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The Mineral Industries of Morocco and Western Sahara

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MOROCCO

In 2016, Morocco was the world's leading exporter of phosphate fertilizers, phosphate rock, and phosphoric acid; it was the world's third-ranked producer of phosphate rock after China and the United States and accounted for about 10.5% of the world's phosphate rock output. Morocco also was the world's third-ranked producer of barite after China and India and accounted for 9.1% of world output. The country was the world's 8th- and 17th-ranked producer of fluorspar and silver, accounting for 1.2% and 1.1% of world output, respectively. Additionally, Morocco produced a wide range of mineral commodities that included arsenic trioxide, cement, clay (bentonite, fuller's earth, and montmorillonite), cobalt, copper, crude petroleum, feldspar, iron ore, lead, natural gas, nickel, salt, and zinc. Morocco's real gross domestic product (GDP) increased by 1.2% in 2016 compared with a revised increase of 4.5% in 2015. The secondary sector, which included building and public works, electricity, industry, and mining, contributed about 26.1% of the GDP in 2015 and 2016, respectively, compared with 26.5% in 2014 (table 1; Bank Al-Maghrib, 2017, p. 219−220; OCP Group, 2017, p. 24; Silver Institute, The, 2017, p. 26; Jasinski, 2018; McRae, 2018; Singerling, 2018).

Minerals in the National Economy

The mining sector's contribution to the GDP was 2.1% in 2016 compared with 2.3% in 2015, and the value added by the mining sector to the GDP increased by 2.2% in real terms in 2016 compared with a decrease of 5.1% in 2015 and a revised increase of 3.0% in 2014. Morocco's mineral industry was the leading foreign exchange earning sector for the Government, and the phosphate rock mining and phosphate-based products industry continued to be a major source of export earnings for the country, accounting for about 18% of total exports (Bank Al-Maghrib, 2017, p. 74, 219−220; Office National des Hydrocarbures et des Mines, 2017a, p. 10).

The flow of foreign direct investment (FDI) into Morocco decreased by about 30% to $2.3 billion in 2016 from $3.3 billion in 2015, and the flow of FDI out of Morocco decreased by 2% to $639 million from $653 million in 2015. The value of FDI inward stock in Morocco at yearend 2016 was $54.8 billion compared with $45.1 billion at yearend 2010, and that of FDI outward stock was $5.4 billion in 2016 compared with $ 1.9 billion in 2010. The value of FDI inflows in announced greenfield projects increased to $4.8 billion in 2016 from $3.4 billion in 2015. FDIs went mainly to the real estate sector (40.7%), then to the industry (22.4%) and trade (10.8%) sectors. The major sources of the FDI inflows to Morocco were France (26.4%), the United Arab Emirates (12.2%), and Saudi Arabia (8.4%) (Bank Al-Maghrib, 2017, p. 76; United Nations Conference on Trade and Development, 2017, p. 45, 222, 226).

Government Policies and Programs

In 2015, Morocco's legislative body, which includes the House of Representatives and the House of Councilors, approved the country's new mining law (Bill No. 33–13), which was an update of the 1951 Mining Code and Bill No. 1–73–412 of August 13, 1973. The new law was designed to attract foreign investment, boost exports, and help ensure that companies abide by the Government's labor and environmental laws. The country's hydrocarbon law is based on law No. 21–90 of April 15, 1992, and its amendment by law No. 27–99 of March 16, 2000, and supplements by Decree No. 2–93–786 of November 3, 1993. The law regulates crude petroleum and natural gas exploration and production activity at onshore and offshore locations. The Office National des Hydrocarbures et des Mines [National Office of Hydrocarbons and Mines] (ONHYM) is the primary agency responsible for the exploration of mineral resources in the country and the promotion of investment in the mining sector. The Government promotes investment in the hydrocarbon sector by offering fiscal incentives that allow international petroleum and natural gas companies to acquire up to a 75% share of production in return for investing a portion of their profits in further exploration in the country's open areas onshore and offshore. The royalty on crude petroleum is 10% and that on natural gas is 5%, and a corporate tax holiday for 10 years is given for crude petroleum and natural gas discoveries (Office National des Hydrocarbures et des Mines, 2017b, c).

The Directorate of Mines, which is under the Ministère de l'Energie, des Mines et du Development Durable [Ministry of Energy, Mines, and Sustainable Development] (MEMSD), enforces the law through Executive orders. Exploration permits are awarded for an initial 3-year period for an area that covers up to 16 square kilometers (km^2). The permits are renewable for 4 additional years. Mining permits are awarded for a 10-year period and are renewable in 10-year increments until the reserves are exhausted. The Government provides incentives for mining companies that include tax exemptions on imported equipment for investment that exceeds $25 million and a reduced tax rate of 17.5% for companies that export their output and for companies that supply ores to mineral processing and beneficiation companies. The Government also contributes 5% of the project value to mining projects that plan to invest more than $25 million. The Government contribution goes to infrastructure development, such as building roads and supplying electricity and water to the project areas (Office National des Hydrocarbures et des Mines, 2017b, p. 4).

By the end of 2016, the Government had awarded 6,353 mining permits, 51% of which were granted to mining companies; 34%, to individual operators; and 15%, to ONHYM. In 2016, the ONHYM conducted 40 exploration studies throughout Morocco, 29 of which were ONHYM's own projects and 11 of which were in partnership with domestic and international mining companies. The ONHYM studies included exploration for base metals (cobalt, copper, iron ore, nickel, lead, and zinc), industrial minerals, mineral fuels (uranium), precious metals (gold), and other high-value minerals, such as molybdenum, niobium, and rare-earth elements (Office National des Hydrocarbures et des Mines, 2017a, p. 34; 2017c).

