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Bachelor Thesis

Oil industry: Assessment of Kazakhstan's position in international oil trade

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Oil industry: Assessment of Kazakhstan's position in international oil trade

Objectives of thesis

The primary objective of the bachelor's thesis is to appraise the position of Kazakhstan in the world oil trade. In particular, the author considers the Republic of Kazakhstan as an alternative exporter of crude oil to Europe. The sub-goals are presented as follows:

- to analyze the current state of the global oil market;
- to evaluate the oil sector of Kazakhstan;
- to identify difficulties associated with oil export of the Republic of Kazakhstan;
- to determine Kazakhstan's crude oil export potential.

Methodology

The information contained has been obtained from scientific articles, textbooks, websites, and annual reports of oil companies. The theoretical part begins with a description of the main crude oil quality characteristics that influence oil pricing. Then the petroleum industry value chain is considered. Subsequent parts of the thesis are based on quantitative research with the inclusion of statistical analysis. The author examines the current state of the global oil market. Further, the oil sector of the Republic of Kazakhstan becomes the object of the study, which is analyzed by such key indicators as oil reserves, crude oil quality, oil production, oil self-sufficiency, oil exports, and capabilities of oil export infrastructure. In the final part of the thesis, the results of the previous parts are summarized and discussed.

The proposed extent of the thesis

40-50 pages

Keywords

Crude oil quality, benchmarks, petroleum industry, OPEC, energy crisis, global oil market, oil prices, oil trade, Kazakhstan oil sector, Europe.

Recommended information sources

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Declaration

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In Prague on 15th March 2023

_____ Shaldina Viktoriya _____

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Oil industry: Assessment of Kazakhstan's position in international oil trade

Abstract

Nowadays, the world is undergoing the first significant energy crisis of the twenty-first century. The tightening of energy markets commenced in 2021, but after Russia's invasion of Ukraine, the situation eventually deteriorated into a full-scale energy catastrophe. The thesis analyses the current state of the global oil market and identifies the factors that contributed to the upsurge in oil prices. Although the energy crunch has major consequences for economies worldwide, Europe is at the epicenter of this crisis. This is due to the fact that Russia is one of the world's top exporters of fossil fuels and has historically been a pivotal supplier to Europe. Since Kazakhstan possesses substantial oil reserves, in the practical part, the author evaluates the country's oil sector in order to consider the Republic of Kazakhstan as an alternative oil supplier to the European Union. As a result, the author determined Kazakhstan's crude oil export potential and detected related issues.

Keywords: Crude oil quality, benchmarks, petroleum industry, OPEC, energy crisis, global oil market, oil prices, oil trade, Kazakhstan oil sector, Europe.

Ropný průmysl: Hodnocení pozice Kazachstánu v mezinárodním obchodu s ropou

Abstrakt

V současnosti svět prochází první významnou energetickou krizí 21. století. Zpříšňování energetických trhů začalo v roce 2021, ale po ruské invazi na Ukrajinu situace přerostla v totální energetickou katastrofu. Tato práce analyzuje současný stav světového trhu s ropou a identifikuje faktory, které přispěly k růstu cen ropy. Přestože energetická krize má závažné důsledky pro ekonomiky na celém světě, Evropa je v epicentru této krize. Děje se to díky tomu, že je Rusko jedním z předních světových vývozců fosilních paliv a také historicky hlavním dodavatelem těchto paliv do Evropy. Vzhledem k tomu, že Kazachstán disponuje značnými zásobami ropy, autor v praktické části zhodnocuje ropný sektor země s cílem považovat Kazašskou republiku za alternativního dodavatele ropy do Evropské unie. V důsledku toho autor určil exportní potenciál Kazachstánu surové ropy a odhalil související problémy.

Klíčová slova: Kvalita ropy, benchmarky, ropný průmysl, OPEC, energetická krize, globální trh s ropou, ceny ropy, obchod s ropou, ropný sektor Kazachstánu, Evropa.

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1 Introduction

Oil is a naturally occurring result of decomposing animals and vegetation [1]. Over millions of years, layers of organisms were progressively buried behind increasing thicknesses of rock and sediment, deeper and closer to the earth's core, which caused the temperature of the organic matter to climb. This heating disintegrated the organic material with the release of hydrocarbons [2].

Crude oil is a combination of hydrocarbons, ranging from nearly solid to gaseous, with a low concentration of other chemical compounds [3]. Oil must be processed into products with the desired properties before being used. Petrochemicals are of great importance in household energy consumption [4]. The key significance of oil stems from the fact that it is a versatile and powerful energy source. Energy is generated in large quantities from a tiny amount of oil. Petroleum energy is relatively cheap and can be transported over long distances. Crude oil, at the same time, is a non-renewable fossil resource that is highly polluting. Other energy sources such as wood, coal, hydro and nuclear power plants also have their advantages and disadvantages. Undoubtedly, the optimal source of energy will be clean and renewable [5]. Green energy, however, requires large-scale investments, breakthrough technologies, and extended lead periods [4]. Thus, petroleum continues to dominate world energy consumption despite the development of alternative sources of energy. The intention of many states, particularly economically advanced ones, to increase the share of renewable sources in the national energy balance should not be underestimated. But the «death sentence» for oil, which many politicians and experts repeatedly tried to impose, turned out to be premature [6]. Petroleum provides the fuel that drives the internal combustion engine. These engines are still implemented in various transport modes today. Moreover, crude oil is the raw material for the fuels exploited in jet and rocket engines. Oil also serves as a feedstock for the production of more than a thousand other goods, particularly medicines, cosmetics, detergents, plastics, paints, fertilizers, pesticides, and even food supplements [5].

Petroleum has contributed to the exponential development of society, technical progress, and industrial complexity [7]. Under current conditions, crude oil remains the primary source of energy and occupies a leading position in the global fuel and energy balance. Oil dependence has existed for many decades and is expected to persist in the foreseeable future [8]. In most scenarios of world economic development, oil demand will

rise primarily as a result of emerging nations' accelerated economic growth. However, as the contradicting experience of previous years has demonstrated, the global oil market can be susceptible to abrupt conjuncture fluctuations. The high volatility of oil prices puts states in a difficult socio-economic and political situation [6]. Nevertheless, if the world forfeited petroleum, progress would be slowed and life could become intolerable [4]. It is no coincidence that the oil sector is at the center of geopolitical confrontation and subject to sanctions and restrictions [6].

2 Objectives and Methodology

2.1 Objectives

The primary purpose of the bachelor's thesis is to appraise the position of Kazakhstan in the world oil trade. In particular, the author considers the Republic of Kazakhstan as an alternative exporter of crude oil to Europe. The sub-goals are presented as follows:

- to analyze the current state of the global oil market;
- to evaluate the oil sector of Kazakhstan;
- to identify difficulties associated with oil export of the Republic of Kazakhstan;
- to determine Kazakhstan's crude oil export potential.

2.2 Methodology

The information contained in this research work has been obtained from scientific articles, textbooks, websites, and annual reports of oil companies. The theoretical part begins with a description of the main crude oil quality characteristics that influence oil pricing. Then the petroleum industry value chain is considered. Subsequent parts of the thesis are based on quantitative research with the inclusion of statistical analysis. The author examines the current state of the global oil market. Further, the oil sector of the Republic of Kazakhstan becomes the object of the study, which is analyzed by such key indicators as oil reserves, crude oil quality, oil production, oil self-sufficiency, oil exports, and capabilities of oil export infrastructure. In the final part of the diploma thesis summarises and discusses the results of sections.

3 Literature Review

3.1 Crude oil quality characteristics

Oil is a multi-component organic mixture that inherently comprises saturated and aromatic hydrocarbons, asphaltenes, resins, and hetero-functionalized organic compounds enclosing sulfur, oxygen, and nitrogen [3]. The quality of crude oil can vary considerably depending on the localization of the oil and the conditions surrounding its formation. Distinct physical attributes of crude are employed to construct optimal refineries, categorize the oil, and establish an acceptable price for it [9]. Three main criteria are used by the petroleum industry to evaluate the quality of crude oil:

- 1) The geographical location of production (which influences the cost of transferring oil to a refinery) [10].
- 2) The sulfur concentration.

