



2008 Minerals Yearbook

THE MIDDLE EAST

THE MINERAL INDUSTRIES OF THE MIDDLE EAST

By Mowafa Taib, Philip M. Mobbs, Glenn J. Wallace,
David R. Wilburn, and Thomas R. Yager

The 14 nations of the Middle East that are covered in this volume include Bahrain, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syria, Turkey, the United Arab Emirates (UAE), and Yemen. The Middle East region encompasses an area of more than 6 million square kilometers, or about 4% of the world's land mass. According to the World Bank, the total population of the Middle East region in 2008 was estimated to be about 273 million, or 4% of the world's population of 6.7 billion. The region includes 6 of the 12 member states that make up the Organization of the Petroleum Exporting Countries (OPEC), including Iran, Iraq, Kuwait, Qatar, Saudi Arabia, and the UAE, and 7 of the 11 member states that make up the Organization of Arab Petroleum Exporting Countries (OAPEC), including Bahrain, Iraq, Kuwait, Qatar, Saudi Arabia, Syria, and the UAE. The Gulf Cooperation Council (GCC), which is made up of Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the UAE, is an important economic and trade organization in the Middle East region (table 1; World Bank, The, 2009).

Acknowledgments

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For mineral production statistics—

- Bahrain—National Oil and Gas Authority;
- Israel—Mines Department of the Ministry of National Infrastructures;
- Jordan—Department of Statistics and the Natural Resources Authority;
- Kuwait—Central Statistical Office of the Ministry of Planning;
- Qatar—Qatar Statistics Authority and the Ministry of Energy and Industry;
- Saudi Arabia—Central Department of Statistics and Information of the Ministry of Economy and Planning, and Deputy Ministry for Mineral Resources of the Ministry of Petroleum and Mineral Resources;
- Turkey—General Directorate of Mining Affairs of the Ministry of Energy and Natural Resources.

For basic economic and population data—

- The International Monetary Fund and the World Bank Group in the United States.

General Economic Conditions

The economies of Middle Eastern countries continued to grow in 2008 at various rates. The highest economic growth rate in the Middle East region was achieved by Qatar [16.4% of the real

gross domestic product (GDP)] whereas Turkey had the lowest rate of economic growth (0.9% of the real GDP) in the region. Economic growth, which was taking place in all the Middle East countries between 2006 and 2008, was driven mainly by exports of hydrocarbons to the world market. For most of 2008, the economies of the oil-producing nations in the region were sustained by the continued high international market prices for crude oil and natural gas. The world's average price of crude oil increased by 36.4% in 2008 compared with that of 2007. The economies of nations that were dependent on imports of refined petroleum products, such as Jordan, however, were adversely affected by the higher international oil prices (table 2; International Monetary Fund, 2009, p. 3).

The availability of low-cost electric energy from the region's abundant supply of natural gas (especially in Iran and the GCC countries) and the region's geographic location (which allows for access to ocean transportation) have provided a solid basis for the region's development of energy-intensive mineral industries. These include aluminum smelting; petrochemical production; fertilizer manufacturing; and the production of such value-added mineral commodities as direct-reduced iron, crude steel, and rolled steel. These industries were considered the backbone of the economic diversification efforts in the region, especially in the GCC countries, which depended on hydrocarbon exports to sustain economic growth.

The construction boom that was taking place in most Middle East countries resulted in higher consumption rates for metals and industrial minerals used as building materials, such as cement and steel reinforcing bars (rebar). In 2008, steel consumption per capita varied widely from one country to another within the Middle East region but was estimated to be between 35 kilograms per year (kg/yr) and 1,240 kg/yr. The GCC countries had the highest estimates of steel consumption, led by the UAE (1,240 kg/yr) and Qatar (461 kg/yr), whereas Iraq (66 kg/yr) and Yemen (35 kg/yr) had the lowest estimates of steel consumption. The per capita steel consumption rates for the remaining countries in the Middle East ranged from 116 kg/yr to 298 kg/yr. According to the Iron and Steel Statistics Bureau, apparent steel consumption in the Middle East region (excluding Turkey) was expected to increase to 60 million metric tons (Mt) and 70 Mt in 2009 and 2010, respectively (Mackrell, 2010, p. 21).

In 2008, the cement industry in the Middle East continued to expand with the construction of new cement plants and the addition of new production lines at existing plants. Cement consumption per capita in the GCC countries was estimated to be, on average, 2,345 kg/yr. The UAE consumed 5,098 kg/yr of cement followed by Qatar (4,710 kg/yr), Oman (1,678 kg/yr), Saudi Arabia (1,625 kg/yr), Kuwait (659 kg/yr), and Bahrain (300 kg/yr). The supply of cement was expected to meet market demand in the GCC countries in 2009; however, in such Middle East countries as Iraq, demand for cement exceeded local supply

in 2008, and Governments resorted to importing about 6 Mt of cement from neighboring countries, such as Turkey, to meet the increased demand (Middle East Economist Digest, 2009).

Investment Data and Political Risk

State-owned companies dominated the Middle East's mineral industry, although local and foreign investment in the mineral sector were increasing. The construction of new aluminum smelters (as well as production-capacity expansions at existing smelters), new cement plants, new hydrocarbon-processing plants, and new iron-and-steel-processing facilities was underway in several countries. The expansion of the copper mining and refining capacities of state-owned facilities continued in Iran, subject to the availability of Government funds. Progress was made on the development of copper, gold, and phosphate rock resources in Saudi Arabia and the development of zinc resources in Yemen. In 2008, Lafarge S.A. of France increased its presence in the Middle East cement markets by building new cement plants in Iraq and Syria, as well as in Jordan, where it held majority interest in Jordan Lafarge Cement Factories Co. P.S.C. Other regional investors (mainly from Saudi Arabia) and local investors began cement production projects in Jordan, Syria, and Yemen. Al-Rajhi Investment Co. of Saudi Arabia was in the process of building two cement plants in Jordan and one in Syria (International Cement Review, 2009, p. 30).

