



2011 Minerals Yearbook

YEMEN

THE MINERAL INDUSTRY OF YEMEN

By Mowafa Taib

In 2011, Yemen's contribution to the world supply of minerals was mainly restricted to such mineral fuels as crude oil and liquefied natural gas (LNG). In addition to fuel mineral resources, the country's mineral resources included metals, such as cobalt, copper, gold, nickel, silver, and zinc, and industrial minerals, such as celestine, clays, dolomite, feldspar, gypsum, limestone, magnesite, perlite, sandstone, scoria, talc, and zeolite.

Minerals in the National Economy

Yemen's economy contracted in 2011, and the gross domestic product decreased by 10.5% in real terms compared with an increase of 7.7% in 2010. The decrease was attributable to the political unrest and a lack of security in many parts of the country throughout 2011. The value of exports of Yemeni goods and services increased to about \$8.7 billion from about \$7.7 billion in 2010, and the value of imports of goods and services decreased to \$8.2 billion from \$8.7 billion in 2010. The value of crude oil and natural gas exports increased to \$7.8 billion from about \$6.3 billion in 2010 despite a significant decrease in the volume of crude oil exports. The increase in the value of hydrocarbon exports was attributable to higher crude oil prices as well as the increase in LNG exports in 2011 (Central Bank of Yemen, 2012, p. 31; International Monetary Fund, 2012, p. 10).

Exports by the United States to Yemen were valued at about \$390 million in both 2010 and 2011. The value of U.S. imports from Yemen, however, increased to \$181.4 million in 2010 and to \$561.7 million in 2011 compared with \$7.4 million in 2009. The increase was attributable to LNG imports, which started in 2010, and the resumption of crude and fuel oil imports in 2011 following a 3-year stoppage (U.S. Census Bureau, 2012).

Government Policies and Programs

The Government had been encouraging investment in the production of gold, copper, lead, magnesium, nickel, platinum-group metals (PGMs), silver, tin, and zinc. The Government created opportunities for investing in projects to produce such industrial minerals as basalt, clays, dimension stone, dolomite, feldspar, fluorite, granite, gypsum, kaolin, limestone, marble, perlite, pumice, quartz, salt, silica sand, talc, travertine, volcanic tuff, and zeolite. The Yemen Geological Survey and Mineral Resources Board (GSMRB), which was the state agency responsible for mineral production under the Ministry of Oil and Minerals, promoted investment in Yemen's mining sector and published reports on the mineral resources of Yemen. The reports included chemical analyses and the geologic settings of, the occurrences of, and reserves information for celestite, copper, gold, lead, magnesite, nickel, perlite, PGMs, pumice, rock salt, scoria, zeolite, and zinc.

Production

Data on mineral production are listed in (table 1).

Structure of the Mineral Industry

Article 8 of the Constitution gives the state 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 became known as the Mines and Quarries law. The law was prepared by the GSMRB with the support of the International Finance Corp. (IFC) of the World Bank Group and Yemen's Ministry of Oil and Minerals. 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. A royalty of 8% is applied on the gross value of produced precious and semiprecious stones, 5% on the value of nonmetallic minerals produced, and 3% on the value of metallic and other minerals produced. The law also grants a 30% to 35% income tax on remitted dividends and an exemption of import duties during mine construction. Under the new law mining permits may be for up to 25 years (which could be extended for up to a total of 10 years), and up to 30 years for quarrying, depending on the size of mining project—10 years for small projects, 20 years for mid-size projects, and the full 30 years for large projects (Geological Survey and Mineral Resources Board, 2012).

Commodity Review

Metals

Cobalt, Copper, Nickel, and Platinum-Group Metals.—Cantex Mine Development Corp. of Canada (Cantex) was exploring for cobalt, copper, and nickel at three locations in northeastern Yemen. These locations included 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 Yemen's border with Saudi Arabia. The results of soil surveying indicated the presence of cobalt, copper, nickel, and PGMs. The company planned to test induced polarization, transient electromagnetic, and nickel soil geochemical anomalous zones in the Al Masna'a area and to measure the grade and distribution of nickel and copper in the iron sulfide horizons.

Cantex drilled five vertical holes totaling 686 meters (m) at the Wadi Qutabah to test the continuity of the flat-lying sulfide horizons. These five holes intersected a total of 324 m of weak (<10%) disseminated sulfides, 20 m of moderate (10% to 50%) sulfide mineralization and about 7 m of semimassive to massive sulfide mineralization. The company planned to analyze the mineralized section for nickel-copper-cobalt and PGMs.

