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The Mineral Industry of Israel

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In 2015, Israel played a significant role in the world's production of bromine, magnesium metal, phosphate rock and associated fertilizer, and potash. The country's share of the world's estimated bromine production (excluding that of the United States) amounted to 34%. Other domestically significant mining and mineral-processing operations included cement, iron and steel, refined secondary lead, natural gas, crushed stone, sulfur, and petroleum products. The country held more than 7% of the world's potash reserves, measured in potassium oxide (K_2O) equivalent. Israel consumed substantial amounts of bromine, phosphate rock, and potash in downstream processing operations; the majority of the final products from these operations were exported (Jasinski, 2016; 2017a, b; Kimberley Process Certification Scheme, 2016; Bray, 2017; Schnebele, 2017).

Minerals in the National Economy

In 2015, the mineral sector's contribution to the gross domestic product (GDP) was 14.3%, of which fertilizer manufacturing and petroleum refining contributed 13%; mining and quarrying, 1.1%; and secondary metal production, 0.02%. The chemicals, chemical products, and petroleum products sector employed about 20,700 workers; industrial minerals, about 11,300; mining and quarrying, about 4,200; and basic metals, about 6,700. Israel's total exports amounted to $54.5 billion in 2015, of which diamond accounted for 13.4%. Total imports were valued at about $61.3 billion, of which fuel imports accounted for 12.1%, and diamond imports, 10.2% (Central Bureau of Statistics, 2016, a–d).

The mining sector was governed by the Mining Ordinance of 1925 and subsequent regulations enacted in 1973 and 1978. The regulations enacted in 1978 mandated the establishment of the Quarry Rehabilitation Fund to reduce environmental damage from quarry operations and to ensure the rehabilitation of abandoned mines and quarries. Upstream exploration and production of natural gas and petroleum are governed by the Petroleum Law of 1952 and the Petroleum Regulations of 1953. Downstream production and other activities are governed by the Natural Gas Sector Law of 2002, which established a licensing system for natural gas distribution and transmission and liquefied natural gas facilities.

Israel's exports to the United States were valued at about $24.5 billion in 2015 compared with about $23 billion in 2014. Diamond valued at about $8.3 billion accounted for about 34% of these exports, and pharmaceutical preparation materials valued at about $6.1 billion accounted for about 25%. Semiconductors and chemical fertilizers accounted for about 5% and 1% of Israel's exports to the United States, or about $1.2 billion and $254 million, respectively. Imports from the United States were valued at about $13.5 billion compared with about $15.1 billion in 2014. Diamond valued at about $5.4 billion accounted for about 40% of these imports. Other imports included $554 million worth of semiconductors; $284 million worth of petroleum products; $75 million worth of mineral supplies; $68 million worth of nonferrous metals; and $51 million worth of iron and steel products and mill products (U.S. Census Bureau, 2017a, b).

Production

In 2015, production of lime increased by 122%; gypsum, by 94%; phosphoric acid, by 25%; sulfuric acid, by 18%; sulfur, by 17%; beneficiated phosphate rock, by 15%; and monoammonium phosphate, by 10%. Production of natural gas was reported to have increased by 10%. Increased production of refinery products included asphalt, which increased by 40%; and liquefied petroleum gas and lubricants, by 10% each. Decreased production of industrial minerals and metals included elemental bromine, which decreased by 33%; magnesium chloride, by 30%; potash, by 30%; magnesium metal, by 26%; and magnesia, by 16%. Production decreases were owing to a labor strike at a number of production facilities owned by subsidiaries of Israel Chemicals Ltd. (ICL). Other notable production decreases included salt, which decreased by 28%, and potassium nitrate and brick clay, by 10% each (table 1; Israel Chemicals Ltd., 2016, p. 10, 42, 44–45; Michael Danon, Senior Coordinator, Health, Safety, and Environment in Quarries and Mines, Ministry of National Infrastructures, Energy and Water Resources, written commun., September 15, 2016).

