



2006 Minerals Yearbook

TURKEY

THE MINERAL INDUSTRY OF TURKEY

By Philip M. Mobbs

Turkey had a diverse mineral industry and was a leading producer of barite, bentonite, boron minerals, chromite, feldspar, kaolin, limestone, magnesite, marble, perlite, and pumice. Turkey also was a significant source of value-added processed mineral commodities, such as cement, ceramics, glass, and steel.

Minerals in the National Economy

Mining and quarrying accounted for about 1.08% of the gross domestic product (GDP) (calculated at 1987 producers' prices) in 2006, slightly down from 1.10% in 2005 and 1.5% in 1996. In 2006, the mining sector posted a 4.8% growth rate compared with 2005. The construction sector accounted for 4.7% of GDP in 2006 compared with 4.2% in 2005 and 5.9% in 1996; the energy sector accounted for 3.4% of GDP in 2006 compared with 3.3% in 2005 and 3.1% in 1996. Compared with 2005, the construction sector posted a 19.4% growth rate in 2006, and the energy sector, 8.7%. Of the civilian labor force of about 24.8 million, 4.4 million were employed in the industrial sector, which included the mineral processing, mining, and petroleum sectors, and about 1.3 million in the construction sector (T.C. Başbakanlık Devlet Planlama Teşkilatı Müsteşarlığı, 2007a, tables II-4, IX-1).

Government Policies and Programs

Article 168 of the Constitution (1982) and the Mining Law of June 15, 1985 (Maden Kanunu, law No. 3213) declared that natural resources, such as minerals, belonged to the state and were not considered to be part of the land where they were found. Law No. 5177 of 2004 (the new mining law, which amended the 1985 mining law), the "Regulation Concerning the Implementation of the Mining Law" issued in 2005, and the "Mining Activities Permitting Regulation of 2005" also regulated mining activity in Turkey. The Government issued licenses to Turkish individuals or legal entities to explore for minerals or operate mines for a specific period of time. The Foreign Direct Investment Law of June 2003 (law No. 4875) authorized foreign investors to establish companies in Turkey that could hold mining rights under the Mining Law.

Maden İşleri Genel Müdürlüğü (the General Directorate of Mining Affairs) of the T.C. Enerji ve Tabii Kaynaklar Bakanlığı (Ministry of Energy and Natural Resources) regulated the mining industry. T.C. Çevre ve Orman Bakanlığı (the Ministry of Environment and Forestry) enforced the Environmental Law of 1983 (law No. 2872) and the "Regulation on Environmental Impact Assessment" of December 16, 2003.

State-owned Eti Maden İşletmeleri Genel Müdürlüğü retained exclusive rights to explore and to develop boron deposits under law No. 2840 of 1983. Boron operations had been nationalized by law No. 2712 of 1978.

In general, mineral exports were not prohibited under either Export Regime Decree No. 95/7623 of 1995 or Amended

Communique No. 96/31 of 2000 (Concerning Goods the Export of which is Banned or Subject to Pre-authorization); the export of dual-use and sensitive goods, however, was administered by T.C. Başbakanlık Dış Ticaret Müsteşarlığı (the Undersecretariat of Foreign Trade) under Communique No. 2003/12 of December 2, 2003. Dual-use and sensitive goods included machinery, material, and software that were usable for either civilian or military purposes, such as high-tensile-strength metal alloys.

Petroleum exploration and production were administered by the Ministry of Energy and Natural Resources under the Petroleum Law of 1954 (law No. 6326). The distribution, export, import, refining, and sale of petroleum were licensed under and regulated by the Petroleum Market Law of 2003 (law No. 5015). The distribution, export, import, and transmission of natural gas was regulated by the Natural Gas Market of 2001 (law No. 4646). The marketing of domestic and imported liquefied petroleum gases was regulated by the Liquefied Petroleum Gases (LPG) Market Law of 2005 (law No. 5307).

Production

Significant increases in production were noted for alumina, bauxite, and ferrochromium. Significant increases in production were estimated for antimony, borates, feldspar, glass, manganese ore, and zinc ore and concentrate. A significant decrease in production was posted for chromium. Significant decreases in production were estimated for copper ore, lead ore and concentrate, magnesite, and nitrogen (ammonia). Data on mineral production are provided in table 1.

