

Czech University of Life Sciences Prague

Faculty of Economics and Management

Department of Economics



Bachelor Thesis

**Role of crude oil and natural gas in economic
of Kazakhstan**

Author: Mariya MASLOVA

Supervisor: prof. Ing. Mansoor Maitah, Ph.D. et Ph.D.

© 2019 CULS Prague

BACHELOR THESIS ASSIGNMENT

Mariya Maslova

Economics and Management

Thesis title

Role of crude oil and natural gas in economic of Kazakhstan

Objectives of thesis

The main goal of the thesis is to describe and analyze how crude-oil and gas affect the economy of Kazakhstan. Kazakhstan is rich in oil resources. Oil plays a large role in the economy of Kazakhstan, as in many countries. The purpose of the theoretical part is to describe the main characteristics of crude oil, the role of oil in international trade, and determine what factors affect world oil prices. The purpose of the practical part is to describe the oil reserves of Kazakhstan. Identify major issues in the oil and gas industry. Understand how crude oil affects Kazakhstan's GDP.

Methodology

The thesis will be divided into 2 parts: theoretical and practical one. For theoretical purposes professional publications, scientific articles and annual reports of oil and gas companies were used. This section is describing history and actual status of world crude-oil market, its main players and relationships between different factors and crude-oil price.

The practical part is dedicated to describing Kazakhstan oil and gas industry, particularly the role of oil and gas industry in the national economy of Kazakhstan and the Kazakhstan position on the international market. Also, in this part will be discussed main oil fields and export streams of the Kazakh crude-oil. SWOT analysis will be used to determine the strengths, weaknesses, opportunities, and threats of Kazakhstan's oil and gas sector. The thesis will include descriptive and comparative research methods.

The proposed extent of the thesis

40 – 60 pages

Keywords

oil production, Kazakhstan , international trade ,oil and gas market, SWOT.

Recommended information sources

Dunaev V.F. "Economics of oil and gas industry" ISBN 5-7246-0360-8

Chervinsky O: "The Black blood of Kazakhstan. The oil history of independence." 2017- ISBN: 978-601-06-4488-5

"Základy zpracování a využití ropy" Blažek J., Rábl V. ISBN 80-7080-473-4.

https://www.studmed.ru/dunaev-vf-ekonomika-predpriyatij-neftyanoy-i-gazovoy-promyshlennosti_e2f6c4355d3.html

Expected date of thesis defence

2019/20 WS – FEM (February 2020)

The Bachelor Thesis Supervisor

prof. Ing. Mansoor Maitah, Ph.D. et Ph.D.

Supervising department

Department of Economics

Electronic approval: 22. 11. 2019

prof. Ing. Miroslav Svatoš, CSc.

Head of department

Electronic approval: 25. 11. 2019

Ing. Martin Pelikán, Ph.D.

Dean

Prague on 25. 11. 2019

Declaration

I declare that I have written this writing sample “Role of crude oil and natural gas in economic of Kazakhstan” without any help from others and without the use of document and aids other than those stated in the references. The topic is not already the object of any work or examination of another course unless this explicitly stated.

In Prague on date of 25 of November 2019

Mariya Maslova

Acknowledgement

I would like to thank prof. Ing. Mansoor Maitah, Ph.D. et Ph.D. for his support and supervision and all other persons, for their advice and support during my work on this thesis.

Role ropy a zemního plynu v ekonomice Kazachstánu

Souhrn

Ropa a plyn jsou jedním z nejcennějších zdrojů moderní rozvinuté společnosti. Jejich těžba, zpracování a použití jsou spojeny s vysokými technologiemi a cenami - s ekonomikou a financemi celého světa. Pro mnoho zemí je ropa jednou z hlavních příjmových položek. Kazachstán je jednou ze zemí světa produkujících ropu. Ropa se začala těžit v Kazachstánu na konci 19. století, mnohem dříve než v Íránu, Kuvajtu, Mexiku, Norsku, Saúdské Arábii. Tato práce je věnována analýze a popisu odvětví plynu a ropy v Kazachstánu. Jejich exportu, vývoje a investici. Nedílnou součástí této práce je popis a analýza problémů v odvětví ropy. Tato práce také popisuje roli ropného sektoru v ekonomice (HDP, národní fond) Kazachstánu. A v poslední části sestavujeme SWOT analýzu kazašského ropného sektoru.

Klíčová slova: těžba ropy, Kazachstán, mezinárodní obchod, trh s ropou a plynem, SWOT

Role of crude oil and natural gas in economic of Kazakhstan

Summary

Oil and gas are one of the most valuable resources of a modern developed society. Its extraction, processing and use are associated with high technology, and prices - with the economy and finance of the whole world. For many countries, oil is one of the main revenue items. Kazakhstan is one of the oil producing countries of the world. Oil began to be extracted in Kazakhstan at the end of the 19th century, much earlier than in Iran, Kuwait, Mexico, Norway, Saudi Arabia. This thesis is dedicated to analysis and description of gas and crude oil sectors in Kazakhstan. It export side, development and investments sides. Integral part of this work is a description and analysis of the crude oil sector issues. Also, this work describes role of crude oil sector on the economy (GDP, National Fund) of the Kazakhstan. And in the final part we build SWOT analysis of the Kazakh crude oil sector.

Keywords: oil production, Kazakhstan, international trade, oil and gas market, SWOT

Content

1. Introduction.....	10
2. Objectives and methodology	11
2.1 Objectives.....	11
2.2 Methodology.....	11
3. Theoretical part.....	12
3.1 Worldwide history of crude-oil market.....	12
3.2 Major global oil markets	14
3.3 Demand and supply. Oil reserves	16
3.3.1 Top 3 crude-oil producents	19
3.3.2 Demand	20
3.3.3 World oil reserves.....	23
3.3.4 Relationship of Reserves to Production.....	24
3.3.5 Natural gas. Reserves, production and consumption.....	25
3.4 Types of crude oil	27
3.4.1 Parameters of crude oil	27
3.4.2 Important crude-oils	28
3.5 Price of crude-oil	29
3.5.1 OPEC. OPEC oil basket	32
3.5.2 US dollar exchange rate.....	34
3.5.3 Geopolitical events	35
3.6 Commodities exchanges.....	37
3.6.1 Exchange trading and the role of financial players	38
4. Practical part.....	39
4.1 Crude-oil and gas market in Kazakhstan	39
4.2 Crude-oil and gas fields in Kazakhstan.....	40
4.2.1 Kashagan field.....	41
4.2.2 Tengiz	42
4.2.3 Karachaganak.....	42
4.3 Production of crude-oil and gas in Kazakhstan. Market overview.....	43

4.4 Development of crude-oil sector and investments.....	48
4.5 Export of crude-oil and gas from Kazakhstan and role in GDP and National Fund ...	50
4.6 Issues of crude-oil and gas industry in Kazakhstan	55
4.7 SWOT analysis of crude oil sector in Kazakhstan	57
5. Conclusion	59
6. Bibliography	60

Table of figures

Figure 1. Crude-oil production in 1000 barrels per day by region since 1965	17
Figure 2. Crude-oil production in thousands barrels per day	18
Figure 3. World Annual Oil Production (1900-2018) and Peak Oil (2005-2020 Scenarios) 20	
Figure 4. Crude-oil consumption in 1000 barrels per day since 1965	22
Figure 5. World crude-oil reserves by Non-OPEC and OPEC countries.....	24
Figure 6. Distribution of proved reserves in 1997, 2007 and 2017 in percentage	25
Figure 7. Natural gas production (left) and consumption by region in billion cubic meters since 1992	26
Figure 8. Crude-oil prices since 1860 in 2018 dollars per barrel	31
Figure 9. Map of main crude-oil and gas fields with pipelines for their export.....	40
Figure 10. Crude-oil production in million tons for the period 2016-2018.....	44
Figure 11. Gas production in billion m ³ for the period 2016-2018.....	45
Figure 12. Oil and gas production in billion USD for period 2016-2019 1 st quarter.....	46
Figure 13. Oil production in the Kazakhstan regions since 2016	47
Figure 14. Gas production in the Kazakhstan regions since 2016.....	48
Figure 15. Investments in crude-oil and gas sector in million USD since 2016.....	49
Figure 16. Crude-oil export in 2018.....	50
Figure 17. Natural gas export in 2018.....	51
Figure 18. Total tax revenues and subsidies vs Brent oil prices for 2013-2016.....	52
Figure 19. GDP changes vs Brent oil prices changes	54

1. Introduction

Today, without a doubt, oil is the most important mineral for humans. The life of a modern person is inconceivable without this valuable raw material. Indeed, almost every step a person accompanies the use of oil or petroleum products.

When we hear the word "oil", as a rule, associations arise with gasoline, other fuels, and lubricants. And in this, in fuel, of course, its dominant role. But the use of oil is not limited to a gas station. Oil means much more to every person.

