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### Energy cooperation between Kazakhstan and China under “One Belt and One Road”: current state, challenges and perspectives

#### Abstract

**Object:** The purpose of this study is to examine the opportunities and challenges of energy cooperation between Kazakhstan and China under “One Belt and One Road” (OBOR) using SWOT analysis and to propose optimization recommendations for upcoming energy cooperation projects between the two countries.

**Methods:** The methodology used in this study includes comparative data analysis and statistical analysis for quantitative data. A mind map was created using SWOT analysis to visualize the opportunities and challenges of energy cooperation between China and Kazakhstan.

**Findings:** The results of the study indicate that the complementarity of the energy structures of China and Kazakhstan is a motivation for energy cooperation. The risks of energy cooperation between China and Kazakhstan are mainly due to the instability of the international energy market. Energy cooperation under OBOR Initiative can help to promote the development of their economies.

**Conclusions:** According to the research, energy cooperation is one of the most important components of the OBOR Initiative. Through energy cooperation, Kazakhstan and China can realize their plans for the development of renewable energy sources as much as possible based on ensuring energy security.

**Keywords:** energy cooperation, Kazakhstan, China, economy, renewable energy, fossil energy, investment, SWOT analysis.

#### Introduction

The “One Belt and One Road” is a multilateralized cooperation mechanism proposed led by President Xi Jinping of the People's Republic of China (PRC) in 2013. The OBOR Initiative was proposed with the aim of establishing a diversified cooperation mechanism that would provide a platform for the countries at different stages of development to engage in cooperation and to participate in the sustainable development of global economization.

The OBOR Initiative is tasked with strengthening regional economic cooperation. To achieve this goal, China signed with more than 150 countries and 30 international organizations documents about the “OBOR Cooperation Initiative”. Its scope covers major development programs in mainland China, Central Asia, North and West Asia, the Indian Ocean coast, the Mediterranean coast, South America, Africa, and the At-

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lantic Ocean. International cooperation under the OBOR involves many aspects, including politics, economics, energy, transportation and infrastructure.

Economic and trade cooperation is one of the important topics in the OBOR Initiative. From 2013 to 2022, China's total imports and exports with OBOR countries amounted to \$19.1 trillion, and bilateral investment with OBOR countries exceed \$380 billion, of which China's foreign investment amounted to more than \$240 billion (State Council of the PRC, 2023).

So far, most of projects under OBOR Initiative have contributed to accelerating the economic development of various regions in the world. The OBOR cooperation region can be divided into six economic corridors based on geographic location. In "China-Pakistan Economic Corridor" has projects, such as the construction of Multan-Sukkur Motorway and Karakoram Highway, the commercial operations of Qasim coal-fired power plant and Sahiwal coal-fired power plant in Pakistan. "New Asia-Europe Land Bridge Economic Corridor" finished the projects like Budapest-Belgrade railway, the Pelkesac bay bridge. In Southeast Asia, the completion of projects such as the China-Laos railway and the Jakarta-Bandung high-speed railway marked the achievement of the "China-Indochina Peninsula Economic Corridor".

The "China-Mongolia-Russia Economic Corridor" has boosted the economic development between China, Russia and Mongolia. The Blagoveshchensk-Heihe Bridge and Amur River Railroad Bridge accelerated transportation between these countries, and gas pipeline "Power of Siberia" put into operation. The "China-Central Asia-West Asia Economic Corridor", which includes projects such as the China-Kyrgyzstan-Uzbekistan highway and gas pipelines Central Asia-China, has achieved notable results for the growth of commercial trade and stabilization of energy trade. The Myanmar-China crude oil and natural gas pipeline expands OBOR Initiative to Southern Asia. The Myanmar-China Railway and Bangladesh-China Friendship Bridge achieved positive progress on "Bangladesh-China-India-Myanmar Economic Corridor".

Energy cooperation is a key area in the construction of "One Belt and One Road". Energy infrastructure connectivity continues to develop, for example, the gas pipelines "Central Asia-China", China-Myanmar oil and gas pipelines, and natural gas pipeline "Power of Siberia" from Russia to China. In addition, China has carried out power interconnection projects with seven countries, including Russia and Mongolia.

Although energy cooperation projects under the OBOR have achieved many results, energy cooperation continues to be challenged with the complex geopolitical changes. In particular, the Russian-Ukrainian conflict and the Israeli-Palestinian conflict pose transportation risks and price premium effect. Many countries have also questioned the OBOR, such as Italy formal withdrawal from the One Belt and One Road Initiative in 2023 and Argentina also expressed willingness to withdraw from the OBOR Initiative. Is long-term energy cooperation under OBOR necessary for energy-exporting countries in the current situation of increasing oil and gas prices? With the effects of globalization, these impacts also have created uncertainty in many energy cooperation projects under OBOR. Here we propose the hypothesis that for economic development the advantages of energy cooperation under the OBOR Initiative will overbalance the risks.

