



2013 Minerals Yearbook

YEMEN

THE MINERAL INDUSTRY OF YEMEN

By Mowafa Taib

Yemen's contribution to the world supply of minerals was limited to crude oil and liquefied natural gas (LNG) and to small quantities of dimension stone, gypsum, refined petroleum products, and salt. At the end of 2013, the country's proved reserves of crude oil and natural gas were estimated to be 3.0 billion barrels and 479 billion cubic meters, respectively. The country has abundant mineral resources that were not yet being developed. They include metals, such as cobalt, copper, gold, iron ore, nickel, niobium, platinum-group metals (PGMs), silver, tantalum, and zinc, and industrial minerals, such as black sands (which may contain ilmenite, monazite, rutile, and zirconium), celestine, clays, dimension stone, dolomite, feldspar, fluorite, gypsum, limestone, magnesite, perlite, pure limestone, quartz, salt, sandstone, scoria, talc, and zeolites (BP p.l.c., 2014, p. 6, 20; Yemen Geological Survey and Mineral Resources Board, 2014b–e).

Minerals in the National Economy

According to the International Monetary Fund (IMF), Yemen's gross domestic product (GDP) increased by 4.8% in real terms in 2013 compared with an increase of 2.4% in 2012 and a decrease of 12.7% in 2011. The IMF projected that the country's GDP would increase by 1.9% in 2014. Economic activity in the hydrocarbon sector, which included production of crude oil, LNG, and refined petroleum products, accounted for 98% of Yemen's mineral sector activity, and mining and quarrying activities accounted for only 2%. Hydrocarbon exports accounted for 85% of the value of Yemen's exports, provided 51% of Government revenue, and contributed 15.5% of the country's GDP (Central Bank of Yemen, 2014, p. 13; International Monetary Fund, 2014, p. 204).

In 2013, the value of Yemen's exports was about \$7.8 billion, which was slightly more than that of 2012 but 14% less than that of 2011. Eighty-five percent of Yemen's LNG exports went to Asia, 14% to the Americas (including the United States), and 1% to Europe. The volume of Yemen's crude oil exports decreased to 124,000 barrels per day (bbl/d) from a peak of 350,000 bbl/d in 2003. The value of Yemen's imports decreased to about \$10.8 billion in 2013 from \$11.4 billion in 2012 (Central Bank of Yemen, 2014, p. 12; U.S. Energy Information Administration, 2014).

The value of U.S. exports to Yemen increased to \$516 million in 2013 from about \$469 million in 2012. The value of U.S. imports from Yemen, however, decreased to about \$66 million in 2013 from \$87 million in 2012 and \$562 million in 2011. The decrease was attributable to a sharp decrease in U.S. imports of LNG, which amounted to 300 million cubic meters and accounted for 96% of the value of the total U.S. imports from Yemen. The value of U.S. imports of LNG from Yemen decreased to \$63 million in 2013 from \$84 million in 2012 and \$297 million in 2011 (U.S. Census Bureau, 2014).

Government Policies and Programs

The Ministry of Oil and Minerals (MOM) had been actively promoting investment opportunities in the country's hydrocarbon, industrial mineral, and metal resource sectors. The MOM had been facilitating foreign investment in the country's mineral sector by adopting mining laws that adhere to international industry standards. Yemen General Corporation for Oil, Gas and Mineral Resources is the national oil company that directs several state-owned subsidiaries that are in charge of day-to-day operations. The Petroleum Exploration and Production Authority (PEPA) is the Government unit that represents the MOM's interest in oil exploration and production and manages licensing rounds and contracts with international oil companies. The Yemen Geological Survey and Mineral Resources Board (YGSMRB) is the state agency responsible for mineral production under the MOM; the agency provides chemical analyses, drilling, geophysical and geotechnical services, geologic maps, geo-environmental studies, information on mineral reserves and mineral occurrences in the country, and remote sensing studies (Yemen Geological Survey and Mineral Resources Board, 2014a).

