



# 2010 Minerals Yearbook

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SAUDI ARABIA [ADVANCE RELEASE]

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# THE MINERAL INDUSTRY OF SAUDI ARABIA

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The Kingdom of Saudi Arabia had 19% of the world's total proved crude oil reserves, which ranked it first in the world, and was a leading producer of liquid hydrocarbons, which included condensate, crude oil, and natural gas liquids. The country ranked 8th in the world in terms of petroleum refining capacity and was the 28th ranked steel producer. A variety of industrial minerals and metals also were produced in Saudi Arabia (table 1; BP p.l.c., 2011, p. 6, 10, 16; World Steel Association, 2011).

All mineral deposits are the exclusive property of the state. The Supreme Council for Petroleum and Mineral Affairs defines and approves national hydrocarbon policies and strategies. The Ministry of Petroleum and Mineral Resources implements general policy related to minerals, natural gas, and oil. The Deputy Ministry for Mineral Resources administers activity in the mining sector and promotes the mineral industry. Mining is regulated by Royal Decree No. 47 M (the Mining Investment Code) of 20 Sha'ban 1425 (October 4, 2004). The Saudi-Sudanese Red Sea Commission managed the mineral resources on the Red Sea seabed that were located in water depths greater than 1,000 meters (m).

## Minerals in the National Economy

Saudi Arabia's economy remained strongly linked to hydrocarbon production. Crude oil and natural gas output and refined petroleum products accounted for about 50% of the nominal gross domestic product at producers' values in 2010. The volume of crude oil exported by Saudi Arabian Oil Co. (Saudi Aramco), which was the Government oil company, decreased by about 2% to 2.02 billion barrels (Gbbl) in 2010, and exports of refined petroleum products decreased by 11% to 133 million barrels (Mbbbl). In 2010, the value of Saudi Arabia's total exports increased by about 31% to \$251 billion<sup>1</sup> from \$192 billion in 2009. Mineral products (primarily crude oil) accounted for about 86% of total Saudi Arabian exports in 2010; chemical products (primarily petrochemicals) accounted for 4% (Saudi Arabian Monetary Agency, 2011, table 7-1, 7-2, 9-1; Saudi Arabian Oil Co., 2011, p. 96).

In 2010, 1.1 Gbbl of crude oil (about 56% of Saudi Arabia's crude oil exports) were shipped to Asia and 319 Mbbbl (about 16%) were shipped to the United States. Asian countries also bought 70 Mbbbl of Saudi Arabian refined petroleum products (about 53% of exports) and about 31% of its exports of natural gas liquids (Saudi Arabian Oil Co., 2011, p. 93, 96).

## Production

In 2010, Saudi Arabia increased its output of low-grade bauxite, cement, clays, ethane, low-grade iron ore, direct-reduced iron, lead, methane, propane, pozzolana, sand

and gravel, and silica sand. Granite and marble production were estimated to have increased. Compared with that of 2009, significant decreases in production volume were reported for dolomite, feldspar, refined petroleum products, and silver in 2010. Data on mineral production are in table 1.

## Structure of the Mineral Industry

The Government maintained majority ownership interest in most of the large companies that operated in the mineral sector, which included Saudi Basic Industries Corp. (SABIC) and Saudi Arabian Mining Co. (Ma'aden). Subsidiaries of SABIC included Al-Jubail Fertilizer Co., National Chemical Fertilizer Co., Saudi Arabian Fertilizer Co., Saudi Iron and Steel Co. (Hadeed), and several petrochemical companies. The Ministry of Petroleum and Mineral Resources supervised its affiliate companies in the petroleum sector; these included Aramco Gulf Operation Ltd. and Saudi Aramco. Aramco Gulf Operation and Saudi Arabian Chevron Inc. (which was a subsidiary of Chevron Corp. of the United States) worked in the Partitioned Neutral Zone between Kuwait and Saudi Arabia on behalf of the Ministry. The Ministry also supervised the Saudi Geological Survey.