ONHYM partnered with several local and international mining companies for exploration and development of several mining projects in the country. The companies included Managem Group, which was exploring for copper in the Tizert area in southern Morocco; Maya Gold and Silver Inc. of Canada, which was exploring and developing the Boumadine polymetallic deposit in Er Rachidia Province; Metalex Ventures Ltd. of Canada, which was exploring for copper and gold at the Tichla-Aousserd Awserd area in southern Morocco; and Newmont Mining Corp. of the United States, which was exploring for gold in central Morocco (Office National des Hydrocarbures et des Mines, 2017a, p. 41).

In 2015, representatives of artisanal miners, local governments, and the central Government met to discuss restructuring of artisanal mining in the Figuig and Tafilate area, which was managed by the Central d'Achat et de Développement de la Région Minière du Tafilalet and Figuig (CADETAF). The Government planned to transform old artisanal mining activity in the CADETAF area to small-scale mining operations in a way that takes into consideration artisanal miners' interests and preserves mining operations in the area (Ministry of Energy, Mines, and Sustainable Development, 2017).

Production

Production in 2016 compared with that in 2015 increased most notably for fuller's earth (smectite), by 68%; sulfur, by an estimated 50%; fertilizers, by 34%; sulfuric acid, by an estimated 20%; mined copper, by 19%; salt, by 14%; bentonite, by 12%; and phosphoric acid, by 10%. Notable decreases in production included that of barite, by 45%; montmorillonite (ghassoul), by 22%; gold, by 21%, mined zinc, by 20%; arsenic, by 19%; iron ore, by 14%; and mined lead, by 11%. Data on mineral production are in table 1.

Structure of the Mineral Industry

The Office Chérifien des Phosphates [Office of Moroccan Phosphates] (OCP), which is also known as the OCP Group, was responsible for phosphate rock mining and phosphate-based fertilizers and other products manufacturing in Morocco. OCP, which was wholly owned by the Government, was the country's sole producer of phosphate rock through its 30 subsidiaries and joint ventures (OCP Group, 2017, p. 27).

Managem was a publicly listed company that produced metals, such as cobalt, copper, lead, nickel, and zinc; precious metals, such as gold and silver; and industrial minerals, such as arsenic, fluorspar, and sodium sulfate. Managem was the leading metal mining company in the country; it conducted mineral exploration, marketing, processing, and services through its subsidiaries. In 2016, Managem operated mining development projects in Morocco and some other African countries, such as Gabon and Sudan, and employed more than 5,660 people (Managem S.A., 2017, p. 27, 52, 79).

Artisanal mining in the Figuig and Tafilalet area near Meknes had been legal since 1960. The royal decree (Dahir) of December 1, 1960, created CADETAF as an independent, financially autonomous public institution. The Ministry of Energy and Mines was responsible for technical supervision of mining operations in the Tafilalet and Figuig mining area. Artisanal miners produced barite, lead, kohl (used as eyeliner), and zinc ores within an area of 60,000 km^2. Artisanal miners sold their minerals to collection centers, which were equipped with chemical analysis, storage, and weighing facilities. Prices were based on cost insurance and freight (c.i.f.) value after subtracting taxes, which were 10 Moroccan Dirham per metric ton (MAD/t) (approximately $1.00 per metric ton) for barite, 300 MAD/t (approximately $31.00 per metric ton) for kohl, 10% for lead, and 15% for zinc (Ministry of Energy, Mines, and Sustainable Development, 2017).

Mineral Trade

In 2016, the value of Morocco's total exports increased to $22.9 billion from $22.0 billion in 2015, and imports, to $41.7 billion from $37.5 billion in 2015. The increase in total exports was attributed to higher production amounts of phosphate rock, phosphate-based fertilizers, and phosphoric acid compared with those of the previous year. Exports of mineral or chemical fertilizers increased to $1.8 billion from about $1.6 billion in 2015; phosphoric acid exports decreased to $1.1 billion from $1.6 billion; and phosphate rock exports decreased to $756 million from $1,022 million in 2015. The value of hydrocarbon imports decreased to $4.7 billion in 2016 from $5.8 billion in 2015. The decrease in hydrocarbon imports was attributed to the decline in crude petroleum and natural gas prices on the world market (United Nations Statistics Division, 2017, p. 268−269).

In 2016, Morocco exported 7.9 million metric tons (Mt) of phosphate rock, which accounted for 30% of the world's trade market for phosphate rock, 1.8 Mt of phosphoric acid, and 6.6 Mt of phosphate fertilizer. The country imported 5 Mt of sulfur to produce sulfuric acid for use in fertilizer manufacturing. Morocco's exports of other mineral commodities included barite [556,000 metric tons (t)], copper and zinc in concentrate (115,000 t each), lead ore (53,000 t), and other raw mineral products (1.8 Mt). Morocco's sulfur imports were valued at $455 million in 2016; they originated mainly in the United Arab Emirates (44%), Russia (18%), Poland (9%), and the United States (8%). Morocco's coal briquet imports were valued at $450 million in 2016; they came from Russia (42%), South Africa (37%), the United States (14%), Poland (4%), Colombia (2%), and Spain (1%) (Bank Al-Maghrib, 2017, p. 232, 235; OCP Group, 2017, p. 18; Observatory of Economic Complexity, The, 2018a, b).