Structure of the Mineral Industry

Most of Israel's mining and mineral processing operations were privately owned, including the producers of aggregates, cement, clays, dolomite, lime, and salt. Israel Chemicals Ltd. of Israel (ICL), which was owned by Israel Corp. (46%), public investors (14%), and Potash Corp. of Canada, was the country's sole producer of bromine, magnesia, refined magnesium, phosphates, potash, and sulfuric acid. Other mineral commodities produced by only one domestic company included cement, lead, refined secondary zinc, and silica sand. The diamond cutting and polishing industry was composed of many small producers (table 2).

Commodity Review

Metals

Copper and Iron and Steel.—In July 2015, Arava Mines Ltd., a subsidiary of Altos Hornos de México S.A. de C.V. (AHMSA) of Mexico, continued construction of a new solvent extraction–electrowinning plant with a capacity of 24,000 metric tons per year (t/yr) of copper cathode. The project is located at the Timna copper deposit in the Negev Desert. In early 2015, Yehuda Steel Ltd. of Israel was reported to be engaged in the construction of a new plant with a capacity of 350,000 t/yr that would produce

rebar from remelted scrap (Metal Bulletin Magazine, 2015a; 2015b, p. 9; Altos Hornos de México S.A.B. de C.V., 2017).

Magnesium.—In 2015, Dead Sea Magnesium Ltd. (DSM), a subsidiary of ICL, produced 19,307 metric tons (t) of magnesium metal compared with 26,000 t in 2014. Decreased production was attributed to the labor strike that took place at production facilities, located in Sodom, during the first half of 2015. At yearend, the company planned to close the magnesium plant in January 2017. The company planned to use the latest year of operation to study the effects of taxes and royalties on the plant's economic viability. The company was reported to have operated the plant at a financial loss in 2015. In 2014, the United States imported 11,700 t of magnesium metal and 3,690 t of magnesium alloys from Israel. Israel supplied about 72% and 74% of the United States' total imports of magnesium metal and magnesium alloys, respectively (Bray, 2016; Israel Chemicals Ltd., 2016, p. 45, 82, 121; Michael Danon, Senior Coordinator, Health, Safety, and Environment in Quarries and Mines, Ministry of National Infrastructures, Energy and Water Resources, written commun., September 15, 2016).

Industrial Minerals

Bromine.—Dead Sea Bromine Company Ltd. (DSBC), a subsidiary of ICL, extracted brines and carnallite from the Dead Sea at DSBC's plant at Sodom, which had a capacity of 280,000 t/yr of bromine. Production decreased to about 116,000 t in 2015 from 174,000 t in 2014 owing to a labor strike that halted production from February to May 2015. In 2015, ICL consumed about two-thirds of the bromine produced for the downstream manufacturing of bromine compounds at its plants in China, Israel, and the Netherlands. Bromine compounds produced by DSBC were used in such applications as flame retardants, natural gas and crude petroleum production, pharmaceuticals, and water treatment (Israel Chemicals Ltd., 2016, p. 41, 45, 144–145, F-12).

Phosphate Rock.—Rotem Amfert Negev Ltd. (a subsidiary of ICL) produced phosphate rock at the Oron, the Rotem, and the Zin Mines in the Negev Desert. The production of beneficiated phosphate rock increased to 3.85 million metric tons (Mt) in 2015 from 3.36 Mt in 2014. The estimated remaining life of the Zin Mine was 11 years; the Rotem Mine, 7 years; and the Oron Mine, 6 years (table 1; Israel Chemicals Ltd., 2016, p. 87).

Potash.—Dead Sea Works (DSW) (a subsidiary of ICL) extracted carnallite from the Dead Sea to supply raw material for its potash plants. In 2015, the company completed a plan to increase the Sodom facility's potash production capacity by 500,000 t/yr, which was greater than the company's capacity to produce raw material from evaporation ponds. DSW's potash production decreased to about 2.44 Mt in 2015 from 3.50 Mt in 2014 owing to a labor strike (Israel Chemicals Ltd., 2016, p. 36).