The U.S. Government renewed sanctions on international and U.S. company investment in Iran under Executive Order 12957 of March 15, 1995; Executive Order 12959 of May 6, 1995; Executive Order 13059 of August 19, 1997; Public Law 104-172 (The Iran Sanctions Act of 1996 [ISA], formerly the Iran-Libya Sanctions Act of 1996 [ILSA]); Public Law 107-24 (ISA Extension Act of 2001, formerly the ILSA Extension Act of 2001); and Public Law 109-293 (Iran Freedom Support Act), which extended the ISA sanctions until 2011. The U.S. Government also renewed Executive Order 13338 of May 14, 2004, and Public Law 108-175 (Syria Accountability and Lebanese Sovereignty Restoration Act), which prohibits trade in most of the items on the commercial control list. The repeal of the antidumping duty, which had been imposed on rebar from Turkey in 1997, went into effect in March.

Legislation

In Iraq, a proposed new hydrocarbon law, which was approved by the Cabinet in February 2007, was still awaiting approval by the Parliament as of December 2008. The Yemen Geological Survey and Mineral Resources Board (GSMRB) of the Ministry of Oil and Minerals of Yemen drafted a new mines and quarries law with the help of the International Finance Corp. (the private sector arm of the World Bank). The new law, which emphasizes transparency, efficiency, and accountability, was expected to be put before the Parliament for approval in 2009. The proposed law would apply an 8% royalty for precious stones, a 5% royalty for nonmetallic minerals, and a 3% royalty for metallic and other minerals. The law also proposes a 30% to 35% corporate income tax on remitted dividends and exempts

mining companies from payment of import duties on mining equipment and machinery during mine construction (Yemen Geological Survey and Mineral Resources Board, 2009).

Exploration

State-owned and international oil companies continued exploration for hydrocarbons in almost all the countries in the region. More than five crude oil discoveries were reported in Iran, four in Iraq, three each in Oman and the UAE, and two in Syria. One natural gas discovery was reported in Oman. Exploration activities for natural gas were ongoing in such countries as Kuwait, Saudi Arabia, Syria, and Yemen. Local and international exploration companies were allowed to explore for nonfuel minerals in most of the countries of the region (Organization of Arab Petroleum Exporting Countries, 2009, p. 15-16).

In 2008, metal exploration activity was most notable in Iran, Oman, Turkey, and Yemen. Government agencies engaged in mineral prospecting and general exploration included the Geological Survey of Iran, the Department of Geological Survey of the Directorate General of Minerals in Oman, the Saudi Geological Survey, the General Directorate of Mineral Research and Exploration in Turkey, and the GSMRB of Yemen.

Metal exploration in the region focused on gold (66%) and base metals (34%). Sixteen mining companies were registered with the GSMRB to search for, explore, or exploit base-metals, precious metals, and industrial mineral resources in Yemen. In Iraq, the State Company of Geological Survey and Mining (GEOSURV), which was an agency of the Ministry of Industries and Mining, conducted mapping, mineral exploration, and studies of Iraq's geology (table 3).

In October 2008, the Government of Yemen, Korea National Oil Corp., and Total S.A. of France formed a joint venture to explore for gas and oil in Yemen's onshore Block 70, which is located southeast of the Marib Basin. Two oil discoveries were reported in the Sharnah-1 well of Block 47 and in the basement near the Henin-1 well of Block 71 (Rigzone.com, 2008).

Commodity Overview

The Middle East region was a significant producer of hydrocarbons in 2008. The region accounted for about 31% of the world's total crude oil production and 12.4% of world's natural gas output. The share of the Middle East region in the world mineral production in 2008 also included gypsum, 13%; chromite and potash, 10% each; refinery petroleum products, 9%; phosphate rock, 8%; ammonia, 7%; cement, 6%; primary aluminum, 5%; and crude steel, 3%.

Metals and industrial minerals production made vital contributions to the economies of Iran and Turkey. Metal production also was a notable factor in the economies of Bahrain, Oman, Saudi Arabia, and the UAE. The continued international demand for mineral fuels, especially in the first three quarters of 2008, extended the Middle East region's economic boom (table 4; BP p.l.c., 2009, p. 6, 8, 22, 24).

In tables 5 through 16, estimates for the production of major mineral commodities for 2011 and beyond have been based

upon supply-side assumptions, such as announced plans for expanded production capacity and new capacity construction, and on bankable feasibility studies of development projects. The outlook tables in this summary chapter show historic production and projected production capacity trends; therefore, no indication is made about whether the data are estimated or reported, and revisions are not identified. Data on individual mineral commodities in tables in the individual country chapters are labeled to indicate estimates and revisions. The outlook segments of the mineral commodity tables are based on projected trends that could affect current (2008) producing facilities and on planned new facilities that operating companies, consortia, or Governments have projected to come online within indicated timeframes. Forward-looking information, which includes estimates of future production, exploration and mine development, cost of capital projects, and timing of the start of operations, are subject to a variety of risks and uncertainties that could cause actual events or results to differ significantly from expected outcomes. Projects listed in the following section are presented as an indication of industry plans and are not a USGS prediction of what will take place.

Metals

Alumina and Bauxite and Aluminum.—In 2008, about 49,000 metric tons (t) of aluminum was produced at the newly built 360,000-metric-ton-per-year (t/yr)-capacity aluminum smelter at Sohar, Oman. The construction of Qatar's first aluminum smelter, which had 585,000 t/yr of capacity, continued throughout 2008, and full production was scheduled for 2010. Bahrain and the UAE accounted for more than 2% each of the world's aluminum production in 2008 (table 4). Other aluminum producers in the region included Iran and Turkey.

Bahrain and the UAE were among the world's top importers of alumina. According to the United Nations' Comtrade statistics, the UAE was the fifth ranked country in the world in terms of the value of its bauxite ores and alumina concentrates' imports in 2008 and Bahrain was the seventh ranked country.