Morocco's exports to the United States increased slightly to $1,021 million in 2016 from $1,012 million in 2015. They included, in descending order of value, chemical fertilizers ($349 million), barite ($98 million), iron and steel products ($15 million), inorganic chemicals ($10 million), and cement, sand, and stone ($2 million). Morocco's imports from the United States increased to $1.9 billion in 2016 from $1.6 billion in 2015. Major minerals and metal-related exports included, in descending order of value, fuel oil ($179 million), natural gas liquids ($110 million), petroleum products ($49 million), other chemicals ($39 million), metallurgical-grade coal ($36 million), other nonmetallic minerals ($33 million), fertilizers ($31 million), chemical fertilizers ($31 million), coal and other fuels ($17 million), excavation machinery and iron and steel products ($5 million each), and steelmaking materials (about $3 million) (U.S. Census Bureau, 2017a, b).

Commodity Review

Metals

Cobalt and Nickel.—Compagnie de Tifnout Tighanimine (CTT) (a subsidiary of Managem) mined cobalt and nickel ore at the Bou-Azzer Mine, which is located 35 kilometers (km) south of Marrakech in southern Morocco within the central Anti-Atlas Mountain range. Cobalt production increased to an estimated 2,400 t from 2,250 t in 2015. Refined cobalt (cobalt cathode) production increased to 2,081 t in 2016 from 1,982 t in 2015. CTT repeated the discovery of an additional 3,624 t of cobalt content resources in 2016, which increased mineral resources at the Bou-Azzer Mine to 17,596 t from 13,972 t of contained cobalt. CTT also produced nickel as a byproduct of cobalt production at the Guemassa metal complex. In 2016, nickel production decreased by 7% to 188 t from revised 203 t in 2015 (table 1; Managem S.A., 2017, p. 9, 31, 47, 49).

Copper.—In 2016, Morocco's output of copper in concentrate increased by 19% to 113,219 t from 95,542 t in 2015. Copper production came from four mines that were subsidiaries of Managem—the Blieda Mine, which was operated by Société Minière de Bou Gaffer (SOMIFER) and produced 25,301 t of copper in concentrate; the Akka Mine, which was operated by Akka Gold Mining Co. (AKG) and produced 33,904 t; the Oumjrane Mine, which was operated by Compagnie Minière de Oumjrane S.A (CMO) and produced 17,989 t; and the Douar Hajar Mine, which was operated by Compagnie Minière de Guemassa (CMG) and produced 18,348 t. Managem completed a feasibility study for the Bouskour copper project, which is located 80 km southeast of Ouarzazate and had an estimated 9 Mt of resources grading 1.61% copper, and progressed in developing a feasibility study for the Tizert copper project, which is located 80 km east of the city of Agadir and had combined mineral resources of 35 Mt. Managem planned to increase its copper production to 250,000 t by 2020 through increased production at its active mines and to begin commercial production at the Bouskour and the Tizert projects (Managem S.A., 2017, p. 6, 40, 44, 46, 52).

Silver.—In 2016, Société Métallurgique d'Imiter (SMI), in which Managem owned a 75.72% interest, increased its silver production at the Imiter Mine by 7% to 221,126 kilograms (kg) from 206,921 kg in 2015. The company estimated mineral resources at the Imiter Mine at the end of 2016 to be 5,562 t of contained silver. Zgounder Millennium Silver Mining, which was owned by Maya Gold (85%) and ONHYM (15%), produced 16,191 kg of silver at the Zgounder Mine in 2016 compared with 9,462 kg in 2015. The Zgounder Mine is located 150 km south of Marrakech, had an estimated historical (2004) reserve of 582,000 t at an average grade of 361 grams per metric tons (g/t) silver. The mine also had an additional 500,000 t of tailings at an average grade of 125 g/t silver. The company also was the sole owner of concessions that held polymetallic deposits at the Amizmiz property, the Azegour Mine, and the 233263 permit, and it also held an 85% share in the development of the gold-lead-silver-zinc deposit at the Boumadine polymetallic mine, which had been in operation between 1964 and 1992 (Managem S.A., 2017, p. 45, 49; Maya Gold and Silver Inc., 2017).

Tin.—In 2016, Kasbah Resources Ltd. of Australia planned a second definitive feasibility study for the Achmmach tin project, which is located in the El Hajeb region in the Central Hercynian Massif, about 150 km east of Rabat. The definitive feasibility study was expected to be completed in June 2018. The Achmmach tin project was owned by Kasbah (75% interest), Toyota Tsusho Corp. of Japan (20%), and Nettetsu Mining Co. Ltd. of Japan (5%) and consisted of two mining permits (PE No. 2912 and PE No. 193172) that cover an area of about 32 km^2. In 2016, the Achmmach project was at an advanced development stage following the completion of 120 km of diamond drilling. The project holds a measured and indicated mineral resource of 14.9 Mt grading 0.85% tin and a mining reserve of 6.6 Mt grading 0.85% tin. The project was expected to produce 750,000 metric tons per year (t/yr) of ore during a mine life of 10 years (Kasbah Resources Ltd., 2018).

Industrial Minerals

Barite.—Barite production decreased sharply by 45% to 668,500 t from 1.2 Mt in 2015. The decrease was attributed to decreased worldwide demand for barite by oil companies that use barite as a water-based mud for oilfield drilling. Broychim S.A.R.L. was the country's leading producer and exporter of barite products, holding about 65% of the market share. Broychim exported barite to the United States as well as to 14 other countries. Broychim owned six mines, which had a combined estimated resource of 3 Mt. The Nkob and the Touroug Mines were the only two active mines in 2016. The Touroug Mine had the capacity to produce 200,000 t/yr of barite. Other barite producers in Morocco included CADETAF, Compagnie Marocaine des Barytes S.A., Société Nord Africaine de Recherches et d'Exploitation des Mines d'Argana, and Société Nouvelle Union des Métaux Maroc (tables 1, 2; Broychim S.A.R.L., 2017).