Mineral Fuels

Natural Gas.—In December 2015, the Government exempted Noble Energy Inc. of the United States, Delek Group of Israel, and their joint-venture partners from antitrust laws regarding the petroleum rights to the Leviathan gasfield through the implementation of the Natural Gas Framework, under Section 52 of the Restrictive Trade Practices Act. Under the conditions of the framework, Delek and Noble were allowed to keep their interest in the Leviathan gasfield; however, Delek was required to sell its rights in the Tamar gasfield and Noble was required to sell 11% of its interest in the Tamar gasfield by December 21 to limit its maximum holding to 25%. The framework also specified that Delek and Noble must sell their rights in the Alon A and Alon C license areas, which host the Karish and Tanin discoveries, respectively, within 14 months; that the Leviathan leaseholders must invest a minimum of $1.5 billion in gasfield development by yearend 2017; and that the Tamar and Leviathan leaseholders must invest a minimum of $800 million in Israel's goods and services, research and development, and personnel training. The framework granted gas purchasers a 2-year period, which was to be decided, to reduce current "take or pay" contracted gas volumes by 50% and permitted purchasers to resell 15% of contractually purchased volumes without pricing restrictions. The stability clause provision precludes the Government from changing the framework for 10 years. Noble (39.7%), Delek (22.7%), and their partners continued the planned development of the Leviathan gasfield, and expected to begin production in late 2019. The companies expected to produce 21 billion cubic meters per year at Leviathan. Resources at the Leviathan gasfield were estimated to be about 621 billion cubic meters at yearend (Delek Group, 2016, p. A–16, A–60, A–68; Noble Energy Inc., 2016, p. 17; Oil and Gas Engineer, 2017).

Noble, Delek, and their joint-venture partners produced natural gas at the Tamar offshore gasfield in the Mediterranean Sea; Noble and Delek also produced natural gas at Mari-B. At the end of 2015, reserves at Tamar and Tamar Southwest combined were estimated to be about 290 billion cubic meters. In 2015, Noble completed the Tamar field compression project at the Ashdod onshore terminal, expanding the Tamar field production capacity to about 33.4 million cubic feet per day. For the purpose of export, the company planned further capacity expansion at the Tamar field through the construction of a third flow line from the field and the addition of producing wells, although the company did not state a timeline for completion. The project was expected to increase the field's production capacity to about 58.8 million cubic meters per day. (Environmental Resource Management, 2015, p. 9; Noble Energy Inc., 2016, p. 17–18, 23, 34, 61).

Outlook

The production of potash is likely to increase between 2016 and 2017 owing to ICL's capacity expansion. Domestic demand for natural gas is expected to increase in response to expected economic expansion, emission reduction goals, and the certainty of domestic natural gas supply and availability. In response to demand, natural gas production is expected to increase between 2015 and 2020 with the opening of the Leviathan gasfield and the expansion of the Tamar gasfield, which may transform Israel into a major natural gas producing country in the region. Refined copper production could also start in the near future with the completion of the refinery. Production of steel is likely to increase in the near to medium term as Yehuda Steel

is expected to complete construction of its plant and begin production. The production outlook for bromine, fertilizer, and phosphate rock will likely depend on Israel's tax policy, domestic labor disputes, and market conditions in the world economy.

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TABLE 1
ISRAEL: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2, 3]		2011	2012	2013	2014	2015
METALS						
Iron and steel, steel, crude[e]		300,000 [r]	300,000 [r]	300,000 [r]	300,000 [r]	300,000
Lead, refined secondary		27,000	21,791	22,418	26,426	26,000
Magnesium, metal		26,284	27,292	27,399	26,000	19,307
INDUSTRIAL MINERALS						
Bromine, elemental		202,313	173,940	184,943	173,796	115,583
Cement, hydraulic	thousand metric tons	5,480	5,892	6,398	6,603	6,904
Clay:						
Brick clay		57,908	49,539	41,534	50,000	45,000
Common clay		1,220,379	1,057,000	1,241,000	996,640	1,041,509
Flint clay[e]		300,000 [4]	270,000	290,000	320,000	330,000
Gypsum		20,437	45,407	27,200	82,000	159,299
Lime		715,487	769,611	300,391	250,000	554,000
Magnesium compounds:						
Magnesia		40,000	42,000	43,000	45,000	38,000
Magnesium chloride, Mg content		126,988	105,610	91,040	135,966	95,397

See footnotes at end of table.

