



2015 Minerals Yearbook

VIETNAM [ADVANCE RELEASE]

THE MINERAL INDUSTRY OF VIETNAM

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Vietnam is endowed with many mineral deposits distributed throughout the country, including deposits of antimony, barite, bauxite, bismuth, coal, copper, fluor spar, nickel, rare earths, silica sand, silver, tin, titanium, tungsten, zinc, and zircon. In 2015, Vietnam was a major producer of bismuth (19.4% of the world's total production), tungsten (6.3%), tin (2%), and cement (1.6%) (Anderson, 2017a, b; Shedd, 2017; van Oss, 2017). Other minerals produced in the country included antimony, barite, bauxite, chromite ore, coal, cobalt, natural gas, lead, manganese, nickel, phosphate rock, salt, titanium mineral concentrate, and zircon concentrate. Vietnam's production of processed minerals included refined copper, rolled steel, refined tin, and zinc. A complete list of mineral commodities produced in Vietnam can be found in table 1.

Minerals in the National Economy

The output value of the mining and quarrying sector in 2015, which included nonfuel minerals, increased by 3.1% to an estimated \$11,090 million¹ (in 2010 constant dollars) from \$10,754 million in 2014. In 2015, the mining and quarrying sector made up about 8.4% of the country's total estimated gross domestic product (GDP) of \$132.6 billion (in 2010 constant dollars) and was the fifth-ranked sector in terms of contribution to the GDP (General Statistics Office of Vietnam, 2015b).

According to the General Statistics Office of Vietnam, the number of employees working in the mining and quarrying sector in 2015 was approximately 238,000, which accounted for less than 1% of the total number of employed individuals in the country. Investments in the mining and quarrying sector for 2015 increased by 9.8% to an estimated \$2,675 million (in 2010 constant dollars) compared with \$2,436 million in 2014 and represented about 5.6% of the total investment in the country (General Statistics Office of Vietnam, 2015a, c).

Government Policies and Programs

Decree No. 15/2012/ND-CP (Decree 15) of March 2012 designates the ministries and Government offices that oversee matters related to Vietnam's mineral 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 materials. The MIT sets the conditions and standards for the export of most minerals, with the exception of construction materials; exports of construction materials are coordinated by the Ministry of Construction. Under the MONRE, the General Department of Geology and Minerals processes applications for mining licenses and applications for mine closures, and the Office of the Council for Assessment of

National Mineral Resources certifies the validity of mineral-resource assessments (Mayer Brown JSM, 2012a, b).

In 2015, the Government of Vietnam continued with its creation and approval of decisions and decrees that support the implementation of the 2010 Mineral Law. The 2010 Mineral Law is the legislation that regulates the mineral industry in Vietnam, and it became fully effective in July 2011. The 2010 Mineral Law replaced the 1996 Mineral Law, as amended in 2005.

In 2015, the Government of Vietnam issued Decree No. 12/2015/ND-CP (February 12, 2015) and Circular No. 26/2015/TT-TC (February 27, 2015), which provided a new method to calculate the royalty rate for gold producers operating in Vietnam. Decree 12 and Circular 26 allow for a considerable amount of the operational costs to be deducted before the 15% royalty on gold is applied. Decree 12 clarifies the Law on Royalty and amends Decree 50 (Guiding Law on Royalty), which came into effect on July 1, 2010 (Besra Gold Inc., 2015a; DFDL Consultants, 2015a).

On March 30, 2015, Directive No. 03/CT-TTg was issued to tighten the control over mineral production and strengthen the implementation of policies and the regulation of minerals. Directive No. 03 mandates that entities that plan to invest or establish a mineral-processing plant in Vietnam must conduct a geologic survey of the area, complete mineral exploration to determine material sourcing, and establish mineral import contracts. The mining license holder is required to use appropriate techniques to process minerals, maximize production according to the plant's production capacity, and comply with environmental protection requirements. Directive No. 3 also designates which various Government agencies are to oversee different aspects of the mineral industry, such as that the Department of Geology and Minerals will coordinate with tax agencies to thoroughly monitor the quantity of minerals mined in Vietnam by license holders; the Ministry of Finance will oversee the General Department of Customs (which is tasked with inspecting exports and applying measures to prevent mineral export fraud); and the Ministry of Defense will direct Vietnam's border guards, marine police, and other agencies to monitor and thwart illegal mineral trade across the country's borders (DFDL Consultants, 2015b; Le & Tran, 2015, p. 25–26; Vietnam Law & Legal Forum, 2015a).

Under Directive No. 3, no new gold exploration and exploitation licenses are to be issued; small-scale mineral exploration licenses are to be limited (with the purpose of eventually stopping the granting of these licenses), the export of unprocessed minerals is prohibited, and the export of minerals is limited to high-value-added (processed) minerals, as stipulated in Circular No. 41/2012/TT- BTC of December 21, 2012. Minerals allowed to be exported are specified in Circular 41, which also specifies the conditions under which the minerals may be exported, such as the quality of the exported material

¹Where necessary, values have been converted from Vietnam dong (VND) to U.S. dollars (US\$) at the average annual exchange rate of VND21,682=US\$1.00 for 2015 and VND20,995=US\$1.00 for 2014.