This paper focuses on energy cooperation between China and Kazakhstan, while Kazakhstan has strategic geopolitical importance on the Eurasian continent and is an important hub for Eurasian energy trade and transportation. Kazakhstan, bordered by China to the east, Russia to the north and other Central Asian countries to the south, is a link for economic development in Central Asia.

It should be noted that investment cooperation in the energy sector between China and Kazakhstan began long before the OBOR initiative. Most of the joint projects have achieved effective results, including "Kazakhstan-China Oil Pipeline", "Central Asia-China Gas Pipeline" and "Kapshagai Photovoltaic Power Plant". More promising conventional and renewable energy projects are planned under OBOR. Analyzing the energy structures of Kazakhstan and China involves identifying development paths for future projects.

The purpose of the study is to analyze the energy potential of Kazakhstan and China, to identify problems and effective directions for the development of economic cooperation in this area, and to offer recommendations for the optimization of upcoming projects.

The analysis of the potential of energy cooperation between Kazakhstan and China in the framework of OBOR is based on SWOT analysis. The statistical methods of data processing used in the study are based on publicly available, official sources published by governments and international organizations. The main data sources are data published by the National Bureau of Statistics of China and Kazakhstan, economic development data published by the World Bank, the Statistical Review of World Energy published by the International Energy Agency (IEA), and energy corporations such as the British multinational oil and gas company British Petroleum (BP).

### ***Literature Review***

Due to the irreplaceable position of Kazakhstan and China in the international energy market, energy cooperation between the two countries has attracted a wide range of attention from economists to investors and market researchers.

Kazakhstan likely to gain more economic benefits from the cooperation with China under the OBOR Initiative. This conclusion pointed out from the research of Akmoldina, Alpysbayeva, Kapsalyamova. The links of economic development between China and Kazakhstan have become even closer because of their geographic location. Cooperation under OBOR Initiative makes more convenience for China and Kazakhstan to integrate logistical resources in transportation system and manufacturing information in the processing industry (Akmoldina et al., 2019).

Birimkulova and Dzhantaleeva mentioned in their studies about effective progress of cooperation between China and Kazakhstan under the “One Belt and One Road” Initiative. As Kazakhstan is located in the strategical position of Eurasian continent, one of the great significances of the opportunities for the future connective of Eurasian economy is cooperation between China and Kazakhstan under OBOR Initiative (Birimkulova, 2019; Dzhantaleeva, 2021).

The relation between OBOR Initiative and the Eurasian Economic Union in promoting the development of political alliances, economic development, energy cooperation and transportation system is mentioned in the study of Shakhanova and Garlick (Shakhanova, Garlick, 2020).

Chinese professor of economy Dong Xiucheng made the research on the opportunities and challenges faced by Chinese enterprises in the energy cooperation with Central Asian countries under the OBOR Initiative in terms of economic development and legal policies (Dong, 2020).

### ***Methods***

In order to identify trends and regularities in the development of the energy potential of Kazakhstan and China, the theoretical and methodological basis of the study is analytical, comparative, and systematic approaches. The method of comparative data analysis is used through statistical data published by national governments and official international organizations.

The method of statistical analysis revealed a positive correlation between energy consumption and economic growth. Analytical and systematized data on Chinese financing of Kazakhstani projects and their efficiency allow to identify trends and priorities for further energy cooperation between China and Kazakhstan.

The SWOT analysis used in the study identifies strengths, weaknesses, opportunities and threats regarding the planning of joint competitive and mutually beneficial projects, as well as to understand what strategic actions the two countries need to take.

### ***Results***

Firstly, in order to understand the energy structure of Kazakhstan and China, we analyze the energy production, and consumption in Kazakhstan and China. We list and analyze data on energy production, consumption and trade in Kazakhstan and China from 2018 to 2022, from which we can explain the current situation of energy structure and predict future developments.

#### **Overview of Kazakhstan and its energy structure**

Kazakhstan has a total area of 2,727,300 square kilometers and a total population of 20 million. Kazakhstan's economy dominates among the Central Asian countries with its GDP reaching \$225,3 billion dollars in 2022. In recent years Kazakhstan's GDP has been growing well with about 3 % annual growth rate (World Bank, 2023). The government has also adopted a series of sustainable development plans to revitalize its economic development in Kazakhstan are processing industry, services, manufacturing, agriculture and so on. According to data published by the Bureau of National Statistics of Kazakhstan, in 2022, the services sector accounted for 53 % of the country's GDP contribution from traditional energy industry (Bureau of National Statistics of Kazakhstan, 2023). The traditional energy industry has always been the cornerstone of Kazakhstan's economic development. In 2022 Kazakhstan's oil and gas sector contributed nearly \$18.9 billion to the national and local budgets, mainly to secure social assistance, healthcare, and education.