Without oil, or rather, without its refined products, not only a single sector of the national economy cannot develop, but also exist. All possible fuels are obtained from oil - boiler, gasoline, kerosene, diesel, gas turbine fuels, lubricants and special oils, carbon black, greases, paraffin, bitumen, petroleum coke. In addition, oil is the raw material for several organic synthesis products.

Today, the development of the oil and gas complex plays a significant role in the economy of the Republic of Kazakhstan. Revenues from the oil and gas industry are the basis of the country's entire budget. The implementation of state development programs on the scale of both regions and the state depends on the work of the oil and gas complex enterprises. Modern Kazakhstan has become a state where the interests of many countries of the world intersect. In the context of globalization of the world economy, many large multinational oil companies are interested in increasing the volume of their own business, and therefore are increasingly penetrating the national economies of other states. This leads to the transformation of modern commodity markets of the oil and gas and processing industries into a platform for the development of global international cooperation. Now, the Republic of Kazakhstan is one of the largest countries - suppliers of crude oil to Central Asia. According to confirmed oil reserves, Kazakhstan is among the 15 leading countries of the world. Oil and gas regions occupy 62% of the entire country and have 250 oil fields, 80 of which are under development.

In this thesis, we will understand the role of oil and gas in the economy of Kazakhstan. We will analyze the main deposits and reserves in the country. Also, in this work will be noticed other aspects as an amount of crude-oil and gas production, export, reserves and the problems in the oil industry of the Republic of Kazakhstan.

2. Objectives and methodology

2.1 Objectives

The main goal of the thesis is to describe and analyze how crude-oil and gas affect the economy of Kazakhstan. Kazakhstan is rich in oil resources. Oil plays a large role in the economy of Kazakhstan, as in many countries. The purpose of the theoretical part is to describe the main characteristics of crude oil, the role of oil in international trade, and determine what factors affect world oil prices. The purpose of the practical part is to describe the oil reserves of Kazakhstan. Identify major issues in the oil and gas industry. Understand how crude oil affects Kazakhstan's GDP.

2.2 Methodology

The thesis will be divided into 2 parts: theoretical and practical one. For theoretical purposes professional publications, scientific articles and annual reports of oil and gas companies were used. This section is describing history and actual status of world crude-oil market, its main players and relationships between different factors and crude-oil price.

The practical part is dedicated to describing Kazakhstan oil and gas industry, particularly the role of oil and gas industry in the national economy of Kazakhstan and the Kazakhstan position on the international market. Also, in this part will be discussed main oil fields and export streams of the Kazakh crude-oil. SWOT analysis will be used to determine the strengths, weaknesses, opportunities, and threats of Kazakhstan's oil and gas sector. The thesis will include descriptive and comparative research methods.

3. Theoretical part

3.1 Worldwide history of crude-oil market

The scale of commodity circulation of the world market of oil and oil products is amazing. In terms of its performance, this market ranks first in the world. It is known that the average turnover in the oil market reaches 300 billion dollars a year. In the decades after the discovery of the first important oil field (1859, Titusville/USA), petroleum was almost exclusively used to fuel lamps. With the invention of cars driven by combustion engines (Benz, 1886) and the electric light (Edison, 1880) on the one hand, and advances in petrochemistry on the other hand, oil began to lose its original function. Since 1900, steam boilers and machines of different kinds had increasingly been fueled by petroleum products. Motor vehicles, airplanes and tanks could only be driven with gasoline. Railways and industrial machines needed oil as lubricant. Asphalt – an oil residue – began to play an essential role in street building.¹

The modern oil industry was origins in Baku, 1837, where the first commercial oil refinery was established to distil crude oil into paraffin (used as lamp and heating oil), and not use crude oil as a direct fuel. The big advantage of establishing of crude oil refinery in this place was the surface oil resources, making oil upstream increadibly easy. By the 19th century, Azerbaijan was by far the frontrunner in the world's oil and gas industry. In 1846 - more than a decade before the Americans made their famous discovery of oil in Pennsylvania - Azerbaijan drilled its first oil well in Bibi-Heybat. At this time, a single oil field in Baku accounted for over 90% of the world's oil production, mostly going to Persia (now Iran).²

Based on Baku success and high interest of other world to get higher profit from so valuable feedstock, other commercial oil wells appeared around the world: Poland (1854), Romania (1857), Canada (1858) and USA (1859), sparking a 'black gold' rush in several of these regions.

The most successful around the world and first American mine was Oil Creek in western Pennsylvania developed by the first oil company, Pennsilvania Rock Oil Co, which was established in 1854. The first Oil Creek mine was drilled in 1859 under the direction of Colonel Edwin Drake. Pennsylvania was the clear winner and within a couple of years was producing almost half of the world's oil.

The highlight of 1870 was the opening of Standard Oil Co in Cleveland, Ohio. Subsequently, J. Rockefeller, the owner of the aforementioned oil company, captured the entire oil market, refining and marketing in the United States. The company quickly emerged

¹ History of oil [online] <https://www.ektinteractive.com/history-of-oil/>

² Petroleum industry in Azerbaijan [RU/online] https://en.wikipedia.org/wiki/Petroleum_industry_in_Azerbaijan

as the dominant player, driving prices down and buying up competition. Standard Oil expanded across the country and began exporting to overseas markets including China. It was so successful that by 1890, it controlled nearly 90% of refined oil in the US.³

The first exchange appeared in 1871, in the state of Pennsylvania, the city of Titusville. The Titusville Oil Exchange was formed in 1871 by independent oil producers, to strategize and stabilize a growing and highly competitive industry, sell shares of stock, establish prices, and enter into refining agreements. Before a formal exchange was formed, producers often discussed industry business along Centre Street and in nearby business establishments. After the assembly of the world's first car and the launch of the conveyor, the need for motor fuel increased significantly. Aviation advanced rapidly, and almost all types of transport switched to motor fuel. This became the main stimulus for the development of the oil industry and the world oil market, and already in 1907, the first automobile refueling appeared in America.⁴ In 1912 oil was discovered in Cushing, Oklahoma, which rapidly became one of the main US oil fields. Though its importance as a production centre has diminished, it has become the settlement point for the West Texas Intermediate (WTI) oil price, a major benchmark of global oil prices.

Texaco was founded in Beaumont, Texas as the Texas Fuel Company in 1902. In 1905, it established an operation in Antwerp, Belgium, under the name Continental Petroleum Company, which it acquired control of in 1913. The next year, Texaco moved to new offices in Houston on the corner of San Jacinto and Rusk. In 1928, Texaco became the first U.S. oil company to sell its gasoline nationwide under one single brand name in all 48 states.⁵

The end of the 19th century in England was marked by the opening of M. Samuel and Co by the entrepreneur M. Samuel. Subsequently, the well-known modern Shell Company was built based on this company. The start of oil production in Indonesia was given in 1885 on the island of Sumatra, which at that time was under Dutch control. The work was led by Royal Dutch. The merger of large companies Royal Dutch and Shell took place in 1907. Royal Dutch/Shell later became the largest oil conglomerate with the aim of remaining competitive in the face of increased price competition from US firms.

BP founded in 1909 as the Anglo-Persian Oil Company and in 1954 was renamed The British Petroleum Company. In 1998, it merged with Amoco, which was the largest industrial acquisition ever. BP is currently the fourth largest company in the world in terms of income and familiarity, and the third largest in the energy business sector. Chevron, Exxon and Mobil (now Exxon Mobil) were formed in 1911 when Standard Oil was split up by the Supreme Court of the United States as a result of antitrust violations.

³ The history of the discovery and use of oil and gas, and their origin [RU/ online] <http://energetika.in.ua/ru/books/book-1/part-2/section-8/8-1>

⁴ History of crude oil [online] <https://www.ig.com/au/commodities/oil/history-of-crude-oil-price>

⁵ History of Texaco [online] http://www.texacobaltic.eu/en/texaco_history

These international oil companies (IOCs) – BP, Chevron, Exxon, Gulf Oil, Mobil, Royal Dutch/Shell and Texaco - would become known as the ‘seven sisters’ and went on to control 85% of the world’s oil reserves at their peak in the early 1970s. Since then, industry dominance has shifted to the OPEC cartel and state-owned oil and gas companies in emerging-market economies, such as Saudi Aramco, Gazprom (Russia), China National Petroleum Corporation, National Iranian Oil Company, PDVSA (Venezuela), Petrobras (Brazil), and Petronas (Malaysia). In 2007, the Financial Times called these "the new Seven Sisters".^{6,7}

Crude oil during World War

World War I drove global demand for oil and caused prices to rise from \$0.81 a barrel in 1914 to \$1.98 in 1918. Demand after the war was driven by the ever-increasing popularity of cars, which caused a gasoline shortage on the west coast of America in 1920. Price surged to \$3.07 a barrel, falling back to \$1.61 by 1922 as production increased.

