

33 TURKEY



33.1 Summary of Coal Industry

Turkey is the 11th largest producer of coal worldwide and has coal reserves of 11,353 million metric tonnes (Mmt). It has an estimated coal mine methane/coalbed methane (CMM/CBM) resource base of 3 trillion cubic meters in the Zonguldak hard coal region. It is estimated that Turkey could generate over US \$37 billion by capturing and utilizing CMM. Turkish Hard Coal Enterprises (TTK) and Turkish Coal Enterprises (TKI), the two state-owned mining businesses, have already shown an interest in CMM capture and utilization projects. Policymakers have already started formulating laws for CMM capture projects; further policy and economic incentives are needed to make CMM/CBM projects economically viable.

33.1.1 ROLE OF COAL IN TURKEY

- Coal accounts for 28 percent of Turkey’s total primary energy consumption (see Table 33-1 for Turkey’s 2017 coal reserves and production).
- Coal production increased 40.5 percent between 2007 and 2017.
- Natural gas consumption increased 51.1 percent between 2007 and 2017.
- Turkey’s electricity generation in 2017 was nearly evenly split among coal (33 percent), natural gas (36.6 percent), and renewables (29.7 percent) (BP, 2018).

Table 33-1. Turkey’s Coal Reserves and Production

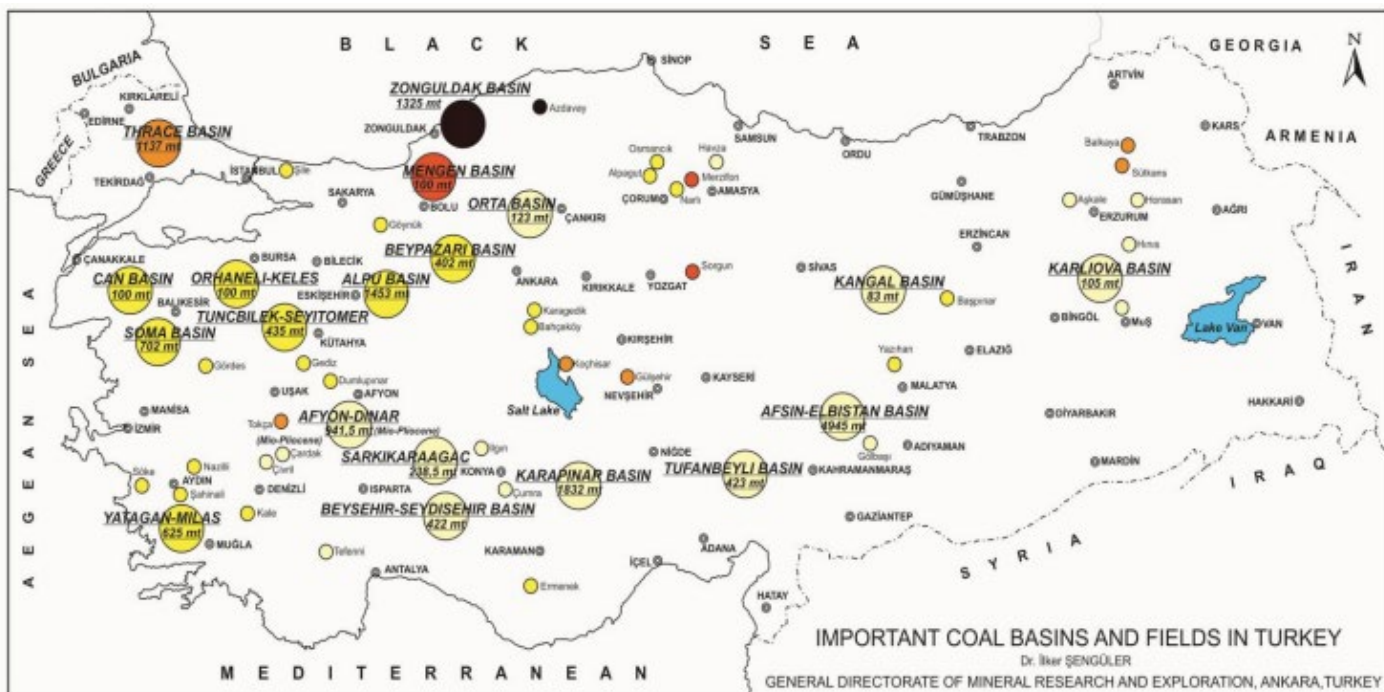
Indicator	Anthracite & Bituminous (Mmt)	Sub-bituminous & Lignite (Mmt)	Total (Mmt)	Global Rank (# and %)
Estimated Proved Coal Reserves (2017)	378	10,975	11,353	11 (1.10%)
Annual Coal Production (2017)	0.57	76.03	76.60	11 (1.29%)

Sources: BP (2018), EIA (2019).