The Government's industrial minerals development plan, which was announced in 2008, includes the development of an industrial city, an industrial minerals export port, a railway to transport industrial minerals to the export port, and a vocational training center. The YGSMRB has been focusing on the development of the country's industrial mineral resources, which are spread throughout the country in large deposits estimated to contain billions of metric tons of dolomite, feldspar, gypsum, limestone, pumice, sandstone, and scoria. Other industrial mineral deposits were estimated to contain hundreds of millions of metric tons of basalt, black sands (which may contain ilmenite, monazite, rutile, and zirconium), clays, magnesite, marble, perlite, rock salt, volcanic tuff, and zeolites. Additionally, the country hosts, in decreasing order, an estimated 34 million metric tons (Mt) of quartz, 1.4 Mt of kaolin, 1.1 Mt of fluorite, and substantial but still undetermined resources of talc (Assabri, 2012, p. 45; Yemen Geological Survey and Mineral Resources Board, 2014a, b).

Production

In 2013, marketed natural gas production (which was mainly exported as LNG) was reported to have increased by 37% to 10.3 billion cubic meters from 7.6 billion cubic meters in 2012. The significant increase in LNG production was attributed to uninterrupted operations, despite several attacks by rebel groups, throughout 2013 compared with the previous year. In 2012, the pipeline that carried natural gas from Block 18 to the Balhaf LNG export terminal was attacked by rebels, and the flow of natural gas was stopped for more than 6 months. Petroleum

production, on the other hand, decreased by about 12% to 161,000 bbl/d in 2013 from 180,000 bbl/d in 2012, which, in turn, was a decrease of about 38% from the average production of 291,000 bbl/d in 2010. The decrease in crude oil production was in line with the general downward trend in production since 2001 but was also partly attributable to the 15 attacks in 2012 and the more than 9 attacks in 2013 on the country's crude oil pipelines, which disrupted production and exports in both years. The estimates for industrial mineral commodity output in table 1 are based on reported data from 2009, which is the latest year for which reported data were available (table 1; BP p.l.c., 2014, p. 8, 22; U.S. Energy Information Administration, 2014).

Structure of the Mineral Industry

Article 8 of Yemen's Constitution gives the Government ownership of the country's mineral and energy resources. Metallic and industrial mineral exploration and production operations are governed by law No. 22 of 2010 Concerning Mining and Quarries, which is known as the Mines and Quarries Law. The Mines and Quarries Law, which was approved by the Government in 2010 and by the Parliament on December 16, 2011, regulates prospecting, exploration, and mining operations as well as artisanal mining. The law sets royalty rates based on the type of mineral commodity and the gross value of production. The royalty rate for precious and semiprecious stones is set at 8% of the gross value of production; nonmetallic minerals, 5%; and metallic minerals, 3%. The law also imposes a 35% income tax on remitted dividends and grants an exemption on import duties during mine construction. Under the new law, a prospecting permit is granted for a period of 1 year for an area of up to 10,000 square kilometers (km²), and an exploration permit is granted for an area of up to 1,000 km² for a period of 4 years; both types of permits can be renewed twice; that is, for two additional 4-year periods. Mining permits are issued for a 25-year period and can be renewed indefinitely in 10-year increments. Quarrying permits are issued for a 10-year period for areas of between 0.5 and 2 km² and can be extended indefinitely in 10-year increments. Artisanal mining permits are issued for a period of 2 years for areas up to 1 km² and can be renewed indefinitely for periods of 1 year at a time (Arab Industrial Development and Mining Organization, 2012, p. 242).

According to the YGSMRB, a number of mining companies had renewed their mining permits in Yemen in 2013. The companies included Ansan Wikfs (Hadramaut) Ltd. of the United Kingdom, Cantex Mine Development Corp. of Canada, Jabal Salab Co. (Yemen) Ltd. of the Cayman Islands, Stone Resources (Yemen) Ltd. of China, Thani Dubai Mining Ltd. of the United Arab Emirates, and Yemen Iron Steel Ltd. (Yemen Geological Survey and Mineral Resources Board, 2014d).