The Second World War crippled the market and even for a while suspended production in the largest oil powers. However, after its completion, oil production began to develop rapidly in the eastern countries: Saudi Arabia, Algeria, Indonesia, Kuwait, Libya, etc. The largest Gavar field was discovered in Saudi Arabia in 1947. After the war, governments looked to nationalise oil production. Iran, Indonesia and Saudi Arabia all partially nationalised their oil infrastructure between 1950 and 1960. Egypt also took control of the Suez Canal, through which nearly 5% of the world’s oil passed, in the crisis of 1956-57.⁸

3.2 Major global oil markets

The **American oil and gas market** takes only 27% of imports from the global oil market, but consumes about 30%. According to statistics, for every US citizen there are almost 2 tons of oil per year. Prices depend on the state of the state economy and on the volume of the world oil market. In addition, the American market has a huge impact on global supplies and prices in general. Crude oil takes 40 percent in the US fuel and energy structure. More than 500 million tons of oil are imported annually into the territory of this state.

The only problem is that America’s resources are almost exhausted, and the need for them is only increasing. The current situation on the world oil market is forcing the U.S. government to take measures to develop the oil industry, namely: to support production in existing fields, to develop new methods of production in previously unprofitable fields, the introduction of research and development in the field of exploration, refining of oil products

⁶ The Seven Sisters: The Great Oil Companies and the World They Shaped [online] <https://www.energytoday.net/conventional-energy/the-seven-sisters-the-great-oil-companies-and-the-world-they-shaped/>

⁷ Oil and gas production in South and Central America [online] <https://www.iogp.org/bookstore/product/global-energy-brief-latin-america/>

⁸ A brief history of oil [RU/online] <http://www.hsib.msu.ru/library/oil.html>

and oil production. High oil prices in the world market for years have become an incentive for investors, they began to invest in the development of fields that are in adverse conditions for production. An example is the case that in Alaska there was some diversification of supplies to the United States. Thus, it can be understood that Middle East shipments are tantamount to shipments from South or North America.⁹

The structure of US oil supplies is formed relative to its main economic regions and now we will analyze in more detail the functionality of each of them.

The Southeast Coast serves as the largest transit hub in the United States for the supply and distribution of crude oil. In addition, this region is the center of the country's oil refining industry. Local oil gains huge competitive advantages thanks to the Gulf of Mexico. Oil in this region is produced mainly in the states of Texas, Louisiana, Venezuela, as well as in Mexico. Oil products from Saudi Arabia also come here. Southeast terminals provide oil refineries located in the Midwestern United States. The second largest oil producer is the East Coast region. Due to the low development of oil refining production, the basis of exports to this region are oil products. Oil comes here through a pipeline running straight from Canada, as well as from Saudi Arabia and Venezuela. The oil reception terminal is located in the city of Philadelphia, and the petroleum products processing terminal is located in New York. The mountainous region has the smallest demand for oil and oil products; demand is satisfied on its own and partially from Canada. The west coast almost completely provides itself with the results of mining from Alaska. But this region is almost completely depleted, therefore, in order to maintain the level of oil demand, the volume of oil products imported into the United States is increased. The impending oil deficit can be filled with supplies from Canada, for which a new gas pipeline is planned.

The **Asia-Pacific region** oil market imports about 39% of the world's oil reserves, while consuming only 29%. It is important to note that the feature of this market is the uneven distribution of fuel resources. There is an excess of fuel resources in more developed countries and a lack of densely populated ones. The instability of the Asian market is associated with the instability of the supply of the main supplier, most of the resources come from the Persian Gulf. This is an impetus for an increase in the range of supplies from Russia and Kazakhstan.¹⁰

In countries belonging to this market, the demand for imported oil is great. For example, 80 percent of Japan's fuel needs are met by countries in the Middle East. The Middle East also assumes 37% of all supplies from China and 78% of supplies from nearby regions. The countries of the South East (Indonesia, Malaysia, Australia) cover only 14% of the needs of the Asian market.¹¹

⁹ US Oil Market: EIA Report [RU/online] <https://www.vestifinance.ru/articles/59821>

¹⁰ Crude-oil market [RU/online] <http://www.iccwbo.ru/blog/2016/mirovoy-rynok-nefti-razvitie-tseny-i-moshenniki/>

¹¹ Crude Oil Across the Asia Region [online] <https://www.cmegroup.com/education/courses/introduction-to-energy/introduction-to-crude-oil/learn-about-crude-oil-across-asia-region.html>

The Asian market clearly shows two features - a continuous increase in demand for petroleum products and a desire to develop supplies at the expense of Russia and Kazakhstan. According to experts, the largest increase in demand for petroleum products is expected precisely in the regions of China. At present, China's oil reserves are about 3.5 billion tons, but this may not be enough. Currently, China is rapidly gaining momentum in the fields of production and science, so the energy issue for them is more than acute. Especially when you consider that their resources are coming to an end, including energy.¹²

In order to at least slightly improve the situation, the Chinese government came up with the following plan of action. By 2030, the authorities want to increase the share of oil and energy from hydroelectric and nuclear power plants to 30%, while minimizing the share of coal due to environmental problems.

In the future, India will take the top of the Asian market. Currently, the bulk of fuel resources comes to the Asian region from the Middle East and Malaysia. It is estimated that over the next twenty years, China and India will become global market leaders. In order to solve pressing problems with energy resources, it was decided to liberalize the oil and gas sector. The main suppliers within the Asian region are: Malaysia, Indonesia and Australia, and more recently, Vietnam. The energy dependence of Asian countries on Middle East supplies worries the global market, so a defensive strategy has been developed as part of a global security system. We are talking about financing fuel reserves on the basis of Russia, the Caspian and Central Asian countries. Asian countries are working to create strategic reserves. So, Japan will be able to provide itself with petroleum products for 84 days.

The **European market** imports 26% of world reserves and consumes about 30%. In fact, the European market depends on the Northern deposits, which are practically exhausted. However, huge competition reigns here, in addition to deliveries from the Northern deposits, there are also fuel resources from Russia, the Middle East and African countries. According to experts, Iranian and Caspian oil may soon enter the market. The European market exists due to a large number of imports. So, 35% of supplies come from the Northern fields, 24% from Russia and Kazakhstan, 23% from the Middle East, 13% from Africa and 5% Algeria. At the same time, petroleum products are evenly distributed across regions with respect to their location and ease of delivery to them.¹³

3.3 Demand and supply. Oil reserves

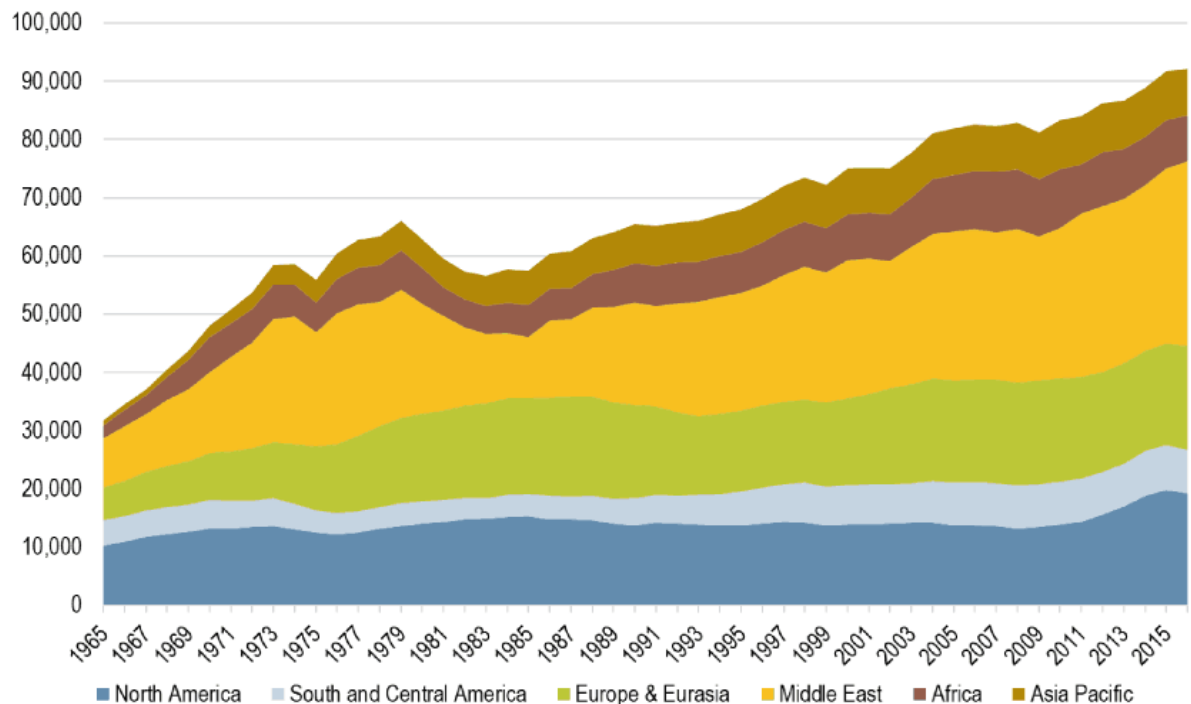
Oil is one of the top money-making commodities in the world today. Ever since the year 2016, the world has experienced a serious climb in terms of oil prices as well as the ever-