Structure of the Mineral Industry

The private sector dominated the country's industrial minerals and metals sectors. In 2006, the Government's privatization of state-owned companies continued. Establishments divested by the Government's T.C. Başbakanlık Özelleştirme İdaresi Başkanlığı (Privatization Administration) included the petroleum refineries of Türkiye Petrol Rafineleri A.Ş. (Tupraş); the assets of Tütün, Tütün Mamulleri, Tuz ve Alkol İşletmeleri A.Ş.' (Tekel) Kaldırım, Kayacık, and Yavşan salt mines; and the iron and steel operations of Ereğli Demir ve Çelik Fab. T.A.Ş (Erdemir).

Mineral Trade

In 2006, total Turkish exports of goods were valued at about \$85.5 billion compared with a revised \$73.5 billion in 2005. Of the total exports in 2006, iron and steel accounted for about \$6.3 billion; refined petroleum products, \$3.4 billion; metalliferous ores and metal scrap, about \$764 million; fertilizers and crude ores, \$729 million; glass and glassware, about \$679 million; boron chemicals, about \$367 million; and natural gas, about \$180 million.

Total imports were valued at about \$139.6 billion in 2006, of which, mineral fuels accounted for about \$28.9 billion, and iron and steel, \$11.5 billion (Eti Maden İşletmeleri Genel Müdürlüğü, 2007; T.C. Başbakanlık Devlet Planlama Teşkilatı Müsteşarlığı, 2007a, tables V-2, V-11, V-15, V-16).

Commodity Review

The increased prices of minerals worldwide and the 2004 amended Mining Law accounted for a significant increase in interest in mining and mineral processing activity in Turkey. In the first 8 months of 2006 (the latest period for which data were available), 9,171 exploration licenses were granted, compared with 9,832 in calendar year 2005 and 4,385 in 2004. In 2006, 455 new mining or quarrying companies were established in Turkey, and 45 mining or quarrying companies were closed (T.C. Başbakanlık Devlet Planlama Teşkilatı Müsteşarlığı, 2007b, p. 155).

Metals

Copper.—In August, onsite work was suspended at Inmet Mining Corp. of Canada's Cerattepe underground copper-zinc mine, which was located near Artvin. The local Erzurum Administrative Court ruled that the Government had incorrectly exempted the operating licenses for the Cerattepe project from environmental assessment regulations. The Ministry of Energy and Natural Resources appealed the Court's decision. Inmet had planned to truck ore from Cerattepe to the Cayeli Mine, which was located about 100 kilometers (km) east of the Cerattepe project (Inmet Mining Corp., 2007, p. 64-66).

Anatolia Minerals Development Ltd. and Rio Tinto plc of the United Kingdom completed another drill program on the Bursa copper prospect. Nuinsco Resources Ltd. of Canada evaluated the Berta and the Elmalaan copper prospects in northeastern Turkey and Stratex International plc of the United Kingdom initiated exploration on the Muratdere project.

Gold.—Turkey's diverse geologic settings have presented exploration companies with a variety of gold deposit types to evaluate, including carbonate-replacement deposits, Carlin-type deposits, epithermal systems, iron oxide copper-gold deposits, orogenic deposits (listwanite-hosted and mesothermal), placers, porphyry systems, and volcanic-associated massive sulfide (both Cyprus- and Kuroko-type) deposits (Yigit, 2006).

In 2006, Koza Altın İşletmeleri A.Ş. began trial mining at Havran-Kucukdere [where more than 50,000 metric tons (t) of ore was produced] and at Mastra (5,000 t of ore). Ore was shipped to the company's Ovacik processing plant, which was located near Bergama. In July, Eldorado Gold Corp. of Canada began commercial production at the 7,500-kilogram-per-year-capacity Kisladag gold mine, which was located about 180 km east of Izmir.

Companies exploring for gold in Turkey in 2006 included Aldridge Minerals Inc. of Canada, which drilled the Yenipazar copper-gold-lead-silver-zinc property; Anatolia Minerals Development, which completed a feasibility study on the Çopler gold project; and Ariana Resources plc of the United Kingdom, which explored the Cinarpinar gold, the Kiziltepe gold, and the Kosedere copper-zinc prospects.

The joint venture of Cloudbreak Resources Ltd. of Canada and Anatolia Minerals Development initiated exploration on the Sarp-Ikiztepe gold property. Eldorado drilled the Efemçukuru Project. Eurasian Minerals Inc. of Canada undertook preliminary exploration of the Akarca gold-silver and the Golcuk copper-silver prospects. Fronteer Development Group of Canada drilled the Agi Dagi gold, the Halilaga copper-gold, the Kirazli gold, and the Pirentepe gold prospects.