Domestic and international companies and their joint ventures were involved in metal exploration and mining activity. Domestic companies dominated operations in the industrial mineral sector. Crude oil exploration and production in Saudi Arabia was restricted to Saudi Aramco, which formed joint ventures with international firms to explore for natural gas and to refine petroleum.

## Commodity Review

### Metals

**Aluminum.**—In 2010, the construction of a 740,000-metric-ton-per-year (t/yr)-capacity aluminum smelter began for the joint venture of Ma'aden (74.9% equity interest) and Alcoa Inc. of the United States (25.1%). The smelter, which was located at Ras Az Zawr (about 90 kilometers northwest of Jubail), was expected to start operations in 2013, and initially was slated to use imported alumina, which would be supplied by Alcoa. Construction of a 1.8-million-metric-ton-per-year (Mt/yr)-capacity alumina refinery and a 380,000-t/yr-capacity aluminum rolling mill at Ras Az Zawr was expected to begin in 2011. After initially processing imported bauxite, the alumina refinery was expected to be supplied by a proposed 4-Mt/yr-capacity bauxite mine at Al Ba'aitha. Alcoa held the right to acquire up to 40% equity interest in the project (Bechtel Corp., 2010; Alcoa Inc., 2011).

Development activities for three other proposed aluminum smelter projects were inactive by yearend. These projects included a 1-Mt/yr-capacity smelter that was proposed to be

<sup>1</sup>Where necessary, values have been converted from Saudi Arabian riyals (SAR) to U.S. dollars (US\$) at the fixed rate of SAR3.75=US\$1.00.

built in Jizan Economic City by Sino Saudi Jazan Aluminum Ltd., which was a joint venture of Aluminum Corporation of China Ltd. (40%), Saudi Binladin Group of Saudi Arabia (40%), and Malaysian Mining Corporation Berhad (20%), and a 700,000-t/yr smelter proposed to be built in the planned King Abdullah Economic City by the joint venture of Emaar, The Economic City of Saudi Arabia, Emirates Aluminium Company Ltd. PSJC of the United Arab Emirates, and the Saudi Arabian General Investment Authority. Development plans for both projects were suspended in 2010 owing, in part, to the lack of an assured fuel supply allocation. Work on a 700,000-t/yr-capacity smelter for Western Way for Industrial Development Co. of Saudi Arabia had been suspended prior to 2010 (Shaheen, Tammar, and Al Ghalib, 2008, p. 9; Al Shaikh and Chahine, 2010, p. 6; Baxter, 2010).

**Copper, Gold, Silver, and Zinc.**—In addition to production operations, Ma'aden and its subsidiaries (Ma'aden Gold and Base Metals Co. and Saudi Company for Precious Metals) explored for precious metals and associated minerals at several sites. Other exploration activity in Saudi Arabia included that of Alara Resources Ltd. of Australia, which agreed to acquire 50% interest in the Khnaiguiyah zinc, the Mutiyah zinc, and the Umm Hija copper projects from United Arabian Mining Co. (Managem). Managem was awarded a 30-year mining license for Khnaiguiyah in December, and in January 2011, Alara and Managem formed the Khnaiguiyah for Mining Company LLC., which planned to begin an exploration drilling program in 2011 (Alara Resources Ltd., 2011).

Al Masane Al Kobra Mining Co. (AMAK), which was a venture of local investors and the Arabian American Development Co. of the United States, continued work on the Al Masane project, which was located in southwestern Saudi Arabia. In 2010, AMAK awarded China National Geological and Mining Corp. a 5-year contract for underground mine development, which was expected to begin in 2011, and mine operations, which were expected to begin in 2012. The mine's surface plant was designed to produce about 51,000 t/yr of zinc concentrate with an average content of about 53% zinc, 35,000 t/yr of copper concentrate with an average content of about 25% copper and with precious metal values, and a dore that was expected to contain about 6,000 kilograms per year (kg/yr) of silver and 200 kg/yr of gold (Desautels and others, 2009, p. 5).