¹² Asia grows as a crude oil price maker [online] <https://www.ft.com/brandsuite/cme-group/asia-grows-as-a-crude-oil-price-maker/index.html>

¹³ Introduction to European Crude Oil [online] <https://www.cmegroup.com/education/courses/introduction-to-energy/introduction-to-crude-oil/introduction-to-european-crude-oil.html>

increasing demand for oil. The production of oil is a process that only stops if there is no more oil to extract. Inflation and the ratio of supply-and-demand in the oil industry has kept the rates of oil at an all-time high, and this has forced oil extraction rates to skyrocket too.¹⁴

Figure 1. Crude-oil production in 1000 barrels per day by region since 1965



Source: World Crude Oil Production and Consumption, 1965-2016

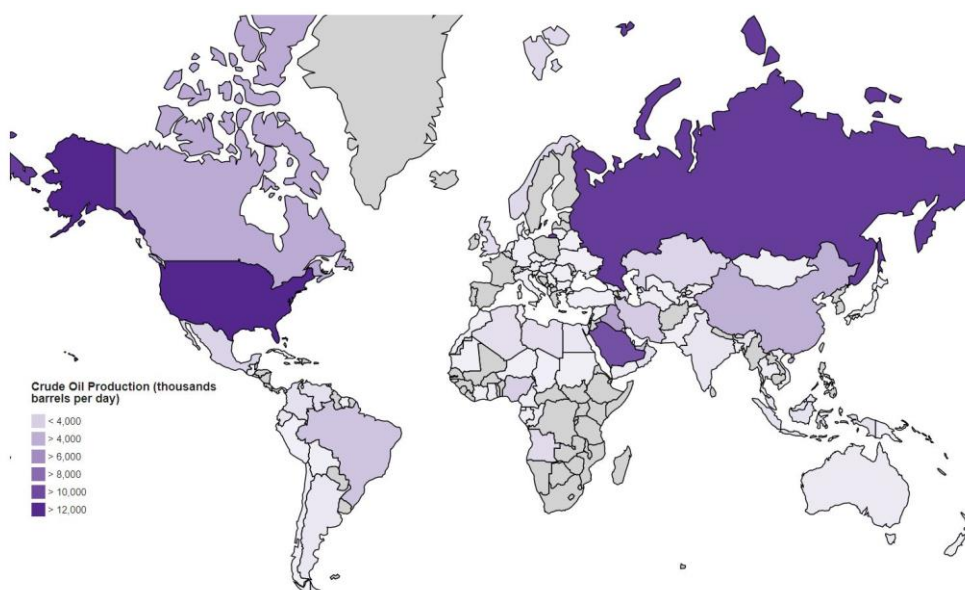
https://transportgeography.org/?page_id=6865

This is not necessarily the best action to take because it does cause pollution and damage to the atmosphere, but as of right now, there is slight chatter regarding cutting oil production among countries that produce oil. Oil production is measured in barrels per day, or BPD. The natural oil source is the plethora of oil wells all around the globe, of course. The interesting part about oil wells is that they do not only trap oil. Excess water and other natural gases are trapped in the wells, too, so miners have to separate the unnecessary water retention and additional gas before containing oil in barrels.¹⁵ Crude oil production by sector and by country is presented at Figure 1 and Figure 2. Also, the list of the Top oil producers is shown in Table 1.

¹⁴ Oil Producing Countries 2019 <http://worldpopulationreview.com/countries/oil-producing-countries/>

¹⁵ Oil well [online] https://energyeducation.ca/encyclopedia/Oil_well

Figure 2. Crude-oil production in thousands barrels per day



Source: Oil Producing Countries 2019 <http://worldpopulationreview.com/countries/oil-producing-countries/>

Tab. 1 The 10 largest oil producers and share of total world oil production in 2018

Country	Million barrels per day	Share of world total
United States	17.87	18%
Saudi Arabia	12.42	12%
Russia	11.40	11%
Canada	5.27	5%
China	4.82	5%
Iraq	4.62	5%
Iran	4.47	4%
UAE	3.79	4%
Brazil	3.43	3%
Kuwait	2.87	3%
Total top 10	70.96	70%

Source: Top ten countries by oil production <https://www.offshore-technology.com/features/oil-production-by-country/>

3.3.1 Top 3 crude-oil producers

1. USA

Number one on this list of the top 10 oil-producing countries is the US. It produced the most oil in 2018, with output increasing from 15,647,000 bpd in 2017 to 17,886,000 bpd in 2018. The US has been described as a swing producer because its production fluctuates alongside market prices. The International Energy Agency forecasts that the country will continue to satiate the world's appetite for oil as demand expands in the next five years.

In addition to being a major oil producer, the US is a big consumer of oil. Last year, the US took in a total of 7.26 billion barrels of petroleum products — that's an average of about 19.88 million bpd. US President Donald Trump has criticized OPEC's cuts, saying they have driven oil prices artificially high. He has also instigated sanctions against both Russia and Iran, and pulled the US out of the Iran nuclear deal.¹⁶

2. Saudi Arabia

Saudi Arabia's output 9.9 million barrels of oil per day - 12.65% of the total daily amount of oil barrels produced in the world. Middle Eastern country possesses 18 percent of the world's proven petroleum reserves and ranks as the largest exporter of petroleum. Its oil and gas sector accounts for about 50 percent of its GDP, and about 85 percent of its export earnings.

In the late 1990s, the country was exposed to a severe economic crisis, as the economy is highly dependent on world energy prices. The country, like Russia, is the main member of OPEC and therefore these two states have agreements to reduce oil production to regulate world prices. The main oil company that controls the Saudi Aramco oil production market.¹⁶

3. Russia

Russian oil output has been increasing steadily over the years, growing from 11,210,000 bpd in 2017 to 11,401,000 bpd last year.¹⁷ Despite coming in third on the list, Russia is the world's largest producer of crude oil and the second largest producer of dry natural gas, according to the EIA. In 2012, the state budget of the Russian Federation was almost 40% generated from profits from the export of "black gold". The Russian government is trying to readjust the economy so that it is less dependent on world oil prices. So, in 2014, due to a fall in world prices, the ruble almost doubled against the dollar and fell in price by half.

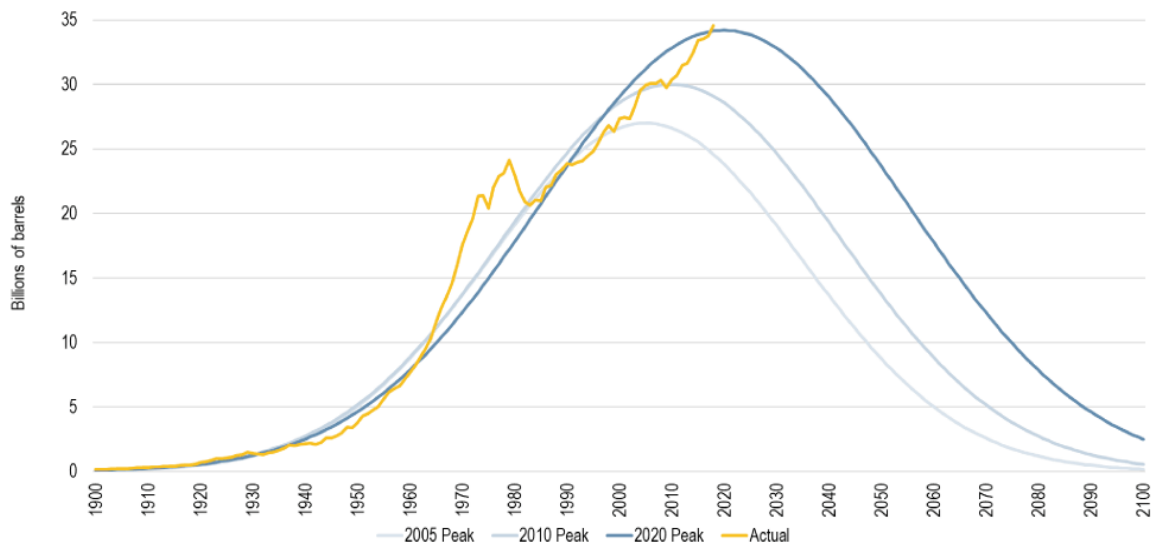
Some believe Russia will be one of the few nations to benefit from US sanctions on Iran. That's because if Iran toes the line on sanctions, then its oil customers, which include

¹⁶ Top 10 Oil-producing Countries <https://investingnews.com/daily/resource-investing/energy-investing/oil-and-gas-investing/top-oil-producing-countries/>

¹⁷ Top ten countries by oil production <https://www.offshore-technology.com/features/oil-production-by-country/>

China, France, Turkey and Italy, could turn to Russia for supply. This would not only give Russia an economic boost, but could improve relations between the countries. However, Iran's current position is to not abide by the sanctions. World annual production since 1900 is presented at Figure 3.

