



Independent Statistics & Analysis

U.S. Energy Information  
Administration

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## Background Reference: Kazakhstan

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### Overview

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*Kazakhstan, an oil producer since 1911, has the second-largest oil reserves and the second-largest oil production after Russia among the former Soviet republics.*

Kazakhstan is a major oil producer. The key to its continued growth in liquids production is the development of its giant Tengiz, Karachaganak, and Kashagan fields. Kazakhstan must also develop additional export capacity to continue its production growth.

Although Kazakhstan became an oil producer in 1911, its production did not increase to a meaningful level until the 1960s and 1970s, when production plateaued at nearly 500,000 barrels per day (b/d), a pre-Soviet independence record-production level. Since the mid-1990s, and with the help of major international oil companies, Kazakhstan's production first exceeded 1 million b/d in 2003.

Kazakhstan is landlocked and is a long distance from international oil markets. The lack of access to the open ocean makes the country dependent mainly on pipelines to transport its hydrocarbons to world markets. Kazakhstan is also a transit country for oil and natural gas pipeline exports to China.

Kazakhstan is one of five countries that border the Caspian Sea. In August 2018, these five countries met regarding a decades-old delimitation dispute about the maritime and seabed boundaries of the Caspian. An accord could allow for additional offshore exploration and infrastructure in what were previously contested waters.

Figure 1. Map of Kazakhstan



Source: Central Intelligence Agency, *The World Factbook*

## Petroleum and other liquids

*Oil field production in the Kashagan field began a significant ramp-up in 2017 after years of delays. In July 2016, the Tengizchevroil consortium made a final investment decision on a project to increase liquids production by about 260,000 b/d beginning in 2022.*

Kazakhstan's recent oil production has primarily been at the giant Tengiz and Karachaganak onshore fields in the northwest of the country and the offshore Kashagan field in Kazakhstan's territory in the Caspian Sea. Kashagan first started oil production in October 2016 after years of delays, but production began to significantly increase in 2017.

## Sector organization

The Ministry of Energy oversees the oil and natural gas industry in Kazakhstan. It was created in August 2014 to absorb the functions of the Ministry of Oil and Gas and parts of the functions of the Ministry for Industry and New Technologies and the Ministry for Environment and Water Resources.<sup>1</sup>

The national oil and natural gas company, KazMunaiGaz (KMG), represents the state's interests in Kazakhstan's oil and natural gas industry. KMG was created in 2002 and holds equity interests in the Karachaganak (10%), Kashagan (8.44%), and Tengiz (20%) fields, as well as interests ranging between 33% and the 100% in many other production projects.<sup>2</sup>

Kazakhstan's Law on Subsoil and Subsoil Use (Subsoil Use Law) governs investments in the oil and natural gas industries. The Subsoil Use Law has been amended several times, most notably in 2005, 2007, 2010, and 2014. Among other provisions, the Subsoil Use Law, along with the December 2009 Local Content Law, established strict local content requirements for oil and natural gas contracts. The Subsoil Use Law also established the government's right to preempt any sale of oil and natural gas

assets. In 2013, Kazakhstan preempted ConocoPhillips' sale of its 8.4% stake in the Kashagan project to India's Oil and Natural Gas Corporation (ONGC). The preemption did not affect ConocoPhillips' proceeds from the sale, but rather than going to ONGC, KMG purchased the stake before reselling it to the China National Petroleum Corporation (CNPC).<sup>3</sup>

The government announced the re-introduction of oil export duties in August 2010. It increased the duty in subsequent years as oil prices climbed and reduced the oil duty several times since 2014 when oil prices declined sharply. Export duties were first introduced in 2008 and were suspended in January 2009. Export duties affect all oil exporters operating in Kazakhstan, except those that have a tax stabilization clause in their contracts.

## Production

In the 1970s, several large discoveries were made in presalt reservoirs, including the Karachaganak and Tengiz fields. However, the development of these fields was not possible at the time because of the technical challenges of developing the deep, high-pressure reservoirs. Because international oil companies began to participate in Kazakhstan's petroleum sector, and as presalt deposits became technically and commercially viable, these fields have become the foundation of the country's petroleum liquids production.

The Kashagan field is the largest known oil field outside of the Middle East and the fifth-largest field in the world in terms of reserves. It is located off the northern shore of the Caspian Sea near the city of Atyrau, Kazakhstan. Kashagan's recoverable reserves are estimated at 7 billion to 13 billion barrels of crude oil. Full capacity for the first phase of development is 370,000 b/d, and all oil produced at Kashagan will be exported.