The company also drilled six additional holes to determine the source of the high PGM values found in three heavy mineral stream samples. The highly anomalous samples were taken from three nearby streams to test the stratigraphy of the watershed (Cantex Mine Development Corp., 2012).

The drill program at the Suwar project, which was carried out to find massive sulfide mineralization and a copper-nickel-cobalt massive sulfides zone, failed to intersect any significant mineralization in 2011. In December 2011, Vale S.A. of Brazil notified Cantex that it was ending the agreement to pursue a purchase option in the Suwar project that was signed in 2008 (Cantex Mine Development Corp., 2011).

Gold.—Several companies had been awarded permits to explore for gold in Yemen. Cantex continued drilling at the Al Hariqah deposit, which is located 130 km northwest of Sana'a. The results from assays of the samples would be used for the prefeasibility study. In December 2011, Cantex signed an option agreement with WCP Resources Ltd. (WCP) of Australia, which would enable WCP to earn up to 70% interest in the Al Hariqah gold project by funding advanced exploration and mine development to commercial production (Cantex Mine Development Corp., 2011).

Thani Dubai Mining Ltd. (TDM), which formed a 50–50 strategic alliance with AngloGold Ashanti Ltd. of South Africa to operate gold mines in the Middle East and North Africa in 2009, held two gold exploration licenses for gold and associated minerals at the Wadi Meddan near Al Mukalla in Hadramaut Governorate and at the Wadi Sharis in Hajjah Governorate. The Wadi Meddan concession had an estimated 7.3 metric tons (t) (reported as 234,000 troy ounces) of gold in measured and indicated resources and 28.9 t (reported as 930,000 troy ounces) of gold in inferred resources. TDM drilled more than 80 wells in 15 sites at Wadi Meddan and collected more than 8,700 rock samples from mineralized zones. The company also drilled 15 sites at the Notisha permit area and collected about 8,000 samples from the mineralized zones. The company started exploration activity at the al-Maslama area. Neither AngloGold Ashanti nor TDM provided an update on Yemen activity in 2011. It was reported that the alliance could not move forward with its gold discoveries because of security threats. The alliance appeared to have shifted its focus to gold prospects in Djibouti, Egypt, Eritrea, Ethiopia, and Saudi Arabia (AngloGold Ashanti Ltd., 2009, 2011; AME Info FZ LLC, 2010; Kumar, 2011).

Lead, Silver, and Zinc.—Work at the Jabali zinc and silver mine site remained idle during 2011 pending the arrangement of about \$100 million in replacement finance. The project was originally financed by sponsor equity and a \$120 million bond placed with hedge funds active in emerging markets. In October 2009, the bond holders retired the bond and reclaimed the cash held in the company's project development account because of slower than expected progress on the project, and the project went into default. Ansan Wikfs Investments Ltd. of Yemen and ZincOx Resources plc of the United Kingdom subsequently repurchased the project for \$10 million and began the process of finding new investors and financing sources. The project, which was owned by Jabal Salab Co., was the first large-scale metal mine planned in Yemen and had the full support of the

Government, which signed a 20-year exploitation agreement with Jabal Salab. The Jabali Mine is located near Nehim about 110 km northeast of Sana'a. Jabal Salab was jointly owned by ZincOx (52% interest) and Ansan Wikfs (48%). The deposit was estimated to contain 12.6 million metric tons (Mt) of oxide ore grading 18.9% zinc, 1.2% lead, and 68 grams per metric ton (g/t) silver, and reserves were estimated to be 8.7 Mt grading 9.2% zinc with a cutoff grade of 4.4%. The deposit would be mined from an open pit at the rate of 800,000 metric tons per year (t/yr) with a waste-to-ore ratio of 2:1. Ore would be crushed and calcined, milled, and leached with ammonia-based solutions. A zinc-containing solution would be filtered, and zinc carbonate would be chemically precipitated by steam injection. Zinc carbonate would be calcined for the production of 70,000 t/yr of high-quality zinc oxide (grading 79% zinc or more). Zinc oxide would be used by local rubber, paint, and ceramics industries, and the remaining would be shipped to Jabali's Rubber Grade Plant (RGP), which was to be constructed in Belgium, where zinc oxide would be milled again to produce a high-quality product that meets the specifications of the European rubber industry. The RGP had been initially planned to be built in Yemen but it was moved to Belgium to meet the strict quality assurance requirements set by the European customers (ZincOx Resources plc, 2012).

