quang Ninh Cement and Construction Joint Stock Co.	Quang Ninh cement plant, Ha Long, Quang Ninh Province	1,200.
Do.	Quan Trieu Cement Joint Stock Co. [Viet Bac Mining Industry Corp. and Vietnam National Coal-Mineral Industries Holding Corp. Ltd. (Vinacomin)]	Quan Trieu cement plant, Thai Nguyen Province	820.
Do.	ROLI-Quang Tri Cement Co.	ROLI-Quang cement plant, Quang Tri Province	600.
Do.	Song Thao Cement Co.	Song Thao cement plant, Phu Tho Province	1,000.
Do.	Thai Nguyen Cement Co.	Thai Nguyen cement plant, Thai Nguyen Province	1,400.
Do.	Thang Long Cement	Thang Long cement grinding plant in Hiep Phuoc Industrial Zone	2,300.
Do.	Tuyen Quang Cement Group 1	Tuyen Quang cement plant, Tuyen Quang Province	600.
Do.	Vietnam Construction and Import-Export Joint Stock Corp. (VINACONEX)	Cam Pha cement grinding plant in Phu Tho Province	2,300.
Do.	do.	Luong Son cement plant, Hoa Binh Province	1,200.
Do.	do.	Yen Bai cement plant, Yen Bai Province	200.
Do.	Vietnam National Cement Corp. (VICEM) (100% state owned)	Bim Son cement, Thanh Hoa Province	3,800.
Do.	do.	But Son cement, Ha Nam Province	1,600.
Do.	do.	Hai Phong cement, Ha Giang Province	1,700.
Do.	do.	Ha Tien I, Ho Chi Minh City	1,500.
Do.	do.	Ha Tien II, Kien Giang Province	1,200.
Do.	do.	Hai Van cement, Danang City	600.
Do.	do.	Hoang Mai cement, Nghe An Province	1,400.
Do.	do.	Hoang Thach cement, Hai Duong Province	2,300.
Do.	do.	Tam Diep cement, Ninh Binh Province	1,400.
Do.	Vietnam Industrial Construction Corp. (VINAINCON)	Quang Son cement factory, in Quang Son Commune, Dong Hy District, Thai Nguyen Province	1,500.
Chromite, gross weight	Thai Nguyen Nonferrous Metal Co. [wholly owned subsidiary of state-owned Vietnam National Minerals Corp. (VIMICO)]	Nui Nua, Thanh Hoa Province	10.
Coal, anthracite	Vietnam National Coal Corp. (VINACOAL) (100% state owned)	Cam Pha, Cao Son, Coc Sau, Vang Danh, Dong Trieu, Ha Lam, Ha Tu, Hong Gai, Khe Cham, Mao Khe, Mong Duong, Deo Nai, Cua Ong, Uong Bi in Quang Ninh Province	42,000.
Copper:			
Concentrate, Cu content	Lao Cai Copper Complex [wholly owned subsidiary of Vietnam National Minerals Corp. (VIMICO)]	Sin Quyen, Lao Cai Province	11.
Ore	Sin Quyen Copper Co. [a subsidiary of Vietnam National Coal-Mineral Industries Holding Corp. Ltd. (Vinacomin)]	Sin Quyen Mine, Bat Xat District, Lao Cai Province	1,200.

See footnotes at end of table.