Crude oil is classified as sweet if it has a comparatively low sulfur concentration (less than 0,5% sulfur content) or sour if it has a high sulfur concentration (more than 1,8% sulfur content). Sweet oil is more precious since it requires less processing before use. Sour oil is less expensive than sweet oil because it poses larger ecological issues and demands additional refining to comply with buyer-imposed sulfur-content requirements. The level of sulfur is crucial due to the circumstance that it specifies the kind of treatment necessary at the refinery. The increased sulfur content is more caustic to equipment and detrimental to the environment [11].

- 3) The API gravity.

The American Petroleum Institute has developed a gravity scale, based on degrees, to measure the relative density of miscellaneous crudes. Pale oil with a liquid consistency includes fewer metals and sulfur compounds. It is referred to as light oil. Opposed to medium and heavy crude oils, light crude oil is more pricey due to its low density. Lighter crude can be refined into premium outputs such as gasoline and diesel fuel. Oil rich in sulfur and metals is considered to be a low-grade heavy crude with a fairly high density. Such oil is longer to produce and more complicated to refine.

- Light oil: API gravity higher than 31,1 degree;
- Medium oil: API gravity between 22,3~31,1 degree;
- Heavy oil: API gravity between 10~22,3 degree [11].

3.1.1 Conventional and unconventional oils

Conventional oil is discovered in a liquid state, which facilitates its extraction to the surface. The production of liquid hydrocarbons involves the employment of less expensive standard techniques. Unconventional oil cannot be extracted by pumping from a regular production well in its natural condition without being diluted or heated, hence it must be produced using unconventional methods. There are four types of unconventional oil: heavy oil, extra heavy oil, oil shale, and oil sand. The heavier the oil, such as bitumen and kerogen, the more carbon, sulfur, and toxic impurities it contains. Compared to even the lowest-grade conventional oils, unconventional oils tend to be much heavier and sourer. As traditional oil reserves are depleted, unconventional oil begins to be exploited more. The development of non-conventional fields has tremendous prospects since it is appraised that a major part of oil and gas stocks reside in unconventional reservoirs. It will be feasible to obtain nontraditional oil more economically with the emergence of new technologies. Alternative oils are anticipated to incrementally transform the whole petroleum value chain industry [12].

3.2 Petroleum industry value chain

The oil industry is subdivided into three pivotal segments: upstream, midstream, and downstream [13].

3.2.1 The upstream sector

Upstream operations encompass explorative work, such as searching for subterranean or subaquatic oil deposits, and initial drilling, followed by the production stage [9].

Exploration

The process of discovering oil reservoirs is known as exploration. This part of the upstream sector is capital-intensive, time-consuming, and exceedingly unpredictable, even with specialized equipment and experts [2]. Drilling a well is the only method to be completely confident that there is oil underground. It entails a significant risk because not all wells consequence in the finding of oil. Before a new oil field is detected, a multitude of

diverse wells may require to be drilled. This is quite expensive considering elaborate equipment is involved and numerous personnel must be engaged. Drilling an exploratory oil well might cost anywhere from \$1 million to \$35 million [9]. Therefore, the decision to drill is made after the evaluation phase, which considers economic parameters and ecologic exposures in conjunction with geologic, magnetic, seismic, and gravimetric data [14].

Production

The production stage commences afterward the first exploration phase and the drilling of exploratory wells. Drilling is classified as either onshore or offshore [9].

- Offshore drilling.

Oil reserves buried underneath the pond's bottom can be retrieved by offshore drilling. Compared to onshore drilling, offshore is more problematic in terms of production, transportation, and environmental safeguard [14]. Oil companies have devised offshore platforms to facilitate the extraction process. Even before oil production, offshore drilling necessitates more than 65% of the anticipated expenditure, thereby raising the possibility of financial loss [9].

- Onshore drilling.

Onshore drilling, in contradistinction to offshore drilling, is associated with lesser risks and comparatively low expenditures. Oil is delivered to gathering centers for separation from salt, sand, water, and gas immediately beyond extraction. After being piped into storage reservoirs, the crude oil is transported to a refinery for further processing [9].

3.2.2 The midstream sector

The midstream industry is primarily responsible for the storage and transportation of oil, although it may incorporate functions of the upstream and downstream sectors. The midstream connects distant areas of oil production with refineries and ends customers [13]. Transportation is a crucial part of the midstream segment, and it is accomplished via pipeline networks, railways, trucks, and vessels.

- Oil transportation by pipeline.

Pipelines are the industry's underpinning since it is the most efficacious, reliable, and cheapest way of transporting oil. Despite the existence of subaqueous pipings, the vast

majority of pipelines are designed for terrestrial transit. Governments, political organizations such as the European Union, or development banks such as the European Investment Bank predominantly commission and invest in pipeline projects. This infrastructure pays off fairly quickly, notwithstanding considerable initial investments [2].

- Oil transportation by sea.

Marine vessels, which generally involve tankers and barges, are the second most cost-effective solution for long-distance oil transportation [10]. The equivalent of 45 railway tanks can be hauled on a standard 30,000-barrel tank barge for roughly a third of the price [2].

- Oil transportation by rail.

Specialized cargo trains make it possible to carry moderate oil capacities over any distance, regardless of the season, and at a faster rate than, for instance, vessels. Rail transport has comparatively high costs of operation [15].

- Oil transportation by road.

This means of transportation is quite costly due to load capacity limitations, therefore tanker trucks tote oil only over short distances and in modest capacities. Among the common methods of oil moving, trucks are the most flexible. Road tankers are ordinarily used to deliver refined oil to distribution points, such as petrol to filling stations [2].

3.2.3 The downstream sector

The downstream segment includes a wide range of refined outputs that are supplied and sold to diverse end consumers depending on the product's purpose [2]. Refineries are complicated industrial facilities that execute a series of procedures to alter crude oil into useful goods. Separation, conversion, and treatment are the three fundamental operations conducted by oil-processing plants [10].

- Separation is a distillation process in which crude oil is heated and separated into various derivatives based on the boiling points of its constituents.
- Conversion is a cracking process in which heavy hydrocarbons are converted into lighter more valuable outcomes under the influence of high temperatures, pressure, and chemical catalysts.

- Treatment is a blending process in which the quality characteristics of final products are specified [9].

All of the aforementioned processing stages are intended to enhance the added value of the purified materials. Simpler refineries only accomplish the first and third phases, but more advanced refineries additionally involve the second step of conversion. Multiple outputs, notably gasoline, diesel, jet fuel, propane, natural gas, synthetic rubber, plastics, pharmaceuticals, and pesticides, are produced by the downstream sector [2].

3.3 Crude oil benchmarks

The application of benchmarks facilitates both seller's and buyer's evaluation of different crude oil types produced throughout the globe. Although there are roughly 160 distinct reference oils, the price of most of them is tied to one of the following main standards:

- Brent crude.

Brent blend is the most ubiquitously used benchmark. Oil extracted from Norwegian and British North Sea fields provided the historical basis for Brent. Over 60% of all crude oil sales worldwide apply this standard as a direct or indirect reference for determining the price of light-sweet crude. According to the EIA, it is predominantly utilized in Europe, Australia, Africa, the Mediterranean, and several Asian countries [16].

- West Texas Intermediate.

West Texas Intermediate is light-sweet crude produced in the United States. This benchmark is used to price sundry domestic (North Dakota, Gulf of Mexico) and imported oils (Latin America, Canada). In contrast to the Brent market, which is founded on offshore production and maritime supplies, the WTI market is based on pipeline connections [16].

- OPEC Reference Basket.