In terms of energy potential, Kazakhstan is rich in fossil resources and is a major producer of fossil energy. Until 2023, Kazakhstan's recoverable oil reserves are estimated at 4.4 billion tons and recoverable natural gas reserves at 1.6 trillion cubic meters (IEA, 2022). In 2022 Kazakhstan produced 84.1 million tons of oil and 26 billion m<sup>3</sup> natural gas, while the majority of the production is attributed to three major oil and gas projects — Tengiz, Karachaganak, and Kashagan (BP, 2023). The changes of Kazakhstan's energy production from 2018 to 2022 are shown in Table 1.

Table 1. The main indicators of Kazakhstan's energy production, 2018–2022

Years	2018	2019	2020	2021	2022
Crude oil (million tons)	90.4	90.6	85.7	85.9	84.1
Natural gas (billion m <sup>3</sup> )	39.2	33.5	30.6	26.7	26
Coal (million tons)	118.5	115	113.4	116.2	118
Renewable energy (terawatt/hours)	0.5	1.1	2.2	3.4	4.2
Solar (terawatt/hours)	0.1	0.4	1.2	1.6	1.7
Wind (terawatt/hours)	0.4	0.7	1.0	1.7	2.5

*Note – compiled by authors according to the data of the resources (Statistical Review of World Energy 2023, available at <https://www.energyinst.org/statistical-review>)*

From Table 1, we can see that Kazakhstan's fossil energy production has remained at a high level in recent years, especially oil and coal. Moreover, the volume of renewable energy production in Kazakhstan has been on a continuous growth trend for the last five years, which is closely related to the active development of clean energy projects in Kazakhstan. The production of renewable energy sources helps to alleviate Kazakhstan's dependence on fossil energy sources and enriches the diversity of the country's energy structure.

Energy consumption in Kazakhstan is gradually growing as the country's economy develops and the standard of living of its citizens rises. At present, 70 % of Kazakhstan's electricity is produced by 37 coal-fired power plants. Besides, Kazakhstan has 136 renewable energy stations and 40 hydroelectric power stations.

The dynamics of Kazakhstan's energy consumption in recent five years are presented in Table 2 as below:

Table 2. The main indicators of Kazakhstan's energy consumption, 2018–2022

Years	2018	2019	2020	2021	2022
Crude oil (exajoules)	0.66	0.67	0.59	0.63	0.78
Natural gas (exajoules)	0.6	0.71	0.64	0.78	0.78
Coal (exajoules)	1.52	1.44	1.37	1.40	1.44
Electricity (terawatt/hours)	107.3	106.5	108.6	115.1	114
Natural gas (terawatt/hours)	20.7	20.8	21.3	27.1	23.7
Coal (terawatt/hours)	79.6	78.1	73	75.2	76.8
Hydroelectricity (terawatt/hours)	10.4	10	9.8	9.2	9.2
Renewable (terawatt/hours)	0.5	1.1	3.7	3.4	4.2

*Note – compiled by authors according to the data of the resources (Statistical Review of World Energy 2023, available at <https://www.energyinst.org/statistical-review>)*

According to the Table 2 we can see that energy consumption in Kazakhstan is dominated by fossil energy consumption. In particular coal consumption accounts for 46 % of Kazakhstan's total energy consumption, oil and gas for 50 %, and renewable energy for 4 %. Kazakhstan's power generation is less clean, 114 terawatt hours (TWh) of total installed power capacity is generated in Kazakhstan in 2022, more than 82 % of which is generated by thermal, of which 76.8 TWh is coal-fired and 23.7 TWh is gas-fired.

Despite the abundant resources, domestic gas supply falls far short of its economic goals, centered on the fact that the gasification rate in many areas of northern and eastern Kazakhstan is 0 % (Bureau of National Statistics of Kazakhstan, 2022). In the electric power sector, power plants in Kazakhstan generate electricity at levels far below the limits of their capacity. Meanwhile, there is virtually no competition in the domestic retail and wholesale energy markets. For decades, the power sector in Kazakhstan has been managed by the State.

What can be seen is that renewable energy power plants in Kazakhstan have developed significantly in recent years. However, more investment is needed for the construction of renewable energy power projects, and the transmission and distribution infrastructure of the power system needs to be reintegrated according to the type of renewable energy source.

In sum, the structure of energy consumption in Kazakhstan is characterized by a predominance of oil and natural gas. Owing to the country's abundant oil and gas resources, these fossil fuels account for a large share of energy consumption. Furthermore, Kazakhstan is actively developing renewable energy sources, such as solar and wind power, to reduce its dependence on fossil fuels. In the future, with the transformation of the global energy structure and increased awareness of environmental protection, the structure of energy consumption Kazakhstan will gradually change, and the share of renewable energy will gradually increase.