Cement.—Morocco's cement production in 2016 was estimated, based on consumption and export data; it decreased slightly to 15.8 Mt in 2016 from nearly 16.1 Mt in 2015. Morocco and Western Sahara's cement production capacity combined was about 25 million metric tons per year (Mt/yr); it included 1.0 Mt/yr of grinding capacity in Jorf Lasfar and Laayoune in Western Sahara. LafargeHolcim Maroc S.A., which

was 50% owned by LafargeHolcim Group of Switzerland, had 57% of the country's total capacity at nine cement plants. Ciments du Maroc S.A., which was majority owned (58.3%) by HeidelbergCement Group of Germany, operated three cement plants at Ait Baha, Marrakech, and Safi; two grinding facilities at Jorf Lasfar and Laayoune; and three quarries for aggregates. The company had the capacity to produce 3.8 Mt/yr of clinker and 5.3 Mt/yr of cement. Ciments de l'Atlas (CIMAT) had a 13% share of the country's cement production capacity and operated two plants at Beni Mellal and Settat, which are located in central Morocco. Asment Temara (a subsidiary of Votorantim S.A. of Brazil) operated one cement plant at Temara, south of Rabat, which had a capacity of 1.9 Mt/yr (table 2; HeidelbergCement Group, 2017; International Cement Review, 2017, p. 241–243).

Phosphate Rock.—Morocco held more than 50 billion metric tons of phosphate rock reserves—including deposits in the Western Sahara region—which represented about 73% of the world's reserves. In 2016, OCP produced 26.9 Mt of phosphate rock compared with 26.3 Mt in 2015. The company also produced 4.9 Mt of phosphoric acid (P_2O_5 equivalent) and 7.0 Mt of phosphate-based fertilizers. OCP's capacity in 2016 was 35 Mt/yr of phosphate rock, 10 Mt/yr of phosphate-based fertilizers, and 5.2 Mt/yr of phosphoric acid. OCP planned to increase its phosphate rock production capacity to 60 Mt/yr by 2025. The company's share in the phosphate rock trade market was 47% for phosphoric acid, 30% for phosphate rock, and 20% for phosphate-based fertilizers. OCP operated phosphate rock production and phosphate-based fertilizer manufacturing plants at the Khouribga mining center, which included the Beni Amir, the Khouribga, the Merah El Ahrach, and the Sidi Chennane Mines; the Gantour mining center, which included the Beni Guerir, the Bouchane, and the Mzinda Mines; and the Phosboucraa Mine, which is located in Western Sahara (OCP Group, 2017, p. 18, 24, 26, 28, 96).

The Beni Amir plant treated 5.5 Mt of phosphate rock from the Beni Amir Mine and 5 Mt from the Sidi Chennai Mine. The plant was one of the world's largest phosphate washing plants and had the capacity to wash 12 Mt/yr of phosphate rock. In February 2015, OCP had commissioned a new fertilizer production unit to help meet the demand from African countries and doubled its fertilizer exports to the African region by yearend (OCP Group, 2016, p. 23−24, 31, 34).

Mineral Fuels

Petroleum and Natural Gas.—In 2016, the ONHYM signed partnership agreements with 20 companies that were exploring for crude petroleum and natural gas in areas that cover about 284,000 km^2. The ONHYM signed two memoranda of understanding for the development of oil shale companies (names not available) and continued oil shale sampling at the Tarfaya and Timahdit areas, and continued its support for other companies with which ONHYM had existing agreements, such as General Strade S.p.A. and ZonaTec S.A. The holders of onshore permits in Morocco included Circle Oil Morocco Ltd., which was exploring at the Liala Mimouna and Sebou zones; Gulfsands plc of the United Kingdom, which was exploring at the Moulay Bouchta zone; Maxim Resources Inc. of Canada, which was exploring at the Hassi Berkane zone; Sound Energy plc of the United Kingdom, which was exploring at the Sidi Mokhtar and Tendaa Lakbir zones; and Petroleum Exploration (Pvt) Ltd. of Pakistan, which was exploring at the Haha onshore zone (Office National des Hydrocarbures et des Mines, 2017a, p. 18, 22−23, 31).

In 2016, Chariot Oil and Gas Ltd. of the United Kingdom held the Mohammedia offshore exploration permit and the Rabat deep offshore permit with Eni S.p.A. of Italy and Woodside Petroleum Co. of Australia. Chevron Morocco Exploration Ltd. (a subsidiary of Chevron Corp. of the United States) and Qatar Petroleum of Qatar held exploration permits for the Cap Cantin, the Cap Rhir, and the Cap Wilidia deep offshore zones. Kosmos Energy Ltd. of the United States held an exploration permit for the Essaouira offshore zone, and it also held the Boujdour Maritime exploration permit with Capricorn Exploration and Development Co. Ltd. (a subsidiary of Cairn Energy Plc of the United Kingdom). Glencore Exploration & Production Morocco Ltd. (a subsidiary of Glencore plc of the United Kingdom) and New Age Morocco Ltd. [a subsidiary of New Age (African Global Energy) Ltd. of the United Kingdom] held the Foum Ognit exploration permit. Repsol Exploration Atlas S.A. of Spain held the Gharb offshore south exploration license. Woodside also held a reconnaissance license for the Rabat ultradeep offshore zone. The Mazagan offshore exploration permit was held by Plains Exploration and Production Co. of the United States and Pura Vida Energy Co. of Australia (Office National des Hydrocarbures et des Mines, 2017a, p. 22−23).

