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Mineral resources and energy from the steppe
An analysis of Kazakhstan's energy and mining sector

Szabolcs Veres

Abstract

Kazakhstan's role in strengthening energy security has taken on a new geopolitical significance recently. Kazakhstan has for a long time wanted to diversify export trade routes for its hydrocarbon resources, but options were very limited. For this reason, the country has paid great attention recently to developing the energy corridor to the West in the hope of supplying the European market with oil and gas. These efforts have the potential to increase global oil and gas supplies in the future. At the same time, fundamental improvements in the supply of Kazakh oil to the foreign market cannot be forecast for the coming years. The main export direction will continue to be Russia, through which most of Kazakhstan's hydrocarbon resources are sold.

Keywords: Kazakhstan, energy policy, Europe

Introduction

The economy of Kazakhstan is largely based on the exploration, refinement and distribution of oil and natural gas, as well as on the extraction of raw materials, particularly coal and uranium. Crude oil exports are the main source of government income, accounting for 32 percent of total state [revenue](#). This high dependency is a symptom of the so-called "resource curse"¹ and exposes the country to the impact of volatile global energy prices. Since the Russian invasion of Ukraine, Kazakhstan has benefited temporarily from high crude oil prices, which reached an [average](#) of USD 94.53 in 2022. However, large fluctuations in oil prices are the rule rather than an exception. In 2020, during the Covid-19 pandemic, the average oil price dropped dramatically to as low as USD 39.68, resulting in a 20 percent loss of government [revenues in Kazakhstan](#). Such volatility means that revenues flowing into the state budget are not stable, thus affecting the government's ability to provide basic social services to the population.

Kazakhstan as hydrocarbon power

Kazakhstan is an excellent example of Central Asian countries' strong dependence on hydrocarbons. The country is the 62nd most [populous](#) country in the world (population 20 million in November 2023), but the 25th largest emitter of greenhouse gases. Kazakhstan's rich natural resources have fueled its economic dependence on oil exports for almost three decades. And the domestic energy sector is dominated by outdated coal-fired power generation, fueled by the mining of large quantities of cheap coal in the Northeast of the country.

¹ The resource curse, also known as the paradox of plenty or the poverty paradox, is the phenomenon of countries with an abundance of natural resources (such as fossil fuels and certain minerals) having less economic growth, less democracy, or worse development outcomes than countries with fewer natural resources.

Hydrocarbon reserves and renewable energy reserves in Kazakhstan (values estimated by international energy agencies)	
Petroleum	30 billion barrels (2020)
Natural gas	2.7 trillion m ³ (2020)
Coal	26.6 billion tons (2020)
Hydropower potential	199 TWh/year
Solar energy potential	3760 GW
Wind energy potential	354 GW

Source: own collection by British Petrol Statistical Review of World Energy, International Energy Agency (IEA) 2022.

Kazakhstan's energy policy is mainly based on the extraction of natural gas, oil and coal. The country is a net exporter of coal and has significant coal reserves. In addition to abundant fossil fuels, Kazakhstan has about 12 percent of the world's uranium reserves and is also the largest producer of [uranium](#) in the world, while the country's total [potential](#) for generating solar energy is estimated at 2.5 billion kilowatts per year.

World Uranium Mining Production 2013- 2022 (Top 10 country)	Production by tonnes U
Kazakhstan	21 227
Canada	7 351
Namibia	5 613
Australia	4 553
Uzbekistan	3 300
Russia	2 508
Niger	2 020
China	1 700
India	600
South Africa	200
Ukraine	100

Source: <https://world-nuclear.org/> data

In Kazakhstan, the main objective of the transition to renewable energy sources is to meet electricity production in line with national economic needs, including the development of existing thermal [power plants](#), as well as the transition to clean coal technologies. From the 2020s, a free energy market is to be developed in Kazakhstan. [Studies](#) show that the introduction of a 100 percent renewable energy system in Kazakhstan is technically possible and economically viable, but the prerequisites for this are political will and full openness to foreign investors.