#### Overview of China and its energy structure

China is a country in East Asia with a population exceeding 1.4 billion. China has area of 9,596,961 square kilometers, China's northern border is connected to Russia, Mongolia, and North Korea. Neighbors on China's western border are Kazakhstan, Kyrgyzstan, Tajikistan, Afghanistan, and Pakistan, and on its southern border are India, Bhutan, Myanmar, Vietnam, etc. China has become one of the most attractive economic giants in the world with an annual economic growth rate of over 6 % consistently. According to the World Bank, the GDP of China amounted to around \$17.9 trillion in 2022 (World Bank, 2023). China is not only one of the world's diversified economies, but also one of the key players in international trade. Major economic sectors include manufacturing, retail, energy generation, electronics, and telecommunication.

China's rapid economic development has led to a significant increase in its energy position. On the one hand, China is one of the world's major energy producers and consumers, and the world's largest importer of oil and gas resources. On the other hand, China is also the most active promoter of the global energy transition, combining energy technology with power technology and information technology, and vigorously stimulating the development of the renewable energy industry. Table 3 demonstrated some main indicators of energy production in China.

Table 3. The main indicators of China's energy production, 2018–2022

Years	2018	2019	2020	2021	2022
Crude oil (million tons)	189.3	191.6	194.8	198.9	204.7
Natural gas (billion m <sup>3</sup> )	161.4	176.7	194	209.2	221.8
Coal (million tons)	3697.7	3846.3	3901.6	4125.8	4560
Renewable energy (terawatt/hours)	636	732	863	1149	1367
Solar (terawatt/hours)	176	223	261	327	427
Wind (terawatt/hours)	365	405	466	655	762

Note – compiled by authors according to the data of the resources (Statistical Review of World Energy 2023, available at <https://www.energyinst.org/statistical-review>)

Table 3 demonstrates that, according to the data published by National Bureau of Statistics of China, in 2022 China coal production was 4.5 billion tons, oil production was 204 million tons and natural gas output was 221.8 billion cubic meters. All of China's fossil energy production has risen significantly in recent years, which has been linked to energy supply shortfalls caused by shocks in international energy markets.

Compared to the growth in energy production, China's energy consumption has shown a downward trend, which is associated with longer-lasting pandemic restrictions in China. Despite the liberalization of pandemic controls in China from 2023, the weakening international export markets for Chinese goods, the ongoing decline in the real estate sector (25 % of China's GDP), rising youth unemployment and declining consumer confidence have overshadowed this positive trend (World Bank, 2023).

The slowdown in the growth rate of China's total energy consumption in 2022 was partly due to the slowdown in China's economic growth, and partly due to the steady advancement of clean energy projects, which caused reduction of energy consumption intensity in 2022. Table 4 explains the changes of domestic energy consumption in China.

From Table 4 we can see that the share of renewable energy increased by 0.8 % in the energy consumption structure in 2022, the share of coal increased by 0.2 %, the share of oil decreased by 0.6 %, and the share of natural gas decreased by 0.4 % compared with the previous year. The decline in natural gas and crude oil consumption was mainly due to a decline in the total volume of industrial and chemical gas and transportation gas consumption (Peng, 2022).

The comparison of Table 3 and Table 4 reveals that the slowdown of energy consumption growth rate and the steady domestic energy production in China lead to a decline of the external dependence of oil, natu-

ral gas, and coal. The decline in external dependence on fossil energy does not mean that China’s demand for energy imports will always decrease. On the contrary, in order to ensure energy security, China will pay more attention to energy cooperation with other countries.

Table 4. The main indicators of China’s energy consumption, 2018–2022

Years	2018	2019	2020	2021	2022
Crude oil (exajoules)	27.12	28.49	28.74	29.52	28.16
Natural gas (exajoules)	10.22	11.10	12.12	13.69	13.53
Coal (exajoules)	80.47	82.52	84.25	87.54	88.41
Electricity (terawatt/hours)	7166	7503	7779	8534.3	8848.7
Natural gas (terawatt/hours)	215	232	247	287	290.6
Coal (terawatt/hours)	4765	4849	4917	5328	5397.8
Hydroelectricity (terawatt/hours)	1198	1272	1322	1300	1303
Renewable (terawatt/hours)	636	742	863	1148	1367

*Note – compiled by authors according to the data of the resources (Statistical Review of World Energy 2023, available at <https://www.energyinst.org/statistical-review>)*

The energy sector is a pillar of economic development, and its development contributes to economic growth in both Kazakhstan and China. At the same time, along with economic growth, the people’s living standard will improve, which will also drive the growth of energy consumption. We therefore have to consider the impact of energy when analyzing the economic situation of different countries. Figure 1 presents a comparison between changes in energy consumption ( $\Delta$ Energy) and GDP growth ( $\Delta$ GDP) in recent years in Kazakhstan and China respectively. For visualizing the trends, we use data of 2001 as the base data and use it to derive the general trend of energy and GDP development in Kazakhstan and China over the last 20 years.