Société Anonyme Marocaine de l'Industrie du Raffinage (SAMIR)'s production of refined petroleum products at the Mohammedia refinery was halted throughout 2016. The closure of the refinery and the liquidation of SAMIR in August 2015 made Morocco entirely dependent on imports of refined petroleum products. No information was available on the resumption of operations at either of the refineries as of yearend 2016 (El Yaakoubi, 2016; Office National des Hydrocarbures et des Mines, 2017c).

Outlook

The Government is likely to continue taking steps to attract foreign investors, including the implementation of the new mining law (Bill 33–13 of 2015), carrying out mineral exploration through the ONHYM, and making geologic information available to mining companies. Morocco's metal production is expected to increase in the next 5 years owing to local and foreign investments in copper, silver, and tin projects. OCP plans to increase its share of the phosphate fertilizer world market, including that of Africa. Managem's output of cobalt, copper, fluorite, lead, and zinc is likely to increase, if market prices for these commodities remain favorable, owing to increased proven reserves for these mineral commodities. The country will likely continue to depend on imports of refined petroleum products if the country's only refinery remains closed.

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WESTERN SAHARA

Western Sahara is a desert area bordering the Atlantic Ocean between Mauritania and Morocco. In 2016, about 75% of the Western Saharan territory was administered by the Government of Morocco and the remaining 25% was under the administration of the Popular Front for the Liberation of the Saguia el Hamra and Rio de Oro (Polisario). The issue of sovereignty for Western Sahara, which was claimed by the Government of Morocco, the Saharawi Arab Democratic Republic (SADR), and the Polisario, remained unresolved as of yearend 2016. Western Sahara's economy is dependent on fishing, pastoral nomadism, and phosphate rock mining. Cement and phosphate rock production, and offshore crude petroleum and natural gas exploration were the main mining activities (U.S. Central Intelligence Agency, 2018).

The Phosboucraa mining center, which was owned by Phosphate de Bou Craa S.A. (Phosboucraa), was the main mineral production facility in Western Sahara. Phosboucraa was a majority owned subsidiary of OCP responsible for mining, beneficiation, transportation, and marketing of phosphate rock at the Phosboucraa Mine. Phosboucraa extracted 1.9 Mt of phosphate rock in 2016, of which 1.8 Mt was from commercial production. The company had the capacity to produce 3 Mt/yr at the mine. The Phosboucraa Mine had the world's longest conveyor belt, employed 2,200 people, and held 800 Mt of phosphate rock ore, which accounted for 2% of Morocco and Western Sahara's reserves. Phosphate rock mined in Western Sahara was moved by the conveyor belt for more than 100 km to the Laayoune Wharf. The wharf contained a docking terminal for loading ships with phosphate ore and an intermediate dock for unloading ships carrying fuel oil to supply the phosphate processing plant. In 2016, Phosboucraa was building a new drying plant, along with a new washing plant with integrated flotation unit, and new storage and handling facility. Ciments du Maroc owned and operated a clinker mill at Laayoune; the mill had the capacity to produce 500,000/t/yr of cement (table 2; HeidelbergCement Group, 2017; OCP Group, 2017, p. 36).

In 2016, several companies were exploring for crude petroleum and natural gas offshore and onshore of Western Sahara. They included San Leon Energy plc of Ireland, which operated the Tarfaya onshore block and the Zag offshore block through its subsidiary San Leon Morocco Ltd.; Glencore plc of Switzerland, which held an exploration license at the Boujdour Offshore Shallow block; Cairn Energy PLC, New Age (African Global Energy) Ltd., Petromaroc Corp. plc, Teredo Oils Ltd., and Xplorer PLC (all of the United Kingdom); and Kosmos Energy Ltd. of the United States, which was exploring at the Boujdour Maritime Block (Western Sahara Resource Watch, 2016; Office National des Hydrocarbures et des Mines, 2017, p. 18−19, 21, 24).

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TABLE 1
MOROCCO: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons, gross weight, unless otherwise specified)

Commodity[2]		2012	2013	2014	2015	2016
METALS						
Antimony, refinery, oxide		7,100	--	--	--	--
Arsenic, arsenic trioxide, oxide content		8,820	8,968	6,863 r	7,566 r	6,122
Cobalt:						
Mine, concentrate:						
Gross weight		20,100	20,330	21,500	22,460	23,900
Co content		2,000	2,000	2,150	2,250	2,400 e
Refinery, Co content		1,314	1,353	1,391	1,982 r	2,081
Copper, mine, concentrate:						
Gross weight		59,000	46,320	66,480	95,542 r	113,219
Cu content		17,700	10,200 r	16,600 r	23,900 r	28,300
Gold, mine, Au content	kilograms	519	320	212	448 r	352
Iron and steel:						
Raw steel		539,000	558,000	500,000 r	516,000 e	520,000
Products, hot-rolled		855,000	1,035,000	970,000	1,200,000 e	1,200,000 e
Iron ore, mine:						
Gross weight		260,700	301,100	22,910	17,860	15,300
Fe content (54%)		140,800 r	162,600 r	12,400 r	9,600 r	8,300
Lead:						
Mine, concentrate:						
Gross weight		39,100	43,700	39,070	45,650	40,690
Pb content		27,400 r, e	30,600 r, e	27,300 r, e	16,325	15,744
Refinery:						
Cuprous matte, Pb content		600	600	600	--	--
Primary		10,000 r, e	-- r	-- r	-- r	--
Secondary		1,000 r, e	14,000 r, e	15,000 r, e	14,000 r, e	15,000
Manganese, mine, largely chemical-grade:						
Gross weight		90,200	110,970	91,271 e	71,700 e	68,330
Mn content		47,800	58,800	48,400	38,000 e	27,000 e
Mercury, Hg content[c]		8	8	8	5	5
Nickel, chemicals, nickel hydroxide, Ni content		288	175	200	203 r	188
Silver, mine, Ag content	kilograms	170,340 r	194,080 r	185,770 r	216,400 r	237,300
Zinc:						
Mine:						
Gross weight		92,000	82,500	89,570	106,010	84,850
Zn content		45,800	47,600	45,000	53,260	42,000
Oxide		6,889	6,963 r	7,166 r	4,890	5,180
INDUSTRIAL MINERALS						
Barite, crude		1,021,400	1,094,470	1,006,600	1,212,130	668,500
Cement, hydraulic	thousand metric tons	16,270	16,870	15,710	16,070 r	15,800 e
Clay and shale:						
Bentonite, crude		91,200	105,240	98,757	92,290	103,230
Fuller's earth, smectite		81,800	59,000	73,500	84,570	141,760
Montmorillonite, ghassoul, crude		1,900	1,990	810	1,160	910
Feldspar, mine		45,000	45,000	45,000	45,000	35,000
Fertilizers, solid	thousand metric tons	4,500	4,659	4,800	5,210	6,960
Fluorspar, acid grade		79,300	73,900	74,854	80,890	73,920
Phosphate rock:						
Gross weight	thousand metric tons	27,060	26,400	27,390	26,264	26,900
P_2O_5 content	do.	8,659	8,448	8,640	8,404	8,607
Phosphoric acid	do.	4,158	4,700	5,000	4,500	4,930