(must contain a minimum percentage of mineral content in the ore in order to be processed), whether the minerals must be processed (to encourage domestic processing of ore), and that the material must have been mined legally in mines with valid licenses or imported lawfully. Under Circular 41, the mineral commodities allowed to be exported include products processed from bauxite and titanium ores, refined products (such as bismuth, copper, fluoride, nickel, and wolframite), and industrial mineral powders (such as barite, rare-earth oxide, and white marble) (General Department of Vietnam Customs, 2012; DFDL Consultants, 2015b; Le & Tran, 2015, p. 25–26).

On November 11, 2015, the MIT released a draft proposal for a circular, which, if approved, would further detail the conditions for mineral exports. The proposed circular would establish that only businesses that are (1) legally operating under the country's Law on Enterprises, (2) in good standing and complying with commodity processing and trading conditions established under the Commercial Law, and (3) partnered with foreign parties approved by the Commercial Law are allowed to export. Other specifics include that mineral export licenses would not be granted to enterprises suspended from export activities nor to those that have committed violations of the laws on minerals, mineral exports, and (or) environmental protection. Mineral products eligible for export must have traceable, legal origins and have been processed according to quality standards. According to the Law on Nuclear Energy, companies wishing to export products containing thorium or uranium in concentrations of 0.05% or higher must obtain an export license approved by the Ministry of Science and Technology. For each exported shipment, the exporter must provide all documentation required by customs law in addition to submitting a product quality declaration or a standard conformity analysis certificate. Exporters are also required to provide records of the amounts of their previous mineral exports. Customs export clearances would be granted to shipments that have passed customs inspection and, when necessary, the shipments would be sampled and tested, at the exporters' expense, using the Vietnam Laboratory Accreditation Scheme. Results deemed noncompliant would be reported as a violation to the People's Committee at the Province level and to the Ministry of Industry and Trade, and the company would be fined according to current regulations and prohibited from exporting minerals. The draft also had a provision that, by the year 2020, the mineral commodities permitted for export would be limited to four—ilmenite, synthetic rutile, titanium slag, and white marble lump (Vietnam Law & Legal Forum, 2015b).

Production

In 2015, mineral production increased for fluor spar (by about 230%), nickel (25.6%), tungsten (24.4%), and cobalt (24.2%). The increases in the production of fluor spar and tungsten were owing mainly to the first full year in production at Masan Resources Corp.'s Nui Phao polymetallics project. The increases in cobalt and nickel were owing mainly to high ore grades mined in Asian Mineral Resources (AMR) of Canada's Ban Phuc nickel mine, which started commercial operations in mid-2013. Other production increases were reported for phosphate rock (11.6%), cement (10.6%), and salt

(9.4%). Production decreased for zircon mineral concentrate (by 60%), titanium concentrate (49.5%), ferrotungsten (48%), lead (33.5%), iron ore (17.7%), and antimony (9.3%). Data on mineral production are in table 1.

Structure of the Mineral Industry

Government-owned corporations were the main operators and (or) majority stakeholders of many of the mining facilities operating in Vietnam. Vietnam National Coal and Mineral Industries Group (VINACOMIN), which is Government owned, was the main operator for facilities in the alumina, bauxite, and copper sectors. Table 2 is a list of major mineral industry facilities, which are dominated by Government-owned enterprises.

Mineral Trade

In 2015, total trade in Vietnam increased by approximately 10% to \$327.6 billion from \$298.1 billion (revised) in 2014. The total value of exports for 2015 was about \$162 billion compared with \$150.2 billion in 2014 (an increase of about 8%). Exports of crude petroleum, by volume, decreased by 1.3% to 67.5 million barrels (Mbbbl) in 2015 from 68.4 Mbbbl in 2014. In terms of value, exports of crude petroleum decreased by approximately 49% to about \$3.7 billion in 2015 from \$7.2 billion in 2014. Additionally, exports of coal, in terms of tonnage, decreased by about 76% to approximately 1.7 million metric tons (Mt) in 2015 from about 7.3 Mt in 2014; in terms of value, coal exports decreased by 67% to \$185 million in 2015 from \$555 million in 2014. In 2015, the total value of imports increased by about 12% to \$165.6 billion from \$147.9 billion in 2014. Imports of iron and steel increased by 32% to about 15.5 Mt from 11.8 Mt in 2014, and imports of refined petroleum products increased by 20% to 74 Mbbbl from 61.7 Mbbbl in 2014. Imports of fertilizers increased by about 19% to 4.5 Mt in 2015 from 3.8 Mt in 2014. Data on the value of these commodities were not available (General Statistics Office of Vietnam, 2015d, g, h).