Uranium production by company 2022		
Company	tonnes U	percent of world total
Kazatomprom	11 373	23
Cameco	5 675	12
Orano	5 519	11
CGN	4 627	10
Uranium One	4 454	9
Navoi Mining	3 300	7
CNNC	3 247	7
BHP	2 813	6
ARMZ	2 508	5
General Atomics/Quasar	1 740	4
Other	4 098	6
Total	49 355	100

Source: <https://world-nuclear.org/> data

The Kazakh energy situation after independence

During the Soviet era, due to its geographical features, a complex energy system was created in Central Asia - the [United Energy System of Central Asia](#) - which united the energy sector of the five countries² of the region instead of building self-sufficient power generation systems for the individual member states.

In the late 1990's and early 2000's, the goal of the Central Asian countries' energy policy was to create independent and self-sufficient energy systems and energy security. As a result, the countries in the region stopped trading electricity and fuels with each other. This led to wasteful use of water and energy sources, frequent power outages and thus a decline in [energy security](#) in the region. Turkmenistan's withdrawal from the United Energy System of Central Asia in 2003 fundamentally challenged the regional energy supply. Following Uzbekistan's withdrawal in [2009](#), the United Energy System was formally terminated.

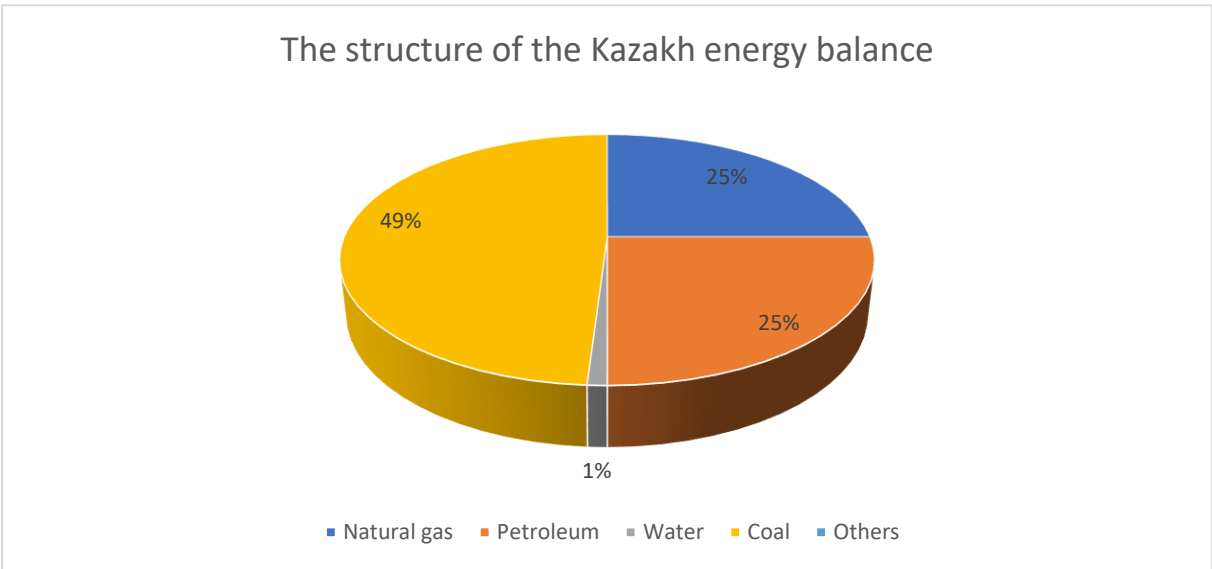
All five Central Asian countries were members of the Soviet Union and chose the path of independence following the breakup of the Soviet Union. Partly because of this, and partly because of the economic legacy of the Soviet Union, the economies of the Central Asian countries were beset by crises in almost all sectors in the 1990's, followed by gradual consolidation after each country embarked on its own path of development. To achieve this, some Central Asian countries (Uzbekistan and Kazakhstan) pursued the idea of developing their own energy sector, including the modernization of electricity grids, as part of a specific economic policy.