- Turkey also imports mostly hard coal for thermal power plants, steel production, and domestic heating.
 - Imports mainly come from Russia, Colombia, the United States of America, and South Africa.

- Lignite and sub-bituminous coal deposits are widespread throughout the country (Figures 33-1 and 33-2).
 - Bituminous coal resources are mainly located in the Zonguldak Coal Basin, which lies in the northern part of the country along the Black Sea Coast.

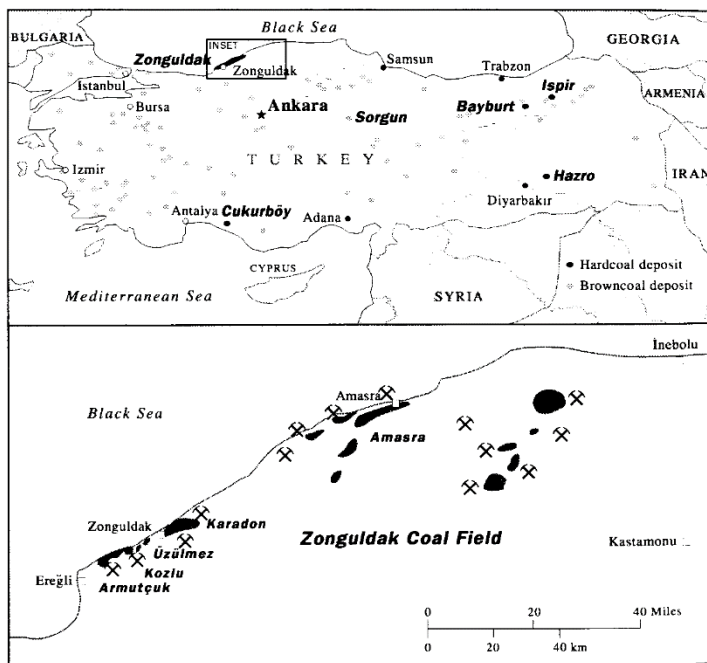
Figure 33-1. Turkey’s Coal Fields



EXPLANATION		
○ (Large)	More than 80 Million tons reserve	
○ (Small)	Less than 80 Million tons reserve	
■ (Light Yellow)	Pliocene lignites	■ (Black)
■ (Yellow)	Miocene lignites	● (Yellow)
■ (Orange)	Oligocene lignites	Coal basin/field and reserve
■ (Red)	Eocene lignites	

Source: Ersoy (2019).|

Figure 33-2. Turkey's Zonguldak Coal Basin



Source: Schwochow (1997).

- Turkey has 17.46 billion tonnes of lignite reserves and 1.3 billion tonnes of bituminous coal resources (Ersoy, 2019).
- Most of Turkey's reserves are considered economically minable (MENR, 2019) by the Turkish Ministry of Energy and Natural Resources (MENR).
 - Approximately 46 percent of Turkey's lignite is in the Afsin-Elbistan Basin.
 - The Zonguldak Basin (Figure 33-2) is estimated to have 1.3 billion tonnes of hard coal.

33.1.2 STAKEHOLDERS

- Table 33-2 presents a summary of key stakeholders in Turkey's CMM industry.
 - There are 436 coal mining companies currently operating in the country that employ an estimated 38,000 people (Ersoy, 2019).

Table 33-2. Key Stakeholders in Turkey’s CMM Industry

Stakeholder Category	Stakeholder	Role
Mining Companies	<ul style="list-style-type: none"> ▪ Turkish Hard Coal Enterprise (Türk Taşkömürü işletmeleri) ▪ Turkish Coal Enterprise ▪ HEMA Enerji 	Project host
Government Agencies	<ul style="list-style-type: none"> ▪ Ministry of Energy and Natural Resources (MENR) ▪ Organization of Aegean Lignite ▪ Representation of Turkish Coal Enterprises 	Legal and regulatory oversight of CMM/CBM