Vietnam's main trading partners in 2015 were China, Germany, Hong Kong, Japan, the Republic of Korea, Taiwan, Thailand, and the United States. The United States was Vietnam's leading export partner and received \$33.5 billion in Vietnamese goods, such as crude petroleum, iron and steel, and precious stones, which represented about 21% of Vietnam's total exports. The second-ranked recipient of Vietnam's mineral commodity exports was China, which received such goods as cement, coal, crude petroleum, and iron and steel, valued at \$17.1 billion (11% of Vietnam's total exports), followed by Japan, which received such goods as coal, crude petroleum, fertilizers, and iron and steel valued at \$14.1 billion (about 9% of Vietnam's total exports). Vietnam's imports came mainly from China, which supplied such goods as coal, fertilizers, iron and steel, liquefied petroleum gas, and petroleum valued at about \$49.5 billion (about 30% of Vietnam's total imports), followed by the Republic of Korea, which supplied such goods as fertilizers, iron and steel, liquefied petroleum gas, petroleum, and precious stones valued at \$27.6 billion (17% of total imports), and Japan, which supplied such goods as coal, fertilizers, iron and steel, petroleum, and precious stones valued

at about \$14.4 billion (9% of total imports) (General Statistics Office of Vietnam, 2015d–f).

Commodity Review

Metals

Bauxite and Alumina and Aluminum.—In 2015, VINACOMIN announced that it had established contracts with 11 international customers to sell alumina from its Tan Rai alumina plant. The customers were from China, Hong Kong, the Republic of Korea, Singapore, and Switzerland; in addition, VINACOMIN had secured contracts with about 20 domestic companies from the building material and chemical sectors. The Tan Rai plant was Vietnam's first alumina plant and was commissioned in 2013; it is located in the Bao Lam District in Lam Dong Province in the country's Central Highlands. In early 2015, the plant was operating at about 75% of its design capacity of 650,000 metric tons per year (t/yr) of alumina (Vietnam National Coal Mineral Industries Holding Co. Ltd., 2015a, b).

In February, VINACOMIN announced that it had the Government's support for its Tan Rai plant to go public; therefore, it was considering equitizing the plant to raise funds to manufacture aluminum and aluminum products. It would allow private investors to participate in projects for the expansion of the plant and to assist in the processing of byproducts derived from the processing of bauxite (Vietnam National Coal Mineral Industries Holding Co. Ltd., 2015b, c).

In May, VINACOMIN announced that the People's Committee of the Central Highlands Province of Lam Dong approved a project to facilitate the transportation of materials and products out of the Tan Rai project facility. The project, which was proposed to be implemented in two phases by Saigon-Lam Dong Transportation JSC, was expected to cost \$13.3 million. The project would have a projected transportation capacity of 1.23 million metric tons per year (Mt/yr) (Vietnam National Coal Mineral Industries Holding Co. Ltd., 2015d).

In February, VINACOMIN reiterated that the construction of its Nhan Co bauxite mining and refinery complex, which was located in Dak Nong Province, was more than 2 years behind schedule. The delay was owing mainly to difficulties in acquiring the land. In July, the company announced that the Nhan Co complex, which had an estimated development cost of \$776 million, had started trial production that would run through September. The complex included a bauxite mine and an alumina refinery. The project was designed to have a capacity of 1.65 Mt/yr of bauxite and an alumina production plant with the capacity to produce 650,000 t/yr (Vietnam Breaking News, 2015; Vietnam National Coal Mineral Industries Holding Co. Ltd., 2015a).

In September 2014, the Ministry of Industry and Trade announced that it had started the construction of another project, the Dak Nong aluminum smelting plant, at an estimated cost of \$575 million. The project was located in the Nhan Co Industrial Park in Dak Nong Province in the Central Highlands and was being developed by Tran Hong Quan Trading Ltd. Co. The plant was expected to commence operations by the end of 2016 and to have a maximum capacity of 450,000 t/yr of aluminum. The

project was divided into three phases with the goal of achieving annual production capacities of 150,000 t/yr of aluminum by 2016, 300,000 t/yr by 2017, and 450,000 t/yr by 2019. The raw material for this plant would be supplied by VINACOMIN's Nhan Co complex (Vietmaz.com, 2014; Vietnam Breaking News, 2014).

Bismuth, Copper, Fluorspar, and Tungsten.—In 2015, the Nui Phao polymetallic project, which was owned by Masan Resources and operated by Nui Phao Mining Co., achieved its first full year of production. Also in 2015, Masan Resources successfully commissioned the ammonium paratungstate (APT) plant, which processes tungsten concentrate to produce value-added tungsten products, such as APT. The APT plant, which was called Nui Phao H.C. Starck Tungsten Chemicals Manufacturing LLC, was established in 2013 under a joint-venture agreement between Nui Phao Mining Co. Ltd. (part of the Masan Group) (74.1%) and H.C. Starck GmbH of Germany. In March 2014, the Nui Phao project started commercial production of copper concentrate and tungsten oxide, followed by production of fluorspar in June and bismuth concentrate in September. The Nui Phao Mine had an estimated mine life of 20 years and estimated proven and probable ore reserves of 66 Mt. The plant had a designed processing capacity of 3.5 Mt/yr of ore. The project consisted of an open pit mine in combination with a plant for crushing, grinding, flotation (for bismuth, fluorspar, and copper), tungsten gravity recovery, and the APT plant. The operating company shipped all its products from the Quang Ninh Port, which is located in Ha Long City about 200 kilometers (km) from the project (Masan Resources Corp., 2015, p. 11, 15, 17).