² The five Central Asian countries are: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan.

Energy balance of Kazakhstan

Among the countries in the region, Kazakhstan is particularly successful in the extraction and processing of hydrocarbons. In 2020, the country's crude oil production reached 2 million barrels per day. Nevertheless, Kazakhstan's oil refining capacity was insufficient in the 1990's and 2000's. For this reason, the country had to import almost 30 percent of its oil products from neighboring countries during this period. Recognizing the vulnerability of the country's economy due to its dependence on external supplies of petroleum products, Kazakhstan launched its own economic development program in 2009 aimed at modernizing oil and gas production.

Thanks to the modernization of refineries in Atirau, Pavlodar and Simkent in 2018, Kazakhstan began to [produce](#) a sufficient amount of oil products to meet domestic demand and the country currently has the largest oil refining capacity in Central Asia. Currently, Kazakhstan is the biggest [exporter](#) of products to Central Asia. Similar growth has been observed in neighboring Uzbekistan and Turkmenistan, suggesting that the region has successfully improved access to fuels for both industry and consumers.



Source: own collection based on the International Energy Agency (IEA) 2022-2023.

After gaining independence, Turkmenistan and Uzbekistan were still quite dependent on natural gas, while Kazakhstan still relies heavily on coal and oil. Tajikistan and Kyrgyzstan relied on coal and oil to meet their energy needs with the help of hydropower. Renewable energy sources such as solar, wind or geothermal energy and bio-fuels played only a minimal role in the region. The excessive dependence on a single energy source in the Central Asian countries posed a major risk to both the economy and the energy industry.

Dynamic development in renewable energies

Only in the last ten years has the renewable energy sector in Kazakhstan experienced robust growth, gradually gaining importance for the country's energy market and energy mix. As Astana also [ratified](#) the Paris Climate Agreement and adopted the carbon neutrality strategy (by 2060), projects to accelerate the development of renewable energy sources are getting on importance for Kazakhstan.

Thanks to the country's geographical location, Kazakhstan has considerable potential in the areas of hydropower, wind energy and solar energy. [According](#) to the Kazakh Ministry of Energy, 130 renewable energy plants with an installed capacity of 2,400 MW were in operation in the Central Asian country in 2022.

The annual electricity generation potential from hydropower plants in Kazakhstan is [estimated](#) at 170 billion kWh. The most promising prospects for hydropower development are in the southern regions of the country, where almost 65-66 percent of hydropower resources are concentrated along mountain rivers. For Astana, the development of such hydropower plants offers the advantages of relatively low energy production costs and environmental sustainability.

In addition, the steppe-covered northern part of Kazakhstan has a huge wind energy potential, estimated at more than 1820 billion kWh. The Kazakh Ministry of Energy has plans of constructing wind farms with a total capacity of more than 1 million kWh in 46 regions of the country by 2030.

In the southern and southwestern regions of Central Asia's largest country by area, the number of hours of sunshine is high throughout the year, so there is considerable solar energy potential. [According](#) to the [Central Asia Data-Gathering and Analysis Team](#) (CADGAT), the potential of energy that can be used with solar cells (photovoltaics) in Kazakhstan, for example, can be put at 6,684 TWh per year. With around 2,200–3,000 hours of sunshine per year, solar radiation reaches 1,200–1,700 kW/m².

New guidelines for foreign policy

Over the past ten years, Kazakhstan's energy policy has been implemented within the framework of the [policy](#) of the Republic of Kazakhstan for 2014–2020 (On the Foreign Policy Concept of the Republic of Kazakhstan for 2014–2020). The document states that Kazakhstan will continue to contribute to regional and global [energy security](#). It strives to balance the interests of producing, transit and consumer countries and create a system of diversified, stable and secure routes for their exports.