Figure 3. World Annual Oil Production (1900-2018) and Peak Oil (2005-2020 Scenarios)



Source: Adapted from BP Statistical Review of World Energy

https://transportgeography.org/?page_id=5944

3.3.2 Demand

Over the past twenty years, world oil demand has steadily increased, and as a whole has increased from 490 tons/day in 1991 to 560 tons/day in 2001, or by 13.8%. World GDP for the same period increased by 43.3%. Thus, on average for the period 1992-2001, a 1% increase in world GDP was accompanied by a 0.32% increase in world oil demand. The slowdown in the global economy is accompanied by a fall in world oil prices. So, with global GDP growth rates of less than 3% per year (this situation took place in 1991, 1993, 1998 and 2001), world oil prices were steadily falling, with their annual decline exceeding 10%.¹⁸ World import of oil and oil products is presented at Table 2.

North America plays a leading role in shaping global oil demand, accounting for 30.4% of global oil consumption (Figure 4). At the same time, 25.6% of world consumption falls on the United States. Europe (excluding countries on the territory of the former USSR) accounts for 21.4% of world consumption, including 18% for EU countries. The third major center of world consumption is the countries of the Asia-Pacific region. Japan is the largest Asian oil consumer, accounting for 7.2% of global consumption. Large consumers are also China (6.8% of world consumption) and South Korea (2.9%). It can be noted that South Korea

¹⁸ Global oil demand to disappoint [online] <https://www.petroleum-economist.com/articles/markets/trends/2019/global-oil-demand-to-disappoint>

alone consumes almost as much oil as all of Africa. The leading role in shaping global oil demand is played by industrialized countries. In 2000, OECD countries accounted for 62.4% of world oil consumption, while the USA, EU countries and Japan accounted for 50.8% of world oil consumption. In Russia, oil consumption is much less than in North America and Europe, and it does not exceed 4% of the total.¹⁹ The role of leading industrialized countries in shaping global demand and, consequently, in shaping oil prices on the world market can be clearly illustrated by data on the structure of world imports of oil and oil products.

Tab. 2 World import of oil and oil products

	Crude-oil		Oil products	
	Million tones	%	Million tones	%
World market	1660.7	100.0	451.2	100.0
USA	446.0	26.9	103.6	23.0
West Europe	402.7	24.2	96.0	21.3
Japan	215.0	12.9	49.1	10.9
Other countries	597.0	35.9	202.5	44.0

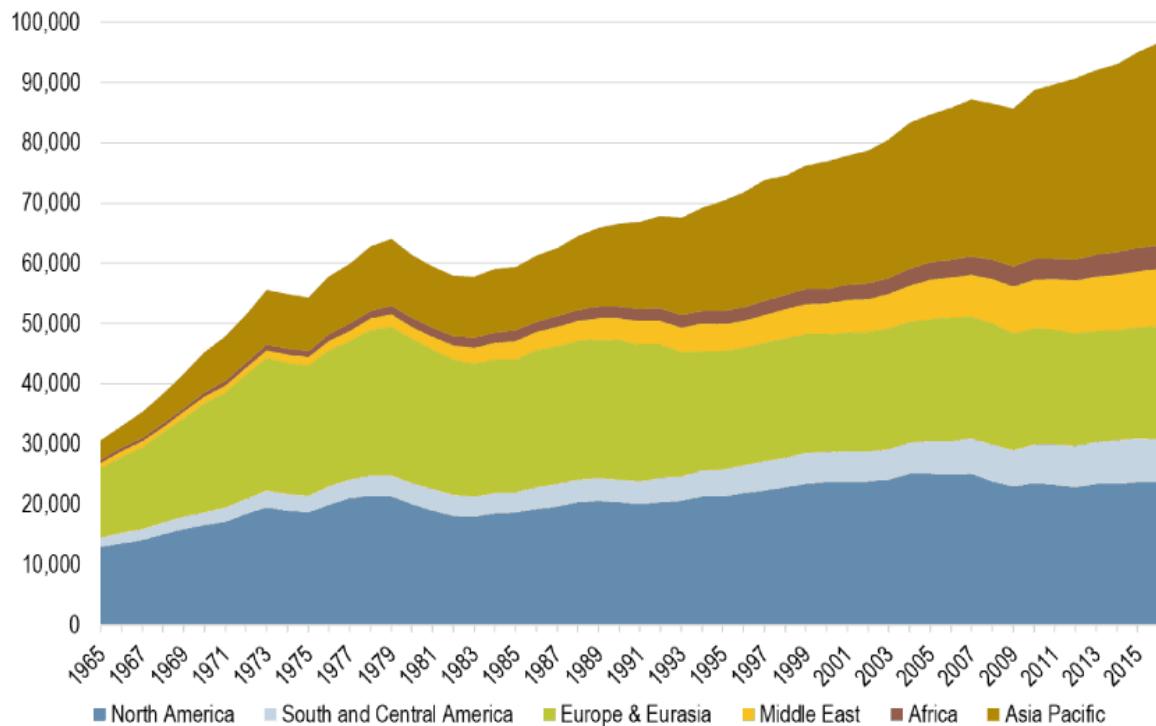
Source: BP Statistical Review of World Energy.

https://transportgeography.org/?page_id=5944

Oil supply in the world market is determined by the demand for oil products and, accordingly, by the factors that form this demand. At the same time, the geological and technological factors reflecting the geological characteristics of the developed and explored fields, the state policy in the oil producing countries in relation to the oil sector, the behavior of oil companies - oil producers, and also some random factors influence the volume of oil supply (production). The 10 largest oil consumers and share of total world oil consumption in 2016 is presented in Table 3.

¹⁹ Global Energy & CO₂ Status Report [online] <https://www.iea.org/geco/oil/>

Figure 4. Crude-oil consumption in 1000 barells per day since 1965



Source: World Crude Oil Production and Consumption, 1965-2016

https://transportgeography.org/?page_id=6865

Tab. 3 The 10 largest oil consumers and share of total world oil consumption in 2016

Country	Million barrels per day	Share of world total
United States	19.69	20%
China	12.79	13%
India	4.44	5%
Japan	4.01	4%
Russia	3.63	4%
Saudi Arabia	3.30	3%
Brazil	2.98	3%
South Korea	2.61	3%
Canada	2.47	3%
Germany	2.38	2%
Total top 10	58.31	60%

Source: U.S energy information administration

<https://www.eia.gov/tools/faqs/faq.php?id=709&t=6>

3.3.3 World oil reserves

World oil reserves currently amount to about 145 billion tons and, on the whole, make it possible to ensure both current and prospective global demand for oil (the current world oil production has proven reserves of 40 years). At the same time, the geographical distribution of oil reserves is extremely uneven. A number of countries that control significant oil reserves have merged into the Organization of Petroleum Exporting Countries (OPEC). OPEC currently includes 11 states: Algeria, Venezuela, Indonesia, Iran, Iraq, Qatar, Kuwait, Libya, Nigeria, United Arab Emirates, Saudi Arabia).²⁰

the geographic imbalance in oil reserves is like production. In the end, OPEC accounts for the bulk of oil reserves. Until recently, Saudi Arabia alone had about 25% of the world's oil reserves, but changes in oil reserve estimates have significantly increased the share of Venezuela and Canada's reserves. Mainly due to rising oil prices and improved production technologies, Canadian bituminous Sands have become economically recoverable, so they can be considered official reserves. The question remains to what extent these reserves are economically recoverable, and if a cost-effective path is chosen, it will go a long way to increasing the availability of oil on world markets. In addition, at the current level of OPEC consumption, it may take a long time to deplete oil reserves. In recent years, the United States has also experienced a significant increase in its reserves due to the inclusion of shale oil. No European country, except Norway, has significant oil reserves.²¹

However, there is some controversy about the true size of oil reserves, especially in the middle East. OPEC countries may have greatly exaggerated their reserves, mainly because production quotas are based on estimated reserves. This means that the larger the reserves, the more OPEC can export oil. Kuwait is a good example of this problem, as it was reported to be gradually reducing its stockpiles in the early 1980s. This was to be expected, since the Kuwaiti oil industry can be considered Mature. However, in 1985, the country reported a 50% increase in its reserves without any new discoveries - a strategy designed solely to increase export quotas. There are three categories of discovered crude-oil reserves. These are based on how likely it is the oil can be recovered using current technology.²¹

Proven Reserves - There is a greater than 90% chance that the oil will be recovered. OPEC proven reserves and OPEC share of world crude oil reserves is presented at Figure 5.