Gold.—In October, Besra Gold Inc. of Canada announced that its Bong Mieu Gold Mining Co. (BMGMC) Mine had resumed operations; however, the company did not release its gold production data from this mine. Previously, in June 2015, the company had announced the temporary shutdown of the Bong Mieu Mine owing to the Quang Nam Tax Department raising unspecified issues that prevented the company from selling its gold production. In February, Besra said that it was developing a payment plan for the outstanding taxes owed to the local authorities. The local tax department imposed sanctions on the company that halted its mining operations (Besra Gold Inc., 2015a, b).

In June, Besra announced that it was preparing to submit a license application for the development of the Ho Ray Thac Trang deposit, which is located on the Bong Mieu property. Also in June, Besra announced that it was preparing for the reopening of the Phuoc Son Gold Co. (PSGC). No further details were released regarding its status (Besra Gold Inc., 2015b).

Cobalt, Copper, and Nickel.—In 2015, the Ban Phuc Nickel project, which was a subsidiary of AMR (90% interest), produced 8,607 metric tons (t) of nickel in concentrate, 4,011 t of copper in concentrate, and 277 t of cobalt in concentrate. The project, which is located approximately 160 km from Hanoi in Son La Province, started production in June 2013 and consisted of a mine and a nickel-copper-cobalt concentrate-processing facility. On February 6, AMR received Decision No. 288/QĐ–BTNMT issued by the MONRE for the amendment of the company's mineral mining license.

Decision 288 settled the mining right grant to a fixed fee of \$2.9 million to be paid in annual installments starting in 2015 and continuing until 2017. When the project started operations in 2013, the Government did not have a system in place to determine the fee that the company needed to pay to the Government. Later in 2013, the Government issued Decree 203 and determined that AMR owed \$4.6 million to the Government based on a calculation according to the 2010 Mineral Law, which determined the fee based on price, amount of reserves, quality of the reserves, and the type of mineral (Asian Mineral Resources, 2015, p. 3–4, 7).

During 2015, AMR continued its exploration efforts to extend the mine life within the company's exploration license of 49.7 square kilometers (km²). The company performed an airborne magnetic survey, field mapping, metallurgical tests, trenching, and soil sampling to identify priority targets. The results identified that the Kingsnake target, which is located about 1 km from the Ban Phuc processing plant, has continuous mineralization similar to that of the Ban Phuc project. In 2015, the Government continued its support for the construction of a nickel smelter in the country. The smelter would enable AMR to enhance the economic potential of the Ban Phuc project by reducing transportation costs and significantly reducing export tariffs to 5% (incurred for nickel matte) compared with 20% (incurred for nickel concentrate). For 2016, AMR expected to continue exploring opportunities to extend the life of the Ban Phuc Mine and to focus on two adjoined exploration targets, the Ban Chang and the Kingsnake deposits (Asian Mineral Resources, 2015, p. 4; 2016).

Iron and Steel.—In September 2015, JFE Steel Corp. of Japan signed an agreement to acquire a 5% stake in Formosa Ha Tinh Steel Corp. (FHS) at a cost of \$225 million. FHS is a joint-venture company headed by Formosa Plastics Group (FPG) of Taiwan (70%), China Steel Corp. (CSC) of Taiwan (25%), and JFE Steel (5%). FHS was building the country's first integrated steel mill plant at a cost of \$10.5 million for the first phase, and construction was expected to be completed by the end of the year. The plant was expected to have a production capacity of 7 Mt/yr of crude steel. JFE Steel would provide technical support to the project, which would include blast furnaces, a hot-rolling mill, and a steelmaking facility to be located in Ha Tinh Province (JFE-steel.com, 2015; SteelOrbis.com, 2015).

In November, Ton Dong A Corp. inaugurated the first phase of its steel sheet plant located in Dong An 2 Industrial Park in Binh Duong Province. The first phase of the project had a cost of \$70 million; the second phase, which would cost \$80 million, was expected to start operations by 2017. When fully operational, the plant would have a capacity of 800,000 t/yr of steel sheet (South East Asia Iron and Steel Institute, 2015b).

In December, Hoa Sen Group acquired a license from the Economic Zone Authority of Binh Dinh Province to develop a steel mill at a cost of \$89 million. The project would be managed by the Hoa Sen Group through its subsidiary Hoa Sen Nhon Hoi-Binh Dinh Ltd. Co. The plant, which would be located in the Nhon Hoi Economic Zone, was expected to be fully operational by 2017 and to have a capacity of 200,000 t/yr

of steel sheet and cold-rolled steel products (South East Asia Iron and Steel Institute, 2015a).