In 2014, the Concept for the Development of the Fuel and Energy Complex of the Republic of Kazakhstan until 2030 was [adopted](#) (see the Resolution of the Government of the Republic of Kazakhstan dated June 28, 2014 No. 724). The document states that transportation of oil produced in the Republic of Kazakhstan is currently carried out via three main routes:

1. transportation via oil pipelines, which are the main transportation route (53.5 million

- tons of crude oil were transported through KazTransOil JSC pipelines in 2012).
2. transport by sea from the port of Aktau (7.1 million tons in 2012) - JSC NMSK Kazmortransflot transported 5.9 million tons from the port of Aktau to the ports of Baku and Makhachkala in 2012;
 3. transport by rail (7.0 million tons in 2012) - mainly to Eastern Europe and the Black Sea ports.

The most important export pipelines are:

1. the Atyrau-Samara oil pipeline (17.5 million tons per year), through which further exports are made through the territory of the Russian Federation via oil pipelines of OAO Transneft towards Eastern Europe and to the Black Sea and Baltic ports.
2. the Caspian Pipeline Consortium (throughput capacity on the Kazakh section is 28.2 million tons per year), which transports Kazakh oil to the port of Novorossiysk.
3. the Kazakhstan-China oil pipeline (the throughput capacity of the Atasu-Alashankou section is 20 million tons per year), which ensures the export of Kazakh oil to the People's Republic of China. Most of the oil extracted in Kazakhstan was therefore routed via Russian territory.

The increasing importance of the extraction of hydrocarbon resources, the difficulties in developing the deposits and the lack of success in diversifying oil supply routes to foreign markets led to more attention being paid to the energy sector. During this period, Kazakhstan faced certain difficulties in the development of hydrocarbon resources.

In 2014, oil production in Kazakhstan amounted to 80.8 million tons of oil, including 67.9 million tons of crude oil and 12.9 million tons of gas condensate, which is 1.2 percent less than in 2013. The deviation from the planned indicators is due to a prolonged period of capital repairs at the Tengiz field and a decrease in the operational characteristics of the old [fields](#). In the medium and long term, the oil industry will remain a system-forming sector of the Kazakh [economy](#), realizing the need to expand the country's resource base.

The most important priorities of Kazakhstan's foreign policy include relations with the countries of Central Asia, which are at the center of Astana's interests, as well as cooperation with Russia. Moscow is a strategic partner of Kazakhstan, also within the framework of the Eurasian Economic Union (EAEU). At the same time, Kazakhstan is striving to find optimal approaches to expanding cooperation with China, which has significantly increased its influence on the countries of Central Asia in general and Kazakhstan in particular over the last ten years.

The situation with the extraction of hydrocarbon resources in the oil and gas fields has a major influence on Kazakhstan's foreign policy. The calculations made in the 1990s and the expectations of achieving sustainable profits from the development of oil and gas resources at the beginning of the 21st century have not yet been fulfilled.

A new situation in energy policy

In 2020, the document “On the Foreign Policy Concept of the Republic of Kazakhstan for 2020–2030” was [adopted](#). This document states that Kazakhstan’s priorities include promoting the strengthening of regional and global energy security, balance the interests of producing countries, transit countries and consumers of energy resources, as well as creating diversified, stable and secure routes for their export.

In mid-2022, Kazakh President Kassym-Jomart Tokayev held a meeting at which he emphasized the special role of the transport and logistics sector in the Kazakh economy. He argued, this sector is important for improving interaction between the regions. Nevertheless, the geopolitical situation and the sanctions have led to a break in the traditional transportation and logistics [chains](#). During the meeting, the need to develop alternative routes for the communication and delivery of goods and the diversification of supplies was emphasized. In particular, the development of maritime transport was discussed. As the head of state [said](#) that the government has the strategic task to transform the ports and make them one of the leading hubs of the Caspian Sea. Conceptually, it is necessary to strengthen the sea fleet and create a container center in the port of Aktau, the head of the state underlined.