Aluminum production capacity in the Middle East is expected to increase by more than two-fold from about 2.5 million metric tons per year (Mt/yr) in 2008 to about 5.8 Mt/yr by 2015. The Middle East region's contribution is expected to increase to about 10% of world production from the current 5% following the completion of a \$13 billion investment in the region's new smelters. The ongoing construction boom in the Middle East absorbed about 75% of the region's aluminum and aluminum product output. Compared with the production capacity levels of 2008, regional aluminum production capacity was expected to increase by about 88% by 2011; 142% by 2013; and 167% by 2015. The projected increase in aluminum output was attributable to the construction of new smelters (which included South Aluminum Corp. in Iran, Sohar Aluminum Co. in Oman, Qatar Aluminium Ltd. in Qatar, Saudi Arabian Mining Co. (Ma'aden) in Saudi Arabia, and Abu Dhabi Basic Industries Corp. and Emirates Aluminium Co. in the UAE) and the expansion of the Arak and the Al Mahdi smelters in Iran and the Dubai Aluminium Co. Ltd. (Dubal) smelter in the UAE. Additional aluminum smelter capacity was proposed to

be built in the planned Jizan Economic City in Saudi Arabia. In addition to primary aluminum production, there were a number of existing downstream facilities in such countries as Bahrain, Oman, Qatar, and the UAE that produced value-added aluminum products (table 6; Bains, 2010, p. 30).

Regional bauxite production capacity was projected to increase significantly by 2014 (compared with that in 2008) following the expected commissioning of the Az Zabirah bauxite mine for Ma'aden. Bauxite from Az Zabirah was to be processed at Ma'aden's planned alumina refinery and aluminum smelter complex at Ras al-Zour, which would be operated as a joint venture of Alcoa Inc. of the United States and Ma'aden.

The future of the aluminum industry in the Middle East region is likely to be determined by two principal factors. The first factor is the availability of sufficient quantities of natural gas to generate electricity for the smelters, and the second factor is the acquisition of a sufficient supply of alumina (Sell, 2010).

Copper.—The Middle East region was a minor contributor to the world's copper supply. Iran was the most notable copper producer in the region and the leading Middle Eastern country in terms of the size of its copper deposits, which were estimated by the National Iranian Copper Industries Co. (NICICO) to be 1.9 billion metric tons (Gt) of ore containing 14 Mt of copper, or about 3% of the world's reserves. Iran's production of 240,000 t of copper in 2008 represented only 1.5% of the world's production, and the country was pursuing plans to increase its production capacity to 440,000 t/yr by 2013. In 2008, NICICO moved forward with the construction of the Chehel-Kooreh Mine, the Yazd Ali-Abad Mine, and the Zahedan Mine. NICICO also was building new copper concentrators at the Sarcheshmeh Mine and the Sungan Mine (tables 7, 8; Gavin, 2010; Middle East Economic Digest, 2010, p. 29).

In Saudi Arabia, Ma'aden's Al Amar Mine started copper production at a rate of 1,100 t/yr in 2008. Two other copper projects were under development and expected to begin production in 2011. The first was the Al-Masane mining project, which was being developed by the Al Masane Al Kobra Mining Co. (a private company owned by Saudi and U.S. investors) and which was expected to produce 16,300 t/yr of copper concentrate in 2011 and 35,200 t/yr by 2013. The second was the Jabal Sayid project, which was owned by Bariq Mining Ltd. (a joint venture of Citadel Resource Group Ltd. of Australia and Consolidated Mining Co.) and which was expected to produce 57,000 t/yr of copper concentrate (Gavin, 2010; Middle East Economic Digest, 2010, p. 29).

Oman produced a relatively small amount of copper but copper emerged as a significant contributor to the country's exports. Oman's copper exports in 2008 were valued at about \$66 million, which was an increase of 6% compared with those of 2007. National Mining Co. L.L.C. (NMC) continued to produce copper, gold, and silver at the Hatta and the Shinas pits in the Al Batinah region. The company was exploring for copper, gold, and silver at its Ajib pit, which is located near the Shinas pit along the border with the UAE (National Mining Co. L.L.C., 2009; Gavin, 2010, p. 30).

In Yemen, Cantex Mine Development Corp. of Canada began drill tests of the Suwar cobalt, copper, and nickel deposit following the completion of an 11-hole drilling program at

the Wadi Qutabah project. Cantex planned to complete a prefeasibility study of the Suwar project by mid-2012. In November, Companhia Vale Do Rio Doce (CVRD) of Brazil committed a \$2 million option to the project, drilled near the mineralization area discovered by Cantex, collected and analyzed soil samples, and performed geophysical surveys. Cantex and CVRD were trying to discover a continuous mineralization that would make the prefeasibility study worth additional investment.

In October, Altos Hornos de México S.A. de C.V. (AHMSA) suspended the Timna Copper Mine project in Israel. The project had been expected to produce and export 22,000 t/yr of refined copper by 2010. The cost of the project was estimated to be more than \$200 million. The reason for the decision by AHMSA was the Government's refusal to grant \$35 million that had been promised to AHMSA's subsidiary Arava Mines Ltd. according to the Law for the Encouragement of Capital Investment (Coren, 2009).

Gold.—The Middle East was a significant gold trading region, and the region's jewelry manufacturing sector was a noted consumer of gold. Until the end of 2008, the UAE gold refineries produced gold that was used entirely by the jewelry market. After 2008, refined gold was often used as an investment product, such as in exchange trade funds and gold futures (Shekhar, 2010).

The Middle East's gold mines were modest contributors to the world's supply of precious metals. Plans to increase mine output of gold significantly in Iran, Saudi Arabia, and Turkey could result in the region's gold production reaching an annual volume of about 29 t by 2011 (table 9).

The value of gold trade at the Dubai Multi Commodities Center (DMCC) increased to \$29 billion in 2008, which was an increase of 53% compared with a value of \$19 billion in 2007. The volume of gold exports in 2008 increased to 371 t from 287 t in 2007, or by 29%. The volume of gold imports in 2008 increased to 674 t from 559 t in 2007, which was an increase of 21% (Dubai Multi Commodities Center, 2009).