This reference is a weighted average of prices for crude oil flows from the Organization of the Petroleum Exporting Countries. It is computed by the OPEC Secretariat in Vienna and represents each participant government's oil production and exports. Currently, the OPEC Basket contains 13 distinct crudes: Murban (UAE), Arab Light (Saudi

Arabia), Qatar Marine (Qatar), Kuwait Export (Kuwait), Merey (Venezuela), Es Sider (Libya), Oriente (Ecuador), Rabi Light (Gabon), Bonny Light (Nigeria), Girassol (Angola), Basra Light (Iraq), Saharan Blend (Algeria), Iran Heavy (Iran) [16].

- Dubai-Oman crude.

The marker was originally premised on Dubai crude, but when output there decreased, oil from Oman fields was appended to maintain the benchmark's subsequent usage. Eventually, this standard implies the average cost of Oman and Dubai crudes (both light to medium and sour). It is employed to set the price for oil leaving the Persian Gulf and the Middle East for Asian markets [16].

3.4 Oil market supply and demand

The world requires more energy as its population increases and as nations become more economically advanced. The United States has the biggest oil demand in the world while having just over 4% of the global population. This country consumes approximately a quarter of global oil production and 45% of worldwide gasoline output. The optimal supply levels are necessitated to meet global oil demand without causing market imbalances [9]. The balance between supply and demand defines crude prices, which affect trading dynamics, political decisions, environmental repercussions, and the bottom lines of producers, retailers, and transporters [17]. If supply falls, prices rise until demand equals supply. The peculiarity of oil is that demand is inelastic in the short term: price increases have minimal influence on demand. Therefore, even a slight drop in oil supply leads to soaring prices [18].

Regarding supply, several major actors have historically had the greatest impact on the oil market, especially the Organization of the Petroleum Exporting Countries [17]. Founder members Venezuela, Saudi Arabia, Kuwait, Iran, and Iraq established OPEC in response to the actions of the "Seven Sisters", a group of major international oil companies [9]. Since the Organization of the Petroleum Exporting Countries is capable to produce over a third of the world's crude oil, even minor alterations in their combined output are more conspicuous than for most other suppliers [17]. The primary objective of OPEC is to maintain oil market stability by avoiding extreme prices. The cartel may ramp up oil output if demand abruptly

rises and supply becomes insufficient, and vice-versa [9]. With the accession of OPEC+, OPEC has expanded to encompass more than 20 governments, which hold over 80% of the world's proven crude oil reserves. Delegates gather twice a year in Vienna to deliberate whether to increase or decrease oil production in order to preserve market equilibrium [17]. Actually, the oil market is never in a state of market equilibrium, but tends to it, like any other economic system. The ability of OPEC to stabilize the market extends primarily to short-term supply changes in reaction to market shocks or fluctuations. The organization has never been able to stabilize the market in response to structural shifts, hence being unable to influence long-term processes [19].

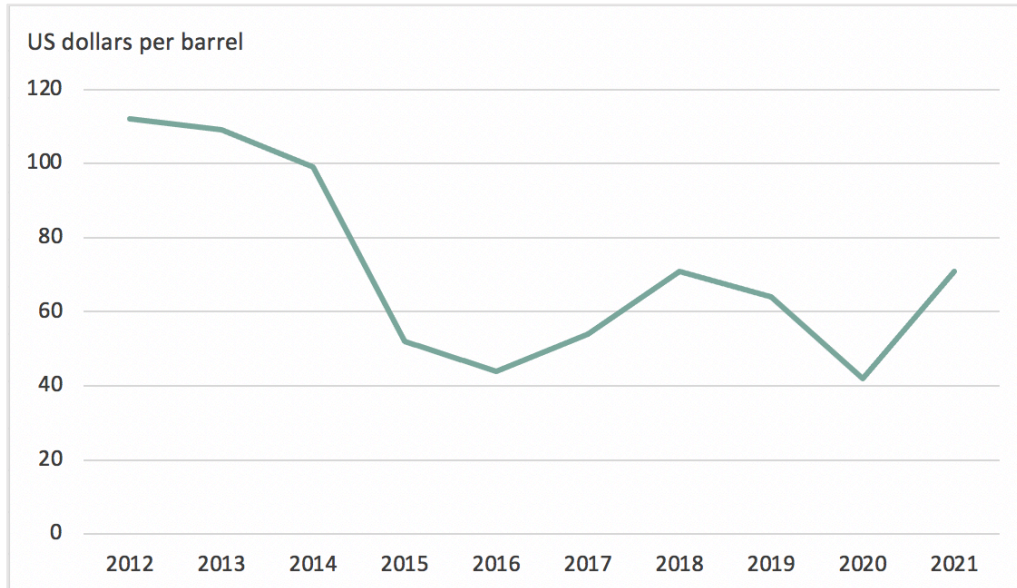
3.5 Current oil market tendencies

3.5.1 Global energy crisis

The world is presently experiencing the first major energy crisis of the twenty-first century. Pressure on markets began in 2021 as the prompt economic rebound from the coronavirus pandemic overloaded all possible global supply chains, comprising energy. There were additional factors associated with weather conditions and more frequent supply interruptions surrounding maintenance carried over from 2020 due to the COVID-19 outbreak. Another matter that aggravated the crisis was Europe's dependence on Russian energy resources. Every fifth unit of primal energy consumed by the EU in 2021 was imported from Russia. Since the Russian Federation is one of the biggest exporters of fossil fuels in the world, its invasion of Ukraine has forced the European Union to respond with sanctions on energy imports from Russia, thereby cutting an important artery of global energy trade. As a consequence, the crisis escalated into a full-scale energy catastrophe - a shock of unprecedented breadth and complicatedness [20].

3.5.2 Crude oil prices

Figure 1: Annual average Brent price from 2012 to 2021

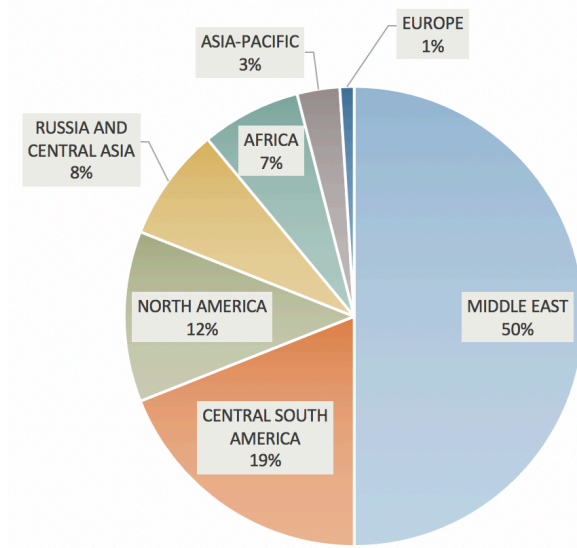


Source: Created by the author based on data from Statista.

Crude oil prices surged in 2021, as rising COVID-19 vaccination rates, relieving pandemic-related restraints, and an expanding economy induced worldwide oil demand to outpace supply, according to Energy Information Administration. Brent, the most widely used benchmark, averaged \$71 per barrel in 2021, which is a three-year high. The price of Brent crude increased by 59% in 2021 compared to 2020. Oil production in the world rose more slowly than demand, leading to higher prices. Sluggish output growth was primarily due to a reduction in crude oil production during the coronavirus outbreak, although it began to climb again in 2021. Nevertheless, the planet is currently facing the first serious energy crisis of the twenty-first century. Since Russia is a large producer and exporter of oil and gas, its recent invasion of Ukraine has aggravated the situation with the energy crunch. Moreover, market stipulations brought on by sanctions on Russian oil and gas limit the supply and promote high petroleum prices.

3.5.3 Global oil reserves

Figure 2: World oil reserves in 2021 by region



Source: Created by the author based on Eni World Energy Review 2022.

The region with the largest proven crude oil reserves on the planet is the Middle East, where most OPEC countries are located. Over the last three decades, the Middle East's share of world oil reserves has declined from more than 60% in 1992 to 50% in 2021. The discovery of substantial oil sand deposits in America was the primary driver of this downturn. For instance, proven oil reserves in Canada skyrocketed from 5 billion to 180 billion barrels in 2002. As a result, unconventional oil introduced a new period of world oil reserve supremacy [21].

