



2016 Minerals Yearbook

ISRAEL [ADVANCE RELEASE]

THE MINERAL INDUSTRY OF ISRAEL

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In 2016, Israel played a significant role in the world's production of bromine, fertilizers, magnesium metal, phosphate rock, and potash. The country ranked first in the world's production of bromine in 2016, accounting for 46% of the world's estimated bromine production (excluding that of the United States). Israel was also the world's third-ranked global producer of magnesium metal in 2016, accounting for 2.3% of the world's estimated magnesium metal production; the sixth-ranked producer of potash, accounting for 5.2% of the estimated world production of potash; and the ninth-ranked producer of phosphate rock, accounting for 1.5% of the estimated world production of phosphate rock. Other mining and mineral-processing operations included those for cement, clay, crude (raw) steel, crushed stone, diamond cutting and polishing, fertilizers, gypsum, lime, refined secondary lead, natural gas, salt, sulfur, and petroleum (both crude and refinery products). The country held 6.9% 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; most of the final output from these operations was exported (Kimberley Process Certification Scheme, 2017; Bray, 2018; Jasinski, 2018a, b; Schnebele, 2018).

Minerals in the National Economy

In 2016, the gross domestic product (GDP) at market prices increased by 5.0% to \$321.1 billion¹ from \$298.1 billion in 2015. In 2016, the manufacturing, mining, and quarrying sector's contribution to the GDP was 17.9% compared with 18.5% in 2015. The chemicals, chemical products, and petroleum products sector employed about 21,100 workers; the industrial minerals sector, about 11,400; the mining and quarrying sector, about 4,200; and the basic metals sector, about 6,600. Israel's total exports amounted to \$52.2 billion in 2016, of which diamond exports accounted for 14.2%. Total imports were valued at about \$65.1 billion, of which diamond imports accounted for 10%, and fuel imports, 9% (Central Bureau of Statistics, 2017a–c).

The mining sector was governed by the Mining Ordinance of 1925 and subsequent regulations enacted in 1973 and 1978. The regulations enacted in 1978 included 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 were governed by the Petroleum Law of 1952 and the Petroleum Regulations of 1953. Downstream production and other activities were 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.

¹Where necessary, values have been converted from Israeli shekels (NIS) to U.S. dollars (US\$) at an annual average exchange rate of NIS3.8=US\$1.00 for 2016 and NIS3.9=US\$1.00 for 2015.

Israel's exports to the United States were valued at about \$22.2 billion in 2016 compared with about \$24.5 billion in 2015. Gem diamond accounted for about 32% of these exports, which were valued at about \$7 billion. Semiconductors and chemical fertilizers accounted for about 4% and 1% of exports, or about \$897 million and \$239 million, respectively. Imports from the United States were valued at about \$13.2 billion compared with about \$13.5 billion in 2015. Gem diamond accounted for about 38% of these imports, which were valued at about \$5.0 billion. Other imports from the United States included \$831 million worth of semiconductors; \$181 million worth of petroleum products; \$65 million worth of nonferrous metals; and \$50 million worth of iron and steel products and mill products (U.S. Census Bureau, 2018a, b).

Production

In 2016, production of potassium oxide content of potash increased by 56%; triple superphosphate, by 45%; crude petroleum, by 44%; elemental bromine, by 40%; silica sand, by 39%; phosphate fertilizers, by 19%; magnesium metal, magnesia, and salt, by 17% each; magnesium content of magnesium chloride, by 12.5%; and common clay, by 11%. Production of marketable natural gas was reported to have increased by 19%. Increased production of refinery production included naphtha, which increased by 153%; and kerosene, by 10%. Decreased production of industrial minerals included construction sand and gravel, which decreased by 11% (table 1; Israel Chemicals Ltd., 2017, p. 71; Michael Danon, Senior Coordinator, Health, Safety, and Environment in Quarries and Mines, Ministry of National Infrastructures, Energy and Water Resources, written commun., October 25, 2017).

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. (ICL) of Israel, which was owned by Israel Corp. (46%), public investors, and Potash Corp. of Canada, was the country's sole producer of bromine, magnesia, refined magnesium, phosphates, potash, and sulfuric acid. Other commodities produced by only one company included cement, refined secondary lead, refined secondary zinc, and silica sand. The diamond cutting and polishing industry was composed of many small producers (table 2).

Commodity Review

Metals

Magnesium.—In 2016, Dead Sea Magnesium Ltd. (DSM) (a subsidiary of ICL) produced 22,548 metric tons (t) of magnesium metal compared with 19,307 t in 2015. The

company planned to close the magnesium plant located in Sodom in January 2017 because the plant was no longer considered economically viable as a result of the natural resource income tax. The company reported that the plant operated at a financial loss in 2016. In 2015 (the latest year for which data were available), the United States imported 9,910 t of magnesium metal and 2,980 t of magnesium alloys from Israel. Israel's share of the United States' imports of magnesium metal and magnesium alloys was 70% and 26%, respectively (table 1; Bray, 2017; Israel Chemicals Ltd., 2017, p. 56, 77; Michael Danon, Senior Coordinator, Health, Safety, and Environment in Quarries and Mines, Ministry of National Infrastructures, Energy and Water Resources, written commun., October 25, 2017, and March 22, 2018).