Commodity Review

Metals

Cobalt, Copper, Nickel, and Platinum-Group Metals.—Cantex was exploring for cobalt, copper, nickel, and PGMs at three locations in northeastern Yemen. These locations were

the Al Masna'a, the Suwar, and the Wadi Qutabah properties. The Al Masna'a project is located in the Saadah region about 205 kilometers (km) northwest of Sana'a, and 25 km south of Yemen's border with Saudi Arabia. Cantex planned to resume exploration at the Al Masna'a area as soon as the security situation in the permit area improves but decided not to renew its exploration license at the Suwar and the Wadi Qutabah properties as of June 2013 (Cantex Mine Development Corp., 2013a).

Gold.—The YGSMRB listed 17 locations in Yemen that were open for foreign investment. In 2011, Cantex signed an option agreement with WCP Resources Ltd. (WCP) of Australia that would enable WCP to earn up to 70% interest in the Al Hariqah gold project by funding the project from advanced exploration and mine development up to commercial production. Cantex reported favorable drilling results that extended the identified area of gold mineralization at the Al Hariqah gold project in October 2013, and WCP decided to become a partner in the project in February 2014. The Al Hariqah gold deposit is located 130 km northwest of Sana'a (Cantex Mine Development Corp., 2013b, 2014; Yemen Geological Survey and Mineral Resources Board, 2014d).

Lead and Zinc.—The Jabali zinc and silver mine site had remained idle for the past 4 years as the owner, Jabal Salab, sought replacement financing for the project. Jabal Salab was jointly owned by ZincOx Resources p.l.c. (52% interest) and Ansan (48%). The Jabali Mine, which is located near Nehim about 110 km northeast of Sana'a, was the first large-scale metal mine planned in Yemen. The deposit was estimated to contain 12.6 Mt of oxide resource grading 8.9% zinc, 1.16% lead, and 69 grams per metric ton (g/t) silver, of which reserves were estimated to be 8.7 Mt grading 9.2% zinc at a cutoff grade of 4.4%. In March, ZincOx sold its interest in Jabal Salab to its joint-venture partner Ansan, which made Ansan the sole owner of the project (ZincOx Resources p.l.c., 2013; Yemen Geological Survey and Mineral Resources Board, 2014d).

Niobium and Tantalum.—Ansan held two mining permits in the Nisab and the Mujab properties, which are located in Shabwah Province in southern Yemen. Earlier geochemical analyses from differentiated pegmatite samples indicated the presence of lithium, niobium, tantalum (0.006% to 0.04%), and tin (more than 0.05%). Ansan estimated the mineral resources of contained niobium oxide and rare-earth oxides to be 30,000 to 40,000 t each. The company measured concentrations between 0.01% and 0.13% niobium and between 0.005% and 0.01% tantalum at the Nisab site, and between 0.02% and 0.05% tantalum and between 0.01% and 0.02% niobium at the Mujab site (Arab Industrial Development and Mining Organization, 2012).

Industrial Minerals

In 2013, the YGSMRB conducted a survey of mining activities in Sana'a and Thammar Provinces. The results of the survey indicated that there were 819 active mining operations in the two Provinces. These operations produced 2 Mt of building materials and 1,000 t of unspecified industrial minerals in 2013 (Abdulmageed, 2014, p. 261).

Cement.—Cement production was estimated to have increased to 3.0 Mt in 2013 from 2.8 Mt in 2011 and 2012. Cement production in Yemen peaked at 3.6 Mt in 2010 after the completion of the country's sixth cement plant, although, in spite of the peak production, the country reported importing 755,000 t of cement in that year. Cement production decreased to 2.8 Mt in 2011 because of high energy costs and political unrest, which caused production to stop at three of the country's cement plants. State-owned cement plants (Al Burh Cement Factory, Amran Cement Factory, and Bajil Cement Factory) produced about 1.1 Mt of cement in 2013 compared with 951,000 t in 2012. In 2013, the YGSMRB received applications and proposals to build new cement plants in Al Hudaydah and Hadramawt Provinces (Al Razhi, 2014, p. 469; National Information Center, 2014, p. 10).