Titanium.—In November, PHI Group Co. Ltd. of the United States signed an investment agreement with Vietnam HTMI Titanium Ore Production and Processing Enterprises Co., Ltd. (HTMI Co., Ltd), which was the owner of a titanium mine and the operator of a titanium slag factory in Binh Thuan Province. The agreement stipulated that PHI Group would assist HTMI in upgrading its facilities to produce refined titanium products and to increase the production capacity for titanium slag to 150,000 t/yr. Under the agreement, PHI Group would hold a 49% interest in HTMI and an additional 2% voting right in the company in exchange for providing the capital and technology to develop the facility into a titanium refinery (Sparks, 2015).

In 2015, production of titanium mineral concentrates decreased by about 50%. According to the Vietnam Titanium Association, by August 2014, about 90% of the titanium-processing factories in Vietnam had suspended operations owing mainly to decreases in titanium prices and an overstock of inventory. These factors in combination with taxes and fees charged to producers, which included the export tax (30%), corporate income tax (25%), resource tax (16%), value-added tax (10%), mineral exploitation fee (5%), and environmental fees, made it not economically feasible for companies to keep their operations open. Before the suspension of operations, about 70 titanium mining and processing plants were active in the country for a combined output of about 1 Mt/yr of titanium. Nearly 50% of the titanium products produced in Vietnam were exported to China, and the remainder went to Japan, the Republic of Korea, and the United States (Vietnamnet.com, 2014).

Industrial Minerals

Cement.—In 2015, the construction sector made up about 6% of Vietnam's total estimated GDP. The output value of the construction sector in the country increased by 7.3% to an estimated \$7.93 billion (in 2010 constant dollars) from \$7.39 billion in 2014. In 2015, cement production in the country increased by 10.6%. As of 2015, the country had 76 cement production facilities for a combined annual capacity of about 81.6 Mt of cement. The Ministry of Construction forecast an increase in the annual sale of cement in 2016 as a result of the increase in construction in the country (table 1; International Cement Review, 2015b; General Statistics Office of Vietnam, 2015b).

According to the Ministry of Construction, in August 2015, Binh Dinh Province granted a permit to the Vietnam Construction Material Co. (VCM) to establish a new grinding plant. The plant would have a design capacity of 1 Mt/yr. The location was yet to be determined. Also in August, Tan Thang Cement JSC announced that the JSC Bank for Investment and Development of Vietnam (BIDV) and the North Asia Commercial Joint Stock Bank (Bac A Bank) had agreed to lend funds totaling \$143.5 million for the construction of the Tan Thang cement plant in Qunh Luu District, Nghe An Province, in central Vietnam. The project would have a production capacity

of 5,000 metric tons per day of clinker and 1.98 Mt/yr of cement. Details of the timeline for the development of the project were not provided (International Cement Review, 2015a, c).

Mineral Fuels

Petroleum.—In June 2015, Vietnam Oil and Gas Group (Petrovietnam) announced the acquisition of 100% of the assets of Chevron Corp. in the Vietnam, which included two offshore production-sharing contracts (PSC) and a stake in a gas development project. The two offshore PSCs, which are located in the Malay Basin off the coast of southwestern Vietnam, consisted of Block B and Block 48/95 operated by Chevron Vietnam (Block B) Ltd. (42.38%) and Block 52/97 operated by Chevron Vietnam (Block 52) Ltd. (43.4%). Petrovietnam also acquired 28.7% of the Block B Gas Development Project operated by Chevron Southwest Vietnam Pipeline Co. Ltd. The gas development project was designed to transport natural gas from Block B, Block 48/95, and Block 52/97 to existing and future-planned powerplants located in southern Vietnam (Rigzone.com, 2015).

Outlook

During 2015, the Government of Vietnam continued with the creation and approval of a series of legal instruments in support of the implementation of the 2010 Mineral Law in order to attract international interest to tap the country's potential for mineral mining and other areas of economic growth. In recent years, Vietnam has experienced an increase in international companies investing in mining projects for such mineral commodities as bauxite, bismuth, cement, cobalt, copper, fluor spar, gold, nickel, and tungsten. In the near future, increases in the production of alumina and bauxite (from the Tan Rai project) are expected, as projects that were under development in recent years have started operations and are expected to reach full production capacity. Another project that is expected to contribute to the increase in production was Nui Phao, which produces bismuth, copper, fluor spar, and tungsten.