TABLE 2—Continued
VIETNAM: STRUCTURE OF THE MINERAL INDUSTRY IN 2012

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Copper—Continued				
Refined		Tang Loong Lao Cai Copper Smelting Enterprise [wholly owned subsidiary of Vietnam National Coal-Mineral Industries Holding Corp. Ltd. (Vinacomin)]	Tang Loong Long Commune, Bao Tang District, Lao Cai Province	10.
Fertilizer:				
Nitrogen, ammonia		Vietnam National Chemical Corp. (VNCC) (100% state owned), and Phyl My Nitrogenous Fertilizer and Chemical Joint Stock Corp.	Ha Bac, northern Vietnam; Phu My, Ba Ria-Vung Tau Province	375.
Superphosphate		do.	Lam Thao, Phu Tho Province	800.
Gas, natural	million cubic meters per day	VietSovPetro (a joint venture of Vietnam Oil and Gas Corp. and Zarubezhneft), and the joint venture of PetroVietnam, BP p.l.c., Oil and Natural Gas Co., and ConocoPhillips Co.	Offshore Bach Ho oilfield, Rang Dong oilfield, and Lan Tay and Lan Do gasfields	20.
Do.		Vietnam Oil and Gas Group (PetroVietnam) and operated by Cuu Long Joint Operating Co.	Su Tu Trang offshore field (Block 15.1) located in Cuu Long Basin	NA.
Gold, gold content of mine output	kilograms	Bong Mieu Gold Mining Company Ltd. (Bong Mieu Holdings Ltd. [a wholly owned subsidiary of Olympus Pacific Minerals Inc.], 80%; Mineral Development Co., 10%; Quang Nam Mineral Joint Stock Co., 10%)	Ho Gan open pit and Nui Kem underground mines, Quang Nam Province	400.
Do.		Besra Gold Inc.	Bai Dat and Bai Go deposit within the Phuoc Son gold property, Quang Nam Province	NA.
Iron ore, gross weight		Thai Nguyen Iron and Steel Corp. [wholly owned subsidiary of Vietnam National Steel Corp. (VNSTEEL)]	Trai Cau and Tein Bo in Thai Nguyen Province; Thach Khe in Ha Tinh Province	850.
Petroleum, crude	thousand 42-gallon barrels per day	VietSovPetro (a joint venture of Vietnam Oil and Gas Corp. and Zarubezhneft)	Offshore Bach Ho, Rong, Rang Dong, Ruby, Bunga Kekwa, Dai Hung, and SuTu Trang oilfields	320.
Do.		Vietnam Oil and Gas Group (PetroVietnam), 50%; ConocoPhillips Co., 23.25%; Korea National Oil Corp., 14.25%; SK Innovation, 9%; Geopetrol SA, 3.5%. Operated by Binh Son Refining and Petrochemical Co.	Dung Quat refinery, in Quang Ngai Province	47,600.
Phosphate rock, gross weight		Vietnam Apatite Limited Co. [Vietnam National Chemical Corp. (VNCC), 100%]	Cam Duong and Tang Loong, Lao Cai Province	1,250.
Rare earths		Lai Chau-Vietnam National Minerals Corp. (VIMICO) Rare Earth Joint Stock Co. and the Japanese Dong Pao Rare Earth Development Co.	Dong Pao Rare Earth Mine, located in Tam Duong District, Lai Chau Province	NA.
Salt		Vietnam National Salt Corp.	Nam Dinh, Nghe An, and Ha Tinh Provinces	12,000.
Steel:				
Crude		Vietnam National Steel Corp. (VNSTEEL)	Cai Lan, Thai Nguyen Province, and Phu My, Ba Ria-Vung Tau Province	2,000.
Products		Shengli (Vietnam) Special Steel Co. Ltd., established by Shengli Group Corp., and Guangdong Metals and Minerals Import & Export Corp.	Cau Nghin Industry billets plant, in Quynh Phu, Thai Binh Province	500.
Do.		do.	Bar & wire rod plant in Quynh Phu, Thai Binh Province	600.
Rolled		Lotus Group	Cold-rolled steel plant in Phu My Industrial Park in Ba Ria-Vung Tau Province	1,000.

See footnotes at end of table.

TABLE 2—Continued
VIETNAM: STRUCTURE OF THE MINERAL INDUSTRY IN 2012

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Steel—Continued			
Rolled—Continued	POSCO-Vietnam, 100% owned by POSCO Group	POSCO Special Steel in Phu My Industrial Park in Ba Ria-Vung Tau Province	700 cold-rolled steel; 3,000 hot-rolled steel.
Do.	Vietnam Shipbuilding Industry Group (VINASHIN)	Cai Lan steel plate hot-rolling plant, Ha Long City, Quang Ninh Province	1,000.
Do.	Viet Steel Corp.	Bar mill in Ba Ria-Vung Tau Province	450.
Tin:			
Concentrate, Sn content	Cao Bang Nonferrous Metal Co. and Nghe Tinh Nonferrous Metal Co. [wholly owned subsidiaries of state-owned Vietnam National Minerals Corp. (VIMICO)]	Pia Oac, Cao Bang Province; Quy Hop, Nghe An Province; and Tam Dao, Tuyen Quang Province	4.
Refined	Thai Nguyen Nonferrous Metals Co.	Thai Nguyen city, Thai Nguyen Province	2.
Titanium, ilmenite	Bimal Minerals Co. Ltd. (Malaysia Mining Corp. and Syarikat Pendorong Sdn. Bhd., 60%, and Binh Dinh Minerals Co., 40%)	Cat Khanh Mine, Qui Nhon, Binh Dinh Province	70.
Do.	Ha Tinh Minerals and Trading Co.	Cam Hoa, Ky Annh-Cam, Xuyen, Ky Khan, and Ky Ninh, Ha Tinh Province	450.
Do.	Mineral Development Co. No. 4 and No. 5 [wholly owned subsidiaries of Vietnam National Minerals Corp. (VIMICO)]	Vinh City, Nghe An Province; Tuy Hoa, Dong Xuan in Phu Yen Province; and Quang Ngan, Vinh My in Thua Thien-Hue Province	50.
Tungsten, concentrates	Vietnam Youngsun Tungsten Industry Co.	Thienke tungsten mine in Tuyen Quang Province	2.
Do.	Do.	Philieng tungsten mine in Lam Dong Province	1.
Tungsten, ferrotungsten, W content	Do.	Quang Ninh plant in Halong, Quang Ninh Province	3.
Zinc:			
Concentrate, Zn content	Thai Nguyen Nonferrous Metal Co. [wholly owned subsidiary of state-owned Vietnam National Minerals Corp. (VIMICO)]	Cho Dien, Backan Province	50.
Refined	Ta Pan Zinc-Lead Plant (a Chinese private firm, 70.2%, and Ha Giang Mineral Exploiting and Engineering Co., 29.8%)	Lung Vay, Bac Me District, Ha Giang Province	6.
Do.	Thai Nguyen Zinc Refinery [wholly owned subsidiary of state-owned Vietnam National Minerals Corp. (VIMICO)]	Thai Nguyen City, Thai Nguyen Province	10.

Do., do. Ditto. NA Not available.