Table 1: Top 10 world oil reserves holders in 2021

Rank	Country	Oil reserves (million barrels)	Global share
1	Venezuela	303,468	17,5%
2	Saudi Arabia	267,192	15,4%
3	Iran	208,600	12,1%
4	Canada	165,916	9,6%
5	Iraq	145,019	8,4%
6	United Arab Emirates	111,000	6,4%
7	Russia	107,804	6,2%
8	Kuwait	101,500	5,9%
9	Libya	48,363	2,8%
10	Nigeria	37,050	2,1%

Source: Created by the author based on Eni World Energy Review 2022.

According to Eni World Energy Review 2022, at the end of 2021, global proven oil reserves stood at 1,729,546 million barrels. Ten countries controlled 86,4% of worldwide oil reserves. Venezuela was the pacesetter with over 303 billion barrels of oil underneath its surface. Saudi Arabia ranked second on the list with 267 billion barrels, and Iran was third with 208 billion barrels of crude oil. The three leading countries accounted for 45% of all world oil resources.

3.5.4 Global oil production

Substantial oil reserves do not automatically equate to high levels of production. These resources must have the capability to be extracted under existing technical limitations. The oil production of the United States is impressive, given the fact that the country does not occupy a leading position in the ranking of global oil reserves.

Table 2: Top 10 world oil producers in 2021

Rank	Country	Oil production (thousand barrels/day)	Global share
1	United States	16,723	18,5%
2	Saudi Arabia	11,036	12,2%
3	Russia	10,867	12,0%
4	Canada	5,625	6,2%
5	Iraq	4,132	4,6%
6	China	4,060	4,5%
7	United Arab Emirates	3,561	3,9%
8	Iran	3,396	3,8%
9	Brazil	3,004	3,3%
10	Kuwait	2,719	3,0%

Source: Created by the author based on Eni World Energy Review 2022.

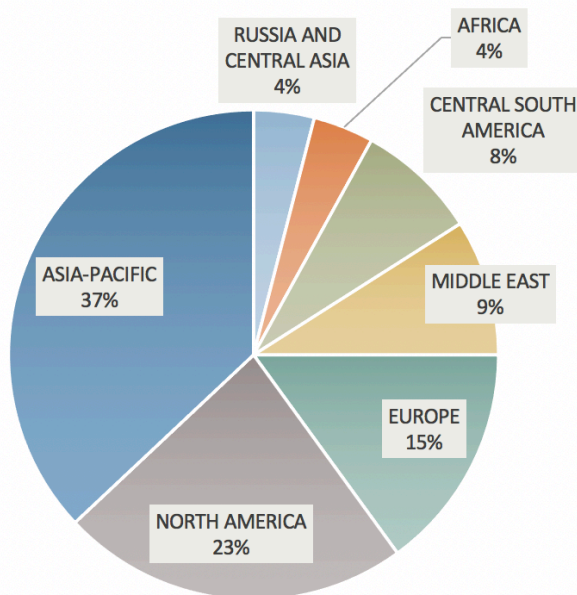
In 2021, the world average produced 90,282 thousand barrels of oil per day, according to Eni World Energy Review 2022. Global crude oil output increased by 1,4% in 2021 following a 6,6% decrease in 2020. In 2021, about 43% of world oil production was obtained from only three countries: the United States, Saudi Arabia, and Russia. These countries

cumulatively produced more oil than the remaining top 10 countries put together. Russia and Saudi Arabia produced almost the same amount of oil equal to 11 million barrels per day.

Norway is the major oil producer in Europe, accounting for approximately 2,3% of global oil output, but it does not cover oil demand from European countries. The absence of large regional oil production contributed to the EU's reliance on Russian oil and gas, which, in turn, exacerbated the energy crisis in Europe. The world is striving to augment the oil supply by unleashing strategic reserves and expanding output to alleviate the crisis and lower oil prices. But it is unclear whether these initiatives to enhance supply will be sufficient to relieve the strain, considering that oil demand is forecasted to hit a new record high in 2023.

3.5.5 Global oil consumption

Figure 3: World oil consumption in 2021 by region



Source: Created by the author based on Eni World Energy Review 2022.

According to Eni World Energy Review 2022, the world consumed 97,525 thousand barrels of oil per day in 2021. This count reflects an upsurge in consumption relative to prior years of the COVID-19 pandemic. As of 2021, 37% of total oil consumption was in the Asia-Pacific region, 23% in North America, 15% in Europe, 9% in the Middle East, 8% in Central

and South America, and 4% in Central Asia, Russia, and Africa. Crude oil consumption in Asia Pacific and other regions has increased over the past ten years, while in Europe and North America, the share of global oil consumption has tended to diminish, according to Statista.

Table 3: Top 10 world oil consumers in 2021

Rank	Country	Oil consumption (thousand barrels/day)	Global share
1	United States	19,926	20,4%
2	China	15,521	15,9%
3	India	4,711	4,8%
4	Russia	3,661	3,8%
5	Saudi Arabia	3,498	3,6%
6	Japan	3,415	3,5%
7	Brazil	3,068	3,1%
8	South Korea	2,587	2,7%
9	Canada	2,347	2,4%
10	Germany	2,136	2,2%

Source: Created by the author based on Eni World Energy Review 2022.

Roughly 62% of world oil consumption in 2021 was accounted for by the ten largest oil-consuming countries, and 38% by the rest of the world. The United States was simultaneously a tremendous producer and consumer of oil, using nearly 20 million barrels per day, more than the whole European Union (14,2 million barrels of oil per day). Ultimately, the US share made up 20,4% of overall worldwide oil consumption. China utilized 15,5 million barrels of oil per day, followed by India with 4,7 million barrels per day. China, India, and the USA alone consumed more than one-third of global crude oil consumption.

3.5.6 World crude oil trade

3.5.6.1 Exports

Table 4: Top 10 world oil exporters in 2021

Rank	Country	Oil export (thousand barrels/day)	Global share
1	Saudi Arabia	6,227	15,0%
2	Russia	4,565	11,0%
3	Canada	3,755	9,0%
4	Iraq	3,440	8,3%
5	United States	2,951	7,1%
6	United Arab Emirates	2,305	5,5%
7	Kuwait	1,740	4,2%
8	Nigeria	1,592	3,8%
9	Norway	1,549	3,7%
10	Kazakhstan	1,355	3,3%

Source: Created by the author based on Eni World Energy Review 2022.

In 2021, crude oil exports totaled 41,618 thousand barrels per day globally, according to Eni World Energy Review 2022. The ten nations mentioned above shipped 70,9% of overall oil exports. Saudi Arabia (6 million barrels per day) and Russia (4,5 million barrels per day) were the two major oil exporters. Canada and Iraq exported almost the same quantity of crude, at 3,755 thousand and 3,440 thousand barrels per day, respectively. Saudi Arabia, Russia, Canada, Iraq, and the United States provided half of all world oil supplies.

3.5.6.2 Imports

Table 5: Top 10 world oil importers in 2021

Rank	Country	Oil import (thousand barrels/day)	Global share
1	China	10,294	24,0%
2	United States	6,108	14,2%
3	India	4,289	10,0%
4	South Korea	2,588	6,0%
5	Japan	2,455	5,7%
6	Germany	1,629	3,8%
7	Spain	1,123	2,6%
8	Italy	1,134	2,6%
9	Netherlands	1,050	2,4%
10	Singapore	900	2,1%

Source: Created by the author based on Eni World Energy Review 2022.

Total imports of crude oil in 2021 complied 42,913 thousand barrels per day. According to data from Statista, Europe bought around 13,5 million barrels of oil per day, which was the worldwide maximum. The top ten countries accounted for 73,4% of global crude oil imports. Only 26,6% of overall imports were shared by the remaining nations. China was the undisputed leader with 24% of the world's oil imports. The United States, which imported 6,108 thousand barrels of oil per day, came second, followed by India with 4,289 thousand barrels per day. These three countries made up nearly 50% of worldwide crude imports.