Mineral Fuels

Natural Gas.—Yemen LNG Co. increased its production by 52% to 9.4 billion cubic meters in 2011 from 6.2 billion cubic meters in 2010 despite disruptions in production owing to the sabotage of the gas pipeline that linked Block 18 (the Marib field) to the Balhaf terminal on the Gulf of Aden in October. Yemen LNG was the sole producer of LNG in Yemen in 2011. The company was a consortium of Total E&P Yemen; Hunt Oil of the United States; state-owned Yemen Gas Co.; Republic of Korea companies of SK Energy; KoreaGas Corp., and Hyundai Corp.; and the Yemen General Authority for Social Security and Pensions (table 2; Yemen LNG Co., 2012).

Petroleum.—Crude oil and condensate production in Yemen decreased by 15% in 2011 compared with that of 2010, which was in line with a decreasing trend in recent years and also because of sabotage to oil and gas pipelines (U.S. Energy Information Administration, 2012).

In 2011, 11 oil companies were active in crude oil production in Yemen—Calvalley Petroleum Ltd. of Cyprus (Block 9); Canadian Nexen Yemen Ltd. (a subsidiary of Nexen Inc. of Canada) (Block 51); DNO Yemen (a subsidiary of DNO International ASA of Norway) (Blocks 32 and 43); Dove Energy Ltd. of the United Kingdom (Block 53); Jannah Hunt Oil Co. (a subsidiary of Hunt Oil Co. of the United States) (Block 5); Korea National Oil Co. (KNOC) (Block 4); Masila Petroleum Exploration and Production Co. (PetroMasila) (Block 14); Occidental Petroleum Yemen (a subsidiary of Occidental Petroleum Corp. of the United States) (Block S1); OMV A.G. of Austria (Block S2); state-owned Safer E&P Operations Co. (Block 18); and Total E&P Yemen (a subsidiary of Total S.A. of France) (Block 10) (table 2; Petroleum Exploration and Production Authority, 2012).

State-owned Yemen General Corporation for Oil and Gas was a minor partner (held 5% to 10% interest) in petroleum exploration activity that was carried out by 10 international oil companies under exploration and production-sharing agreements with the Government. C.C.C. for Oil & Gas (a subsidiary of Consolidated Contractor Co. of Greece) was exploring for oil at the Al-Furt area (Block 33) and the South Al-Furt area (Block 49). Dove Energy had an exploration license at the Ras Hoaira area (Block 73). Gallo Oil (Jersey) Yemen Inc. (a subsidiary of PT Bumi Resources Tbk of Indonesia) was exploring for oil at the Al-Armah area (Block 13) and the East Al-Mabar area (Block R2). Gujarat State Petroleum Corp. Ltd. of India had exploration licenses at the Al-Jawf area (Block 19), the North Balhaf area (Block 28), and the Al Rahan area (Block 57). Kuwait Energy Yemen (a subsidy of Kuwait Energy Co.) had an exploration license at the Mukallah area (Block 15), the Hood area (Block 35), the Qusa area (Block 74), and the Southeast Al-Mabar area (Block 49). Oil Search (Roy) Ltd., which was a subsidy of Oil Search Ltd. of Papua New Guinea, was exploring for oil at the Jardan (Block 3) and the Barq (Block 7) areas. OMV had an engineering and procurement and construction contract at the Al-Mabar area (Block 2) and the South Sanu area (Block 29). PT Medco Energi Internasional Tbk of Indonesia had a permit to explore for oil at the Wadi Amed area (Block 82) and the Wadi Arat area (Block 83). Reliance Industries Ltd. of India was exploring for oil at the Jeza area (Block 34) and the Marait area (Block 37). Sinopec of China had exploration and production-sharing agreements for the Mashaf area (Block 69), the Al-Qarn (Block 71), and the Amakeen area (Block 1) (Petroleum Exploration and Production Authority, 2012).

Outlook

In 2011, Yemen witnessed unprecedented daily popular protests, which began in February and eventually called for the ouster of the regime. The protests were part of the “Arab Spring,” which spread to Egypt, Libya, Syria, and Tunisia, in addition to Yemen. International and regional pressure on the Yemeni regime intensified during most of 2011. On November 23, 2011, the President of Yemen signed an initiative to deescalate tension in the country and began a power transfer to a new government; the initiative was sponsored by the Gulf Cooperation Council (GCC). As part of the implementation of the GCC initiative, the Vice President named a new cabinet to form a National Consensus Government in addition to a Military and Security Committee. A presidential election took place on February 21, 2012, in accordance with the political transition initiative, and the Vice President was sworn in as the newly elected President on February 25, 2012 (U.S. Department of State, 2012).

The development of Yemen’s mineral industry is expected to be critical for future economic growth and could attract foreign

investment to the country and create job opportunities in several parts of the country. The approval of the Mines and Quarries law by the Government and Parliament and the return to political stability and security in the country are likely to increase investments in the mineral sector in the next 5 years.