At the same time, Kassym-Jomart Tokayev emphasized that it is necessary to diversify oil supplies. The [priority](#) direction is the so-called Trans-Caspian route, which passes through China, Kazakhstan, the Caspian Sea, Azerbaijan, Georgia, Turkey and the Black Sea. The KazMunayGas has to work out the best option for implementation, including the possibility of attracting investors to the Tengiz project. Now the government, together with Samruk-Kazyna, should take measures to increase the capacity of the Atyrau-Kenkiyak and Kenkiyak-Kumkol oil pipelines, Kassym-Jomart Tokayev underscored.

On November 21, 2022, the Government issued Resolution No. 931. According to this, about 80 percent of the oil produced in Kazakhstan is shipped for export. At the end of 2021, oil exports amounted to 67.6 million tons (2019: 72.2 million tons, 2020: 68.6 million tons). Kazakh oil is exported via the oil pipelines of the Caspian Pipeline Consortium (hereinafter referred to as CPC), Atyrau - Samara - to European countries, to the terminals on the Black Sea and the Baltic Sea, via the Kazakhstan-China pipeline - to the Chinese market, as well as via the seaport of Aktau. At the same time, the CPC remains the main export route for Kazakh oil, through which about 80 percent of all export oil is transported, which means [dependence](#) on one direction.

Oil production in Kazakhstan has not grown in recent years, but frozen at the same level. In 2020, the country [produced](#) 85.7 million tons, in 2021 - 85.9 million tons, in 2022 - 82.4 million tons. The Kazakh Ministry of Energy expects production to reach 90.5 million tons by the end of 2023. In Kazakhstan, it was noted that “one of the main reasons for the decline in oil production, in addition to the natural depletion of the country’s main stock of oil fields, is insufficient investment in capital expenditures and geological exploration”. There is a negative trend in investment in further development and increasing the efficiency of field development.

At the same time, the situation with gas production and supplies to international markets also remained complicated. In 2022, Kazakhstan produced 53.3 billion m³ (BCM) of gas. At the same time, only a small amount of gas has been exported in recent years. In 2021, gas exports amounted to 7.2 BCM, in 2022 they fell to 4.6 BCM of gas.

The possible solution: Kazakhstan oil for Europe

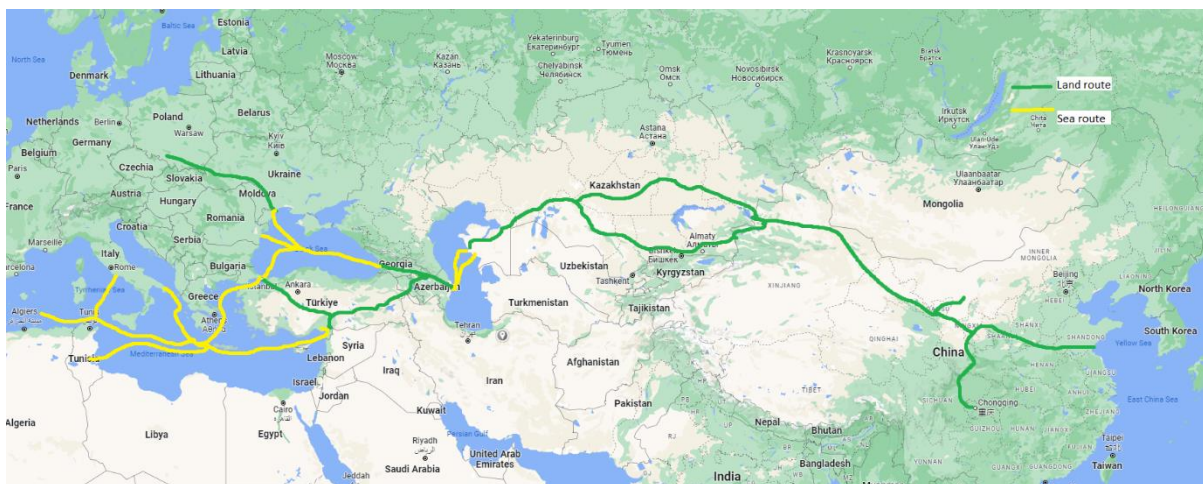
In 2022-2023, Kazakhstan has constantly tried to address the issue of oil supplies to the European market. One of the directions is selling oil to the West. Kazakhstan plans to use the Baku-Tbilisi-Ceyhan pipeline as an “alternative” route - bypassing transit through the CPC system.