4 Practical Part

4.1 Overview of Kazakhstan

The Republic of Kazakhstan is the leading economy and energy producer in Central Asia. It is bordered by China on the east, Russia on the north, and Kyrgyzstan, Uzbekistan, and Turkmenistan on the south. The country has a population of 19 million people with a land area of 2,724,900 square kilometers and 1,894 kilometers of the Caspian Sea coastline. Kazakhstan's economy had one of the highest growth rates in the world up to 2015 [22]. Despite a real GDP increase of 4,5% in 2019, its economy shrank by 2,5% in 2020 as a result of the coronavirus outbreak, which also negatively affected demand for oil, the country's main exports. In 2021, the economy of the republic began to revive and GDP grew by 4% [23]. The development of Kazakhstan's economy is significantly influenced by its petroleum sector. It is a major contributor to the growth of GDP and a pivotal source of national budget income [24].

4.2 Kazakhstan oil reserves

Considering 3,9 billion tons of proven oil reserves, Kazakhstan ranks 12th worldwide and accounts for 1,7% of global oil stocks, based on BP Statistical Review of World Energy 2021. Over 200 oil and gas fields have been discovered in Kazakhstan, covering 62% of the republic's territory [25]. The majority of oil and gas deposits are located in the Caspian Sea

region, which is the western part of the country. Tengiz, Kashagan, and Karachaganak are the three largest fields that represent above 50% of the nation's oil and gas reserves. Kashagan offshore field and Tengiz onshore field are developed mainly for oil production but also encompass a considerable amount of associated gas, whilst Karachaganak onshore field predominantly comprises gas condensate [22]. The proven oil reserves of Kazakhstan are ample for more than 45 years at the present rate of production [25].

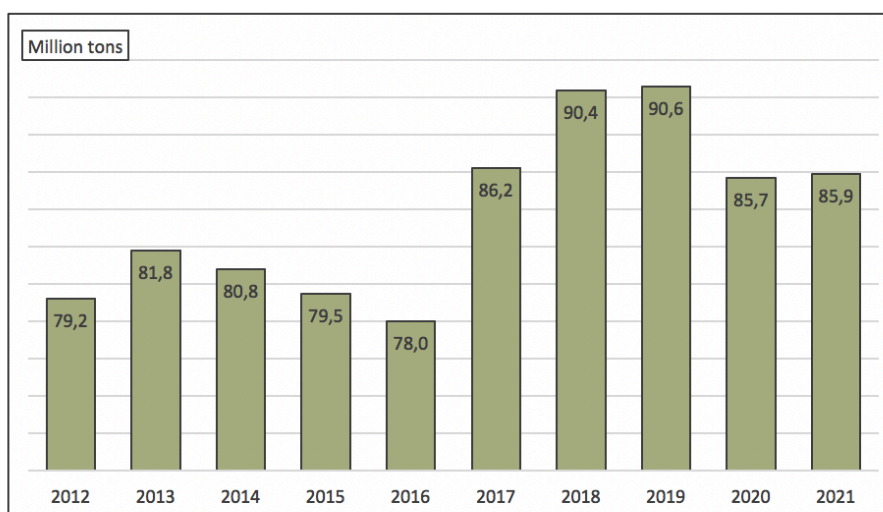
4.2.1 The quality of crude oil in Kazakhstan

CPC Blend is the primary crude oil grade exported from Kazakhstan. This blend represents sweet (0,5% sulfur) and light crude (45° API), which is prized for its high gasoline output. Approximately 60% of the CPC blend is the yield from the Tengiz oilfield. The remaining 40% of the mixture comes from Kashagan, Kumkol, and Karachaganak deposits. Some of CPC Blend's constituents are also sold in lesser quantities as discrete grades of crude oil [26].

4.3 Kazakhstan oil production

The Republic of Kazakhstan has been producing oil for over a century. The first oil deposit was discovered in 1899, and production began shortly thereafter [27].

Figure 4: Dynamics of oil production in Kazakhstan



Source: Created by the author based on Kazakhstan's Bureau of National Statistics.

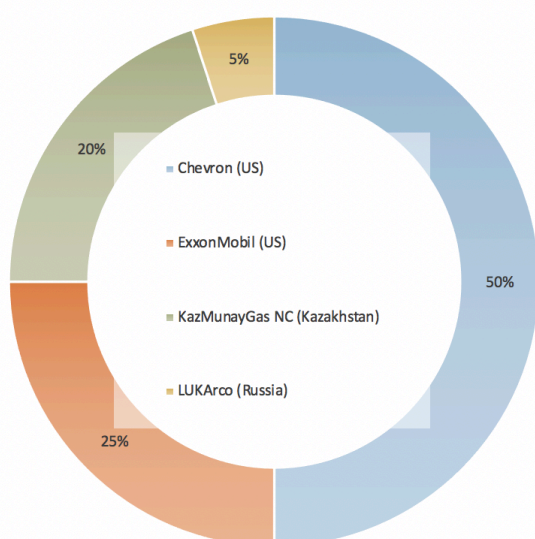
Kazakhstan produced about 85,9 million tons of oil in 2021, an average of 1,8 million barrels per day, having slightly increased from the previous year. It ranks 13th in the world with 2% of global oil production, according to BP Statistical Review of World Energy 2022.

OPEC+ and Kazakhstan have been actively collaborating. In May 2020, the group agreed to reduce production in an effort to normalize crude oil prices amid lessening demand brought on by the Covid-19 pandemic [22]. Therefore, after the record level of oil output in 2019, there was a decline in 2020.

4.3.1 The largest oil-producing companies in Kazakhstan

Tengizchevroil LLP (TCO) and North Caspian Operating Company N.V. (NCOC) are the two biggest oil development and production projects in Kazakhstan. National Campaign «KazMunayGas» is the leader of the Kazakh oil and gas sector with complete integration at all stages of the value chain. Foreign partners control the vast majority of oil and gas production notwithstanding the diversification and substantial involvement of the national company. Around 35% of export earnings are paid out to foreign investors on an annual basis [22].

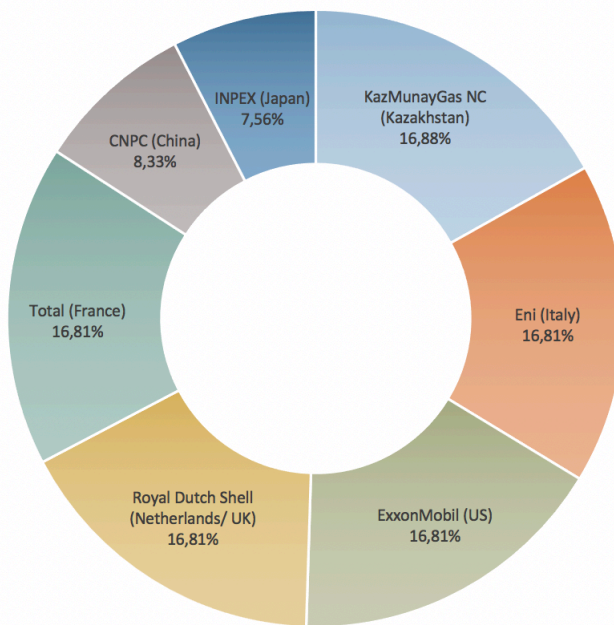
Figure 5: The ownership structure of Tengizchevroil



Source: Created by the author based on Kazakhstan oil and gas tax guide 2021.

Tengizchevroil (TCO), a joint venture of Chevron, ExxonMobil, KMG, and LukArco, has been developing the Tengiz oilfield. In 1993, TCO was granted a 40-year lease for this onshore field. Tengiz, one of the world’s supergiants, contains 510 billion cubic meters of gas and 25,5 billion barrels of crude oil. Most of the gas produced in the field is pumped back in to augment oil outcome [22]. Production in 2021 amounted to about 26,6 million tons or 31% of Kazakhstan's total crude oil production [28].