Iron Ore and Iron and Steel.—*Iron Ore.*—Iron ore was produced from several mines in Iran and from the Divrigi Mine in Turkey. Several iron ore deposits in Saudi Arabia had been explored in the past and some of the deposits of the Wadi Sawawin formation in northwestern Saudi Arabia were reevaluated in 2007. Significant increases in production capacity were planned for Iranian iron ore mines, including expansions of the mines of Chadormalu Mining and Industrial Co., Gol-e-Gohar Iron Ore Co., and Sangan Iron Ore Co.; ongoing development of the Jalal Abad Mine; and the opening of Iran Central Iron Ore Co.'s new facilities at Bafgh, at the Bafgh North Anomaly, and at Chahgaz and Mishdovan. In Turkey, which produced about 4 Mt of iron ore in 2008, Hekimhan Madencilik İthalat İhracat San. ve Tic. A.Ş. (a subsidiary of Kolin İnşaat Turizm San. ve Tic. A.Ş.) moved forward with building a calcination plant to produce about 1 Mt/yr of calcined siderite sintering dust from 2 Mt/yr of ore by 2011 (table 10; Hekimhan Madencilik İthalat İhracat San. ve Tic. A.Ş., 2008).

Steel.—Steel demand in the region was driven mainly by the demand for rebar by the construction industry for residential and commercial housing projects. In the past few years, the highest demand has been from Iran, Saudi Arabia, Turkey, and the

UAE. In Iran, the Government's Fourth Five-Year Development Program included expanding the capacity of the steel plants at Bafgh in Yazd Province, Miyaneh in East Azarbaijan Province, Neiriz in Fars Province, Qaenat (Ghaenat) in South Khorasan Province, Sefid Dasht in Chahar Mahal va Bakhtiari Province, Shadegan in Khuzestan Province, and Sirjan in Kerman Province. Additional crude steel plants were planned to be built at Bandar Abbas and Hamadan, and production capacity expansions were scheduled to be completed at the steel plants of Isfahan Steel Co., Khuzestan Steel Co., and Mobarekeh Steel Co.

Other new crude steel facilities in the region that were expected to begin producing crude steel between 2009 and 2011 included the Shaded Iron & Steel LLC plant in Oman; the Al Atoun Steel Industries Co. plant at Yanbu, Saudi Arabia; the Rajhi Steel Industries plant at Jeddah, Saudi Arabia; the Hmisho International Steel S.A. plant at Adra, Syria; the Emirates Steel Industries plant at Musafah, the UAE; the Essar Group's plant at the Hamriya Free Zone, the UAE; and the United Steel Holding Co. (Foulath) plant at Al Hidd, Bahrain. Planned crude steel production-capacity-expansion projects included the rampup of the fourth electric arc furnace (EAF), which was installed in 2008 at the Qatar Steel Co. plant in Qatar, and the commissioning of a fifth EAF at Qatar Steel by 2009.

Crude steel production in the Middle East region exceeded 44 Mt in 2008. Turkey, which produced 26.8 Mt of steel in 2008, or more than 60% of the total Middle East steel production, was the tenth ranked world steel producer. Iran, which was the second ranked steel producer in the Middle East region, accounted for 23% of total production in the region followed by Saudi Arabia, which accounted for 11%. Turkey was the region's leading steel exporter and was responsible for 67% of the UAE's steel imports and 8% of the world's steel imports (table 11).

Lead and Zinc.—Iran, Saudi Arabia, and Turkey were the only countries in the Middle East that produced lead and zinc in 2008. Projects of the Government of Iran's Fourth Five-Year Development Program accounted for most of the planned expansion of lead and zinc ore and zinc metal production capacities in the region. Included in the 5-year plan were the expansion of production from the Anguran lead and zinc mine and the anticipated construction of a 100,000-t/yr-capacity zinc plant in the Zanzan district (tables 13, 14; Iranian Mines and Mining Industries Development and Renovation Organization, 2005, p. 195).

Zinc production at the Al Amar Mine of Ma'aden began in January 2008 at an expected capacity of 200,000 t/yr of ore. Commencement of the Al-Massane Mine of the Al-Massane Al-Kobra Mining Co. of Saudi Arabia and the United States was scheduled in 2009. The mine was expected to produce 58,000 t/yr of zinc concentrate.

Jabal Salab Company Ltd., which was registered in the Cayman Islands, and owned jointly by ZincOx Resources p.l.c. of the United Kingdom (52% interest) and Ansan Wikfs Investments Ltd. of Yemen (48%), continued with construction of the Jabali lead, silver, and zinc mine, which was the first large-scale metal mine in Yemen. Production was expected to begin in the first quarter of 2010. The operation would mine 800,000 t/yr of zinc ore to produce 70,000 t/yr of zinc oxide.

The open pit was expected to be operational for more than 12 years. The deposit was estimated to contain 12.6 Mt of oxide ore grading 1.2% lead, 68 grams per metric ton (g/t) silver, and 8.9% zinc, and minable reserves were estimated to be 8.7 Mt grading 9.2% zinc with a zinc cutoff grade of 4.4% (Yemen Geological Survey and Mineral Resources Board, 2009; ZincOx Resources plc, 2009, p. 10).

Nickel.—No nickel was produced in the Middle East region in 2008. The dramatic decline in nickel prices during the last three quarters of 2008 resulted in the significant slump in nickel exploration activity in Turkey, which was the only country in the region that had notable nickel reserves. European Nickel plc of the United Kingdom was awaiting the issuance of a forestry permit before proceeding with engineering work for the Çaldag Mine, which is located in western Turkey and which was expected to produce 24,500 t/yr of nickel. Aldridge Minerals suspended work on its Murat Dag nickel laterite project and the joint venture of Lydian International Ltd. and Newmont Overseas Exploration Ltd. decided to seek a partner to develop its Muratdag gold-nickel prospect (table 12; Aldridge Minerals Inc., 2009, p. 3; European Nickel plc, 2009; London Metal Exchange Ltd., undated).