Iron Oxide Pigments and Titanium.—Nine sites had been identified by the YGSMRB as potential locations for mining of iron oxide pigments and titanium in Yemen. The YGSMRB awarded a permit to Yemen Iron Steel Co. to explore for iron oxide in the Thanyiah property, which is located in Ma'rib Province. Shabbir Metals Co. was exploring in the Sabah site (Al Bayda Province) and reported 2 Mt of iron ore reserves grading between 35% and 55% iron. YGSMRB also reported the presence of iron ore and titanium deposits in the Mkiras region (Al Bayda Province), which together contained an estimated reserve of 860 Mt grading 15.6% iron, 5.3% titanium, 3.14% phosphorus, and 0.02% vanadium. The National Cement Co. held a permit to explore for iron oxide pigments at the Um Halwal (Majil) property in Abyan Province. Estimates for resources at this site were 46,000 metric tons (t) grading 68% iron oxide (Arab Industrial Development and Mining Organization, 2012, p. 108; Yemen Geological Survey and Mineral Resources Board, 2014d).

Mineral Fuels

Petroleum.—In 2013, Yemen had 105 concession blocks, of which 13 were in production and operated by 11 oil companies and 26 were being explored by 14 oil companies. In March, the MOM conducted a bidding round for oil and gas exploration and production on 20 of its 66 open blocks (offshore and onshore). The MOM qualified the following nine international oil companies: Circle Oil p.l.c. of Ireland, DNO Yemen (a subsidiary of DNO International A.S.A.) of Norway, Geopetrol International Holding of Panama, Guney Yildizi Petroleum of Turkey, Heritage Oil p.l.c. of the United Kingdom, Hunt Oil Co. of the United States, Kuwait Foreign Petroleum Exploration Co. (KFPEC), Pakistan Oil Fields Ltd., and STR Holding Co. of Brazil. In June, the MOM approved a production-sharing agreement for DNO on Block 84 and KFPEC on Block 102. On Block 84, DNO would be the operator and hold a 59.5% interest; Dogan Enerji Yatirimlari Sanayi ve Ticaret A.S. of Turkey would hold a 25.5% interest; and Yemen General Corporation for Oil and Gas, a 15% interest (table 2; Petroleum Exploration and Production Authority, 2014).

In October, DNO conducted tests for crude oil production at the Salsala 1 exploration well in Block 32. The well produced 5,900 bbl/d of crude oil during the testing phase. DNO was

the operator of Block 32 and held a 38.95% interest in the production-sharing agreement. DNO was also the operator for Blocks 43 and 47, and it had a 24.25% interest in Block 53, which was operated by Dove Energy Ltd. of the United Kingdom, and an 18% interest in Block 72, which was operated by Total S.A. of France (table 2; DNO International A.S.A., 2014).

Kuwait Energy Co. had interests in six crude oil blocks in Yemen, two of which (Blocks 5 and 43) were in production. The company reported a 287% increase in production from Block 5, which was operated by the company, to 4,718 bbl/d of crude oil in 2013 from 1,219 bbl/d in 2012. The increase was attributed to a full year of production in 2013 compared with 113 days of production in 2012. Kuwait Energy also had equity in Blocks 35, 49, 82, and 83, which were at the exploration stage of development during 2013 (Kuwait Energy Co., 2014, p. 16).

Outlook

The approval of the Mines and Quarries Law by the Parliament of Yemen and the gradual return to political stability and security to the country at the end of a 2-year political transition period in early 2014 had been thought likely to bring back some of the foreign investment that had left the country in recent years. The political unrest and military conflict that engulfed the country in the second half of 2014, however, diminished those prospects for the near future. Foreign investment has been cited as necessary for the construction of such projects as an industrial city, an industrial minerals export port, a railway, and a vocational training center. The Jabal Salab zinc project, which would be the country's first large-scale metal mining operation, is another example of a project for which the Government was seeking foreign investment. The development of the mineral industry in Yemen could help reduce the unemployment rate in the country, which exceeds 50%.