In 2006, Kefi Minerals Plc of Turkey was spun off from EMED Mining Public Ltd. of Cyprus (formerly Eastern Mediterranean Resources Public Ltd.). Kefi undertook preliminary exploration of the Artvin Project. Mediterranean Resources Ltd. of Canada worked on the Tac copper-gold and the Corak gold properties. Odyssey Resources Ltd. of Canada worked on the Tavsan gold prospect. Stratex International drilled, mapped, or sampled several projects in the Konya volcanic belt, which included the Doganbey, the Inlice, the Karaagac, and the Oglacki prospects.

Nickel.—In April, European Nickel PLC of the United Kingdom completed an updated definitive feasibility study of the Çaldağ nickel project. European Nickel started mining in September after the company agreed to ship 200,000 t of nickel ore to GMM SA Larco of Greece during a 12-month period. European Nickel had shipped ore to Larco during a trial mining exercise in 2003. In December, the planned construction of the mine's leach pads and the 20,400-metric-ton-per-year (t/yr)-capacity nickel and 1,200-t/yr-capacity cobalt hydroxide processing plant was delayed, pending the receipt of a forestry permit from the Ministry of Environment and Forestry (European Nickel PLC, 2006).

Zinc.—ZincOx Resources plc of the United Kingdom continued work on an environmental impact assessment for its Aliaga recycling project, which was located about 60 km north of Izmir. ZincOx planned to treat 200,000 t/yr of electric arc furnace dust (EAFD), which contained about 24% zinc, to produce 91,000 t/yr of zinc concentrate, 46,000 t/yr of pig iron, and 39,000 t/yr of slag (ZincOx Resources plc, 2007, p. 11).

Silvermet Inc. of Canada (which was formed in 2006 by the merger of Atikokan Resources Inc. and Silvermet Corp.) and Anatolia Minerals Development drilled the Tufanbeyli zinc prospect and initiated the evaluation of processing Tufanbeyli ore and EAFD together in a Waelz kiln. Silvermet proposed to build a 65,000-t/yr-capacity plant to produce zinc oxide (Silvermet Inc., 2007).

Outlook

Turkey has significant resources of bentonite, boron, lignite, marble, and perlite. Although there are numerous other mineral deposits in Turkey, most mineral occurrences tend to be of small- to medium-size relative to deposits in other parts of the world, which leads to more international investor interest in the development of high-value minerals, such as gold (Erşçen, 1989). Administrative and legal difficulties, such as those that resulted in the suspension of operations at the Ovacik gold mine, the delayed permission to construct the Çaldağ nickel mine's heap leach pads and processing plant, and the legal proceedings to cancel previously issued licenses for the Cerattepe copper

and zinc project, could raise questions about possible future problems with mineral development projects in Turkey.

As a major energy transit corridor, Turkey could connect energy producers in Asia with consumers in Europe. Natural gas from Iran and Russia is piped into Turkey. The south Caucasus gas pipeline is expected to begin deliveries of natural gas to Turkey from Azerbaijan beginning in 2007. Connection of the Turkish natural gas pipeline system with the European gas network could provide an alternative route to allow surplus Eurasian and Iranian natural gas to flow into Europe. In 2006, the Baku-Tbilisi-Ceyhan oil pipeline delivered crude oil from Azerbaijan to the export terminals of the Ceyhan oil docks. Crude oil from Iraq intermittently moved through Turkey to Ceyhan; throughput was limited by the frequent sabotage of the Iraqi section of the pipeline. Regular shipments of crude oil from Iraq are not expected to resume until the security situation in Iraq is resolved.