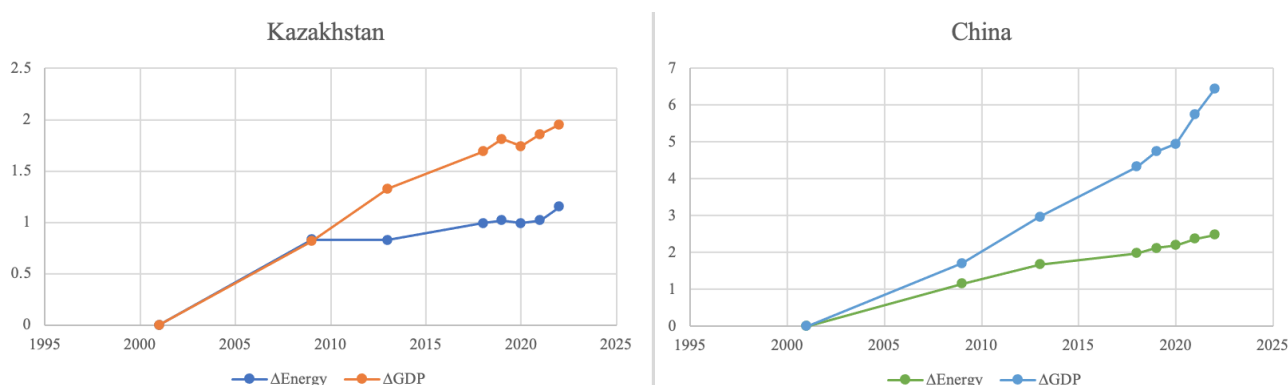


Figure 1. The trend of energy consumption and GDP development of Kazakhstan and China, 2001–2022

*Note — compiled by authors according to the data of the resources (World Bank, available at <https://data.worldbank.org/>)*

Figure 1 visualizes the positive correlation between economic growth and energy consumption both in Kazakhstan and China. In particular, the decade from 2001 to 2010 saw a trend of dramatic growth in economic growth and energy consumption in both countries. So far from 2015, the economic development of the two countries has remained stable, but the growth rate of energy consumption has slowed down, which is associated with strong support the two countries of the role of energy sources such as natural gas and renewable energy in the energy consumption structure. In the future, the development of the energy industry and energy comparison will continue to be one of the main topics in the economic growth of the two countries.

Energy security, affordability and sustainability are universal goals for the development of national energy sectors. China, which has a high degree of external energy dependence, is facing the risks about energy security when its energy consumption structure shifts to coal power, which reveals the reality of the dilemma of low-carbon transformation of China’s energy industry at the current stage.

Overall, the rapid development of China’s economy has changed China’s energy supply and demand, and the transformation of China’s energy supply structure has made China’s energy security more and more

prominent. Energy security has become a strategic issue for China and has also brought about the needs and considerations of how China can participate in and lead the global energy transition to low carbon.

### Discussions

By analyzing the situation of Kazakhstan and China and their energy structures, we can define that Kazakhstan and China have complementary interests in the energy sector. In the fossil energy sector, Kazakhstan is rich in oil and gas resources, and China's huge energy consumption requires security of energy supply through cooperation with Kazakhstan. In the renewable energy sector, Kazakhstan is committed to the development of new energy generation methods to further develop wind and photovoltaic energy in Kazakhstan. China has advanced technology and equipment in renewable energy and can provide financial and technical support for the development of Kazakhstan's renewable energy sector. The above factors provide sufficient motivation for China and Kazakhstan to develop energy cooperation under the OBOR Initiative.

#### *Kazakhstan — China energy cooperation under OBOR*

The introduction of China's "One Belt and One Road" Initiative has a very important relationship with Kazakhstan. A review of the development of the OBOR Initiative reveals that Chinese leader Xi Jinping first put forward the initiative to jointly build the "Silk Road Economic Belt" when he visited Kazakhstan in 2013. This shows that Kazakhstan is not only the core region of the OBOR project, but also one of the key partners in China's economic cooperation.

Several perspective areas of cooperation between China and Kazakhstan, such as oil production and natural gas processing industry, telecommunication, and the construction of infrastructure, were mentioned by Kazakh President Tokayev K.K. at the meeting of Kazakhstan-China Investment Roundtable in 2023.

Since 1997, Chinese enterprises have participated in a lot of oil and gas projects in Kazakhstan, such as exploration of Zhanakhol oil field and the modernization of Shymkent oil refinery. In addition, China has shown strong interest in investing in the development of wind and solar energy industry in Kazakhstan. Figure 2 illustrates the total amount of Chinese investment in Kazakhstan in different sectors from 2005 to 2023.

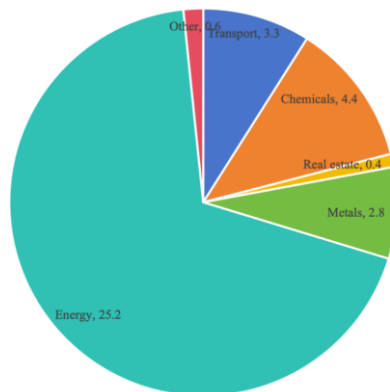


Figure 2. The value of China's investment in Kazakhstan, 2005–2023 (\$ billion)

Note – compiled by authors according to the data of the resource (Official website of National Bureau of Statistics of PRC, available at <http://www.stats.gov.cn>)

Figure 2 visualizes the fact that Chinese investment in Kazakhstan is focused on the energy sector. In the total amount of \$36.7 billion Chinese investment in various sectors of Kazakhstan \$25.2 billion was invested in the energy sector.