Industrial Minerals

Bromine.—Dead Sea Bromine Company Ltd. (DSBC), which was 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 metric tons per year of bromine. Production increased to about 162,000 t in 2016 from nearly 116,000 t in 2015 as a result of resuming regular production operations after the resolution of a 2015 labor strike that had halted production from February to May 2015. ICL consumed most 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 (table 1; Israel Chemicals Ltd., 2017, p. 56, 77–78, 82).

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 3.95 million metric tons (Mt) in 2016 from 3.85 Mt in 2015. As of yearend 2016, the estimated remaining lives of the Zin Mine and the Rotem Mine were 10 years and 6 years, respectively. The remaining mine life of the Oron Mine increased, by 2 years to 7 years, with the approval of a new mine site at the Oron Mine. The approval of the new site increased the mine's reserves by 7.0 Mt of phosphate rock (table 1; Israel Chemicals Ltd., 2017, p. 131).

Potash.—Dead Sea Works (DSW) (a subsidiary of ICL) extracted carnallite from the Dead Sea to supply raw material for its potash plants. DSW's potash production increased to about 3.74 Mt in 2016 from 2.44 Mt in 2015. Increased production was a result of resuming regular production operations after the resolution of a 2015 labor strike (table 1; Israel Chemicals Ltd., 2017, p. 109, 166).

Mineral Fuels

Natural Gas.—As provided by the Israel Natural Gas Framework, Noble Energy Inc. of the United States signed a definitive agreement to divest a portion of the company's interest in the offshore Tamar field in 2016. The framework allowed Delek Group of Israel and Noble Energy to keep their majority interest in the offshore Leviathan gasfield. Under the framework, Delek must sell its rights in the Tamar gasfield, and

Noble Energy must sell 11% of its interest in the Tamar gasfield to limit its maximum holding to 25% by December 2021. In May 2016, Noble Energy awaited regulatory approval of the development plan for the Tamar Southwest gasfield and continued to plan the Tamar expansion project. The project was expected to increase production to about 59 million cubic meters per day. Marketed natural gas production from the Tamar gasfield averaged about 24 million cubic meters per day in 2016 (Noble Energy Inc., 2017, p. 13; Oil and Gas Engineer, 2017).

In May, the Government approved a development plan for the Leviathan gasfield, which was owned by Noble Energy (39.7%), Delek (22.7%), and their partners. The Leviathan gasfield had reserves of 616 billion cubic meters. The companies planned to produce 21 billion cubic meters per year at Leviathan. Production was expected to begin by yearend 2019. In early 2014, Noble Energy had signed a 15-year gas sales and purchase agreement with the National Electric Power Company of Jordan for the export of natural gas, which is set to commence at the start of production (Delek Group, 2017, p. A–10, A–16, A–70; Noble Energy Inc., 2017, p. 13–14).

Outlook

The production of potash is likely to increase in 2017 owing to ICL's capacity expansion, which took place in 2015. Domestic demand for natural gas is expected to increase in response to expected economic expansion, emission reduction goals, and the increased availability of domestically produced natural gas. 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 Eastern Mediterranean region. Production of primary magnesium metal will likely substantially decrease and then be discontinued with the closing of DSM's magnesium metal plant in Sodom. Production outlooks for bromine, phosphate rock, and fertilizer 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 COMMODITIES¹

(Metric tons, gross weight, unless otherwise specified)