Such plans are not new. After the collapse of the USSR, Kazakhstan did not rule out the possibility of oil supplies to Azerbaijan. Projects were proposed by various companies, but never implemented. As a result, Kazakhstan now supplies 2 million tons of oil annually via the Caspian Sea. This amount is insignificant and cannot be considered to be a successful diversification of supplies.

In recent years, Kazakhstan has paid great attention to the development of the Trans-Caspian International Transport Route (TITR or TMTM), primarily from the point of view of diversifying export.

The Central Trade Corridor, officially known as the [Trans-Caspian International Transport Route](#) (TITR) for Türkiye, the countries of the Caucasus (Azerbaijan, Georgia, Armenia), and the Central Asian countries (Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan) an excellent opportunity to increase their income. The eastern end of the trade corridor starts in China and passes through the lowland part (steppe) of Kazakhstan before reaching the Kazakh and Turkmen ports on the Caspian Sea. The rest of the route is then connected by sea to the Azerbaijani ports on the Caspian Sea, continues to Georgia (through the South Caucasus) and then reaches Türkiye and from there the European Union.

A possible version of the Trans-Caspian International Transport Route



Source: Google Maps, own editing

The Middle Corridor is a multilateral institutional development that links container rail and, in some cases, road freight networks between China and the European Union. According to the description of the Middle Corridor, this route could later be suitable for the transfer of freight traffic from Mongolia, South Korea and Southeast Asia to Europe, but the plans in this direction are still under progress at the moment.

Discussions about possible oil supplies through Azerbaijani territory take place both at the level of government authorities and national companies. So far, both sides have expressed their political support for the discussed plans for oil supplies through the TMTM, but they have not progressed further.

The Azerbaijani side was not interested in oil supplies from Kazakhstan. There are still serious differences in the quality of oil produced in Azerbaijan and Kazakhstan. Baku produces high-quality oil and therefore does not want to mix its oil with Kazakh oil, the latter is of significantly lower quality which is reflected in lower market prices as well.

It is difficult for Azerbaijan and Kazakhstan to agree on transportation tariffs too. Export via the Baku-Tbilisi-Ceyhan pipeline is more expensive than the Russian route through Novorossiysk. In order to be able to export Kazakh oil via Baku, two sea terminals must also be built in the Caspian Sea and a fleet of tankers purchased. In addition, dredging work will have to be carried out in the shallow part of the Caspian Sea, which will also lead to a considerable increase in oil costs. However, despite all the technical difficulties and unprofitability from a cost point of view, Kazakhstan returned to the issue of diversification of its export in 2022, especially since the President of Kazakhstan has instructed the government to carry out work that will allow a breakthrough in this field.

Significant support for the construction of the energy corridor has come from Western countries that want to cut Russia off from participating in the transportation of Caspian hydrocarbons. In 2022-2023, relations between Russia and the West deteriorated and discussions about plans to organize Kazakhstan's oil supplies intensified again.

Despite the lack of progress, the idea of the TMTM has gained support again in recent years. In mid-2022, the Kazakh president set the task of broadening export opportunities for hydrocarbon resources and called for the development of alternative routes for the supply of Kazakh oil to international markets. Kazakhstan intends to supply up to 8 percent of its oil through Azerbaijan. The national company of Kazakhstan, Kazmunaigas, negotiated the terms with the state oil company of Azerbaijan, SOCAR. Based on the agreement, Kazakhstan is expected to supply around 1.5 million tons of oil per year via the Baku-Tbilisi-Ceyhan oil pipeline. It is very likely that this amount represents the upper limit, as most of Kazakh's oil is extracted via Russian territory.