Probable Reserves - The chance of actually getting the oil out is greater than 50%.

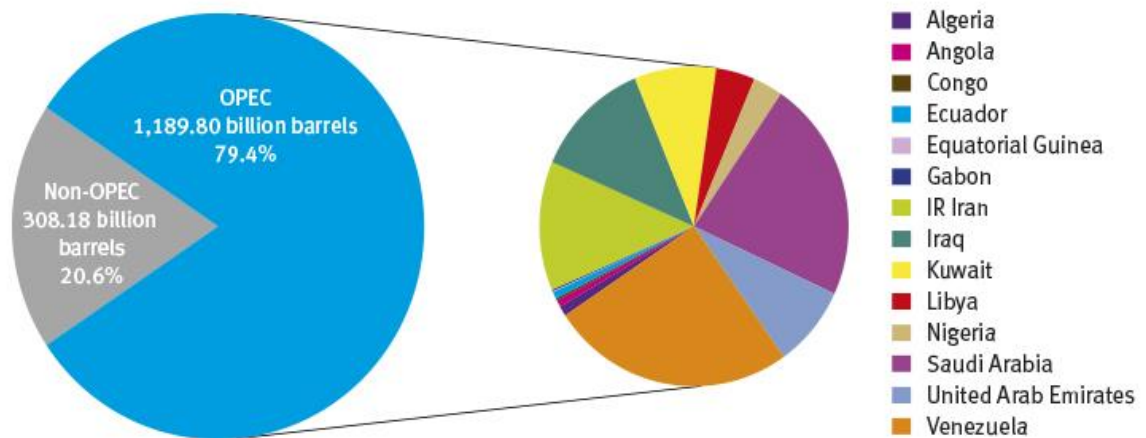
Possible Reserves - The likelihood of recovering the oil in place is significant, but less than 50%.

²⁰ OPEC website https://www.opec.org/opec_web/en/

²¹ Major Crude Oil Reserves, 2000-2018 [online] https://transportgeography.org/?page_id=6828

Figure 5. World crude-oil reserves by Non-OPEC and OPEC countries

OPEC share of world crude oil reserves, 2018



OPEC proven crude oil reserves, at end 2018 (billion barrels, OPEC share)

Venezuela	302.81	25.5%	Kuwait	101.50	8.5%	Algeria	12.20	1.0%	Gabon	2.00	0.2%
Saudi Arabia	267.03	22.4%	UAE	97.80	8.2%	Ecuador	8.27	0.7%	Equatorial Guinea	1.10	0.1%
IR Iran	155.60	13.1%	Libya	48.36	4.1%	Angola	8.16	0.7%			
Iraq	145.02	12.2%	Nigeria	36.97	3.1%	Congo	2.98	0.3%			

Source: OPEC annual statistical bulletin 2019

https://www.opec.org/opec_web/en/data_graphs/330.htm

Of the three categories, the most commonly used is proven oil reserves. That's where analysis of geological and engineering data demonstrates with reasonable certainty to be recoverable from known reservoirs. Only the oil that is commercially viable under current economic conditions is counted. If oil prices rise or new technology makes costs lower, then more fields become viable.²²

Oil Sands Reserves - the ability to extract oil sands for a reasonable cost has increased the amount of proven reserves. Most of it, totaling about 166 billion barrels, is in Alberta, Canada. The United States imported 1.236 billion barrels from these fields in 2014.²³

3.3.4 Relationship of Reserves to Production

A country must have large reserves to produce and export a lot of oil. But having large reserves isn't enough. It must also have the political stability and expertise to extract, refine, and ship the oil. For example, Venezuela has the world's largest reserves. But its type of reserves is expensive to extract, requiring a high level of expertise. In addition, the government, which had nationalized the oil industry, also mismanaged the production. It may have even damaged the reserves. As a result, it's not even in the list of top 10 oil producers.

²² Oil Reserves, Their Categories, and the World's Largest [online] <https://www.thebalance.com/oil-reserves-definition-categories-world-s-largest-3305873>

²³ Oil sands facts and statistics [online] <https://www.alberta.ca/oil-sands-facts-and-statistics.aspx>

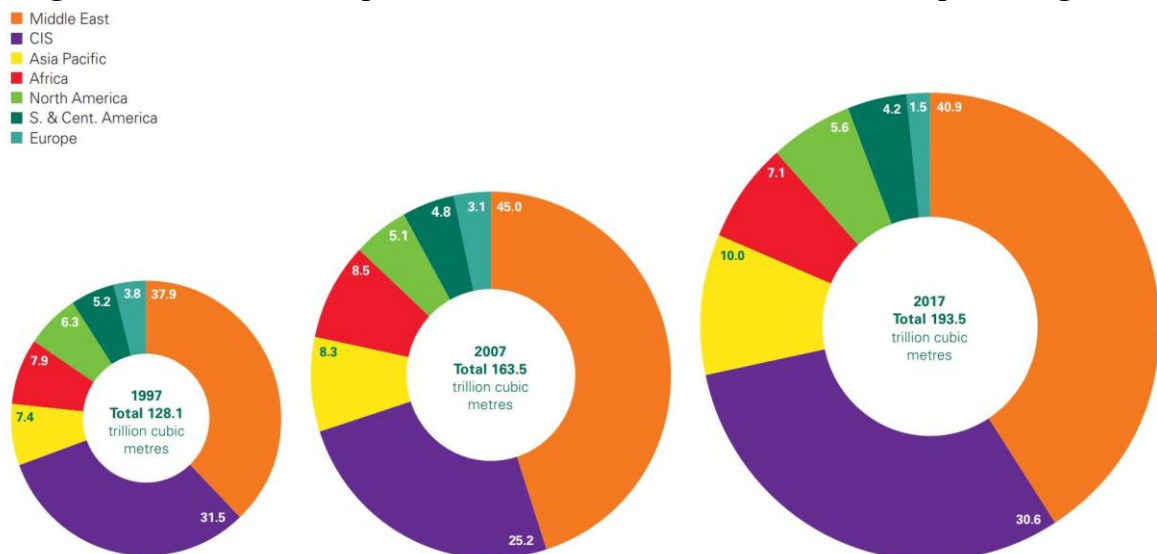
Since most of the government's revenue depended on oil, the country's economy has collapsed.²²

In Russia there is a classification according to which oil and gas reserves are divided into categories based on the knowledge of the degree of industrial development. It is important to emphasize that indicators of world oil reserves are constantly changing due to the discovery of new and the exhaustion of existing fields. At the beginning of 2017, the total reserves of world oil amounted to 1,706.8 billion barrels.

3.3.5 Natural gas. Reserves, production and consumption.

Natural gas is widely distributed in the world (Figure 6), mainly as associated petroleum gas. The leading gas producing countries are the USA, Russia and Canada, but prospecting for exploration at sea, especially off the coast of Africa, Asia, South America, in the North and Caspian seas, offers great prospects for discovering potentially significant deposits. The main use of natural gas is as a fuel in industry and household. In industry, it is used in the smelting of metals and glass, the production of lime and cement, the preparation of bread and other food, and in many other cases. It is also used in the production of gasoline, soot and some important chemical products, such as methyl alcohol, formaldehyde, synthetic ammonia. In households, gas is combustible in stoves, heaters, gas stoves, and the like.²⁴

Figure 6. Distribution of proved reserves in 1997, 2007 and 2017 in percentage



Source: BP Statistical Review of World Energy 2018.