Commodity ²	2012	2013	2014	2015	2016
METALS					
Iron and steel, crude steel ^c	300,000	300,000	300,000	300,000	300,000
Lead, refinery production, secondary	21,791	22,418	26,426	26,000 ^c	26,000 ^c
Magnesium metal, primary	27,292	27,399	25,993 ^r	19,307	22,548
INDUSTRIAL MINERALS					
Bromine, elemental	173,940	172,341 ^r	173,796	115,583	161,986
Cement, hydraulic thousand metric tons	5,892	6,398	6,603	6,904	7,150
Clay and shale:					
Brick clay	49,539	41,534	50,000	45,000	44,000
Common clay	1,057,000	1,241,000	996,640	1,041,509	1,152,694
Flint clay ^c	270,000	290,000	320,000	330,000	330,000
Fertilizers, phosphate fertilizer:					
Monoammonium phosphate	86,600	85,980	78,327	86,381	87,061
Triple superphosphate	455,000	560,940	560,940 ^r	431,630	625,329
Other	315,580	371,610	316,460	242,379 ^r	288,901
Gypsum	45,407	27,200	82,000	159,299	147,000
Lime	769,611	300,391	250,000 ^c	554,000 ^c	573,000
Magnesium compounds:					
Magnesia	42,000	43,000	45,000	29,708 ^r	34,649
Magnesium chloride, Mg content	105,610	91,040	135,966	95,397	107,274
Phosphate rock, beneficiated:					
Gross weight thousand metric tons	3,513 ^r	3,578	3,357	3,849	3,946
P ₂ O ₅ content do.	1,090 ^c	1,100 ^c	1,040 ^c	1,190 ^c	1,223
Phosphoric acid	572,870	530,460	483,655	606,955	614,560
Potash:					
Gross weight thousand metric tons	3,526 ^r	3,591	3,503	2,438	3,739
K ₂ O content do.	1,830	2,268	2,213	1,540	2,400 ^c
Products, potassium nitrate	403,500	374,000	397,600	358,500 ^r	369,600
Salt, marketable thousand metric tons	415	442	460	333	389
Stone, sand, and gravel:					
Sand and gravel, construction, other do.	4,000	4,500	5,500	5,500 ^r	4,904
Silica, mine production, unspecified	180,000 ^c	200,000 ^c	200,000 ^c	218,000	302,000
Stone, crushed, unspecified thousand metric tons	46,000	47,000	46,000	51,650 ^r	55,254
Stone, dimension, marble	63,000	67,000	74,000	77,000	76,000 ^c
Sulfur compounds, sulfuric acid:					
Gross weight thousand metric tons	1,773	2,030	1,818	2,148	2,185
S content do.	580	664	594	702	720
Sulfur, petroleum, byproduct, S content do.	60	60	61	72	71

See footnotes at end of table.

TABLE 1—Continued
ISRAEL: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons, gross weight, unless otherwise specified)

Commodity ²	2012	2013	2014	2015	2016
MINERAL FUELS AND RELATED MATERIALS					
Natural gas:					
Gross million cubic meters	2,557	6,496	7,672 ^r	8,370 ^r	9,390
Marketable do.	2,280 ^r	5,870 ^r	6,870 ^r	7,500 ^r	8,900 ^e
Petroleum:					
Crude thousand 42-gallon barrels	225	383	440	473 ^r	681
Refinery production:					
Asphalt do.	NA	1,378	1,203	1,684	1,566
Distillate fuel oil do.	29,206	23,061	24,175	24,168	24,326
Gasoline do.	23,961	21,776 ^r	24,016	22,250 ^r	21,980
Kerosene do.	9,070	10,471	9,297	8,673 ^r	9,550
Liquefied petroleum gas do.	5,777	4,651	4,991	5,505	5,015
Lubricants do.	NA	225	41	45	114
Naphtha do.	3,978	6,952	6,772	6,817	5,544
Oil shale do.	217	217	220	210 ^e	NA
Residual fuel oil do.	12,075	15,636	15,087	15,709 ^r	14,656
Other ^e do.	12,000	18,000	20,000	21,000	20,000
Total ^e do.	96,300	102,000	106,000	106,000	103,000

^eEstimated. ^rRevised. do. Ditto. NA Not available.

¹Table includes data available through March 2, 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.

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

TABLE 2
ISRAEL: STRUCTURE OF THE MINERAL INDUSTRY IN 2016

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
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 Ramle	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
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

See footnotes at end of table.

TABLE 2—Continued
ISRAEL: STRUCTURE OF THE MINERAL INDUSTRY IN 2016

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Natural gas	million cubic meters	Noble Energy Inc., 36%; Iramco 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, 42.50%)	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 3,800 ^c
Salt		do.	do. 700
Do.		Israel Salt Industries Ltd. (subsidiary of Danker Group)	Eilat 150
Do.		do.	Atlit 14
Silica sand		Negev Industrial Minerals Ltd.	Mactesh Htira 300
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
Stone, sand, and gravel		Lime & Stone Production Company Ltd. [Housing & Construction Holding Company Ltd., 50%, and Readymix (Israel) Ltd., 50%]	Modiim 6,000 ^c
Do.		do.	Dragot, Ein Harod, Eilat, Golani Junction, Kadarim, Revivim, Segev, and Shefar'am 5,000 ^c
Do.		Shapir Civil and Marine Engineering Ltd.	Etziona quarry, Emek Haela 2,500 ^c
Do.		do.	Vered quarry, Eron 2,500 ^c
Do.		Hanson Israel (HeidelbergCement AG)	Migdal Zedeka and other quarries 8,000 ^c
Sulfur		Bazan Group Ltd. (Israel Corp., 37.08%; Israel Petrochemical Enterprises Ltd., 20.42%; private investors, 42.50%)	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

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

¹Not operational in 2016.

²P₂O₅ equivalent.