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TABLE 1
YEMEN: PRODUCTION OF MINERAL COMMODITIES¹

(Thousand metric tons unless otherwise specified)

Commodity ²	2009	2010	2011	2012	2013
INDUSTRIAL MINERALS					
Cement	2,118	3,600 ^r	2,800 ^r	2,800 ^r	3,000
Gypsum ^e	200 ³	200	100	100	100
Salt ^e	79 ³	75	75	75	75
Sand and gravel ^e	12,360 ³	12,500	6,000	6,000	6,000
Stone ^e					
Basalt	899 ³	900	500	500	500
Granite	220 ³	220	100	100	100
Limestone	5,900 ³	6,000	3,000	3,000	3,000
Marble	690 ³	250	250	250	250
Volcanic tuff	2,657 ³	2,700	1,400	1,400	1,400
MINERAL FUELS AND RELATED MATERIALS					
Natural gas:					
Gross					million cubic meters
Marketed	800	6,200	9,400 ^r	7,600 ³	10,300 ³
Petroleum:					
Crude, including condensate	111,690	106,125	83,220	65,700	58,765
Refinery products:					
Liquefied petroleum gas	8,526 ^r	8,538 ^r	6,786 ^r	7,772 ^r	9,245
Naphtha	488 ^r	761 ^r	1,861 ^r	2,704 ^r	6,054
Gasoline	8,991 ^r	8,052 ^r	3,736 ^r	1,092 ^r	1,552
Kerosene	4,121 ^r	3,633 ^r	1,956 ^r	1,252 ^r	3,262
Distillate fuel oil	7,982 ^r	8,176 ^r	5,684 ^r	2,651 ^r	6,430
Residual fuel oil	4,595 ^r	3,976 ^r	3,263 ^r	1,379 ^r	4,296
Asphalt	564	594 ^r	145 ^r	79 ^r	145
Total	35,267 ^r	33,730 ^r	23,431 ^r	16,929 ^r	30,984

^eEstimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. ^rRevised. do. Ditto.

¹Table includes data available through February 9, 2015.

²In addition to the commodities listed, aggregate, clays, feldspar, mica, rolled-steel bars, silica sand, scoria, talc, and zeolites may have been produced, but available information is inadequate to make reliable estimates of output.

³Reported figure.