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TABLE 1
TURKEY: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity	2002	2003	2004	2005 ^e	2006 ^e
METALS					
Aluminum	62,501 ³	63,000	60,000	60,000	60,000
Antimony: ^e					
Ore, mine output:					
Gross weight	4,800	12,500	20,107 ³	28,000	35,000
Sb content	250	650	900	1,400	1,800
Concentrates:					
Gross weight	1,000	2,000	3,000	5,000	6,000
Sb content	150	400	700	1,200	1,500
Bauxite and alumina					
Bauxite ²	287,403	364,306	365,836	475,349 ³	771,227 ³
Alumina, gross weight	152,869	162,174	169,991	112,558 ³	140,089 ³
Chromium, gross weight (34% to 43% chromic oxide) ⁴	313,637	229,294	506,421	688,377 ^{r,3}	457,893 ³
Copper:					
Mine output, exclusive of pyrite: ⁵					
Gross weight	2,942,721	2,620,896	2,356,147	2,946,106	2,500,000
Cu content of ore	48,253	58,000 ^e	49,000 ^e	54,000 ^r	46,000
Metal:					
Smelter output, primary and secondary	32,550	30,400 ^e	34,700 ^r	27,600 ^r	30,000
Refined ^c	41,000	45,000	64,000 ^r	95,000	106,000
Gold ^{e,6} kilograms	5,000	6,500	4,500	5,000	4,500
Iron and steel:					
Iron ore:					
Gross weight thousand metric tons	3,433	3,429	4,120	4,598 ³	3,251 ³
Fe content ^e do.	1,830	1,830	2,200	2,450	1,730
Metal:					
Pig iron and ferroalloys:					
Ferrochromium	11,200	35,393	28,701	26,043 ³	67,975 ³
Ferosilicon	7,245	7,000 ^e	--	4,000	2,000
Pig iron	157,622	181,080	213,210	215,000	220,000
Steel, crude including castings thousand metric tons	16,046	18,298	20,478	20,960 ³	23,300
Lead:					
Mine output, Pb and Pb-Zn ores:					
Gross weight	375,592	379,250	407,637	450,000	400,000
Pb content	17,352	17,500	18,650	21,000	16,500
Concentrates: ^c					
Gross weight	25,000	25,000	26,000	29,000	23,000
Pb content	16,000	16,000	17,000	19,000	15,000
Metal, refined ^c	4,000	6,000	6,000	6,000	6,000
Manganese ore, gross weight ⁷	20,000	18,000	13,751	15,000	35,000
Nickel, mine output, Ni content ^c	NA	640	40	1,000	1,000
Silver, mine output, Ag content ⁸ kilograms	79,000	95,000	73,000 ^e	80,000	80,000
Zinc:					
Mine output, Zn and Cu-Zn ore:					
Gross weight thousand metric tons	895	930	765	1,000	1,500
Zn content do.	46	47	44	50	80
Concentrates: ^c					
Gross weight	49,000	49,000	49,000	53,000	90,000
Zn content	33,100	33,600	33,400	36,000	60,000
INDUSTRIAL MINERALS					
Aluminum sulfate, alunite	11,389	10,458	10,920	11,000	11,000
Barite, crude	106,843	119,648	134,504	157,179 ³	200,000
Boron minerals:					
Run of mine	2,214,064	2,207,092	2,878,930	3,478,784 ^{r,3}	3,955,574 ³
Concentrates	1,368,000	1,399,000	1,587,992 ^r	1,824,571 ^{r,3}	1,818,944 ³
Refined borates	436,000	518,000	714,538 ^r	923,253 ^{r,3}	1,021,139 ³
Cement, hydraulic thousand metric tons	32,576	35,077	38,796	42,787 ³	47,977 ³

See footnotes at end of table.