Figure 6: The ownership structure of North Caspian Operating Company



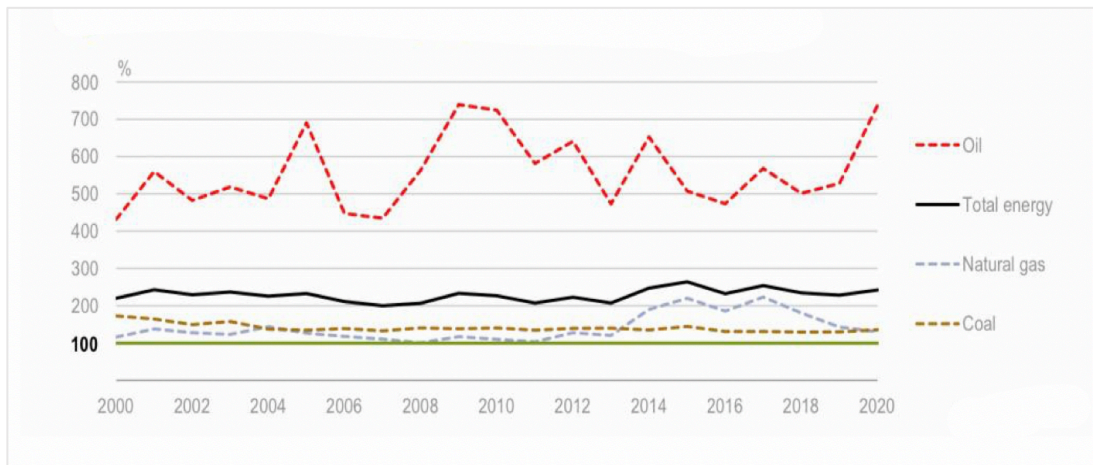
Source: Created by the author based on Kazakhstan oil and gas tax guide 2021.

North Caspian Operating Company (NCOOC), a joint venture of Eni, ExxonMobil, Royal Dutch Shell, Total, KazMunayGas, China National Petroleum Corporation (CNPC), and Inpex, has been developing the Kashagan oilfield. The contract for this field was concluded in 1997 and is slated to expire in 2041. Kashagan is the first offshore field to be evolved in Kazakhstan. It is estimated that recoverable oil is 13 billion barrels, and natural gas reserves reach 1,353 billion cubic meters [22]. Output capacity in 2021 was about 16,2 million tons, and the share of the project in the national oil production approached 19% [28].

4.4 Energy self-sufficiency of the Republic of Kazakhstan

The capability of a country to meet its own energy needs is referred to as energy self-sufficiency. It is computed by domestic production over the total energy supply. The country is dependent on imports and is not self-sufficient if the count is less than 100%. A number higher than 100% denotes that the country is a net energy exporter whose production exceeds its consumption [29].

Figure 7: Kazakhstan's self-sufficiency by energy source from 2000 to 2020



Source: International Energy Agency – Kazakhstan 2022.

During the past two decades, the sizable overall energy surplus of Kazakhstan has been steady, representing on average 230% of the energy supply required to fulfill internal demand. Kazakhstan's domestic energy demands in 2020 were satiated to a 737% extent by oil production, 136% extent by coal, and 131% extent by natural gas. As a result, the Republic of Kazakhstan has become a major net exporter of fossil fuels.

4.5 Trade of Kazakhstan

Trade balance

The Republic of Kazakhstan has maintained an active trade balance over the past 20 years. A positive trade balance indicates a trade surplus, that is, the total value of exported

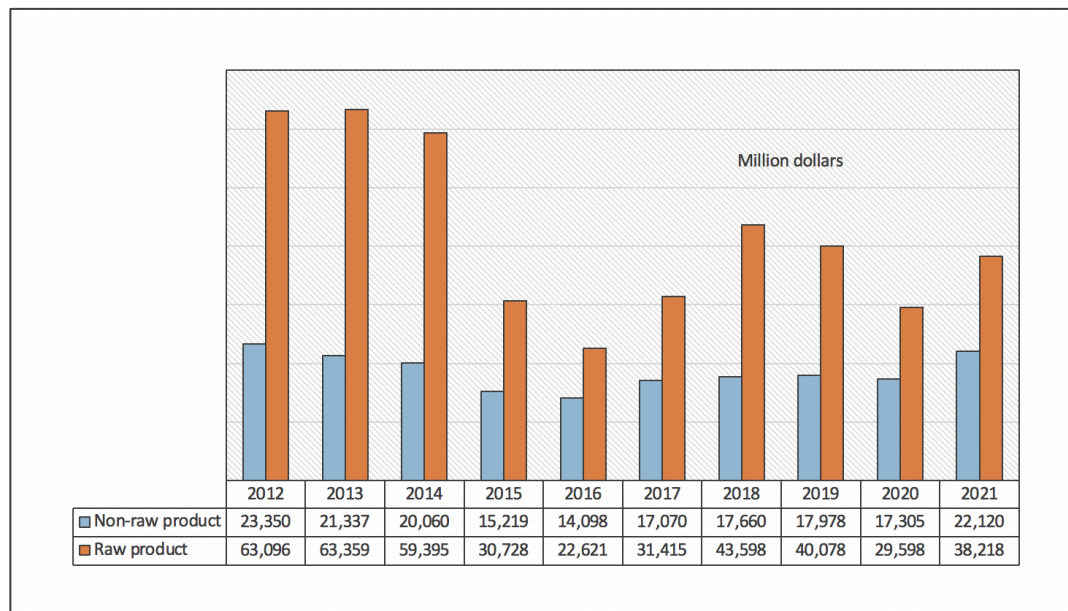
goods exceeds the total value of imported goods. In 2021, Kazakhstan recorded a trade surplus of 19,45 billion dollars [30].

Foreign trade turnover

By the end of 2021, Kazakhstan's foreign trade turnover amounted to 101,5 billion dollars, which is 16,3% higher than in the previous year, and 3,7% more than in pre-crisis 2019. Of the total foreign trade turnover, imports accounted for 41,2 billion dollars and exports 60,3 billion dollars [31].

4.6 Kazakhstan export structure

Figure 8: Export dynamics of Kazakhstan from 2012 to 2021

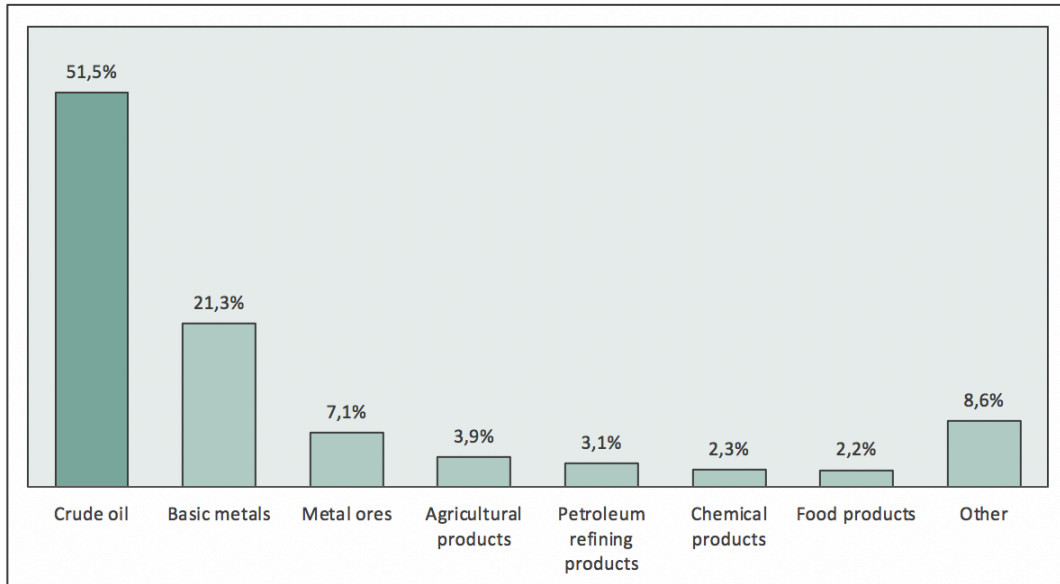


Source: Created by the author based on Kazakhstan's Bureau of National Statistics.