<https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2018-full-report.pdf>

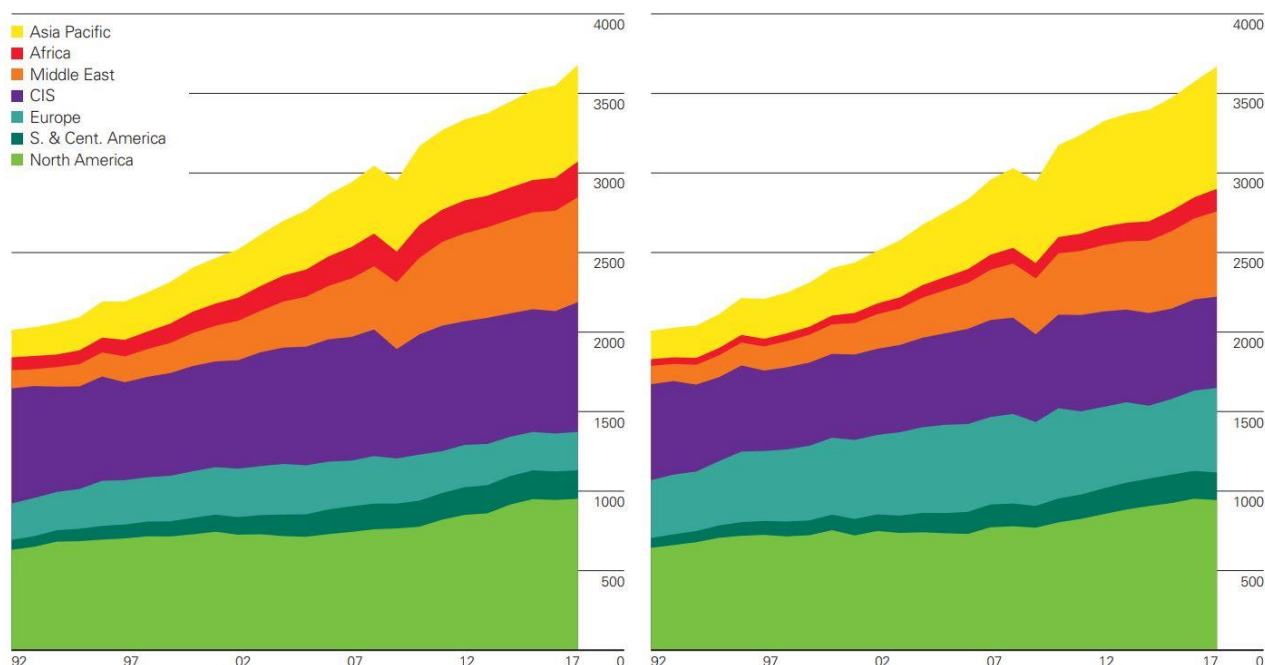
Global proved gas reserves in 2017 rose slightly by 0.4 trillion cubic metres (tcm) or 0.2% to 193.5 tcm. This is sufficient to meet 52.6 years of global production at 2017 levels.

²⁴ Oil and Gas Trends 2018-19 [online] <https://www.strategyand.pwc.com/gx/en/insights/industry-trends/2018-oil-gas.html>

Israel was the largest single contributor to growth (0.3 tcm), while the CIS region also added 0.2 tcm to reserves. By region, the Middle East holds the largest proved reserves (79.1 tcm, 40.9% of the global total), followed by CIS (59.2 tcm, a 30.6% share).²⁵

Global natural gas production (Figure 7) increased by 131 billion cubic metres (bcm), or 4%, almost double the 10-year average growth rate of 2.2%. Russian growth was the largest by far at 46 bcm, followed by Iran at 21 bcm, and Australia at 17 bcm. Gas consumption rose by 96 bcm, or 3% – the fastest growth since 2010. Growth was driven by China (31 bcm, or 15.1%), the Middle East (28 bcm) and Europe (26 bcm). Consumption in the US fell by 1.2%, or 11 bcm.²⁶

Figure 7. Natural gas production (left) and consumption by region in billion cubic meters since 1992



Source: BP Statistical Review of World Energy 2018

<https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2018-full-report.pdf>

²⁵ The world's biggest natural gas reserves [online] <https://www.hydrocarbons-technology.com/features/feature-the-worlds-biggest-natural-gas-reserves/>

²⁶ BP Statistical Review of World Energy 2018. <https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2018-full-report.pdf>

3.4 Types of crude oil

3.4.1 Parameters of crude oil

Several methods have been developed to classify crude oil, ie to classify into certain groups according to common features. The origin, age, fractional composition, chemical composition and physical properties of the various types of oil differ markedly from each other, so none of the methods used can characterize the oil in a simple way.

Demand on different types of crude-oil is based on the crude-oil properties and composition. For instance, lighter crude oil has higher price on the market than heavy crude-oils, cause of energy and economical recovery for the producing of transport fuels.²⁷

Each oil is typically characterized by the contents of each gaseous hydrocarbon, sulfur, water and inorganic salts, density, viscosity, and freezing point. Then the oil is distilled into narrower fractions, the yield of the individual fractions is determined and selected properties, in particular density, viscosity, freezing point, sulfur and nitrogen contents, for light fractions, group composition (alkane, alkene, cycloalkane and aromatics).

This detailed analysis of Crude Oil Assay is used to estimate the yield and properties of the individual fractions obtained by the industrial distillation of crude oil and the post-processing process. The most important parameter used for simple oil classification is density, since its value suggests the content of light fractions. The density of oil and petroleum fractions is very often expressed in API degrees (Table 4).²⁸

Tab. 4 Classification of crude-oil by API degree

Type of oil based on CFE	°API	Density at 15,6 °C (g/cm ³)	Type of oil based on WEC	°API	Density at 15,6 °C (g/cm ³)
Light oil	>31,1	<0,87	Conventional oil	>25	<0,904
Medium oil	31,1-22,3	0,87-0,92	Medium oil	20-25	0,904-0,934
Heavy oil	22,3-10	0,92-1,00	Heavy oil	10-20	0,934-1,00
Extra heavy oil	<10	>1,00	Extra heavy oil	<10	>1,00

CFE – Canadian center for energy

WEC – world energy council

Source: Blažek J., Rábl V.: *Základy zpracování a využití ropy*, ISBN 80-7080-619-2.

Depending on the sulfur content, crude oil is divided into non-sulfur (S content up to 0.2 wt%), low sulfur (S content 0.21-0.50 wt%), sulfur (S content 0.51-3.0 wt%) and very sulfur (S content above 3.0 wt.%). According to the content of solid hydrocarbons (paraffin), which can be after cooling the oil to a certain the oil is divided into paraffinic (paraffin content

²⁷ Blažek J., Rábl V.: *Základy zpracování a využití ropy*. 2. vyd. Vysoká škola chemicko-technologická v Praze, Praha 2006. ISBN 80-7080-619-2

²⁸ API gravity [online] https://www.engineeringtoolbox.com/api-gravity-d_1212.html

above 2.0 wt.%), semi-paraffinic (paraffin content 1.0-2.0 wt.%) and non-paraffinic (paraffin content below 1.0 wt.%).²⁹

3.4.2 Important crude-oils

Brent oil is a world standard of oil in terms of its quality, properties and composition, which is the most optimal from the point of view of refining and production of oil products. All oil produced in the world (in Saudi Arabia, the North Sea, the USA, the Gulf of Mexico, Southeast Asia, etc.) is related to the standard of Brent oil, which was once developed by oil exporting countries (OPEC). The oil produced in a particular field, of course, differs from the standard, and its price depends on the magnitude of this difference. That is, the worse the oil, the further it is separated in quality, properties and composition from the Brent standard, the lower its price. In turn, the price of Brent oil is just a benchmark. Brent oil is produced in the North Sea. The name Brent consists of the first letters of the names of the layers Broom, Rannoch, Etieve, Ness and Tarbat.³⁰

The Brent deposit is located in the northern part of the Viking graben of the Central North Sea reef system of the North Sea oil and gas basin. Oil of the field is one of the main components of the so-called Brent mixtures, which is one of the main reference mixtures of oil in the world market. Brent is considered the most suitable for the production of gasoline and medium distillers. It is usually processed in Northwest Europe, then, if the price is suitable for export to the Eastern Gulf of the United States or the Mediterranean.

Brent mix is classified as light low-sulfur oil, its density at 20 ° C is about 0.825-0.828 g/cm³ (38.6–39 degrees API), and its sulfur content is about 0.37%. According to these indicators, WTI (West Texas Intermediate, aka Light Sweet) is close to the American mixture. Typically, Brent crude oil is refined in the north-west of Europe, but at favorable pricing conditions it can be delivered for refining in the USA and the Mediterranean.³¹

West Texas Intermediate (WTI) also known as Texas light sweet is a brand of oil produced in the state of Texas (USA), the density in degrees of API is 39.6 °, the density is 0.827 g/cm³, the sulfur content is 0.4-0.5 %. It is mainly used for the production of gasoline, therefore, this and similar grades of oil are in high demand, in particular in the USA and China. Oil prices are largely determined by the value of the West Texas Intermediate brand, traded on the NYMEX exchange since 1983. Typically, WTI futures are set for delivery to hubs in Cushing, Oklahoma, USA.³²

²⁹ Crude oil characterization [online] https://petrowiki.org/Crude_oil_characterization

³⁰ Brent Crude Oil Analysis [online] <https://www.ivoryresearch.com/writers/paula-wright/>

³¹ Brent Crude – Definition [online] <https://thebusinessprofessor.com/knowledge-base/brent-crude-definition/>

³² Benchmark Oils: Brent Blend, WTI and Dubai [online]

<https://www.investopedia.com/articles/investing/102314/understanding-benchmark-oils-brent-blend-wti-and-dubai.asp>

WTI and another major brand, Brent, represent almost the same product in terms of composition. For a long time, the difference between their prices was small. Typically, Brent was trading at US \$ 1–4 per barrel lower than WTI due to higher shipping costs to the US. However, since 2011, parity has changed and Brent began to bargain with a premium of \$ 10–20 per barrel to WTI prices. The difference in price between them can be explained in various ways, including: direct connection of WTI futures with physical deliveries (they reach 3–4% of contracts), in contrast to more convenient for trading and speculating non-deliverable Brent futures; congestion in the infrastructure of Cushing (overstocking of oil storage facilities); greater economic growth of countries whose imports are set by Brent prices.³³

Export prices for 2/3 of the world's oil varieties directly or indirectly depend on the prices of WTI and Brent, despite the fact that the production of the WTI grade itself is less than 1% of all world oil production.