TABLE 1--Continued
TURKEY: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity	2002	2003	2004	2005 ^c	2006 ^c	
INDUSTRIAL MINERALS--Continued						
Clays:						
Bentonite	559,224	831,146	850,000 ^c	925,000	1,000,000	
Kaolin	372,344	370,455	536,008	580,000	650,000	
Other ^c	2,500,000	2,500,000	2,750,000	2,750,000	3,000,000	
Diatomite	10,000	10,000	10,000	10,000	11,000	
Emery	15,418	15,402	7,902	12,000	13,000	
Feldspar, run of mine	1,766,387	1,862,310	1,983,336	2,331,971 ^{r,3}	2,900,000	
Fluorspar	5,344	718	880	800	1,000	
Glass, crude	thousand metric tons	1,242	1,315	1,229	1,058 ³	2,518
Graphite, run of mine ^c	1,393 ³	942 ³	1,000	6,000	8,000	
Gypsum, other than that for cement	264,038	196,668	250,099	250,000	300,000	
Lime ^{e,9}	thousand metric tons	3,300	3,300	3,400	3,400	3,500
Magnesium, magnesite, run of mine	3,044,440	3,224,278	3,732,952	3,400,000	2,088,033 ³	
Nitrogen, N content of ammonia	300,500	289,300	329,400	330,000	100,000	
Perlite, run of mine	151,902	136,683	133,829	156,935 ^{r,3}	120,000	
Pumice	820,347	895,616	1,035,975	1,000,000	930,000	
Pyrites, cupreous, gross weight	952,094	1,103,872	765,432	800,000	900,000	
Sepiolite, meerschaum ^c	kilograms	300	200	150	170	130
Silica sand, gross weight	thousand metric tons	1,274	1,283	1,188	1,200	1,200
Sodium compounds:						
Salt, NaCl, all types	do.	2,197	2,243	2,158	2,253 ^{r,3}	2,800
Soda ash, trona ^c	do.	825	835	846	850	850
Sodium sulfate, concentrates		562,660	556,575	523,285	550,000	550,000
Stone:						
Dolomite	975,971	1,158,539	2,109,362	2,200,000	2,500,000	
Limestone, other than for cement	thousand metric tons	30,261	28,609	30,963	35,000	40,000
Marble	cubic meters	557,630	544,629	668,996	800,000	1,200,000
Quartzite		2,006,654	2,908,584	2,961,932	3,200,000	3,400,000
Strontium minerals, celestite: ^c						
Run of mine		116,278 ³	116,000 ³	100,000	100,000	20,000
Concentrates		70,000	70,000	60,000	60,000	12,000
Sulfur: ^c						
Byproduct:						
Petroleum		48,000 ³	42,000	49,000 ³	54,000 ³	55,000
Other		75,000	46,000	19,000	20,000	15,000
S content of pyrites		34,000	28,000	20,000	20,000	20,000
Total		157,000	116,000	88,000	94,000	70,000
Talc		98	60	60	100	100
MINERAL FUELS AND RELATED MATERIALS						
Asphalt, natural		118,235	217,759	738,915	1,761,500 ^{r,3}	2,220,400 ³
Carbon black		37,413	6,754	32,686	26,820 ³	51,788 ³
Coal:						
Hard coal, run of mine	thousand metric tons	3,313	3,090	2,843	3,050 ³	3,071 ³
Lignite, run of mine	do.	49,627	43,749	43,754	55,626 ³	61,006 ³
Coke and semicoke	do.	2,080	2,543	2,855	2,800	
Gas, natural, marketed	thousand cubic meters	268,000 ^c	275,947	344,196	600,000	750,000
Petroleum:						
Crude	thousand 42-gallon barrels	17,579	16,980	16,270	16,500	13,600
Refinery products:						
Liquefied petroleum gas	do.	8,580	7,960	8,340	8,900	9,300
Gasoline	do.	31,634	28,800	27,350	30,300	30,800
Naphtha	do.	11,947	10,700	12,700	11,500	11,500
Jet fuel	do.	9,368	13,300	14,000	15,800	16,900
Kerosene	do.	312	540	340	124	200
Distillate fuel oil ¹⁰	do.	59,281	53,800	53,660	56,400	56,800
Lubricants	do.	2,090	1,960	2,050	2,400	2,300
Residual fuel oil	do.	53,077	38,600	40,270	42,100	36,600
Asphalt	do.	7,548	8,550	8,430	10,700	13,400
Unspecified ¹¹	do.	6,125	2,640	3,610	1,050	5,300
Total	do.	189,962	166,850	170,750	179,000	183,000

See footnotes at end of table.

TABLE 1--Continued
TURKEY: PRODUCTION OF MINERAL COMMODITIES¹

²Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [†]Revised. NA Not available.

¹Table includes data available through November 16, 2007. In addition to the commodities listed, large quantities of construction materials (clay, and sand and gravel) are quarried. Also mined are basalt, diabase, granite, onyx, sandstone, serpentine, slate, and travertine for building stone; limestone and gypsum for cement manufacture; and garnet, iron oxide pigment, molybdenum, olivine, titanium, tungsten, and zeolite, but available information is inadequate to make estimates of output. Asbestos also may have been produced in 2006.

²Data are for public sector production only. Data for private sector production are not available, but production is believed to be approximately 30,000 metric tons per year.

³Reported figure.

⁴Approximately 70% of gross production is salable product.

⁵Copper mines produce a copper concentrate (of about 22% Cu) and a cupreous pyrite concentrate (of about 0.7% Cu). Copper is not recovered from the cupreous pyrite concentrate.

⁶Data includes estimated content of Turkish copper refinery tankhouse slimes.

⁷Does not include manganiferous iron ore from the Deveci Mine, production of which amounts to several hundred thousand metric tons per year and has a manganese content of between 3% and 5%.

⁸Includes estimated content of base-metals-refinery tankhouse slimes.

⁹Estimated sales only.

¹⁰Diesel fuel (gasoil) and special heating oil.

¹¹Includes refinery fuel and losses.