See footnotes at end of table.

TABLE 1—Continued

MOROCCO: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons, gross weight, unless otherwise specified)

Commodity[2]		2012	2013	2014	2015	2016
INDUSTRIAL MINERALS—Continued						
Salt[3]		755,000	508,920	459,160	555,760	634,610
Sulfur, all forms, S content		62,000	60,000	60,000	20,000 r, e	30,000 e
Sulfur compounds, sulfuric acid[4]	thousand metric tons	12,500	14,000	15,000	15,000	18,000 e
Talc		200	--	--	--	--
MINERAL FUELS AND RELATED MATERIALS						
Natural gas, dry basis	million cubic meters	43	45	44	41	41
Petroleum:						
Crude	thousand 42-gallon barrels	1,600	1,847	1,847	1,781	1,781
Refinery production:[5]						
Distillate fuel oil	do.	19,722	16,121	16,443	9,044	--
Gasoline	do.	3,472	3,310	2,876	1,582	--
Jet fuel	do.	6,955	8,406	7,185	3,952	--
Liquefied petroleum gas	do.	1,322	1,114	9,915	5,453	--
Residual fuel oil	do.	14,106	13,054	10,026	9,044 r	--
Other	do.	3,423	1,995	1,555	855	--
Total	do.	49,000	44,000	48,000	30,000	--

eEstimated. rRevised. do. Ditto. -- Zero.

[1]Table includes data available through March 14, 2018. All data are reported unless otherwise noted. Totals and estimated data are rounded to no more than three significant digits; may not add to totals shown.

[2]In addition to the commodities listed, gypsum, perlite, and a variety of crude construction materials may have been produced in Morocco, but available information was inadequate to make reliable estimates of output.

[3]Includes marine and rock salt.

[4]From imported sulfur.

[5]Petroleum refining was suspended in August 2015.

TABLE 2
MOROCCO AND WESTERN SAHARA: STRUCTURE OF THE MINERAL INDUSTRIES IN 2016

(Metric tons unless otherwise specified)

Country and commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
MOROCCO			
Arsenic trioxide	Compagnie de Tifnout Tighanimine (CTT) (Managem S.A., 55.2%, and Société Metallurgique d'Imiter, 20%)	Mine at Guemassa, Marrakech	6,100
Barite	Central d'Achat et de Développement de la Région Minière du Tafilalet et de Figuig (CADETAF) (artisanal miners)	Figuig Mines	300,000
Do.	Broychim S.A.R.L.	Plant at Casablanca	120,000
Do.	do.	Plant at Safi	30,000
Do.	do.	Nkob Mine, Ouarzazate	100,000
Do.	do.	Touroug Mine, Er Rachidia Province	200,000
Do.	Compagnie Marocaine des Barytes S.A. (COMABAR) [Norbar Minerals AS, 55%, and Office National des Hydrocarbures et des Mines (ONHYM), 45%]	Mine at Tlet Ighoud, Safi	160,000
Do.	do.	Mine at Zelmou, Figuig	110,000
Do.	Société Nord Africaine de Recherches et d'Exploitation des Mines d'Argana (SNAREMA)	Mine at Seksaoua, Marrakech	120,000
Do.	Société Nouvelle Union des Métaux Maroc	Mine at Jbel Abdellah	12,000
Barite, chemical grade	Société Nord Africaine de Recherches et d'Exploitation des Mines d'Argana (SNAREMA)	Mine at Argana	30,000
Do.	Compagnie Marocaine des Barytes S.A. (COMABAR) [Norbar Minerals AS, 55%, and Office National des Hydrocarbures et des Mines (ONHYM), 45%]	Mine at Azzouzet-Tidiennit	5,000
Do.	North African Industrial Minerals Exploration S.A.R.L. (S&B Group)	Trebia Mine	NA
Cement, portland	Asment Temara (Cimentos Asment EAA, 63%; Procimar S.A., 21%; Ciments Français, 16%)	Kiln and mill at Temara	1,900,000
Do.	Ciments de l'Atlas (CIMAT)	Beni Mellal kiln and mill	1,600,000
Do.	do.	Settat kiln and mill	1,600,000
Do.	LafargeHolcim Maroc S.A. (LafargeHolcim Group, 50%)	Bouskoura, near Casablanca	3,000,000
Do.	do.	Tetouan, south of Casablanca	2,500,000
Do.	do.	Cadem clinker mill at Meknes	1,750,000
Do.	do.	Tamuda kiln and mill, Tetouan	800,000
Do.	do.	Grinding unit at Tangier	1,000,000
Do.	do.	Kiln and mill at Oujda	1,300,000
Do.	do.	Settat kiln and mill	1,700,000
Do.	do.	Kiln and mill at Fes, Ras El Mal	1,300,000
Do.	do.	Clinker mill at Fes, Doukkarat	600,000
Do.	do.	Nador clinker mill	400,000
Do.	Ciments du Maroc S.A. (CIMAR) (HeidelbergCement Group, 58.3%)	Kiln and mill at Ait Baha	2,200,000
Do.	do.	Kiln and mill at Marrakech	1,300,000
Do.	do.	Kiln and mill at Safi	1,000,000
Do.	do.	El Jadida clinker mill	450,000
Do.	do.	Jorf Lasfar clinker mill	450,000
Clay:			
Bentonite	Société Miniere Bentonite d'Afarha S.A. [Grupo Tolsa, 80%, and Office National des Hydrocarbures et des Mines (ONHYM), 20%]	Mine at Aferha	9,200
Do.	Société d'Exploitation des Mines du Rif (SEFERIF) [Office National des Hydrocarbures et des Mines (ONHYM), 100%]	Mine at Bou Hoed, near Ouixane	15,000
Momtorillonite, ghassoul	Société du Ghassoul et de ses Derives SEFRIOUI SA	Mine at Tamdafelt	NA