Mineral Fuels and Related Materials

Coal.—Iran and Turkey were the only countries in the Middle East region that produced coal. Iran planned to double its output capacity of coal to more than 4 Mt/yr by yearend 2011. Production of coke from coal was begun at the Zarand Iranian Steel Co.'s 400,000-t/yr-capacity plant, which was located at Zarand, Kerman Province, and reached 60% of capacity by yearend 2008. In Turkey, coal production was used primarily for electrical power generation. Although the Turkish Government encouraged the use of natural gas for new power generation projects and retained control of hydroelectric generating facilities, many of Turkey's lignite and subbituminous coal operations had been divested to the private sector in the past decade. Coal production was expected to vary, depending on the demand for electric power not met by imported natural gas (table 15).

The Government of Oman was evaluating a project to build a coal-fired powerplant at Duqm in the Wusta region to reduce its dependence on natural gas. The independent powerplant would have 1,000 megawatts (MW) of capacity and was expected to commence production in 2012. The plant would use coal imported from the international market and from local coal deposits.

In July, the Government of the Emirate of Ajman in the UAE signed an agreement with MMC Corp. Bhd of Malaysia to establish the first coal-fired powerplant in the Gulf region. The \$2 billion plant was expected to have the capacity to generate 1 gigawatthour of electricity and to commence production in 2012. In December, Ras Al-Khaimah Investment Authority was preparing to invite bids for a coal-fired powerplant to be built at Mina Saqr, which is located 110 kilometers (km) northeast of Dubai, UAE. The initial capacity of the plant would be 500 to 600 MW; this amount could increase to 4,000 MW in the final phase of the project (Carlisle, 2008; Maree, 2008).

Natural Gas.—The Middle East region's natural gas reserves were estimated to be about 76 trillion cubic meters, or 41% of the world's total reserves. Iran and Qatar were the second and third ranked countries in the world in terms of the size of their natural gas reserves, which were estimated to be 29.61 trillion cubic meters (16% of the world's natural gas reserves) and 25.46 trillion cubic meters (13.8% of the world's natural gas reserves), respectively. Production of natural gas in the region was 381.4 billion cubic meters in 2008, which was an increase of 6.3% compared with that of 2007. Iran was the region's leading producer of natural gas followed by Saudi Arabia, then Qatar. Although natural gas was produced by all the countries of the Middle East in 2008, only four countries were net natural gas exporters. The region's natural gas exports totaled 79.5 billion cubic meters in 2008; 71.4% of the gas was exported by Qatar, which was the world's leading exporter of natural gas; 13.7%, by Oman; 9.6%, by the UAE; and 5.3%, by Iran (BP p.l.c., 2009, p. 22, 24; Organization of Arab Petroleum Exporting Countries, 2009, p. 59).

Qatar's gas-to-liquids (GTL) projects, which aim to make natural gas a portable global commodity, continued to receive the Government's support. In November 2008, Oryx GTL, which was a joint venture between Qatar Petroleum and Sasol Ltd. of South Africa, was established to convert natural gas to diesel, naphtha, and liquefied petroleum gas. Oryx GTL announced that it would achieve the 34,000-barrel-per-day (bbl/d) production target within 1 year (Petroleum Economist, 2008).

In Yemen, the construction of a two-train 6.7-Mt/yr capacity natural gas liquefaction plant and related dock facilities at the Balhaf terminal on the Gulf of Aden for Yemen LNG Co. continued in 2008. The \$4.5 billion that was invested mainly by Total (39.62%), Hunt Oil Co. of the United States (17.22%), and Yemen Gas Co. (16.73%) in the Yemen Liquefied Natural Gas (LNG) project was considered the single largest investment ever made in the country. The first shipment of LNG was expected by yearend 2009 using four LNG carriers that were being built in Japan with a total capacity of 644,000 cubic meters (Yemen LNG Co., 2009, p. 3, 8, 29).

Petroleum.—The Middle East region's proved crude oil reserves were estimated to be more than 754 billion barrels, or about 60% of the world's total crude oil reserves. The region's crude oil production increased by 4% in 2008 compared with that of 2007. Saudi Arabia was the leading petroleum producing country in the world and the region; the other leading regional producers were, in order of volume produced, Iran, the UAE, and Kuwait. Crude oil production increased by 13% each in Iraq and Qatar in 2008 compared with that of 2007 and Yemen's crude oil production decreased by 11.6%. The Middle East region's crude oil exports averaged 18.1 million barrels per day in 2008, 70% of which came from the GCC countries (BP p.l.c., 2009, p. 8; International Monetary Fund, 2009, p. 39).

DNO International ASA of Norway made four new oil discoveries in 2008 and completed the first phase of the Tawke production-sharing contract (PSC) with the KRG in northern Iraq. A consortium led by Korea National Oil Corp. (KNOC) (Government of the Republic of Korea, 100%) signed a \$2.1 billion PSC with the KRG in November 2007

for the development of the Hawler, the Qush Tapa, the Sangaw South fields, and the Bazian Block in the Kurdistan region of Iraq. Following the withdrawal of some consortium partners, KNOC decided to continue solo in the project and signed a contract with KRG that gave KNOC access to eight oilfields in northern Iraq. In August 2008, North Oil Co., which was one of the Government-owned oil companies, signed a \$3 billion agreement with China National Petroleum Corp. (CNPC) for the development of the Al-Ahdab oilfield, which was expected to increase production to 115,000 bbl/d from 90,000 bbl/d after 7 years of the 20-year contract (Petroleum Economist, 2008, p. 36).

In May, Jordan's Natural Resources Authority signed a concession agreement with Jordan Oil Shale Co. B.V. (a subsidiary of Royal Dutch Shell plc of the Netherlands) to explore for oil resources in oil shales in Jordan, which had been estimated to be more than 40,000 Mt (Oil & Gas Journal, 2008).