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TABLE 1
YEMEN: PRODUCTION OF MINERAL COMMODITIES¹

(Thousand metric tons unless otherwise specified)

Commodity ²	2007	2008	2009	2010	2011
INDUSTRIAL MINERALS					
Cement	1,728	2,111	2,118	3,500 ^e	3,500 ^e
Gypsum	92	100	100	100	100 ^e
Salt	61	65	65	75	75 ^e
Sand and gravel	1,328	1,500	1,500	1,500 ^e	1,500 ^e
Stone:					
Marble thousand square meters	244	250	250	250	250 ^e
Other quarried stone	4,558	4,700	5,000	5,000	5,000 ^e
MINERAL FUELS AND RELATED MATERIALS					
Natural gas:					
Gross million cubic meters	29,200	29,632	29,632	29,200 ^{r,3}	29,600 ³
Marketed do.	817	776	800 ^r	6,200 ³	9,400 ³
Liquids thousand 42-gallon barrels	3,650	3,650	3,650	3,650	3,650 ³
Petroleum:					
Crude do.	124,465 ^r	114,975 ^r	111,690 ^r	109,865 ^{r,3}	83,220 ³
Refinery products:					
Liquefied petroleum gas do.	438	438	438	438	438 ³
Naphtha do.	1,842	888	645	645	645 ³
Gasoline do.	5,110	5,110	5,110	5,110	5,110 ³
Kerosene do.	4,052	4,052	4,052	4,050 ^r	4,050 ³
Distillate fuel oil do.	7,775	7,775	7,775	7,780 ^r	7,780 ³
Residual fuel oil do.	14,750	14,750	14,750	14,800 ^r	14,800 ³
Asphalt do.	733	703	564	564	564 ³
Other do.	1,143	2,127	2,509	2,510 ^r	2,510 ^e
Total do.	35,843	35,843	35,843	35,800 ^r	35,800 ³

^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 December 31, 2012.

²In addition to the commodities listed, aggregate, feldspar, limestone, mica, pumice, rolled-steel bars, scoria, silica sand, 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 2011

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity ^e
Cement	Amran Cement Factory [Yemen Corporation for Cement Industry and Marketing (YCC), 100%]	Kilns and mills at Amran	1,500,000
Do.	Al Burh Cement Factory [Yemen Corporation for Cement Industry and Marketing (YCC), 100%]	Kilns and mills at Mafraq	800,000
Do.	Bajil Cement Factory [Yemen Corporation for Cement Industry and Marketing (YCC), 100%]	Kilns and mills at Bajil near Taiz	500,000
Do.	National Cement Co. (Hayel Saeed Anam & Co. Ltd., 100%)	Kilns and mills at Wadi Saim, Lahj	1,600,000
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, Hadramaout	1,500,000

See footnotes at end of table.

TABLE 2—Continued
YEMEN: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity ^c
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 ¹
Liquefied	thousand metric tons	Yemen LNG Co. (Total E&P Yemen, 39.6%; Hunt Oil Co., 17.2%; Yemen Gas Co., 16.7%; SK Energy, 9.6%; Korea Gas Corp., 6%; Hyundai Corp., 5.9%; Yemen General Authority for Social Security and Pensions, 5%)	Marib 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%)	Marib field (Block 18)	22,000
Do.	do.	Masila Petroleum Exploration and Production Co. (PetroMasila)	Masila field (Block 14)	42,000
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
Refined	42-gallon barrels per day	Aden Refinery Co. (Government, 100%)	Refinery at Aden	120,000
Do.	do.	Yemen Oil Refining Co. (Yemen Hunt Oil Co. and Exxon Yemen, Inc., 75.5%, and Yukong Group, 24.5%)	Topping plant at Marib	20,000
Salt:				
Crude:				
Marine		Local private companies	Eleven saltworks near Aden	150,000
Rock		do.	Five salt mines near Salif	140,000
Refined		Salt Refining and Packing Factory (Government)	Salif	NA
Do.		Aden Salt Factory (Government)	Aden	NA
Steel, rolling mills		Arab Iron and Steel Corp.	do.	40,000
Do.		Mukalla Iron and Steel Co.	Rayan	120,000 ²
Do.		Yemen Steel Manufacturing Company Ltd. (Al-Rhabi Trading Group, 100%)	Al Hodeidah	120,000
Stone		About 1,900 local private companies	Dhamar, Mayana, Sana'a, Taiz, and Wadi Marek areas	5,000,000

^cEstimated; estimated data are rounded to no more than three significant digits. Do., do. Ditto. NA Not available.

¹Most produced natural gas was stripped of hydrocarbon liquids and reinjected into oil reservoirs.

²Under construction.