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TABLE 1
VIETNAM: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity ²	2011	2012	2013	2014	2015	
METALS						
Alumina	thousand metric tons	--	--	214	485	484
Antimony, ore:						
Gross weight		714	1,199	2,476	2,745 ^f	2,489
Sb content (40%)		290	480	990	1,100 ^f	1,000
Bauxite		100,000	100,000	482,000 ^f	1,090,000 ^f	1,150,000
Bismuth		--	--	--	2,000	2,000
Cobalt, concentrate, Co content		--	--	25	223	277
Copper concentrate:						
Gross weight		47,552	50,862 ^f	49,148	48,394 ^f	49,304
Cu content ^e		11,300	12,700 ^f	12,300	12,100 ^f	12,300
Gold, mine output, Au content	kilograms	1,333	600 ^c	1,872	164	--
Iron and steel:						
Iron ore:						
Gross weight		4,474,000	2,842,000 ^f	4,708,200	5,130,200 ^f	4,222,300
Fe content (53%)		2,400,000	1,500,000 ^f	2,500,000	2,700,000 ^f	2,200,000
Pig iron	thousand metric tons	600	650	650	1,393 ^f	1,500 ^c
Metal:						
Steel, crude	do.	2,931	2,965	3,484 ^f	3,954 ^f	4,122
Steel, rolled	do.	8,085	8,405	9,252 ^f	10,739 ^f	12,065
Lead, mine output, Pb content (60%) ^{e,3}		5,180 ^f	360 ^f	1,870 ^f	2,840 ^f	1,890
Manganese: ^{e,4}						
Concentrate, gross weight		64,600	15,800	9,700	760 ^f	--
Mn content (43%)		27,800	6,800	4,200	330 ^f	--
Nickel, mine output, Ni content		--	--	1,166 ^f	6,854 ^f	8,607
Rare-earth oxide ^{e,3}		200	200	100	-- ^f	250
Tin, metal, smelter		3,900	4,000 ^c	4,000 ^c	4,000 ^e	4,000 ^c
Titanium mineral concentrate, gross weight ⁵		760,000 ^f	978,300 ^f	1,025,800 ^f	558,000 ^f	282,000
Tungsten:						
Mine output, W content		1,635	1,050	1,660	4,500 ^f	5,600
Ferrotungsten, gross weight, shipped ⁶		--	--	511	764 ^f	400 ^c
Zinc: ^e						
Mine output, Zn content		30,000	30,000	20,000	26,000 ^f	27,000 ^f
Slab		18,000 ^f	18,000	12,000 ^f	12,000 ^f	10,000
Zirconium, gross weight ^{e,3}		14,000	15,600	7,600 ⁷	8,500	3,400
INDUSTRIAL MINERALS						
Barite ^e		135,000 ^f	110,000 ^f	75,000 ^f	100,000 ^f	100,000
Cement, hydraulic	thousand metric tons	58,271	56,353 ^f	57,516	60,982 ^f	67,427
Fluorspar		--	--	--	50,000	166,000
Lime ^e	thousand metric tons	850 ^f	850 ^f	850 ^f	850 ^f	840
Monazite, concentrate, REO content ³		360 ^f	369	178	-- ^f	456
Phosphate rock:						
Gross weight	thousand metric tons	2,395	2,365	2,656	2,471 ^f	2,758
P ₂ O ₅ content	do.	670 ^f	665 ^f	745 ^f	700 ^f	800
Salt	do.	862	776 ^f	719	906 ^f	991 ^f
Sand and gravel, and silica sand	do.	101,295	83,223	87,205 ^f	91,231 ^f	93,415
Stone, all types	do.	404,427 ^f	355,251	348,556 ^f	382,715 ^f	402,654

See footnotes at end of table.

TABLE 1—Continued
VIETNAM: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity ²	2011	2012	2013	2014	2015	
MINERAL FUELS AND RELATED MATERIALS						
Coal, anthracite	thousand metric tons	46,611	42,083 ^r	41,064	41,086 ^r	41,484
Natural gas, gross	million cubic meters	8,480	9,355 ^r	9,751	10,210	10,660
Petroleum:						
Crude	thousand 42-gallon barrels	111,315 ^r	122,707 ^r	122,458 ^r	127,494 ^r	137,419
Refinery products: ⁵						
Liquefied petroleum gas	do.	2,600	2,900	3,000	3,000	3,000
Gasoline	do.	17,300	19,000	17,200 ^r	17,600 ^r	17,600
Other	do.	21,200	23,300	24,300 ^r	24,600 ^r	24,600
Total	do.	41,100	45,200	44,500 ^r	45,200 ^r	45,200

⁶Estimated; estimated data are rounded to no more than three significant digits. ^rRevised. do. Ditto. -- Zero.

¹Table includes data available through September 12, 2016.

²In addition to the commodities listed, bentonite, refractory clay, chromium ore, construction aggregates, refined copper, gemstones, gold, granite, graphite, gypsum, ilmenite, kaolin clay, lignite, marble, nitrogen, pig iron, pyrite, pyrophyllite, silver, sulfur, and tin (mine output) were produced but not reported, and available information was inadequate to make reliable estimates of output.

³Estimated figures based on Vietnam's estimated exports of ores to China.

⁴Estimated figures based on Vietnam's estimated exports of manganese ores to China and Japan.

⁵Estimated figures based on Vietnam's estimated exports of titanium ores to China, Japan, and the Republic of Korea.