Many of the repeated delays at Kashagan were the result of the field's adverse operating environment and complexity, resulting in significant cost overruns. The Kashagan reservoir is located more than 13,000 feet below the seabed and is under very high pressure (770 pounds per square inch). The reservoir contains high levels of hydrogen sulfide, which is both highly toxic and highly corrosive and has been blamed for pipeline leaks. In addition, conventional drilling and production technologies such as fixed or floating platforms cannot be used because of the shallow water and cold climate. Instead, offshore facilities are installed on artificial islands (drilling and hub islands) that house drilling and processing equipment. The processing facilities separate recovered liquids from the natural gas, reinject a portion of the natural gas, and send the liquids and the remainder of the natural gas to shore for further processing. Before production could restart, the pipelines connecting the field with the onshore processing facilities had to be replaced using higher-grade materials that are more resistant to corrosion.

In July 2016, the Tengiz partners made a final investment decision to proceed with the Future Growth Project. This expansion project is expected to be completed by 2022, bringing about 260,000 b/d of additional liquids production from Tengiz. An expansion project has also been proposed for the Karachaganak field, but it is at a less-advanced stage of planning.

**Table 1. Kazakhstan's major oil and natural gas fields**

Field Name	Companies	Start year	Liquids production	Natural gas production
Tengiz (& Korolev)	Chevron, ExxonMobil, KazMunaiGaz, and Lukoil	1991	586,000 b/d petroleum and other liquids production in 2017 Expansion project to add 260,000 b/d of crude production beginning in 2022	272 Bcf dry marketed gas production in 2017
Karachaganak	BG, Eni, Chevron, Lukoil, KazMunaiGaz	1984	247,000 b/d total liquids production in 2017 An expansion project is under consideration, but potential production volumes are uncertain	About 300 Bcf wet marketed gas production in 2017
Kashagan	KazMunaiGaz, Eni, ExxonMobil, Shell, Total, China National Petroleum Corporation, Inpex	2016	370,000 b/d liquids processing capacity with current development	More than 100 Bcf natural gas production capacity

Source: U.S. Energy Information Administration based on TengizChevroil, Chevron, Karachaganak Petroleum Operating (KPO), and Eni

## Oil exports

Kazakhstan is an exporter of light, sweet crude oil. Most of Kazakhstan’s crude oil exports travel around or across the Caspian Sea to European markets. A significant portion of Kazakhstan’s exports transit Italy and the Netherlands, making it difficult to determine where this crude oil ends up because Kazakhstan reports these volumes as having been delivered to the transit countries. A small percent of Kazakhstan’s crude oil exports flowed east via a pipeline to China.

## Export routes

Kazakhstan's pipeline system is operated by the state-run KazTransOil, a subsidiary of KazMunaiGas, which runs approximately 3,400 miles of pipelines. Because of Kazakhstan’s landlocked location and the continued use of Soviet-era infrastructure, much of Kazakhstan’s oil and natural gas export infrastructure is integrated with [major Caspian oil and natural gas export routes](#) that interlink the region. Since independence, Kazakhstan has successfully expanded and diversified its export capabilities. Major crude oil export pipelines include the Caspian Pipeline Consortium (CPC) pipeline to the Black Sea port of Novorossiysk, the Kazakhstan-China pipeline, and the Uzen-Atyrau-Samara pipeline to Russia (Figure 2). Following an expansion of the pipeline in 2017, CPC has a design capacity of 1.4 million b/d.<sup>4</sup>

Figure 2. Kazakhstan map of major crude oil pipelines



Kazakhstan also exports crude oil via the Caspian Sea and via rail. Oil is loaded onto tankers or barges at Kazakhstan's port of Aktau or the smaller Atyrau port and then shipped across the Caspian Sea, where it is loaded onto the Baku-Tbilisi-Ceyhan pipeline or the Northern Route pipeline (Baku-Novorossiysk) for onward transport, mainly to Europe. In addition, Kazakhstan has an extensive rail network, which it uses to transport liquid fuels for domestic consumption and for exports. Continued expansion and diversification of Kazakhstan's petroleum liquids transport capacity, particularly export capacity, is key to its future ability to increase production.