Bariq Mining Ltd., which was a joint venture of Citadel Resources Group of Australia and Consolidated Mining Company Investments Ltd. of Saudi Arabia (each of which held a 50% equity interest), was granted a mining license for the Jabal Sayid copper and gold project in May 2010. Citadel subsequently increased its interest in Bariq to 70% in June, and in September, agreed to acquire 100% equity interest in Bariq by early 2011. In October, Equinox Minerals Ltd. of Canada initiated proceedings to acquire Citadel. By December, Equinox Resources Ltd., which was a subsidiary of Equinox Minerals, had secured 50% of Citadel's equity interest, and by February 2011, 100%.

Construction of the Jabal Sayid Mine's surface facilities and the rehabilitation of the existing decline to the Lode 2 orebody started in 2010. Stockpiling of ore was expected to begin in mid-2011, and the processing plant was expected

to be commissioned by 2012. The mine was expected to operate for at least 10 years and to produce an average of 230,000 t/yr of copper concentrate, which was expected to contain about 57,000 metric tons (t) of copper, 14 t of silver, and 300 kilograms of gold (Citadel Resources Group, 2010a, p. 6; Equinox Minerals Ltd., 2011, p. 37).

Citadel also had an extensive exploration program underway. At Jabal Sayid, a deeper segment of the Lode 4 orebody was drilled. A scoping study of open pit development of the Lode 1 orebody was completed as was an updated resource estimate of the Lode 1 orebody [6.4 million metric tons (Mt) of ore with an average grade of 1.8% copper, 28 grams per metric ton (g/t) silver, and 0.44 g/t gold]. Citadel also drilled the Jabal Baydan copper-gold-silver-zinc prospect on the Wadi Shugea project, started a drill program at the Bil'iwy prospect on the Murayjib gold prospect, drilled the Lahuf gold prospect on the Mahd ahd Dhahab project, drilled the Wadi Kamal copper-nickel-platinum-group metals project, and reported an initial resource estimate of 8.7 Mt of ore with an average grade of 9.8% zinc, 16.4 g/t silver, and 1.4 g/t gold for the Jabal Shayban deposit on the Wadi Shugea project (Citadel Resources Group, 2010b, c).

The joint venture of Diamond Fields International Ltd. of Canada (50.1% interest) and Manafa International Trade Co. of Saudi Arabia (49.9% interest) acquired a mining license from the Saudi-Sudanese Red Sea Commission for the Atlantis II Deeps project. Previous exploration activity on the deposit, which was located about 115 kilometers west of Jeddah in about 2,000 m of water, had discovered copper, silver, and zinc mineralization (Diamond Fields International Ltd., 2010, 2011).

In 2010, the Gold and Minerals joint venture (formerly called Gemco Ltd.) of Abdul Rahman Saad Al-Rashid & Sons Company Ltd. of Saudi Arabia (60% interest) and Kefi Minerals Plc of the United Kingdom (40% interest) submitted 21 exploration license applications. The joint venture also continued reconnaissance for gold prospects in Saudi Arabia.

**Iron Ore.**—In 2010, London Mining Plc of the United Kingdom and National Mining Co. of Saudi Arabia signed a new agreement on the Wadi Sawawin iron ore project. Instead of maintaining the original joint venture, which was known as Saudi London Iron Ltd. (in which each company held 50% interest), an arrangement was developed (subject to Government approval) for London Mining to acquire 25% interest in National Mining, which would retain the exploitation and exploration licenses for the Wadi Sawawin project. The companies continued to attempt to secure funding for the project's proposed iron ore mine and 5-Mt/yr-capacity seaside iron ore pelletizing plant (London Mining Plc, 2011, p. 116–17).