33.1.3 STATUS OF COAL AND THE COAL MINING INDUSTRY

- The Turkish government has complete ownership over the country’s coal resources.
 - State-owned coal companies accounted for 46 percent of coal production in 2017, down from 89 percent in 2011. The rest is mined by the private sector (Ersoy, 2019).
- TKI and TTK are the two government-owned corporations that manage and develop Turkey’s coal resources.
 - TKI was established in 1957 to operate the coal mines in Turkey and is the major brown coal producer in the country.
- In recent years, TKI and TTK have leased out coal reserves to private companies and several private mines are in operation.
- Turkey has both active surface and underground mines. Its largest underground mines are:
 - Ömerler – 1-Mmt production cap, longwall mining method, low gas content;
 - Soma Eynez – 6.8-Mmt production cap, longwall, 1 tonne methane per cubic meter (m³);
 - Soma Eynez East – 4.2-Mmt production cap, longwall, 0.78 tonne methane/m³ (Ersoy, 2019).
- Ninety percent of the country’s lignite production comes from surface mines (MBendi, 2010). Lignite accounts for 39 percent of Turkey’s energy production with hard coal producing 2 percent (Ersoy, 2019).

33.2 Overview of CMM Emissions and Development Potential

- According to the Global Methane Initiative (GMI) CMM International Projects Database, there are currently no active CMM recovery and utilization projects in Turkey (USEPA, 2016).

- Under the auspices of GMI, the U.S. Environmental Protection Agency has funded two pre-feasibility studies for CMM development in Turkey:

Kozlu and Kiaradon Coal Mines, Zonguldak Basin

- Average gas content of 9.07 cubic meters per tonne (m³/tonne).
- Average specific emissions of 20.94 m³/tonne mined.
- TTK management has determined that controlling outburst problems at two of the five active mines—Kiaradon and Kozlu—is high priority, as there is no gas drainage system in place (USEPA, 2015b).

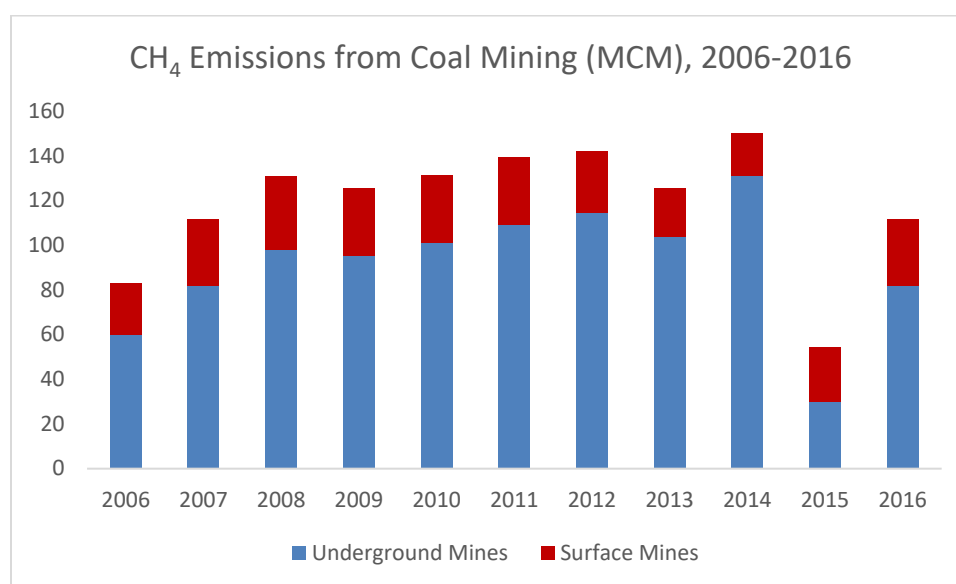
Amasra Mine, Zonguldak Basin

- The mine is designed to achieve a maximum production of 5 thousand tonnes per year, with overburden depths ranging from 700 to 800 meters (USEPA, 2015a).
- The study showed that in-mine, directionally drilled boreholes would be an effective method to reduce in-situ gas content prior to mining.

33.2.1 CMM EMISSIONS FROM OPERATING MINES

- Coal mining was responsible for 54.9 percent of total Turkish energy sector methane emissions in 2016. Although underground mines constitute only 16.5 percent of Turkish mines, they produce 76.0 percent of coal mining-related emissions (UNFCCC, 2018; Figure 33-3).

Figure 33-3. Methane Emissions from Coal Mining, 2006–2016



Source: UNFCCC (2018).

- There was a 67.6 million cubic meters (MCM) (125 percent) increase in CMM emissions between 2015 and 2016 due to increased production from underground mines.