See footnotes at end of table.

TABLE 2—Continued
MOROCCO AND WESTERN SAHARA: STRUCTURE OF THE MINERAL INDUSTRIES IN 2016

(Metric tons unless otherwise specified)

Country and commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
MOROCCO—Continued				
Clay:—Continued				
Momtorillonite, ghassoul—Continued		Antonio Reyes Mines S.A.	Mine at Haddou Ammar, Nador	NA
Cobalt:				
Ore, gross weight		Compagnie de Tifnout Tighanimine (CTT) (Managem S.A.)	Bou-Azzer Mine, Ouarzazate	200,000
Metal		do.	Guemassa polymetallic plant Marrakech	2,500
Copper, concentrate		Société Minière de Bou Gaffer (SOMIFER) (Managem S.A., 100%)	Bleida Mine, central Anti-Atlas	50,000
Do.		Compagnie Minière de Guemassa (CMG) [Managem S.A., 70.77%, and Office National des Hydrocarbures et des Mines (ONHYM), 29.23%]	Douar Hajar Mine, Guemassa, Marrakech	18,000
Do.		Akka Gold Mining Co. (AKG) [Managem S.A., 50.02%, and Office National des Hydrocarbures et des Mines (ONHYM), 16.07%]	Akka Mine at Iourim, Tiznit	35,000
Do.		Compagnie Minière de Oumjrane S.A (CMO) (Managem S.A., 100%)	Oumjrane Mine, Er Rachidia	20,000
Fluorspar, concentrate		Société Anonyme d'Entreprises Minières (SAMINE) (Managem S.A., 100%)	El Hammam Mine, Khemisset	100,000
Iron ore:				
Mine		Société d'Exploitation des Mines du Rif (SEFERIF) [Office National des Hydrocarbures et des Mines (ONHYM), 100%]	Mine at Bouhoua, Nador	120,000
Concentrate		Compagnie Minière de Guemassa (CMG) [Managem S.A., 74%, and Bureau de Recherches de Participations Minières (BRPM), 23.08%]	Bou Azzer Mine, Guemassa	29,900
Do.		Compagnie Minière de Touissit (CMT) (Emerging Capital Partners, 50%, and Truffle Capital, 50%)	Mine at Touissit, Jerada	73,000
Lead		Société des Fonderies de Plomb de Zellidja (SFPZ)[1] (Zellidja S.A., 50.4%)	Plant at Oued El Heimer	70,000
Lime		Lafarge Calincor Maroc (Lafarge Group)	Two kilns at Tlad Loulad	180,000
Manganese, concentrate		Société Anonyme Chérifienne d'Etudes Minières (SACEM) [Bureau de Recherches de Participations Minières (BRPM), 43%, and Compagnie Minière de l'Ogooué SA (COMILOG), 30%]	Mine at Imini, Ouarzazate	14,000
Natural gas	million cubic meters	Joint venture of Circle Oil Maroc Ltd. (COML), 75%, and Office National des Hydrocarbons et des Mines (ONHYM), 25%	Sebou gasfield	72
Nickel metal		Compagnie de Tifnout Tighanimine (CTT) (Managem S.A.)	Guemassa metal complex	250
Petroleum, refinery products	thousand 42-gallon barrels	Société Anonyme Marocaine de l'Industrie du Raffinage (SAMIR) (Group Corral Petroleum, 64.7%, and general public, 35.3%)	Refinery at Mohammedia[2]	75,000
Do.	do.	do.	Refinery at Sidi Kacem[3]	9,500
Phosphate rock		Office Chérifien des Phosphates (OCP) (Government, 100%)	Khouribga mining center (Beni Amir, Khouribga, Merah El Ahrach, and Sidi Chennane Mines)	22,600,000
Do.		do.	Gantour mining center (Ben Guerir, Bouchane, and Mzinda Mines)	14,000,000

See footnotes at end of table.