TABLE 1—Continued
ISRAEL: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2, 3]		2011	2012	2013	2014	2015
Phosphate:						
Phosphate rock, mine output:						
Beneficiated	thousand metric tons	3,105	3,514	3,578	3,357	3,849
P_2O_5 content[e]	do.	960 [r]	1,090 [r]	1,100 [r]	1,040 [r]	1,190
Phosphatic fertilizers:						
Monoammonium phosphate		NA	86,600	85,980	78,327 [r]	86,381
Triple superphosphate		NA	455,000	560,940	443,610	431,630
Other		NA	315,580	371,610	316,460	242,279
Phosphoric acid		NA	572,870	530,460	483,655 [r]	606,955
Potassium:						
Potash:						
Gross weight	thousand metric tons	2,983	1,135 [r]	3,591	3,503	2,438
K_2O equivalent	do.	1,790 [r]	1,830 [r]	2,268	2,213	1,540
Potassium nitrate		NA	403,500	374,000	397,600	358,490
Salt, marketed	thousand metric tons	410	415	442	460	333
Sand:[e]						
Silica sand		232,909 [4]	180,000	200,000	200,000	218,000 [4]
Other	thousand metric tons	3,500	4,000	4,500	5,500	5,500
Stone:[e]						
Crushed	do.	49,000	46,000	47,000	46,000	48,000
Dimension, marble		58,000	63,000	67,000	74,000	77,000
Sulfur:						
Byproduct from petroleum[e]	thousand metric tons	60	60	60	61 [4]	72 [4]
Sulfuric acid:						
Gross weight	do.	1,900 [e]	1,773	2,030	1,818	2,148
S content	do.	620 [e]	580	664	594	702
MINERAL FUELS AND RELATED MATERIALS						
Gas, natural:						
Gross	million cubic meters	4,318	2,557	6,496	7,591 [r]	8,345
Dry[5]	do.	1,788	1,047	2,160	2,389 [r]	2,606
Petroleum:						
Oil shale	thousand 42-gallon barrels	213 [6]	217 [6]	217 [6]	220 [e]	210 [e]
Crude	do.	34	225	383	440	480
Refinery products:						
Liquefied petroleum gas	do.	6,600	5,777	4,651	4,991	5,505
Gasoline	do.	23,048	23,961	21,000 [e]	24,016	21,780
Naphtha	do.	5,713	3,978	6,952	6,772	6,817
Kerosene	do.	10,521	9,070	10,471	9,297	8,841
Distillate fuel oil	do.	26,573	29,206	23,061	24,175	24,168
Residual fuel oil	do.	16,523	12,075	15,636	15,087	14,978
Asphalt	do.	NA	NA	1,378	1,203	1,684
Lubricants	do.	NA	NA	225	41	45
Other[e]	do.	12,800 [4]	12,000	18,000	20,000	21,000
Total[e]	do.	101,800 [4]	96,100	102,000	106,000	105,000

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. do. Ditto. NA Not available.

[1]Table includes data available through November 9, 2016.

[2]In addition to the commodities listed, caustic soda, secondary refined zinc, and semimanufactured steel were produced, but available information was inadequate to make reliable estimates of output.

[3]Diamond imported and cut in Israel was previously reported, in thousand carats, as follows: 2011—230; 2012—200; 2013—200; and 2014—200.

[4]Reported figure.

[5]Sales of natural gas.

[6]Converted from metric tons of oil equivalent.