In December, CNPC and International Petroleum Investment Co. (IPIC) signed an engineering, procurement, and construction contract for the Abu Dhabi Crude Oil Pipeline (ADCOP). ADCOP was to be a 400-km pipeline that would carry oil from the Habshan oilfield to the Port of Fujairah on the Gulf of Oman. The \$3.29 billion project would be jointly executed by China Petroleum Engineering & Construction Corp. and China Petroleum Pipeline Bureau. It was the largest overseas turnkey engineering construction project for which CNPC had ever contracted. The project was expected to be completed by August 2011. ADCOP would enable the UAE to export up to 60% of its oil production from Gulf of Oman, thus bypassing the checkpoints at the Strait of Hormuz and the potential navigation risk in the Gulf of Oman waters (Pipeline & Gas Journal, 2009; U.S. Energy Information Administration, 2009).

Uranium.—In Turkey, Aldridge Minerals Inc. of Canada acquired mineral licenses for properties that had the potential for uranium mineralization. At yearend 2008, ownership of the uranium properties was transferred to Aldridge Uranium Inc., which was a newly formed company owned by Aldridge Minerals shareholders. No information was available on uranium production in Iran in 2008 (table 16).

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TABLE 1
MIDDLE EAST: 2008 TOTAL AREA AND POPULATION

Country	Total area ¹ (square kilometers)	Estimated population ² (millions)
Bahrain	665	0.8
Iran	1,648,000	72.0
Iraq	437,072	28.9 ³
Israel	20,770	7.3
Jordan	92,300	5.9
Kuwait	17,820	2.7
Lebanon	10,400	4.1
Oman	212,460	2.8
Qatar	11,437	1.3
Saudi Arabia	2,149,690	24.6
Syria	185,180	21.2
Turkey	780,580	73.9
United Arab Emirates	83,600	4.5
Yemen	527,970	23.1
Total	6,177,944	273.1
World	148,940,000 ⁴	6,692.0

¹Source: U.S. Central Intelligence Agency, The World Factbook 2009.

²Source: The World Bank, 2008 World Development Indicators Database.

³Source: U.S. Central Intelligence Agency, The World Factbook 2009.

⁴Land area.

TABLE 2
MIDDLE EAST: GROSS DOMESTIC PRODUCT^{1,2}

Country	Gross domestic product based on purchasing power parity		Real gross domestic product growth rate (percentage)		
	Gross value (million dollars)	Per capita (dollars)	2006	2007	2008
Bahrain	27,014	34,662	6.7	8.1	6.1
Iran	805,365	11,052	5.8	7.8	2.5
Iraq	105,737	3,477	6.2	1.5	9.5
Israel	202,562	28,474	5.3	5.2	4.0
Jordan	32,416	5,537	8.0	8.9	7.9
Kuwait	137,415	39,915	5.1	2.5	6.3
Lebanon	49,525	13,006	0.6	7.5	8.5
Oman	68,331	24,674	6.0	7.7	7.8
Qatar	94,404	86,008	15.0	15.3	16.4
Saudi Arabia	592,886	23,814	3.2	3.3	4.4
Syria	94,563	4,757	5.1	4.2	5.2
Turkey	915,212	13,139	6.9	4.7	0.9
United Arab Emirates	185,287	38,894	9.4	6.3	7.4
Yemen	55,393	2,411	3.2	3.3	3.6
Total	3,366,110	XX	XX	XX	XX
World total	69,489,850	XX	5.1	5.2	3.0

XX Not applicable.

¹Source: International Monetary Fund, World Economic Outlook Database, October 2009.

²Gross domestic product listed may differ from that reported in individual country chapters owing to differences in source or date of reporting.

TABLE 3
SELECTED MIDDLE EAST EXPLORATION ACTIVITY IN 2008

Country	Type ¹	Prospect	Commodity ²	Companies	Resource notes ^{2,3}	Exploration notes
Iran	P	Sarcheshmeh	Cu, Mo, Au, Ag	National Iranian Copper Industries	8.4 Mt Cu, 360,000 t Mo, 10.4 Moz Au, 150 Moz Ag	Ongoing exploration associated with mine expansion.
Turkey	E	Agi Dagı	Au, Ag	Fronteer Development Group Inc.	800,000 oz Au, 6.7 Moz Ag	Completed \$10 million exploration drilling program.
Do.	E	Alımtıpe	Au	Stratex International plc.	320,000 oz Au	Ongoing resource definition drilling program.
Do.	D	Caldag	Ni, Co	European Nickel plc.	375,000 t Ni, 23,000 t Co	Ongoing permitting.
Do.	P	Cayeli	Cu, Zn, Au, Ag	Inmet Mining Corp.	334,000 t Cu, 509,000 t Zn, 190,000 oz Au, 14 Moz Ag	Ongoing mine infrastructure improvement program.
Do.	D	Cöpler	Au, Ag, Cu	Anatolia Minerals Development Ltd.	3.7 Moz Au, 11 Moz Ag, 95,000 t Cu	Ongoing drilling. Commenced construction.
Do.	E	Corak	Au, Cu	Mediterranean Resources Ltd.	540,000 oz Au, 650,000 oz Ag, 29,000 t Pb, 48,000 t Zn	Ongoing drilling.
Do.	F	Efemçukuru	Au	Eldorado Gold Corp.	1.5 Moz Au	Completed program of mapping, sampling, and drilling.
Do.	E	Hallıga	Au, Cu	Teck Cominco Ltd.	Data not released	Completed drilling program.
Do.	E	Karakartal	Cu, Au	Anatolia Minerals Development Ltd.	do.	do.
Do.	E	Kızıltepe	Au, Ag	Ariana Resources plc.	100,000 oz Au, 1.8 Moz Ag	Ongoing drilling.
Do.	E	Tac	Au, Cu	Mediterranean Resources Ltd.	1 Moz Au, 27,000 t Cu	do.
Do.	E	Tavsan	Au, Ag	Ariana Resources plc.	87,000 oz Au, 230,000 oz Ag	Ongoing exploration. Scoping study planned.
Do.	E	Yenipazar	Zn	Aldridge Minerals Inc.	880,000 oz Au, 26 Moz Ag, 80,000 t Cu, 280,000 t Pb, 370,000 t Zn	Completed bulk sampling and drilling programs.
Yemen	F	Jabali	Zn	ZincOx Resources plc.	800,000 t Zn	Ongoing exploration. Development planned.