Another export route possibility for Caspian crude oil is via swaps with Iran. For years, Kazakhstan and other Central Asian countries delivered their crude oil to Iran's Caspian Sea port of Neka. From there the crude oil was delivered to refineries in Tehran and Tabriz, and the refined products were distributed and consumed in northern Iran. In exchange, Iran exported equal volumes of crude oil out of its Persian Gulf ports on behalf of Kazakhstan. Swap volumes have varied over the years, with little to no crude oil swapped since 2011. Sanctions against Iran reportedly complicated swap arrangements, especially the marketing of the crude oil exported in the Persian Gulf, which had been done by Iran. Also complicating the swap arrangements was Iran's desire to raise the fee it charged Kazakhstan for each barrel of crude oil swapped.

## Oil grades

Kazakhstan's main export oil grade is the CPC Blend. CPC Blend is a very light (45.3° API), sweet crude (0.56% sulfur)<sup>5</sup> that is valued for its high yield of gasoline and light distillates. Production from the Tengiz field accounts for about 60% of the CPC blend. Other components include production from the Karachaganak, Kashagan, and Kumkol fields; some Russian grades such as Siberian Light; and a variety of other Russian and Kazakh grades.

Smaller volumes of many of the components of CPC Blend are also marketed separately as distinct crude oil grades. However, with the recent expansion of the CPC pipeline, the volumes of crude oil marketed separately have declined.

## Refining

The three major oil refineries in Kazakhstan are Pavlodar, Atyrau, and Shymkent. The Pavlodar refinery is in north-central Kazakhstan and is supplied mainly by a crude oil pipeline from western Siberia, because Russian supplies are well-placed geographically to serve that refinery. The Atyrau refinery uses only domestic crude oil from northwest Kazakhstan, and the Shymkent refinery currently uses crude oil from the oil fields at Kumkol and the nearby area in central Kazakhstan. Aktau also has a smaller refinery that processes heavy crude oil produced at a nearby field to make bitumen for road construction.<sup>6</sup>

## Natural gas

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*Kazakhstan's largest petroleum liquids fields also contain substantial volumes of natural gas, most of which is reinjected into oil wells to improve oil recovery rates.*

Most of Kazakhstan's natural gas reserves are in crude oil or condensate-rich fields. The two largest petroleum liquids fields, Karachaganak and Tengiz, are also the two largest natural gas fields.

## Production

Much of Kazakhstan's gross natural gas production is reinjected (more than 35% in 2016) to increase oil production. Much of the natural gas produced at Tengiz and Kashagan is high in sulfur, and therefore it requires special handling and is more costly to process.

Unlike the Tengiz project, which includes a natural gas processing plant, the Karachaganak project has insufficient natural gas processing capacity. Most of the raw marketed production from the Karachaganak field must be exported to Russia to be processed at a natural gas processing plant in Orenberg.

Production restarted at the Kashagan field in October 2016. When the project reaches full capacity, it is expected to produce about 100 billion cubic feet (Bcf) of natural gas per year for domestic consumption, with additional produced gas reinjected into the reservoir to boost liquids recovery.

## Trade

Kazakhstan has two major export pipelines for natural gas (Figure 3). The Central Asia Centre pipeline (CAC), which traverses the western edge of Kazakhstan on its way to Russia and points further west, and the Turkmenistan-China pipeline, which traverses the southern edge of the country on its way to China. Both pipelines are part of the regional [Caspian export infrastructure](#) and mainly carry natural gas exports from Turkmenistan, along with smaller but still significant volumes of exports from Kazakhstan and Uzbekistan. The CAC pipeline also serves local natural gas demand in western Kazakhstan, including northwestern Kazakhstan, where most of the country's production is located.

A third major international pipeline, the Bukhara-Tashkent-Bishkek-Almaty pipeline, serves local demand in southern Kazakhstan. Two of Kazakhstan's three underground natural gas storage facilities are located along this pipeline.

Natural gas production in Kazakhstan is concentrated in the northwest and, until recently, has not been connected to population centers in the south, north, center, and east. Before 2016, consumers in southern Kazakhstan were supplied with imported natural gas from Turkmenistan or Uzbekistan. However, in November 2015, KazTransGas, the state-owned natural gas pipeline operator, completed the final link in the new Beinu-Bozoi-Shymkent pipeline. This pipeline allowed Kazakhstan to supply natural gas to communities along the route of the pipeline that previously had no access to gas. It has also connected the natural gas fields and infrastructure in the northwest of the country to the population centers in the south of the country, replacing imported natural gas in those markets with domestically-produced gas. About three-fourths of Kazakhstan's domestic natural gas consumption comes from the country's three main oil and natural gas fields.<sup>7</sup>

Completing this link in the new Beinu-Bozoi-Shymkent pipeline also connected Kazakhstan's producing regions with the CAC to China, allowing production from northwestern Kazakhstan to be exported to China. Natural gas was first delivered to China from Kazakhstan via the CAC pipeline grid in late 2017.