Export of Kazakhstan in 2021 compared to the previous year increased by 22,2% — from 46,9 to 60,3 billion dollars. This value is 3,8% greater than it was in 2019 before the pandemic. Kazakhstan's economy has been buoyed by huge commodity exports since its independence, but now the country strives to increase non-commodity exports. The share of non-raw products in the republic's exports in 2021 was the highest for the period from 2013 to 2021. Nevertheless, the share of primary exports still prevails over the non-primary share

of exports. In 2021, resource exports amounted to 38,2 billion dollars and non-resource exports were 22,1 billion dollars.

Figure 9: Kazakhstan's export structure for 2021



Source: Created by the author based on data from the Economic Research Institute of Kazakhstan.

It is common for a nation with abundant natural resources to possess a large share of them in exports. Over the years, Kazakhstan's natural resources have averaged 70% of total exports. Especially most of Kazakhstan's exports came from oil. In 2021, the share of crude oil in the country's exports accounted for 51,5%.

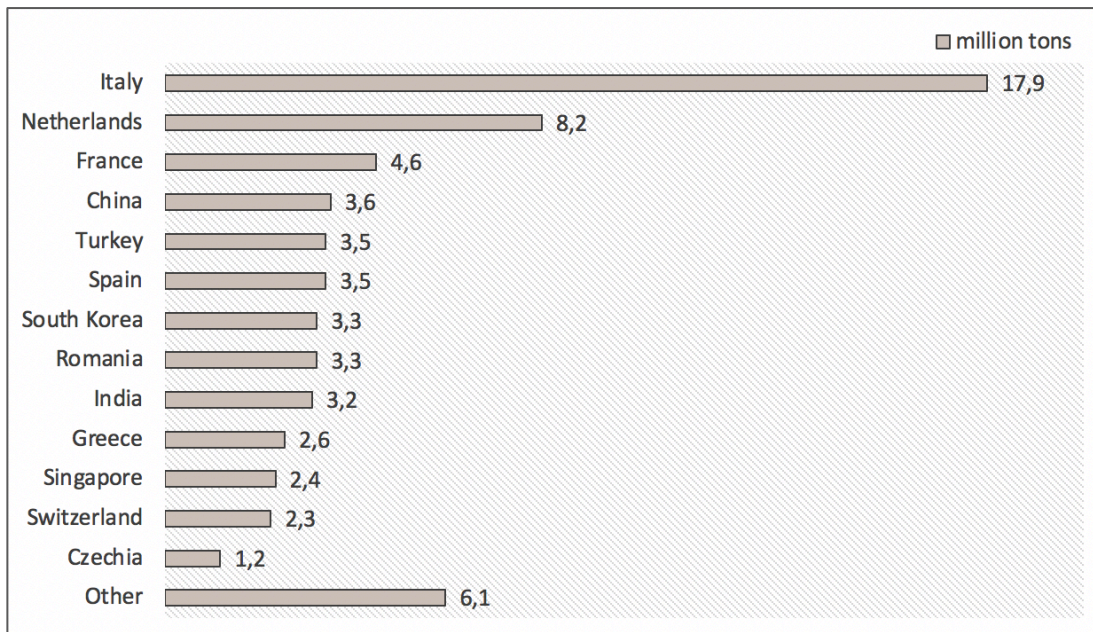
Higher oil prices are considered beneficial for exporting countries, but at the same time, when oil prices fall, this leads to instability of economic growth. This justifies the significance of export diversification [32].

4.7 Kazakhstan oil export

The Republic of Kazakhstan exports about 80% of its crude oil output and is one of the world's top ten oil exporters [22]. In 2021, Kazakhstan exported 67,6 million tons of oil for a total of 31,1 billion dollars. Although this is less in volume than in 2020, it is 31,2% more in monetary terms due to price rises [33]. Over 96% of the oil was transported via

pipelines, while more than 70% of the overall amount was exported to European countries [25]. Kazakhstan is among the top five crude oil suppliers in the EU and contributes to the diversification of oil supplies to the European market [34].

Figure 10: Oil exports from Kazakhstan by country in 2021



Source: Created by the author based on Kazakhstan's Bureau of National Statistics.

The Republic of Kazakhstan exported 17,9 million tons of oil to Italy in 2021. Italy ranks first among Kazakhstan's oil consumers by a wide margin. The Netherlands and France are also major importers of Kazakh oil. These three European countries represent 45% of Kazakhstan's total oil exports. The average volume of oil transferred to such destinations as China, Turkey, Spain, South Korea, Romania, and India was 3,4 million tons.

Regarding the Czech Republic, Kazakhstan in the past few years has been the third biggest supplier of oil to the country after Russia and Azerbaijan. However, according to statistics for 2021, Kazakhstan rose to the position of second-largest oil supplier to the Czech Republic, contributing nearly 18% of the country's total oil imports [35].

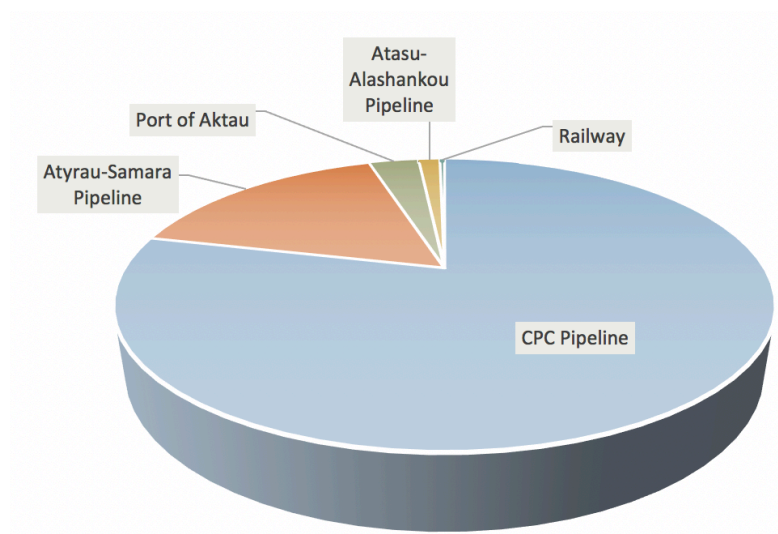
4.8 Foreign direct investment in Kazakhstan

In 2021, global flows of foreign direct investment to Kazakhstan soared by 77% to about 1,65 trillion dollars from 929 billion dollars in 2020, exceeding their level before COVID-19. The Republic of Kazakhstan has implemented a number of reforms after gaining independence in order to liberalize its economy and raise foreign capital. Approximately 70% of all FDI influxes into the Central Asian region go to Kazakhstan, which continues to be the region's top investment destination. The primary sources of foreign investment in the republic are the metallurgical and oil sectors [36].

4.9 Kazakhstan oil export infrastructure

The Republic of Kazakhstan has enhanced its export capacities since becoming independent. Due to a lack of access to the ocean, the country is mostly reliant on pipelines for transporting petroleum to the global market, however, exports are also conducted by sea and rail itineraries. The Caspian Sea serves as a conduit for a part of the oil supplies. Kazakhstan possesses a comprehensive railway infrastructure, which is employed to tote petroleum liquids for internal consumption and exports [37].

Figure 11: Kazakhstan oil export channels



Source: Created by the author based on Jusan Analytics 2022.

- The Caspian Pipeline Consortium.

The Caspian Pipeline Consortium is the principal conduit for exporting oil from the Republic of Kazakhstan to the international market. Oil is carried by the CPC via western Kazakhstan to the export terminal on the Black Sea coast of Russia. This pipeline infrastructure is among the longest in the whole world, with a length of 1,500 kilometers. The CPC hauled 53,2 million tons of oil in 2021, which accounted for 79% of Kazakhstan's total oil exports. Along the way, this pipeline tucks up 10% of Russian oil, but most of the oil comes from the Tengiz, Kashagan, and Karachaganak fields [22].

- The Atyrau-Samara pipeline.