TABLE 2
YEMEN: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity ^e
Basalt		Local private companies	Hadramawa, Sana'a, Ta'izz, Dhamar	900
Cement		Amran Cement Factory [Yemen Corporation for Cement Industry and Marketing (YCC), 100%]	Kilns and mills at Amran	1,500
Do.		Al Burh Cement Factory [Yemen Corporation for Cement Industry and Marketing (YCC), 100%]	Kilns and mills at Maфраq	800
Do.		Bajil Cement Factory [Yemen Corporation for Cement Industry and Marketing (YCC), 100%]	Kilns and mills at Bajil near Ta'izz	500
Do.		National Cement Co. (Hayel Saeed Anam & Co. Ltd., 100%)	Kilns and mills at Wadi Saim, Lahj	1,600
Do.		Arabian Yement Cement Co. Ltd. (Eastern Province Cement Co., 30%; Al-Amoudi Group, 15%; Bagshan Group, 15%; Saudi Binladin Group, 10%; Baroom Investment Holding Co. Ltd., 10%; Ali Ali Hussain Miksa, 10%; Sara Development Co. Ltd., 5%; Yemeni Group for Development of Yemen, 5%)	Kilns and mills at Al-Oyoun, Hadramawt	1,500
Clays		Local private companies	Al Hudaydah, Lahij, Ibb, Hijjah, Al Jawf, Ma'rib, Samaa, Shabwah, Ta'izz	700
Gypsum		do.	Al Hudaydah, Hadramawt, Sana'a, Shabwah	200
Limestone		do.	Amran, Hadramawt, Sana'a, Ta'izz	4,000
Do.		3S Minerals Pvt. Ltd	Hadramawt	1,000
Do.		Naine Minerals and Resources Pte. Ltd.	Hadramawt, Yathmoon	1,000
Marble		do.	Hijjah, Ma'rib, Ta'izz	700
Natural gas:				
Associated	million cubic meters	Jannah Hunt Oil Co. (Yemen General Corporation for Oil and Gas, 71%, and Hunt Oil Co., 29%)	Jannah field (Block 5)	227
Liquefied	thousand metric tons	Yemen LNG Co. (Total E&P Yemen, 39.62%; Hunt Oil Co., 17.22%; Yemen Gas Co., 16.73%; SK Energy, 9.55%; Korea Gas Corp., 6.00%; Hyundai Corp., 5.88%; Yemen General Authority for Social Security and Pensions, 5.00%)	Ma'rib field (Block 18), LNG plant in Belhaf	6,700
Petroleum:				
Crude	thousand 42-gallon barrels	Occidental Petroleum Yemen (Occidental Petroleum Corp., 65%, and Yemen General Corporation for Oil and Gas, 35%)	Damis field (Block S1)	4,000
Do.	do.	OMV A.G., 68%, and Yemen General Corporation for Oil and Gas, 32%	Al-Uqla field (Block S2)	1,560
Do.	do.	Calvalley Petroleum Ltd., 59%, and Yemen General Corporation for Oil and Gas, 41%	Malik field (Block 9)	2,000
Do.	do.	DNO Yemen (Yemen General Corporation for Oil and Gas, 52%, and DNO International ASA, 48%)	Hwarim field (Block 32)	3,300
Do.	do.	DNO Yemen (DNO International ASA, 62%, and Yemen General Corporation for Oil and Gas, 38%)	South Hwarim field (Block 43)	2,600
Do.	do.	Yemen General Corporation for Oil and Gas, 51%, and Dove Energy Ltd., 49%	East Saar field (Block 53)	4,000
Do.	do.	Jannah Hunt Oil Co. (Yemen General Corporation for Oil and Gas, 71%, and Hunt Oil Co., 29%)	Jannah field (Block 5)	15,700
Do.	do.	Korea National Oil Co. (KNOC), 82%, and Yemen General Corporation for Oil and Gas, 18%	West Ayad field (Block 4)	123
Do.	do.	Total E&P Yemen (Yemen General Corporation for Oil and Gas, 59%, and Total S.A., 41%)	East Shabwah field (Block 10)	13,700
Do.	do.	Safer E&P Operations Co. (Government, 100%)	Ma'rib field (Block 18)	22,000
Do.	do.	Canadian Nexen Yemen Ltd. (Nexen Inc., 63%, and Yemen General Corporation for Oil and Gas, 37%)	East Al-Hajr oilfield (Block 51)	5,500
Do.	do.	Masila Petroleum Exploration and Production Co. (PetroMasila)	Masila field (Block 14)	42,000

See footnotes at end of table.

TABLE 2—Continued
 YEMEN: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity ^c
Petroleum—Continued:			
Refined thousand 42-gallon barrels	Aden Refinery Co. (Government, 100%)	Refinery at Aden	150
Do.	do. Yemen Oil Refining Co. (Yemen Hunt Oil Co. and Exxon Yemen, Inc., 75.5%, and Yukong Group, 24.5%)	Topping plant at Ma'rib	140
Pumice	Local private companies	Dhamar	2,500
Salt:			
Crude:			
Marine	Local private companies	Eleven saltworks near Aden	150
Rock	do.	Five salt mines near Salif	140
Refined	Salt Refining and Packing Factory (Government)	Salif	50
Do.	Aden Salt Factory (Government)	Aden	150
Scoria	Local private companies	Dhamar, Ma'rib, Shabwah	500
Steel, finished products	Arab Iron and Steel Corp.	do.	100
Do.	Mukalla Iron and Steel Co.	Rayan	500
Do.	Yemen Steel Manufacturing Company Ltd. (Al-Rhabi Trading Group, 100%)	Al Hudaydah	500
Stone	About 1,900 local private companies	Dhamar, Mayana, Sana'a, Ta'izz, and Wadi Marek	16,000

^cEstimated; estimated data are rounded to no more than three significant digits. Do., do. Ditto.