### **Mineral Fuels**

**Natural Gas and Petroleum.**—New fields discovered in 2010 by Saudi Aramco included the Arsan, the AsSayd, the Namlan, and the Qamran oilfields and the Jalamid gasfield. A project was initiated to sustain the production capacity of the Safaniya oilfield, and the Khursaniyah gas plant started operations to recover salable hydrocarbon liquids from processed natural gas.

## Outlook

With its significant crude oil resources and production capacity, Saudi Arabia is well placed to meet international demand for petroleum. Ongoing infrastructure development, which includes the expansion of the national highway and railroad network, is likely to maintain the short-term demand for construction minerals and products, such as cement, glass, sand, steel, and stone. The Kingdom's encouragement of private investment in mineral projects is expected to be attractive to domestic and international investors.

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TABLE 1  
SAUDI ARABIA: PRODUCTION OF MINERAL COMMODITIES<sup>1</sup>

(Thousand metric tons unless otherwise specified)

Commodity <sup>2</sup>	2006	2007	2008	2009	2010 <sup>p</sup>	
METALS						
Bauxite, low grade, for cement	--	--	150 <sup>e</sup>	246 <sup>r</sup>	284	
Copper content of concentrate and bullion	metric tons	730	737	1,465	1,719 <sup>r</sup>	1,603
Ferroalloys <sup>c</sup>	do.	85,000	85,000	90,000	90,000	90,000
Gold content of concentrate and bullion	kilograms	5,180	4,440	4,527	4,857 <sup>r</sup>	4,476
Iron and steel:						
Low-grade iron ore, for cement		584	642	581	600 <sup>e</sup>	700 <sup>e</sup>
Direct-reduced iron		3,580	4,340	4,970	5,000	5,500
Steel, crude		4,000	4,600	4,670	4,700	5,000
Lead content of concentrate	metric tons	--	123	600 <sup>e</sup>	347 <sup>r</sup>	543
Silver content of concentrate and bullion	kilograms	9,100	9,028	8,232	8,527 <sup>r</sup>	7,670
Zinc content of concentrate	metric tons	983	716	3,663	4,952 <sup>r</sup>	4,897
INDUSTRIAL MINERALS						
Barite	metric tons	23,308	30,000	30,000 <sup>e</sup>	30,000	30,000
Cement, hydraulic		27,056	30,369	31,823	36,500 <sup>r</sup>	42,300
Clays:						
Kaolin	metric tons	3,957	4,415	15,000 <sup>e</sup>	4,166 <sup>r</sup>	62,000
Other, for brick and tile		3,800	3,900	5,000	4,700 <sup>r</sup>	5,800
Feldspar	metric tons	42,300	73,000	55,000 <sup>r,e</sup>	55,000 <sup>r</sup>	42,300
Fertilizer, phosphatic, P <sub>2</sub> O <sub>5</sub> content <sup>c</sup>		300	300	300	300	300
Gypsum, crude		2,101	2,100	2,300	2,000 <sup>r</sup>	2,100
Lime <sup>c</sup>		360	400	400	400	400
Nitrogen:						
N content of ammonia		2,000	2,600	2,500 <sup>r,e</sup>	2,400 <sup>r,e</sup>	2,500 <sup>e</sup>
N content of urea		1,400	1,850	1,700 <sup>r,e</sup>	1,600 <sup>r,e</sup>	1,700 <sup>e</sup>
Salt		1,752	1,507	1,600	1,640 <sup>r</sup>	1,800
Sand and stone:						
Aggregate		217,000	234,000	248,000	259,000 <sup>r</sup>	277,000
Basalt		53	--	--	--	--
Dolomite		550	465	465	669 <sup>r</sup>	583
Granite		962	954	1,100	1,100 <sup>e</sup>	1,300 <sup>e</sup>
Limestone:						
Blocks		308	308	242	522 <sup>r</sup>	704
For cement		30,500	33,447	36,100	46,900 <sup>r</sup>	45,749
Marble <sup>c</sup>	metric tons	84,700 <sup>3</sup>	85,000	85,000	85,000	100,000
Pozzolana and scoria		400	784	810	802 <sup>r</sup>	915
Sand and gravel		35,000	26,000	22,000	19,000 <sup>r</sup>	26,000
Schist		--	--	--	--	573
Silica sand (glass sand)		781	820	799	709 <sup>r</sup>	820
Sulfur, byproduct, hydrocarbon processing	metric tons	2,906,911	3,089,223	3,163,346	3,213,678	3,200,000
MINERAL FUELS AND RELATED MATERIALS						
Gas, natural:						
Gross	million cubic meters	85,001	82,665	86,158	88,432	95,032
Dry (methane)	do.	60,300	61,900	68,000	65,000	75,000
Ethane	do.	10,600	10,700	10,600	11,500	13,800
Petroleum:						
Crude oil	million 42-gallon barrels	3,253	3,114	3,266	2,888	2,887
Natural gas liquids:						
Propane	thousand 42-gallon barrels	149,320	143,681	146,048	152,262	168,513
Butane	do.	94,338	92,684	94,483	100,679	106,640
Condensate	million 42-gallon barrels	94	94	93	83	94
Natural gasoline and other	thousand 42-gallon barrels	61,456	63,926	68,195	74,468	75,924