According to Dauren Karabayev, Deputy Chairman of the Board of Directors for Economy and Finance, a five-year contract has been signed between KazMunayGas and the State Oil Company of Azerbaijan (SOCAR) for the transportation of 1.5 million tons of oil through the Baku-Tbilisi-Ceyhan (BTC) pipeline. We assume that the volumes will increase in the future, as not only Kazakhstan but also Azerbaijan are [interested](#) in this. The volume of oil supplies from Kazakhstan via Azerbaijan is expected to increase to 6-6.5 million tons in the next years.

This problem can only be solved with additional investment and a reduction in export profits. At the same time, China as market is practically not considered by Kazakhstan as an alternative to the existing export directions. This is due to the China's energy policy, which takes the long-term view and limits further expansion of hydrocarbon resources in the Chinese economy. Accordingly, the main direction of oil supplies from Kazakhstan will remain the Russian direction for the time being. In particular, Kazakhstan intends to supply about 3.5 million tons of oil annually via the Baku-Supsa pipeline from 2023. In general, supplies of Kazakh oil via Russian territory are stable and risk-free.

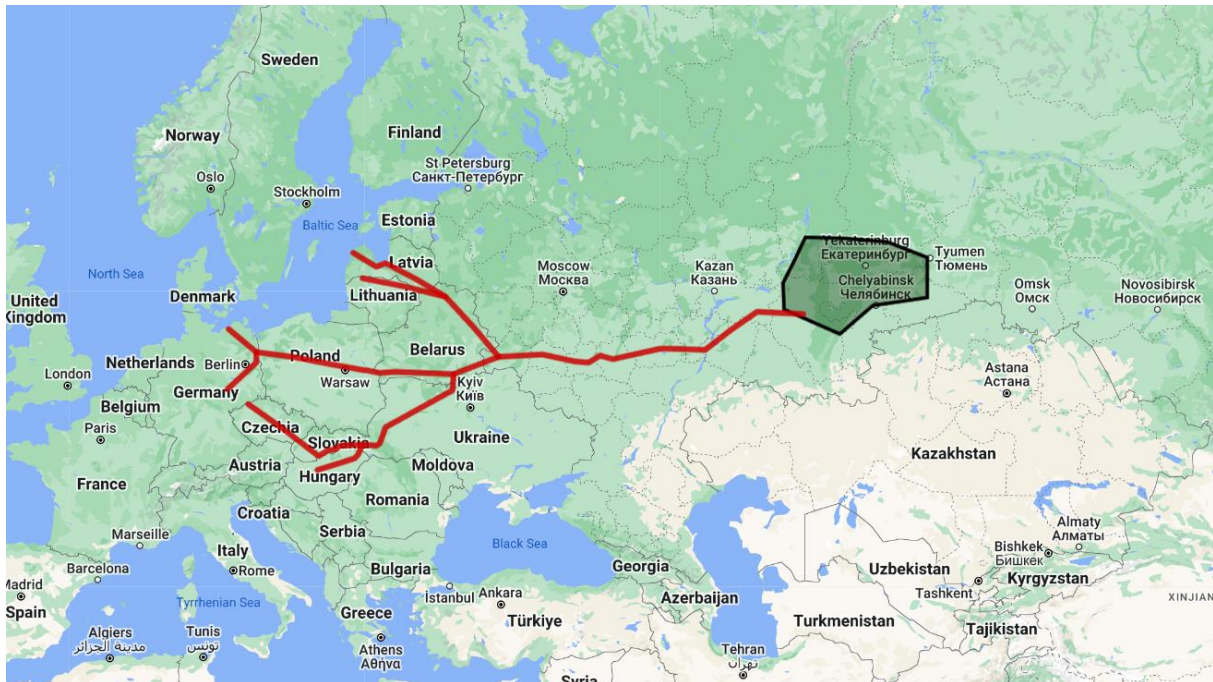
Kazakhstan relies on good friendships

The European oil market is very attractive for Kazakhstan, as it is seen as an alternative to other transportation routes. Recently, Kazakhstan has focused on supplying oil to Germany. This task is seen as one of the most important ones in Kazakhstan.