#### Traditional energy projects

The traditional energy cooperation between Kazakhstan and China is focused on those areas, such as oil and gas production, refinery modernization and pipeline construction projects. For now, China National Petroleum Corporation (CNPC) has invested about \$45 billion in Kazakhstan' oil and gas fields to increase the oil and gas production and provided technical support. As one of the leading operators in Aktobe region, the joint oil company CNPC–Aktobemunaigas had directly solved the local employment of about 20,000 residents. To improve the quality of oil processing CNPC invested \$1.6 billion to complete the modernization of the Shymkent Refinery.

The oil and gas pipeline constructions are landmark projects of OBOR Initiative. According to the data of National Bureau of Statistics of PRC, China imported 5.8 billion m<sup>3</sup> natural gas from Kazakhstan worth

\$1.4 billion through the Central Asian–China gas pipelines and 5.7 million tons crude oil worth \$3.7 billion through Kazakhstan–China oil pipeline system in 2023.

We can see that the focus of traditional energy cooperation between Kazakhstan and China in the future will put on expending oil pipeline and gas processing systems and increasing refinery capacity.

#### Renewable energy projects

The construction of six renewable energy power plants in Kazakhstan completed by Chinese companies marked the significant achievement of OBOR Initiative in Central Asia. Table 5 demonstrated the information about existing wind power plants (WPP) and solar power plants (SPP) in Kazakhstan invested and constructed by Chinese power companies under OBOR Initiative:

Table 5. Existing wind and solar power plants in Kazakhstan invested under OBOR Initiative

Power Plants	Region	Capacity	Investment	Construction Company
WPP in the Shelek corridor	Almaty region	60 MW	\$80 million	Samruk–Energy, China Power Corporation
Zhanatas WPP	Zhambyl region	100 MW	\$180 million	Visor Kazakhstan LLP China Power Corporation
Abay–1 WPP	Abay region	100 MW	\$173 million	Universal Energy
Ybyrai WPP	Kostanai region	50 MW	\$61 million	Universal Energy
Kapshagay SPP	Almaty region	100 MW	\$27 million	Eneverse Kunkuat
Kaskelen SPP	Almaty region	50 MW	\$29 million	Universal Energy

*Note – compiled by the authors*

From Table 5 we can find that the perspective of renewable energy projects for providing more green electricity for Kazakhstan in the future. The renewable energy projects not only present the sustainable development of OBOR Initiative, but also provide cheaper electricity with less CO<sub>2</sub> emissions. These renewable energy power plants could reduce about 1 million tons CO<sub>2</sub> emissions per year and meet the electricity needs of around 600,000 local households in Kazakhstan (IEA, 2022).

In East Kazakhstan region the Turgusum hydropower plant completed by China International Water and Power Corporation solves the problem of electricity deficit by 78 million kW·h per year and creates new jobs for residents.

The completion of Moynak HPP with capacity of 300 Megawatts replaced traditional coal-fired power plant and made an important contribution to energy security of the southern region of Kazakhstan. In the total construction cost of \$330 million, China Development Bank provided \$200 million loan as financial support.

The future share of renewable energy in Kazakhstan's energy structure needs to increase to at least 70 % to realize the Carbon-neutral plan by 2060 (Prime minister, 2021). To achieve the Carbon-neutral goal, Kazakhstan will provide full support for developing renewable energy projects. Meanwhile, Kazakhstan is studying the possibility of exporting electricity to Central Asia countries, Russia and even China in the framework of OBOR Initiative.

#### SWOT analysis on Kazakhstan-China energy cooperation

It is generally accepted that geopolitical, economic, social and technological factors influence international energy cooperation with different effectiveness. Through SWOT analysis, the study identifies the strengths, weaknesses, opportunities and risks of energy cooperation between China and Kazakhstan (Fig. 3).

According to Figure 3 let's analyze the key factors of strengths, weaknesses, opportunities and risks of energy cooperation between Kazakhstan and China from the following aspects.

#### Strengths

The importance of the energy sector for the “One Belt and One Road” can be seen by the fact that Chinese investment in Kazakhstan's energy sector has reached \$25 billion. Many renewable energy projects in Kazakhstan were launched with the financial support from the Asian Infrastructure Investment Bank, which established by the OBOR Initiative.

China's energy production and transportation has accumulated a lot of self-developed experience and technologies, especially in the field of unconventional oil and gas and renewable energy, which can provide technological innovations for Kazakhstan's energy sustainability.

Energy cooperation projects between China and Kazakhstan can provide more jobs for local residents and improve their income level and quality of life.