See footnotes at end of table.

TABLE 1—Continued  
SAUDI ARABIA: PRODUCTION OF MINERAL COMMODITIES<sup>1</sup>

(Thousand metric tons unless otherwise specified)

Commodity <sup>2</sup>	2006	2007	2008	2009	2010 <sup>P</sup>	
Petroleum—Continued:						
Refinery products:						
Liquefied petroleum gases	thousand 42-gallon barrels	14,730	11,521	11,300	13,677	12,846 <sup>4</sup>
Gasoline and naphtha	do.	186,420	188,644	200,610	180,076	167,807 <sup>4</sup>
Jet fuel and kerosene	do.	77,330	67,282	69,680	56,674	45,957 <sup>4</sup>
Distillate fuel oil	do.	241,790	238,496	247,440	210,778	196,453 <sup>4</sup>
Residual fuel oil	do.	181,000	174,385	174,380	158,944	122,705 <sup>4</sup>
Unspecified <sup>5</sup>	do.	14,160	15,041	17,960	17,034	18,212 <sup>4</sup>
Total	do.	715,430	695,369	721,370	637,183	563,980 <sup>4</sup>

<sup>6</sup>Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. <sup>P</sup>Preliminary. <sup>T</sup>Revised. do. Ditto. -- Zero.

<sup>1</sup>Table includes data available through October 4, 2011.

<sup>2</sup>In addition to commodities listed, low-grade bauxite, carbon black, and methanol were produced, but available information is inadequate to make reliable estimates of output.

<sup>3</sup>Reported figure.

<sup>4</sup>Does not include refined output of Rabigh Refining and Petrochemical Co.

<sup>5</sup>Includes asphalt.