TABLE 2—Continued
MOROCCO AND WESTERN SAHARA: STRUCTURE OF THE MINERAL INDUSTRIES IN 2016

(Metric tons unless otherwise specified)

Country and commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
MOROCCO—Continued				
Phosphoric acid, P_2O_5		Office Chérifien des Phosphates (OCP) (Government, 100%)	Maroc Chimie I and II, Safi	500,000
Do.		do.	Maroc Phosphore I and II, Safi	1,150,000
Do.		do.	Maroc Phosphore III, IV, Jorf Lasfar	1,500,000
Do.		Africa Fertilizer Complex (Office Chérifien des Phosphates (OCP), 100%	Jorf Lasfar	450,000
Do.		Indo Maroc Phosphore S.A. [Office Chérifien des Phosphates (OCP), 33.33%; Chambal Fertilizers and Chemicals Ltd., 33.33%; Tata Chemicals Ltd., 33.33%]	Plant at Jorf Lasfar	430,000
Do.		Bunge Maroc Phosphore [Office Chérifien des Phosphates (OCP), 50%, and Bung Brasil, 50%]	do.	375,000
Do.		Jorf Fertilizer Co. V [Office Chérifien des Phosphates (OCP), 100%]	do.	375,000
Do.		Pakistan Maroc Phosphore [Office Chérifien des Phosphates (OCP), 50%, and Fauji Pakistani Group, 50%]	do.	375,000
Phosphoric acid, P_2O_5 (purified)		Euro-Maroc Phosphore Co. [Office Chérifien des Phosphates (OCP), 33%; Société Chimique Prayon-Rupel, 33%; Chemische Frabrik Budenheim KG, 33%)]	Plant at Jorf Lasfar[2]	150,000
Salt:				
Rock		Société de Sel de Mohammedia (SSM) [Office National des Hydrocarbures et des Mines (ONHYM), 100%]	Mine at Ain Tekki, Mohammedia	226,500
Marine		Société Chérifienne des Sels (SCS) [Government, 50%, and Société Nouvelle des Salins du Sine Saloum (SNSSS), 50%]	Lac Zima, Safi	30,000
Silver	kilograms	Société Metallurgique d'Imiter (SMI) (Managem S.A., 75.72%, and general public, 24.28%)	Imiter Mine, Imiter	230,140
Do.	do.	Zgounder Millennium Silver Mining [Maya Gold and Silver Inc., 85%, and Office National des Hydrocarbures et des Mines (ONHYM), 15%]	Zgounder Mine, 150 kilometers south of Marrakech	17,727
Steel products:				
Bars and sections		Société Nationale de Sidérurgie (Sonasid) (general public, 31.14%; Société Nationale d'Ivestissement S.A., 21.07%; Axa Assurances Maroc, 8.53%; Aceralia Redendos, 8.5%)	Plant at Jorf Lasfar	300,000
Rebar and wire rod		Univers Acier S.A.	Plant at Casablanca	1,000,000
Do.		do.	do.	80,000
Cold-rolled sheet		Maghreb Steel S.A.	do.	250,000
Sulfuric acid		Bunge Maroc Phosphore S.A.	Plant at Jorf Lasfar	1,250,000
Do.		Indo Maroc Phosphore SA (IMACID)	do.	1,200,000
Do.		Maroc Phosphore III-IV [Office Chérifien des Phosphates (OCP)]	do.	5,800,000
Do.		Pakistan Maroc Phosphore S.A (PMP)	do.	1,300,000
Do.		Office Chérifien des Phosphates (OCP)	do.	3,200,000
Do.		Maroc Chemei [Office Chérifien des Phosphates (OCP)]	Plant at Safi	1,600,000
Do.		Maroc Phosphore I [Office Chérifien des Phosphates (OCP)]	do.	2,500,000
Do.		Maroc Phosphore II [Office Chérifien des Phosphates (OCP)]	do.	1,900,000
Talc and pyrophyllite:				
Pyrophyllite		Société Industrie Minière Marocaine (IMM)	Mine at Khenifra	NA
Talc		Société Zenaga	Mine at Tinjdad, Errachidia	NA
Do.		do.	Mine at Taliouine, Ouarzazate	NA
Zinc, concentrate		Compagnie Minière de Guemassa (CMG) [Managem S.A., 70.77%, and Office National des Hydrocarbures et des Mines (ONHYM), 29.23%]	Douar Hajar Mine, Guemassa	170,000
Do.		do.	Draa Sfar Mine	NA

See footnotes at end of table.

TABLE 2—Continued
MOROCCO AND WESTERN SAHARA: STRUCTURE OF THE MINERAL INDUSTRIES IN 2016

(Metric tons unless otherwise specified)

Country and commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Zinc, concentrate—Continued			
Do.	Société Mineral et Substances	Mine at Lalla Mimouna, Taza	NA
Do.	Société des Mines de Tennous (SOMITE)	Mine at Aguerd N'Tazoult, Azilal	NA
WESTERN SAHARA			
Cement	Ciments du Maroc S.A. (CIMAR) (HeidelbergCement Group, 58.3%)	Grinding unit at Laayoune	500,000
Phosphate rock	Phosphates de Bou Craa S.A. (Phosboucraa) [Office Chérifien des Phosphates (OCP), 65%]	Phosboucraa Mine and mining center	3,000,000

Do., do. Ditto. NA Not available.
[1]Société des Fonderies de Plomb de Zellidja also refined silver and produced copper matte and sodium antimonate.
[2]Shut down in August 2015.
[3]Shut down in August 2008.