The Atyrau-Samara pipeline is another key oil export itinerary, which binds Kazakhstan to export ports on the Black and Baltic Seas. This transport line is the first major export route of the Republic of Kazakhstan with a length of 1,380 kilometers. This pipeline carried 11,2 million tons of oil in 2021, representing 17% of the country's total oil exports [22].

- The Atasu-Alashankou pipeline.

Kazakhstan's QazaqGaz and China National Oil & Gas Exploration and Development Corporation share 50/50 ownership of the Atasu-Alashankou pipeline to China. Kazakhstan exported just approximately 1 million tons of oil over this line in 2021, while this channel has the capacity to transport up to 20 million tons per year [22].

- Aktau Sea Port.

Oil exports are also accomplished through Kazakhstan's Caspian port of Aktau to Azerbaijan, where it enters the Baku-Tbilisi-Ceyhan pipeline and heads to the Mediterranean coast [26]. In 2021, the Republic of Kazakhstan shipped 2,1 million tons of oil via this line. This channel is capable of transferring 50 million tons of oil per year, but in 2021 it was loaded only by 55%. Kazakhstan's Ministry of Energy has been investigating the prospects for extending the utilization of this path along with KMG and KazTransOil [22].

4.10 The increasing role of Kazakhstan in international oil trade

The key crude oil supplier to Europe was Russia, but following the conflict in Ukraine, Russian oil exports to the region drastically decreased. 10 days after the imposition of the EU embargo and G7 price limit on Russian oil, maritime imports to the European Union of Russia's main export-grade Urals crude plummeted from 1,5 million barrels per day to 123,000 barrels per day. The primary raw material for refiners in Northwestern Europe and the Mediterranean was Urals crude oil. Before the invasion, Europe was importing around 2,7 million barrels of Urals oil per day, incorporating pipeline streams [38]. As Western countries, in particular, Europe, are in search of alternate oil suppliers, Kazakhstan's role in the global arena is increasing [39]. In July 2022, German industrialists appealed to the authorities with a proposal to boost the supply of Kazakh oil. Before the war in Ukraine, Russian oil imports to Germany accounted for 35%. This volume had reduced to 16% by October 2022, as Germany enhanced its oil imports from the United States, the United Kingdom, and Kazakhstan. In 2023, oil supplies from Kazakhstan are planned to be carried out through the Druzhba pipeline [40]. According to tanker tracking data, European refiners have hastened the transition to purchasing more oil from Kazakhstan, Azerbaijan, and Norway, in order to cover the deficit in Russian crude supplies. Kazakhstan's CPC Blend and KEBCO crudes cumulatively became the largest source of oil imports to the EU at 1,2 million barrels per day in November 2022 [38]. The Republic of Kazakhstan intends to raise its oil production to 103-107 million tons by 2024. Therefore, Kazakhstan will inevitably have to solve issues related to the expansion of transport capabilities [41].

4.11 Discussion of issues concerning the export of Kazakh oil

Most of Kazakhstan's oil is exported via the Caspian Pipeline Consortium, which partially crosses the territory of Russia. The consortium's operations were repeatedly put on hold in 2022. Interruptions in the activity of the CPC prompted allegations against Moscow. Despite these facts, it is assumed that Kazakhstan's oil will steadily enter the EU market. For instance, through Kazakhstan's pipelines, Russia transfers some of its oil to China. Hypothetically, Astana may suspend these exports in retaliation for any disruptions in the future. Kazakhstan has China's support in this regard. The Chinese authorities reacted to the

failures in the CPC by freezing the large petrochemical investment project Sinopec in Russia [42]. Kazakhstan will have to look for alternative oil export routes, even if the Caspian Pipeline Consortium system operates without a hitch since the republic intends to boost oil output in response to growing demand from European countries [41].

The Government of Kazakhstan has already begun to expand and diversify its export channels. In July 2022, President Tokayev emphasized that the Trans-Caspian route, also known as the Middle Corridor, is a priority for energy exports [42]. The Trans-Caspian International Transport Route runs through Kazakhstan, the Caspian Sea, Azerbaijan, Georgia, Turkey and leads to European countries, bypassing Russia. The role of the Caspian Sea has soared amid the reformatting of global supply chains. Considering the current situation, the further development of the Trans-Caspian route is momentous. Careful coordination on technical issues among the countries of the Middle Corridor will be required to mitigate the problems. In November 2022, the heads of the foreign ministries of Kazakhstan, Azerbaijan, Georgia, and Turkey convened in Aktau and signed a Roadmap for 2022-2027 on the agreed elimination of bottlenecks. All countries taking part in this initiative will invest 7,5 billion dollars to treble present capacity [39]. The Republic of Kazakhstan has already successfully completed negotiations on the export of about 5 million tons of oil in 2023 along the Middle Corridor. Through the port of Aktau in western Kazakhstan, oil tankers are shipped to Baku. Then the Baku-Tbilisi-Ceyhan and Baku-Supsa pipelines are used to transport oil to the ports of the Mediterranean Sea. This itinerary has been available to Kazakhstan since 2006 but has not been extensively utilized [42].

Despite all the drawbacks, experts consider that the Caspian Pipeline Consortium will remain the most optimum route for exporting Kazakh oil, both in terms of delivery speed and pumping cost (38 dollars per 1 ton) [41]. The ban on the import of Russian oil, which was adopted by the United States in March 2022, will not affect Kazakhstan's oil trade through the CPC. Distribution systems such as the CPC may segregate different sources of crude oil, allowing petroleum that is not of Russian origin to be sold and loaded separately. The ban on importing certain goods from Russia excludes imports that do not originate in the Russian Federation, even if such goods transit through its territory or are exported from Russia [43].

5 Conclusion

The Republic of Kazakhstan possesses verily large proven oil reserves, occupying the twelfth place in the world. Furthermore, Kazakhstan has the ability to extract these resources and ranks thirteenth among the world's largest oil producers. Oil production exceeds domestic consumption, indicating the country's self-sufficiency in oil resources, which in turn allows Kazakhstan to be a net oil exporter. The foreign trade of the Republic of Kazakhstan is dominated by the export of crude oil, which accounts for more than half of the country's total exports. The top ten oil exporters globally include Kazakhstan. Kazakh oil is prized throughout the world due to its high quality. Based on the data analyzed in the thesis, it can be concluded that Kazakhstan's oil exports are heavily oriented toward Europe. Even before Russia's invasion of Ukraine, Kazakhstan was a major contributor to the diversification of oil supplies to European countries, and in November 2022, it became the largest oil supplier to the European Union under the embargo on oil imports from the Russian Federation.

Kazakhstan's foremost oil export route, the Caspian Pipeline Consortium, partially passes through the territory of Russia. This fact has caused many questions and concerns since the Republic of Kazakhstan exports a considerable amount of oil and in case of any problems with oil supplies from Kazakhstan, this cannot but affect the world oil market, which happened in the summer of 2022, when the work of the consortium was suspended several times. Eventually, it was clarified that sanctions do not apply to systems such as the CPC. However, it is crucial for the country to diversify its oil export itineraries even if the Caspian Pipeline Consortium system runs smoothly. Kazakhstan plans to boost oil production in the near future due to the sharply increased demand for oil from European countries, which in turn implies working to enhance the capacity of export infrastructure. The Government of the Republic of Kazakhstan has already begun to address the issues surrounding oil exports to Europe. Kazakhstan has successfully concluded negotiations on increasing oil exports through the Middle Corridor. It is also planned to deliver Kazakh oil via the Druzhba pipeline.

Based on the foregoing, it is possible to conclude that the role of Kazakhstan in international oil trade is quite high, and given the current circumstances, Kazakh oil is gaining importance in the world. The development of the oil sector has elevated the Republic of Kazakhstan to a significant position on the global stage. Kazakhstan could be considered

as a long-term supplier of oil to Europe, but it would not be possible to substantially raise oil exports in the short term because of the limited capacity of the existing export infrastructure. It will take at least a year for the Republic of Kazakhstan to ramp up oil output and expand oil export channels.

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