⁶Reported as tons of ferrotungsten shipped by ATC Alloys Ltd. (formerly known as Hazelwood Resources Ltd.), which was one of two ferrotungsten plants operating in Vietnam.

⁷Reported figure.

Sources: Copper Bulletin of the International Copper Study Group, July 2016; International Tungsten Industry Association, 2015; South East Asia Iron and Steel Institute, Crude Steel Production, Annual Statistics 2015; United Nations Comtrade database for the years 2011–2015; Vietnam's General Statistics Office, Statistical Yearbook, 2011–2015; World Bureau of Metal Statistics Yearbook 2015; World Steel Association, Steel Statistical Yearbook, 2015.

TABLE 2
VIETNAM: STRUCTURE OF THE MINERAL INDUSTRY IN 2015

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Alumina	Vietnam National Coal and Mineral Industries Group (VINACOMIN)	Tan Rai alumina complex, Bao Lam District, Lam Dong Province	650.
Barite	NA	Ao Sen deposit, Son Duong District, Tuyen Quang Province	80.
Bauxite	Vietnam National Coal and Mineral Industries Group (VINACOMIN)	Tan Rai plant, Bao Lam District, Lam Dong District	650.
Do.	do.	Nhan Co Mine, Dak Nong Province	NA.
Bismuth	Masan Group	Nui Phao Mine, Thai Nguyen Province	2.
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, 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	2,200.
Do.	Chinfong 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, Dong Nai Province	500.
Do.	La Hien Cement Co.	La Hien cement plant, Thain Nguyen Province	600.
Do.	Langbang Cement Co.	Langbang cement plant, Quang Ninh Province	1,500.
Do.	Luckvaxi Cement Co.	Luckvaxi cement plant, 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.

See footnotes at end of table.

TABLE 2—Continued
VIETNAM: STRUCTURE OF THE MINERAL INDUSTRY IN 2015

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement—Continued	Midland Construction Corp. (COSEVCO)	Song Gianh cement plant, Quang Binh Province	1,400.
Do.	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	5,200.
Do.	Nghi Son Cement Corp. [Taiheiyo 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 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.	PT Semen Indonesia (Persero) Tbk, 70%	Thang Long cement plant, Quang Ninh Province	2,500.
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 Tau Province	2,300.
Do.	do.	Luongson 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	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, Da Nang 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, 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.
Cobalt	metric tons Asian Mineral Resources (Ban Phuc Nickel Mines LLC, 90%)	Ban Phuc nickel project, Son La Province	300.

See footnotes at end of table.

TABLE 2—Continued
VIETNAM: STRUCTURE OF THE MINERAL INDUSTRY IN 2015

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Copper:			
Concentrate, Cu content	Asian Mineral Resources (90% owned through subsidiary Ban Phuc Nickel Mines LLC)	Ban Phuc nickel project, Son La Province	3.
Do.	Lao Cai Copper Complex [wholly owned subsidiary of Vietnam National Minerals Corp. (VIMICO)]	Sin Quyen, Lao Cai Province	11.
Do.	Masan Group	Nui Phao Mine, Thai Nguyen Province	7.
Ore	Sin Quyen Copper Co. [operated by Vietnam National Coal and Mineral Industries Group (VINACOMIN)]	Sin Quyen Mine, Bat Xat District, Lao Cai Province	1,200.
Refined	Tang Loong Lao Cai Copper Smelting Enterprise [wholly owned subsidiary of Vietnam National Coal and Mineral Industries Group (VINACOMIN)]	Tang Loong Long Commune, Bao Tang District, Lao Cai Province	10.
Fertilizer:			
Nitrogen, ammonia	Vietnam National Chemical Corp. (VNCC) (100% state owned), and Phy My Nitrogenous Fertilizer and Chemical Joint Stock Corp.	Ha Bac, Thanh Hoa Province and Phu My, Ba Ria-Vung Tau Province	375.
Superphosphate	do.	Lam Thao, Phu Tho Province	800.
Fluorspar	Masan Group	Nui Phao Mine, Thai Nguyen Province	210.
Gold, mine output, kilograms Au content	Bong Mieu Gold Mining Company Ltd. (Besra Gold Inc., 80%; Mineral Development Co., 10%; Quang Nam Mineral Joint Stock Co., 10%)	Bong Mieu Mine and Nui Kem underground mines, Quang Nam Province	400.
Do.	Besra Gold Inc., 85%	Bai Dat and Bai Go deposit in Phuoc Son gold property, Quang Nam Province	NA.
Gypsum	USG Boral Gypsum Vietnam Co. Ltd. (Boral Ltd., 50%, and USG Corp., 50%)	USG Boral Building Products, Ho Chi Minh City	20,000.
Do.	Huy An Co.	NA	2,500.
Do.	Saint-Gobain Gyproc	Nha Be District, HCM City	9,000.
Iron ore, gross weight	Thai Nguyen Iron and Steel Corp. [Vietnam National Steel Corp. (VNSTEEL), 100%]	Trai Cau and Tein Bo in Thai Nguyen Province; Thach Khe in Ha Tinh Province	850.
Natural gas 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), Cuu Long Basin	NA.
Nickel	Asian Mineral Resources (Ban Phuc Nickel Mines LLC, 90%)	Ban Phuc nickel sulphide deposit, Son La Province	9.
Petroleum:			
Crude	Santos Ltd. and Premier Oil (31.875%), and Petro Vietnam (68.125%)	Dua Oil project (offshore) in Nam Con Son Basin (Block 12W)	NA.
Do. 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.
Refined thousand 42-gallon barrels	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, 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.