Do., do. Ditto.

¹D—Development approved or ongoing; E—Active exploration; F—Feasibility work ongoing/completed; P—Exploration at producing site.

²Abbreviations used for commodities in this table are as follows: Ag, silver; Au, gold; Co, Cobalt; Cu, copper; Mo, molybdenum; Ni, nickel; Pb, lead; Zn, zinc. Abbreviations used for units of measure in this table are as follows: Moz, million troy ounces; Mt, million metric tons; oz, troy ounces; t, metric tons.

³Resources reported where available based on data from various public sources at the measured + indicated level unless otherwise specified. Data were not verified by the U.S. Geological Survey.

TABLE 4
MIDDLE EAST: PRODUCTION OF SELECTED MINERAL COMMODITIES IN 2008¹
(Thousand metric tons unless otherwise specified)

Country	Metals				Industrial minerals					Petroleum		
	Aluminum, metal, primary	Chromite, mine output, gross weight	Steel, crude	Ammonia, N content	Cement, hydraulic	Gypsum	Phosphate rock, gross weight	Potash, K ₂ O equivalent	Crude, including condensate	Refinery products	Mineral fuels and related materials	
											(thousand 42-gallon barrels)	(thousand 42-gallon barrels)
Bahrain	872	--	--	474	370	--	--	--	66,864	96,368	--	--
Iran ^e	248	180	9,960	2,000	44,400	12,000	325	--	1,490,000	600,000	--	--
Iraq	--	--	--	10 ^e	6,455	2	--	--	884,395	163,155	--	--
Israel ^f	--	--	480	--	5,000	83	3,088 ²	2,300	8	90,800	--	--
Jordan	--	--	150 ^e	--	4,284	232	6,266	1,223	16	28,600 ^e	--	--
Kuwait ^e	--	--	500	485	2,200	--	--	--	990,000	329,000	--	--
Lebanon ^e	--	--	--	--	4,200	30	--	--	--	--	--	--
Oman	49	784	84 ^e	1,000 ^e	4,000	180	--	--	276,971	37,187	--	--
Qatar	--	--	1,434	1,797	3,500 ^e	135	--	--	305,500	96,433	--	--
Saudi Arabia	--	--	4,670	2,600 ^e	31,823	2,300	--	--	3,359,000	721,370	--	--
Syria	--	--	63	120 ^e	5,336	573	3,221	--	139,081	90,621	--	--
Turkey	65	1,886	26,809	--	51,432	3,000 ^e	--	--	14,700 ^e	172,000 ^e	--	--
United Arab Emirates	920	34	100 ^e	380 ^e	13,200	160 ^e	--	--	951,660	148,000 ^e	--	--
Yemen	--	--	--	--	2,111	50	--	--	107,400	37,248	--	--
Total	2,150	2,880	44,300	8,870	178,000	18,700	12,900	3,520	8,590,000	2,610,000	--	--
Share of world total	5%	10%	3%	7%	6%	13%	8%	10%	31%	9%	--	--
United States	2,660	--	91,900	7,850 ³	87,600	17,900	30,200	1,100	1,940,000	6,620,000	--	--
World total	39,600	28,000	1,330,000	128,000	2,840,000	142,000	165,000	34,900	27,700,000	30,200,000	--	--

^eEstimated; estimated data, U.S. data, and world totals are rounded to no more than three significant digits. -- Zero.

¹Totals may not add due to independent rounding. Percentages are calculated on unrounded data. Table includes data available as of June 21, 2010.

²Reported figure.

³Synthetic anhydrous ammonia; excludes coke oven byproduct ammonia.

TABLE 5
MIDDLE EAST: HISTORIC AND PROJECTED BAUXITE MINE PRODUCTION, 1995-2015¹

(Metric tons)

Country	1995	2000	2005	2008	2011 ^e	2013 ^e	2015 ^e
Iran	148,000	485,130	437,595	520,000	710,000	710,000	710,000
Saudi Arabia	--	--	--	--	--	--	3,500,000
Turkey	232,278	458,537	475,349	350,000	800,000	800,000	800,000
Total	380,000	944,000	913,000	870,000	1,500,000	1,500,000	5,000,000

^eEstimated. -- Negligible or no production.

¹Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 6
MIDDLE EAST: HISTORIC AND PROJECTED PRIMARY AND SECONDARY ALUMINUM PRODUCTION, 1995-2015¹

(Metric tons)

Country	1995	2000	2005	2008	2011 ^e	2013 ^e	2015 ^e
Bahrain ²	450,709	509,308	750,710	876,580	870,000	870,000	870,000
Iran	119,400	140,000	220,000	248,000	470,000	745,000	745,000
Oman	--	--	--	49,000	360,000	360,000	360,000
Qatar	--	--	--	--	585,000	585,000	585,000
Saudi Arabia	--	--	--	--	--	200,000	740,000
Turkey	61,514	61,000	60,000	65,000	65,000	65,000	65,000
United Arab Emirates	247,400	470,000	722,000	920,000	1,700,000	2,400,000	2,400,000
Total	879,000	1,180,000	173,000	2,160,000	4,100,000	5,200,000	5,800,000

^eEstimated. -- Negligible or no production.

¹Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

²May include some secondary aluminum produced from used beverage cans.

TABLE 7
MIDDLE EAST: HISTORIC AND PROJECTED COPPER MINE PRODUCTION, 1995-2015^{1,2}

(Metal content of concentrate in thousand metric tons)

Country	1995	2000	2005	2008	2011 ^e	2013 ^e	2015 ^e
Iran	102	125	190	240	350	350	350
Oman	--	--	--	1	1	1	1
Saudi Arabia	1	1	1	1	10	16	10
Turkey	24	70	54	83	80	80	80
Total	127	196	245	325	440	450	440

^eEstimated. -- Negligible or no production.