33.2.2 CMM EMISSIONS FROM ABANDONED MINES

Table 33-3 summarizes methane emissions from abandoned mines in Turkey from 1995 to 2016.

Table 33-3. Methane Emissions from Abandoned Mines, 1995–2016

Year	Methane (thousand tonnes)	Carbon Dioxide Equivalent (thousand tonnes)	Carbon Dioxide Equivalent (MCM)
1995	2.5	62	34
2000	2.4	60	33
2005	5.4	135	74
2010	4.0	101	55
2015	5.2	130	71
2016	5.5	138	75

Source: UNFCCC (2018).

- No information exists currently on CMM capture projects for abandoned coal mines in Turkey.

33.2.3 CBM FROM VIRGIN COAL SEAMS

- The in-place CBM resources in two districts of the Zonguldak hard coal region are presently estimated to be 3 trillion cubic meters (Balat and Ayar, 2004).
 - A CBM feasibility project was conducted in the Zonguldak region in 2019 by the Turkish Petroleum Organization. Based on the positive results, drilling of the company's first CBM pilot well in the field is scheduled for February and March 2020 (Bulguroğlu et al., 2019).
- Turkey could generate US \$37 billion from utilization of its 130 billion m³ of CMM/CBM emissions in the Zonguldak Basin (Anadolu Agency, 2017).
- HEMA Energi has drilled a series of wells throughout its license area and intends to initiate a full-scale development program.
 - This development is a result of a 2012 CBM feasibility study funded by the U.S. Trade and Development Agency.

33.3 Opportunities and Challenges to Greater CMM Recovery and Use

33.3.1 MARKET AND INFRASTRUCTURE FACTORS

- In May 2001, Turkey enacted the Natural Gas Law, which requires that natural gas transmission, storage, and distribution networks be open to competition and monopolistic elements be unbundled.
- Prior to this law, most of the natural gas market and infrastructure was dominated by the Petroleum Pipeline Corporation (a.k.a., BOTAS, a state-owned company).
- BOTAS still owns the majority of the transmission infrastructure and most of the market; however, distribution, storage, and imports are now open to competition.
- With potential for thermal power generation, Turkey has opened up six of its lignite fields to the private sector under a royalty model (MBendi, 2010).
- In 2015, Turkey produced an estimated 14 billion cubic feet of natural gas and consumed approximately 1,700 billion cubic feet of natural gas, relying almost entirely on gas imports (EIA, 2017).
- Installation of pre-drainage systems into areas surrounding coal seams would offset some of Turkey's high demands for foreign natural gas.

33.3.2 REGULATORY INFORMATION

- Turkey is the world's 20th largest emitter of greenhouse gases (Timperley, 2018).
- Turkey has not yet ratified the Paris Climate Accord (UNFCCC, 2019; Table 33-4).

Table 33-4. Turkey's Climate Change Mitigation Commitment

Agreement	Signature	Ratification
UNFCCC*	–	February 24, 2004 (accession)
Kyoto Protocol**	–	–
Paris Agreement***	April 22, 2016	–

Sources: * UNFCCC (2007), ** UNFCCC (2010), *** UN (2015).

- The MENR is the main body of the Turkish mining and energy sector, and is responsible for:
 - The preparation and implementation of mining and energy policies
 - Plans and programs, in coordination with its dependent and related institutions

- Other public and private entities.
- The 2015 amendment to mining laws made critical changes to license fees, royalty payments, license applications, and coal exploitation (Budak, 2016). As of 2019, a 12.5 percent royalty was collected on the wholesale price of CMM; however, a number of other project-related construction, maintenance, and production activities receive tax exemptions (Özgür, 2019).
 - To incentivize international investment, Turkish law allows for CMM project profits to be transferred abroad.
- Three types of licenses are available for coal mining and production:
 - **Prospecting license**, enabling its holder to carry out prospecting activities in a specific area
 - **Operation license**, enabling its holder to carry out operational activities within the same area as stated in the prospecting license
 - **Operation permit**, enabling its holder to operate a specific mine as specified in the operation license (Kayıkçı, 2010).
- Petroleum and natural gas are regulated, respectively, under Petroleum Law No. 6491 and Natural Gas Market Law No. 4646.
 - To receive an operating license for CMM under Turkish Petroleum Law No. 6491 (as amended by Law No. 6719), the methane content in coal seams must be at least 5 m³/tonne (Özgür, 2019).

33.4 References

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