See footnotes at end of table.

TABLE 2—Continued
VIETNAM: STRUCTURE OF THE MINERAL INDUSTRY IN 2015

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
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, Tam Duong District, Lai Chau Province	NA.
Salt	Vietnam National Salt Corp.	Nam Dinh, Nghe An, and Hai Tin Provinces	1,200.
Steel:			
Crude	Vietnam National Steel Corp. (VNSTEEL)	Cai Lan, Thai Nguyen Province, and Phu My, Ba Ria-Vung Tau Province	1,500.
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, Quynh Phu, Thai Binh Province	500.
Do.	do.	Bar and wire rod plant, Quynh Phu, Thai Binh Province	600.
Do.	Lotus Group	Cold-rolled steel plant, Phu My Industrial Park, Ba Ria-Vung Tau Province	1,000.
Do.	POSCO-Vietnam, 100% owned by POSCO Group	POSCO Special Steel, Phu My Industrial Park, Ba Ria-Vung Tau Province	700 cold-rolled steel.
Do.	do.	do.	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, Ba Ria-Vung Tau Province	450.
Do.	Vietnam National Steel Corp. (VNSTEEL)	Cai Lan, Thai Nguyen Province, and Phu My, Ba Ria-Vung Tau Province	2,500.
Do.	China Steel Sumikin Vietnam Joint Stock Co. (China Steel Corp., 56%; Nippon Steel & Sumitomo Metal Corp., 30%; Formosa Ha Tinh Steel Corp., 5%; Nippon Steel & Sumikin Bussan Corp., 5%; Chun Yuan Steel Industry Co., Ltd., 2%; Hsin Kuang Steel Co., Ltd., 2%)	Sheet steel mill, Ba Ria-Vung Tau Province	1,200.
Do.	Ton Dong A Corp.	Steel sheet plant in Dong An 2 Industrial Park, Binh Duong Province	NA.
Tantalum	Thai Nguyen Nonferrous Metal Co.	Thai Nguyen City, Thai Nguyen Province	NA.
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 Metal Co.	Thai Nguyen, Bac Thai 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, Qui Nhon, and Binh Dinh Provinces	70.
Do.	Ha Tinh Minerals and Trading Co.	Cam Hoa, Ky Annh-Cam, Xuyen, Ky Khan, and Ky Ninh, Ha Tinh Province	450.

See footnotes at end of table.

TABLE 2—Continued
 VIETNAM: STRUCTURE OF THE MINERAL INDUSTRY IN 2015

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Titanium, ilmenite—Continued	Mineral Development Co. No. 4 and No. 5 [Vietnam National Minerals Corp. (VIMICO), 100%]	Vinh City, Nghe An Province; Tuy Hoa, Dong Xuan in Phu Yen Province; and Quang Ngai, Vinh My in Thua Thien-Hu Province	50.
Tungsten, concentrates	Nui Phao H.C. Starck Tungsten Chemicals Manufacturing LLC [Nui Phao Mining Co. Ltd (Masan Group), 74.1%, and H.C. Starck GmbH]	Nui Phao, ammonium para-tungsten plant, Dai Tu District, Thai Nguyen Province	7.
Do.	Sanher Tungsten Vietnam Co. Ltd.	Nhon Trach District, Dong Nai Province	NA.
Do.	Tejing (Vietnam) Tungsten Co., Ltd.	Trang Bang District, Tay Ninh	2.
Do.	Vietnam Youngsun Tungsten Industry Co.	Thienke tungsten mine, Tuyen Quang Province	2.
Tungsten, ferrotungsten, W content	Vietnam Youngsun Tungsten Industry Co. Ltd. (Hong Kong Wolfram International Investment Co., Ltd.)	Cailan Industrial Zone, Quang Ninh plant, Halong, Quang Ninh Province	3.
Do.	ATC Ferrotungsten [Asia Tungsten Products Vietnam Ltd. (ATC Alloys Ltd.), 60%]	Tan Tien Industrial Zone, Vinh Bao District, Hai Phong Province	4.
Zinc:	Thai Nguyen Nonferrous Metal Co.	Cho Dien, Bac Can Province	50.
Concentrate, Zn content	[Vietnam National Minerals Corp. (VIMICO), 100%]		
Refined	The 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 [Vietnam National Minerals Corp. (VIMICO), 100%]	Thai Nguyen City, Thai Nguyen Province	10.

Do., do. Ditto. NA Not available.