TABLE 2
ISRAEL: 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
Aggregates		Lime & Stone Production Company Ltd. [Housing & Construction Holding Company Ltd., 50%, and Readymix (Israel) Ltd., 50%]	Modiim	6,000 e
Do.		do.	Dragot, Ein Harod, Eilat, Golani Junction, Kadarim, Revivim, Segev, and Shefar'am	5,000 e
Do.		Shapir Civil and Marine Engineering Ltd.	Etziona quarry, Emek Haela	2,500 e
Do.		do.	Vered quarry, Eron	2,500 e
Do.		Hanson Israel (HeidelbergCement AG)	Migdal Zedeka and other quarries	8,000 e
Bromine		Dead Sea Bromine Company (DSBC) [Israel Chemicals Ltd. (ICL), 100%]	Sodom	280
Cement		Nesher Israel Cement Enterprises Ltd. (Clal Industries and Investments Ltd., 100%)	Plant at Ramla	5,000
Do.		do.	Clinker plant at Ramla	4,000
Do.		do.	Grinding mill at Haifa	1,200
Clay		Negev Industrial Minerals Ltd.	Ramon Crater	NA
Copper ore		Arava Mines Ltd. (Altos Hornos de México S.A.B. de C.V., 100%)	Timna Mine in the Negev Desert[1]	NA
Diamond, cut and polished		Various producers	Various locations	NA
Dolomite		Shapir Civil and Marine Engineering Ltd.	Natuf quarry	NA
Do.		do.	Zenuach quarry	NA
Lead, refined, secondary		Hakurnas Lead Works Ltd.	Ashdod	38
Lime		Negev Industrial Minerals Ltd.	Mishor Rotem	180
Do.		Lime & Stone Production Co. Ltd.	Shefeya	150
Magnesium:				
Magnesia		Dead Sea Periclase Ltd. [Israel Chemicals Ltd. (ICL), 100%]	do.	53
Magnesium, refined		Dead Sea Magnesium Ltd. (DSM) [Israel Chemicals Ltd. (ICL), 100%]	Sodom	34
Natural gas	million cubic meters	Noble Energy Inc., 36%; Isramco Negev 2 LLP, 28.75% Avner Oil Exploration, 15.625%; Delek Group, 15.625%	Tamar gasfield	10,000
Do.	do.	Delek Group, 53%, and Noble Energy Inc., 47%	Mari-B gasfield	6,200
Petroleum:				
Crude	thousand 42-gallon barrels	Lapidoth Israel Oil Prospectors Corp.	Heletz field	NA
Refined	do.	Bazan Group Ltd. (Israel Corp., 37.08%; Israel Petrochemical Enterprises Ltd., 20.42%; private investors)	Haifa	71,900
Do.	do.	Paz Oil Company Ltd.	Ashdod	40,200
Phosphate:				
Phosphate rock		Rotem Amfert Negev Ltd. [Israel Chemicals Ltd. (ICL), 100%]	Oron, Rotem, and Zin Mines in the Negev Desert	4,500
Phosphatic fertilizers		do.	Mishor Rotem	1,900
Phosphoric acid[2]		do.	do.	640
Potash		Dead Sea Works (DSW) [Israel Chemicals Ltd. (ICL), 100%]	Sodom	3,700 e
Salt		do.	do.	700
Do.		Israel Salt Industries Ltd. (Danker Group)	Eilat	150
Do.		do.	Atlit	14
Silica sand		Negev Industrial Minerals Ltd.	Mactesh Htira	300

See footnotes at end of table.

TABLE 2—Continued
ISRAEL: 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
Steel:			
Crude	Hod Metal Products & Manufacturing Co. Ltd.	Acre	250
Do.	Yehuda Steel Ltd.	Ashdod	250
Billet	do.	Bene Ayish	200
Do.	do.	Ashdod	180
Do.	Hod Metal Products & Manufacturing Co. Ltd.	Acre	250
Rebar	Yehuda Steel Ltd.	Bene Ayish	200
Do.	do.	Ashdod	120
Do.	Hod Metal Products & Manufacturing Co. Ltd.	Kiryat Gat	250
Sulfur	Bazan Group Ltd. (Israel Corp., 37.08%; Israel Petrochemical Enterprises Ltd., 20.42%; private investors)	Haifa	40
Do.	Paz Oil Company Ltd.	Ashdod	33
Sulfuric acid	Rotem Amfert Negev Ltd. [Israel Chemicals Ltd. (ICL), 100%]	Mishor Rotem	2,400
Zinc, refined, secondary	Numinor Chemical Industries Ltd.	Ma'a lot-Tarshisha	NA

[e]Estimated; estimated data are rounded to no more than three significant digits. Do., do. Ditto. NA Not available.
[1]Not operating in 2015.
[2]P_2O_5 equivalent.