¹Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

²Copper content of mined ore (gross weight).

TABLE 8
MIDDLE EAST: HISTORIC AND PROJECTED REFINED COPPER METAL PRODUCTION, 1995-2015^{1,2}

(Metric tons)

Country	1995	2000	2005	2008	2011 ^e	2013 ^e	2015 ^e
Iran	90,400	155,856	178,000	200,000	300,000	440,000	440,000
Oman	33,900	24,281	24,543	12,000	22,000	22,000	22,000
Turkey	100,300	64,100	95,000	90,000	100,000	100,000	100,000
Total	225,000	244,000	298,000	302,000	420,000	560,000	560,000

^eEstimated.

¹Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

²May include secondary production.

TABLE 9
MIDDLE EAST: HISTORIC AND PROJECTED GOLD MINE PRODUCTION, 1995-2015¹

(Metal content of ore in kilograms)

Country	1995	2000	2005	2008	2011 ^c	2013 ^c	2015 ^c
Iran	630	216	1,000	400	500	500	500
Oman	591	551	384	43	--	--	--
Saudi Arabia	8,080	3,800	7,456	4,527	8,000	8,000	8,000
Turkey	1,200	500	4,170	11,120	17,000	15,000	15,000
Total	10,500	5,100	13,000	16,100	26,000	24,000	24,000

^cEstimated. -- Negligible or no production.

¹Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 10
MIDDLE EAST: HISTORIC AND PROJECTED BENEFICIATED IRON ORE PRODUCTION, 1995-2015¹

(Metal content of ore in thousand metric tons)

Country	1995	2000	2005	2008	2011 ^c	2013 ^c	2015 ^c
Iran	4,500	5,800	9,162	12,000	30,000	30,000	30,000
Turkey	2,750	2,200	2,450	2,100	2,700	2,700	2,700
Total	7,000	8,000	12,000	14,000	33,000	33,000	33,000

^cEstimated.

¹Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 11
MIDDLE EAST: HISTORIC AND PROJECTED CRUDE STEEL PRODUCTION, 1995-2015¹

(Thousand metric tons)

Country	1995	2000	2005	2008	2011 ^c	2013 ^c	2015 ^c
Iran	4,696	6,600	9,400	9,960	15,000	29,000	29,000
Iraq	300	50	--	--	--	1,500	2,000
Israel	200	280	480	480	480	480	480
Jordan	30	30	150	150	390	390	390
Kuwait	--	--	450	500	500	500	500
Oman	--	--	84	84	1,200	1,200	1,200
Qatar	614	744	1,057	1,434	1,500	1,500	1,500
Saudi Arabia	2,451	2,973	4,185	4,670	6,500	6,500	6,500
Syria	70	70	70	70	590	590	590
Turkey	12,744	14,325	20,960	26,809	27,000	27,000	27,000
United Arab Emirates	--	90	90	90	1,700	3,400	6,500
Total	21,000	25,000	36,000	44,000	59,000	72,000	76,000

^cEstimated. -- Negligible or no production.

¹Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 12
MIDDLE EAST: HISTORIC AND PROJECTED NICKEL MINE PRODUCTION, 1995-2015

(Metal content of ore in metric tons)

Country	1995	2000	2005	2008	2011 ^c	2013 ^c	2015 ^c
Turkey	--	--	1,000	--	--	20,000	20,000

^cEstimated; estimated data are rounded to no more than three significant digits. -- Negligible or no production.

TABLE 13
MIDDLE EAST: HISTORIC AND PROJECTED ZINC MINE PRODUCTION, 1995-2015¹

(Metal content of ore in metric tons)

Country ²	1995	2000	2005	2008	2011 ^c	2013 ^c	2015 ^c
Iran	145,100	90,000	167,000	150,000	180,000	180,000	180,000
Saudi Arabia	500	3,000	--	3,663	3,000	3,000	3,000
Turkey	9,118	39,000	36,000	80,000	50,000	50,000	50,000
Total	155,000	132,000	203,000	233,000	230,000	230,000	23,000

^cEstimated. -- Negligible or no production.

¹Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

²In Yemen, the Jabail zinc deposit was to be developed as a zinc oxide project. Output of 70,000 metric tons per year of zinc oxide was expected to start in 2010. The ore would be treated hydrometallurgically and not concentrated.

TABLE 14
MIDDLE EAST: HISTORIC AND PROJECTED ZINC METAL PRODUCTION, 1995-2015¹

(Metric tons)

Country	1995	2000	2005	2008	2011 ^c	2013 ^c	2015 ^c
Iran	--	51,475	120,000	100,000	230,000	230,000	230,000
Turkey	17,050	--	--	--	--	--	--
Total	17,100	51,500	120,000	100,000	230,000	230,000	230,000

^cEstimated. -- Negligible or no production.

¹Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 15
MIDDLE EAST: HISTORIC AND PROJECTED SALABLE COAL PRODUCTION, 1995-2015^{1,2}

(Thousand metric tons)

Country	1995	2000	2005	2008	2011 ^c	2013 ^c	2015 ^c
Iran	1,640	2,002	1,898	2,000	4,500	4,500	4,500
Turkey	59,408	64,645	58,676	89,296	90,000	80,000	80,000
Total	61,000	67,000	61,000	91,000	94,000	84,000	84,000

^cEstimated.

¹Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

²Includes anthracite, bituminous, and lignite.

TABLE 16
MIDDLE EAST: HISTORIC AND PROJECTED URANIUM PRODUCTION, 1995-2015

(Metal content in metric tons)

Country	1995	2000	2005	2008	2011 ^c	2013 ^c	2015 ^c
Iran ¹	--	--	NA	NA	50	50	50

^cEstimated; are rounded to no more than three significant digits. NA Not available. -- Negligible or no production.

¹Uranium may have been produced in 2005 and 2008, but information is inadequate to estimate output.