Plans to supply other parts of the country with natural gas and connect them to the existing infrastructure in the West and South are more uncertain. A new pipeline running from southwest

Kazakhstan north to the capital, Astana, was proposed in 2012 and is still in the initial planning stages. The vast distances and relatively low population density in the north, center, and east make the economics challenging for any potential natural gas pipeline projects to serve those regions. Kazakhstan's coal basins, which lie in the north and center of the country, could also be a source of natural gas supplies for areas of the country that are located far from existing natural gas production and infrastructure. Kazakhstan has been exploring the potential to produce and market methane from coal mines and coal beds.

Figure 3. Kazakhstan map of major natural gas pipelines



## Coal

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Kazakhstan is among the top 10 countries in the world in terms of coal reserves, coal production, and coal exports and is also in the top 15 countries in the world in terms of coal consumption. Despite being among the top coal countries, Kazakhstan is a relatively small contributor to global coal volumes. The top four countries globally account for disproportionate shares of total global coal reserves, production, consumption, and exports (between 65% and 75% combined), and Kazakhstan accounts for 1% to 4%.

About one quarter of Kazakhstan's coal production is exported and most goes to Russia. Virtually all of Kazakhstan's coal production and exports consist of steam coal, which is suitable for burning in electric power plants or in other applications to generate steam and heat. Kazakhstan also produces smaller quantities of metallurgical coal that are consumed domestically. Kazakhstan is rich in a variety of minerals, and mineral and coal deposits are concentrated in the north and center of the country. Coal is a major energy source for the mining and smelting industries and for the electricity sector in Kazakhstan.

## Electricity

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*Most of Kazakhstan's power generation comes from coal-fired power plants concentrated in the north of the country near the coal-producing regions.*

Kazakhstan's only nuclear power plant, a BN-350 nuclear reactor at Aktau, was shut down in 1999. Kazakhstan has some of the largest uranium deposits in the world and is the world's largest uranium producer.<sup>8</sup> Although plans have long existed to build additional nuclear power plants, little progress has been made on constructing these units.

Kazakhstan's national grid is operated by the Kazakhstan's Electricity Grid Operating Company, a state-owned company, which is responsible for electric transmission and network management. A number of medium and small regional electricity companies handle distribution, some of which are privately owned. The electricity transmission and distribution sectors are considered to be natural monopolies and are regulated by the government. However, wholesale generation of power is considered to be a competitive market with most generation assets owned by private enterprises.

## Notes

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- In response to stakeholder feedback, the U.S. Energy Information Administration has revised the format of the *Country Analysis Briefs*. As of December 2018, updated briefs are available in two complementary formats: the Country Analysis Executive Summary provides an overview of recent developments in a country's energy sector and the Background Reference provides historical context. Archived versions will remain available in the original format.
- Data presented in the text are the most recent available as of December 2018.
- Data are EIA estimates unless otherwise noted.

## Endnotes

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<sup>1</sup> Tengrinews, "[Nazarbayev rearranges Kazakh government](#)," (August 6, 2014).

<sup>2</sup> KazMunaiGas Financial statements and annual reports, *Management discussion and analysis of financial and operating performance of JSC NC "KazMunayGas" for the twelve months ended 31 December 2017*, pp. 9; KazMunaiGas Press release, *2017 financial and operations results of NC KazMunayGas*, (March 20, 2018).

<sup>3</sup> U.S. Department of State, [2014 Investment Climate Statement – Kazakhstan](#), accessed December 18, 2014; U.S. Department of State, [2015 Investment Climate Statement – Kazakhstan](#), accessed September 25, 2018; and Office of the U.S. Trade Representative, 2014 National Trade Estimate Report on Foreign Trade Barriers, [Kazakhstan](#), accessed December 18, 2014.

<sup>4</sup> Chevron, "[2017 Supplement to the Annual Report](#)," p. 24.

<sup>5</sup> Platts, "[Methodology and Specifications Guide: Crude Oil](#)," updated July 2017, p. 32.

<sup>6</sup> Kaz Munay Gas, [Annual Report 2015](#), accessed March 31, 2017.

<sup>7</sup> KazTransGas, [About Company](#), accessed September 25, 2018.

<sup>8</sup> World Nuclear Association, [Uranium and Nuclear Power in Kazakhstan](#), (updated June 2018).