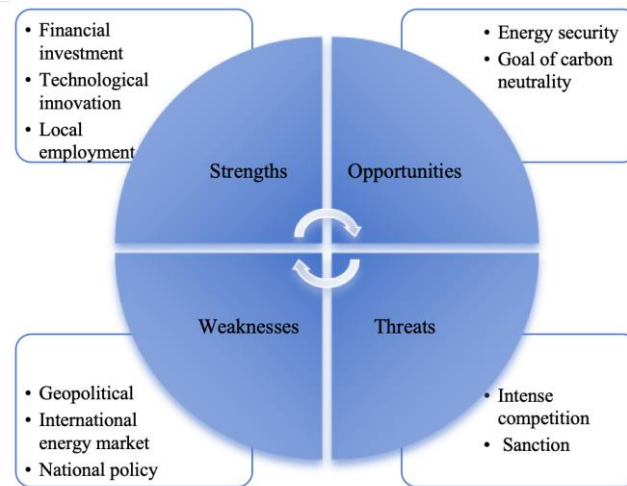


Figure 3. SWOT analysis on Kazakhstan-China energy cooperation

Note – compiled by the authors

#### Weaknesses

Kazakhstan is located at the strategic position on the Eurasian continent and is vulnerable to the geopolitical influence of neighboring countries. Adjustments in the energy strategies of neighboring countries, such as Russia, Turkmenistan, and Uzbekistan, will inevitably have a certain impact on Kazakhstan's energy industry.

The international energy market is in a state of instability, the blockage of Russian oil, and the OPEC+ policy of production cuts is having an impact on the implementation of new projects in Kazakhstan.

Kazakhstan's energy resource development and management policies are in a reform phase, and many national policies do not provide strong guarantees of marketability and economy, and there is some uncertainty.

#### Opportunities

Although Kazakhstan is relatively rich in natural resources, the infrastructure and distribution system needs to be improved. As well, China's rapid economic development needs to be supported by a reliable energy supply. Energy cooperation between the two countries is conducive to ensuring energy security for both sides.

Kazakhstan and China, as key players in the international energy market, are working together to achieve the 2060 carbon neutrality goal, and the two countries share a common vision of energy development. In addition to helping Kazakhstan reduce its carbon emissions, renewable electricity also offers the possibility of exporting Kazakhstan's electricity.

#### Threats

Kazakhstan's oil and gas development projects are led not only by national energy companies, but also by large multinational energy companies from Europe and the United States. This means that the energy companies involved in the project also face intense competition among themselves for operational and managerial power.

Against the backdrop of the Russia-Ukraine conflict, Kazakhstan's close political and economic ties with Russia could lead to economic sanctions against Chinese energy projects in Kazakhstan. Due to its tight trade and logistics ties with Russia, Kazakhstan is facing a growing risk of secondary sanctions, which poses a potential risk to energy cooperation between China and Kazakhstan.

In general, the strengths of energy cooperation between China and Kazakhstan include economic support and technological innovation, and the OBOR Initiative provides a platform for energy cooperation. The development of renewable energy projects in China and Kazakhstan creates more possibilities for ensuring national energy security and achieving carbon neutrality goals. The complex and volatile international energy environment and geopolitical conflicts have created many negative impacts and potential risks for energy cooperation between China and Kazakhstan.

#### Conclusions

This paper aims to identify the necessity of energy cooperation between Kazakhstan and China under OBOR Initiative. It analyzes the relations between energy and economic development, the details of energy

cooperation under OBOR Initiative and builds a SWOT analysis model. In the current international environment, energy cooperation between Kazakhstan and China under OBOR Initiative has a positive significance for the economic growth of the two countries, especially cooperation of renewable energy has a prospective meaning for guaranteeing the energy security. This finding confirms our proposed hypothesis.

The above analysis allows us to summarize the energy structure in Kazakhstan and China in recent years. The production of fossil and renewable energy sources in Kazakhstan has been growing steadily, which demonstrated the importance Kazakhstan attaches to the development of the energy sector. The structure of energy consumption in Kazakhstan is still characterized by the use of fossil energy as the main source of consumption. In particular, the renewable energy sources have driven the power sector of Kazakhstan.

In terms of energy structure of China, energy consumption reduced and domestic energy production increased have led to a decline in China's external energy dependence. This demonstrates the huge technological and innovative potential of China's domestic energy production, which can contribute to energy cooperation between China and Kazakhstan. China already possesses advanced technology and rich experience in the utilization of renewable energy and has contributed to the realization of China's low carbon policy.

The energy sector has been a key sector for Chinese investment since the OBOR Initiative was launched in 2013. The investment from China in the energy sector of Kazakhstan has reached \$25 billion, and it is noteworthy that China is enthusiastic about investing in the renewable energy industry. For Kazakhstan, renewable energy power plants with photovoltaic and wind power not only reduce CO<sub>2</sub> emissions, but also provide a clean and efficient source of electricity for the local population.