A window of opportunity for Kazakhstan opened after Germany stopped importing Russian oil and started looking for alternative oil sources. This explains Germany's growing interest in oil from Kazakhstan. This interest intensified significantly when the EU introduced new sanctions against Russia, which included new restrictions on the export of hydrocarbon resources. As a result, in September 2022, Germany announced the start of negotiations with Kazakhstan on the supply of Kazakh oil via the Druzhba pipeline³ system to replace Russian raw materials.

³ The Druzhba oil pipeline originates in the Russian city of Almeteyevsk, passes through Bryansk and then runs in two directions. One direction – North – leads to Belarus, then to Poland and then to Germany. The second route – South – leads from Belarus to Ukraine and on to Hungary, Slovakia and the Czech Republic.

The Druzhba Pipeline⁴



Source: Google Maps, own editing

While the German side rejected Russian oil and showed interest in hydrocarbons from Kazakhstan, it also hoped to be able to use the Russian pipeline infrastructure. The transit of Kazakh oil through Russian territory takes place within the framework of an agreement between the governments of Russia and Kazakhstan signed in 2002.

The Kazakh oil is to be exported to the city of Schwedt, where the oil refinery is located. It is designed for 12 million tons of oil per year. The refinery was previously owned by Rosneft, but was taken over by the Federal Network Agency in September 2022. The plant was originally designed to refine Russian oil.

Kazakhstan supplies KEBCO Blend with oil from the Karachaganak field. The Kazakh company KazMunaygas as well as foreign companies - Eni, Chevron, Shell - and the Russian

⁴ Type of Hydrocarbon: Oil

Year built: 1960 (completed in 1964)

Cost: USD 12.7 Million

Origin-Ending: Almatyevsk (Tatarstan) - Schwedt (Germany)/ Prague, Budapest

Countries: Russia - Belarus, Poland Germany (northern Druzhba) - Ukraine, Slovakia, Hungary, Czech Republic (southern Druzhba)

Adminstring Company: Transneft (Russia), Gomeltransneft Druzhba (Belarus), Ukrtransnafta (Ukraine), PERN Przyjazn SA (Poland), Transpetrol AS (Slovakia), Mero (Czech Republic) and MOL (Hungary).

Capacity: 3 Mbd

Diameter: 530, 630, 720, 820 and 1020 mm

Markets Involved: Druzhba is nowadays the main Oil supply source for the European continent

Subsidiaries: OAO MN Druzhba (Rosneft Subsidiary)

company Lukoil are involved in the development of the field. The resources extracted from this field have so far also been delivered through Russia.

In December 2022, Transneft received an application from the Kazakh company KazTransOil to pump 1.2 million tons of oil to Germany. Kazakhstan began transporting its oil to Germany at the end of February 2023, which flows through the Druzhba oil pipeline. The hydrocarbon resources should be [delivered](#) to European consumers. Despite the statement of Energy Minister Bolat Akchulakov that the country has the necessary reserves and is ready to supply up to 6 million tons of oil annually, Kazakhstan is not able to supply the required amount.

Despite the strong presence of its neighbors, the EU is Kazakhstan's largest trading partner and foreign investor, accounting for almost 30 percent of foreign trade and 48 percent of total foreign direct [investment](#) in 2021. This makes the EU an important counterweight to the influence of Russia and China, which are central to Kazakhstan's multi-sectoral foreign policy.

Indeed, large European companies such as Shell, Eni and Total hold significant investments in the Kazakh fossil fuel industry and are active in exploration and excavation of fields too. Some of these companies have recently shown interest in investing in renewable energy projects. However, this has not been accompanied by a reduction in investment in fossil fuels.

At the moment, it is a crucial question to what extent Kazakhstan's future efforts to diversify its hydrocarbon reserves will bear fruit in the coming years. Kazakhstan's strong economic dependence on Russia is likely to continue in the future.