TABLE 2  
SAUDI ARABIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners		Location of main facilities	Annual capacity
Bauxite, low-grade for cement	Saudi Arabian Mining Co. (Ma'aden) (Government, 50%)		Central zone, Az Zabirah area	250,000
<b>Cement:</b>				
Grey portland	Al Jouf Cement Co.		South of Turaif	1,500
Do.	Al Safwa Cement Co. (Khayyat Group, 50%, and Lafarge Cement S.A., 50%)		Jabal Farasan	1,400
Do.	Arabian Cement Co. Ltd.		Rabigh	3,100
Do.	Eastern Province Cement Co.		Al Khursaniyah	3,500
Do.	Najran Cement Co.		About 160 kilometers northwest of Najran	4,000
Do.	Northern Region Cement Co.		About 190 kilometers west-northwest of Arar	2,000
Do.	Qassim Cement Co.		Jal al Watah, 18 kilometers north of Buraydah	3,500
Do.	Riyadh Cement Co.		About 30 kilometers southwest of Riyadh	1,700
Do.	Saudi Cement Co.		Al Hofuf, about 120 kilometers southwest of Dammam	4,000
Do.	do.		Ayn Dar, about 120 kilometers southwest of Dammam	1,450
Do.	Southern Province Cement Co. (Government, 52%)		Suq Al Ahad, 10 kilometers northeast of Jizan	2,600
Do.	do.		Bishah, 550 kilometers southeast of Jiddah	2,000
Do.	do.		Tihama	1,800
Do.	Tabuk Cement Co.		Tabuk	1,800
Do.	Yamama Cement Co. Ltd.		Riyadh	4,600
Do.	Yanbu Cement Co.		Yanbu	4,600
White	Al-Gharbiah Cement Factory		Jeddah	250
Do.	Saudi White Cement Co.		About 30 kilometers southwest of Riyadh	200
Copper, Cu content of ore	Saudi Arabian Mining Co. (Ma'aden) (Public Investment Fund, 50%)		Al Amar Mine, Ar Riyadh Province, and Mahd Adh-Dahab Mine, Al Madinah Province	1,000
Gold	kilograms	do.	Al Amar Mine, Ar Riyadh Province; Al-Hajar Mine, Asir Province; Bulgah Mine, <sup>1</sup> Al Madinah Province; Mahd Adh-Dahab Mine, Al Madinah Province; and Sukhaybarat plant, <sup>1</sup> Al Madinah Province	8,000
Kaolin	do.		Central zone, Az Zabirah	50,000
<b>Petroleum:</b>				
Crude	million barrels	Saudi Arabian Oil Co. (Saudi Aramco) (Government, 100%)	Eastern Province, Najd Region, and offshore; includes the Ghawar, the Hawtah, the Khurais, the Safaniya, and the Shaybah fields	4,500
Refined products	do.	Jeddah Oil Refinery Co. [Saudi Arabian Oil Co. (Saudi Aramco), 100%]	Jeddah	38
Do.	do.	Rabigh Refining & Petrochemical Co. (PetroRabigh) [Saudi Arabian Oil Co. (Saudi Aramco), 50%, and Sumitomo Chemical Co., 50%]	Rabigh	140
Do.	do.	Riyadh Oil Refinery Co. [Saudi Arabian Oil Co. (Saudi Aramco), 100%]	Riyadh	50
Do.	do.	Saudi Arabian Oil Co. (Saudi Aramco) (Government, 100%)	Ras Tanura	193
Do.	do.	do.	Yanbu	82
Do.	do.	Saudi Aramco Mobil Refinery Co. Ltd. [Saudi Arabian Oil Co. (Saudi Aramco), 50%, and Mobil Yanbu Refining Company Inc., 50%]	do.	140
Do.	do.	Saudi Aramco Shell Refining Co. [Saudi Arabian Oil Co., (Saudi Aramco), 50%, and Shell Saudi Arabia Refining Ltd., 50%]	Al Jubayl	110
Steel, crude	National Steel Co. Ltd. (Al Tuwairqi Group, 100%)		Dammam	800
Do.	Saudi Iron and Steel Co. (Hadeed) [Saudi Basic Industries Corp. (SABIC), 100%]		Al Jubayl	5,200
Titanium dioxide	The National Titanium Dioxide Co. Ltd. (Cristal) (Gulf Investment Corp. of Kuwait; National Industrialization Co. of Saudi Arabia; Shairco Trading Industry and Contracting of Saudi Arabia)		Yanbu	100
Zinc, Zn content of ore	Saudi Arabian Mining Co. (Ma'aden) (Government, 50%)		Al Amar Mine, Ar Riyadh Province, and Mahd Adh-Dahab Mine, Al Madinah Province	2,000

Do., do. Ditto.

<sup>1</sup>The Bulgah Mine and the Sukhaybarat plant are operated by the Saudi Company for Precious Metals, which is a subsidiary of Saudi Arabian Mining Co.