The results of the study indicate that energy cooperation is one of the most prospective topics of the OBOR Initiative. Through energy cooperation, Kazakhstan and China gain more opportunities to realize the development of renewable energy sources based on ensuring energy security. This paper provides a comprehensive investigation and analysis of Kazakhstan–China energy cooperation under OBOR, which key points can be concluded as the following aspects: a) The energy projects in which China and Kazakhstan have jointly participated have achieved positive results and established a good foundation for newly signed cooperation. The advantages of Kazakhstan–China cooperation lie in the stable political environment and rapid economic development of the two countries. Weaknesses lie in its vulnerability to geopolitics and international energy markets; b) China and Kazakhstan are technically and economically complementary in the development of their energy sectors, and China's need for energy security and Kazakhstan's goal of renewable energy development make energy cooperation attractive and effective; c) Under the instability of global political and economic situation, the realization of sustainable energy cooperation requires the joint efforts of Kazakhstan and China. Energy cooperation between China and Kazakhstan will not only stimulate the development of the regional economy, but will also activate the international energy market.

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### **Қазақстан мен Қытай арасындағы «Бір белдеу және бір жол» шеңберіндегі энергетикалық ынтымақтастық: ағымдағы жай-күй, сын-тегеуріндер мен перспективалар**

#### **Аңдатпа:**

**Мақсаты:** Зерттеудің мақсаты SWOT–талдауды пайдалана отырып, «Бір белдеу және бір жол» (OBOR) шеңберінде Қазақстан мен Қытай арасындағы энергетикалық ынтымақтастықтың мүмкіндіктері мен проблемаларын зерделеу және екі ел арасындағы алдағы энергетикалық ынтымақтастық жобалары үшін оңтайландыру бойынша ұсынымдар ұсыну.

**Әдісі:** Зерттеуде деректерді салыстырмалы талдау және сандық деректерді статистикалық талдау әдістері қолданылған. SWOT–талдауды пайдалана отырып, Қытай мен Қазақстан арасындағы энергетикалық ынтымақтастықтың мүмкіндіктері мен проблемаларын визуализациялау үшін зияткерлік картасы жасалды.

**Қорытынды:** Зерттеу нәтижелері Қытай мен Қазақстанның энергетикалық құрылымдарының өзара толықтырылуы энергетикалық ынтымақтастық үшін мотивация болып табылатынын көрсетеді. Қытай мен Қазақстан арасындағы энергетикалық ынтымақтастықтың тәуекелдері негізінен халықаралық энергетикалық нарықтың тұрақсыздығына байланысты. OBOR бастамасы шеңберіндегі энергетикалық ынтымақтастық олардың экономикаларының дамуына ықпал етуі мүмкін.

**Тұжырымдама:** Зерттеуге сәйкес, энергетикалық ынтымақтастық OBOR бастамасының маңызды құрамдас бөліктерінің бірі. Энергетикалық ынтымақтастықтың арқасында Қазақстан мен Қытай энергетикалық қауіпсіздікті қамтамасыз ету негізінде жаңартылатын энергия көздерін дамыту жөніндегі өз жоспарларын барынша іске асыра алады.

**Кілт сөздер:** энергетикалық ынтымақтастық, Қазақстан, Қытай, экономика, жаңартылатын энергия көздері, қазба энергия көздері, инвестициялар, SWOT–талдау.

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### **Энергетическое сотрудничество между Казахстаном и Китаем в рамках «Одного пояса—одного пути»: текущее состояние, вызовы и перспективы**

#### **Аннотация:**

**Цель:** Целью данного исследования является изучение возможностей и проблем энергетического сотрудничества между Казахстаном и Китаем в рамках Программы «Один пояс—один путь» (OBOR) с использованием

SWOT-анализа и предложение рекомендаций по оптимизации для предстоящих проектов энергетического сотрудничества между двумя странами.

**Методы:** Методы, используемые в этом исследовании, включают сравнительный анализ данных и статистический анализ количественных данных. С использованием SWOT-анализа была создана интеллектуальная карта для визуализации возможностей и проблем энергетического сотрудничества между Китаем и Казахстаном.

**Результаты:** Результаты исследования указывают на то, что взаимодополняемость энергетических структур Китая и Казахстана является мотивацией для энергетического сотрудничества. Риски энергетического сотрудничества между Китаем и Казахстаном в основном обусловлены нестабильностью международного энергетического рынка. Энергетическое сотрудничество в рамках инициативы OBOR может способствовать развитию их экономик.

**Выводы:** Согласно исследованию, энергетическое сотрудничество является одним из важнейших компонентов инициативы OBOR. Благодаря энергетическому сотрудничеству Казахстан и Китай могут максимально реализовать свои планы по развитию возобновляемых источников энергии на основе обеспечения энергетической безопасности.

**Ключевые слова:** энергетическое сотрудничество, Казахстан, Китай, экономика, возобновляемые источники энергии, ископаемые источники энергии, инвестиции, SWOT-анализ.

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