Dubai Crude is a marker grade of oil produced in Dubai and used since the mid-1980s as a benchmark in setting prices for other brands of export oil in the Persian Gulf region, as well as for exporting to the Asian region. The other two reference brands in the world are Brent (Europe) and West Texas Intermediate (USA).³⁴

Bonny Light (Nigerian light) is a brand of oil produced in Nigeria. It is used in setting prices for other grades of export oil in the Gulf region. Density is 33.4 ° API, sulfur content is 0.16%. Included in the OPEC export basket.³⁵

Urals oil (Russian export blend) is a high-sulfur oil grade (sulfur content of about 1,3 wt%), which is a mixture of oil produced in the Khanty-Mansiysk and Yamalo-Nenets Autonomous Districts, Bashkortostan, Tatarstan and Samara Region. The cost of Russian oil has historically been defined as the price of a barrel of Brent oil at a discount, that is, reduced by 1–2 dollars, since Russian oil is heavier (contains less gasoline and gas oil fractions and, as a result, has a higher density) and has a higher sulfur content. Since the late 2000s, it has actually been an independent marker variety.³⁶

3.5 Price of crude-oil

Oil is a certain fuel, or energy, basis for the global economy. And not only in Russia, which is considered to have long been hooked on an oil needle, fuel and energy prices interest residents of all countries of the world. Let's take a closer look at the factors of price dynamics in the global oil market. Black gold is a commodity, which means that the rule "there is demand, there will be supply" applies to it.

³³ West Texas Intermediate [online] https://en.wikipedia.org/wiki/West_Texas_Intermediate

³⁴ Benchmark Oils [online] <http://www.petroleum.co.uk/benchmarks>

³⁵ Bonny Light crude [online]

<https://www.mckinseyenergyinsights.com/resources/refinery-reference-desk/bonny-light-crude/>

³⁶ Urals oil [RU/online] <https://ru.wikipedia.org/wiki/Urals>

Originally, the extracted oil was transported in barrels (metal barrels), so it was removed the amount of oil extracted or consumed was reported in barrels (bbl). Thus, expressed oil production and consumption has been preserved to the present time. Oil is usually paid in US dollars (USD), so the price of oil is usually quoted in USD / bbl. One ton oil contains 7 - 8 barrels depending on oil density. The price of oil varies according to supply and demand, it is also influenced by various political influences and events. On the oil exchanges, the following four types of crude oil are mainly observed the price of other types of oil depends on:

- Brent - oil from the North Sea (known as Forties from 1976 to 1984)
- WTI - West Texas Intermediate
- Dubai - Gulf oil (known as Arabian Light from 1972 to 1986);
- Nigerian Light - African oil.

For oil prices, it is necessary to distinguish whether these are so-called spot prices or prices on-site (FOB - Free On Board) or prices including shipping and insurance (Cost, Insurance, Freight).³⁷ The price is also influenced by whether it is long-term contractual delivery or immediate purchase resulting from an urgent need. Oil price US inflation is also affected, as oil is usually paid in US dollars. The price of oil also depends on its properties, especially its density and sulfur content. The lower the oil density, the greater the distillate content boiling up to 360 °C, which are used for the production of fuel, which is also more expensive. The oil has bigger heteroatom content], which must be removed from many of the fractions obtained by treatment, the lower the price. The price of oil mined in areas where oil must be in large import volumes are higher than the price at the places where oil is exported. Therefore, the price of oil WTI exceeds the price of much lighter Saharan Blend, the price of which is for US consumers increased by shipping costs.²⁷

The main factors affecting pricing:³⁸

- The ratio of fuel exporting countries. For example, OPEC can set any production quota, and if this organization makes a strong-willed decision, the supply will noticeably decrease and the price will rise (more in section 3.5.1 OPEC. OPEC oil basket).
- The instability in the politics of oil-rich countries is a factor slowing down the supply process (more in section 3.5.3 Geopolitical events).
- Natural conditions. Various disasters and natural disasters can slow down the supply or even interrupt it for an indefinite period of time.

³⁷ Cost, Insurance and Freight – CIF Definition [online] <https://www.investopedia.com/terms/c/cif.asp>

³⁸ What determines oil prices? [online] <https://www.investopedia.com/articles/economics/08/determining-oil-prices.asp>

-Political decision to reduce or increase stocks in the United States.

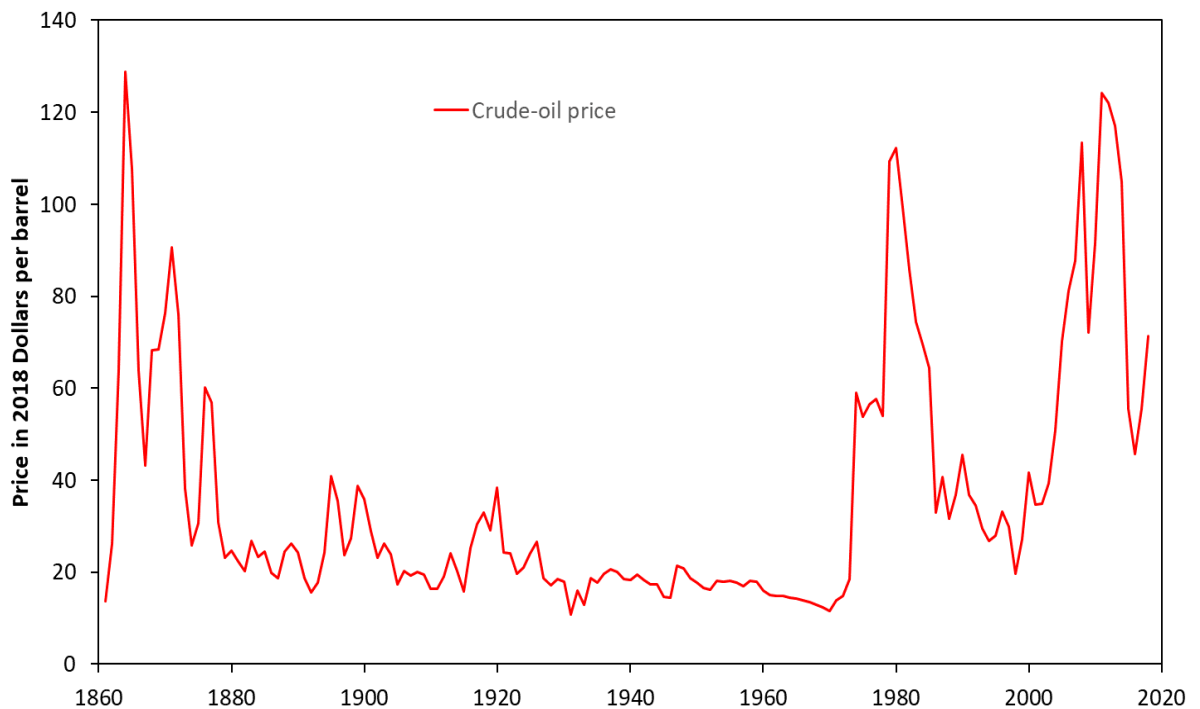
-The development of science, the introduction of new laws.

These factors are enough to deduce the following:³⁹

-Fluctuations in the exchange rate may depend not only on market conditions, but also on the “games” of small investors. The speculative moment in such markets is no less than in the financial ones.

The history of crude oil prices since 1860 is presented in Figure 8.

Figure 8. Crude-oil prices since 1860 in 2018 dollars per bareel



Source: Crude Oil Prices <https://www.macrotrends.net/1369/crude-oil-price-history-chart>

Impotrant dates in history of crude oil prices:⁴⁰

1862-1865 – US Civil War drices up commodity prices

1865-1890 – prices boom and bust with fluctuation in US drilling

1890-1892 – recession and strong production from US and Russia bring prices down

1891-1894 – Pennsylvania oilfields begin to decline, setting the stage for higher prices in 1895

1894 – Cholera epidemic cuts production in Baku, Azerbaijan, contributing to 1895 spike

1920 – rapid adoption of the automobile drastically raises oil consumption

³⁹ What Affects Oil Prices? Three Critical Factors [online] <https://www.thebalance.com/how-are-oil-prices-determined-3305650>

⁴⁰ TIMELINE: The tumultuous 155-year history of oil prices <https://www.businessinsider.com/timeline-155-year-history-of-oil-prices-2016-12>

1931 – prices hit record low as onset of Great Depression reduces demand
1947- post-war automobile boom creates fuel shortages in some US states
1956-1957 – Suez crisis takes 10% of worlds oil off the market
1972 – US oil production peak
1973-1974 – Arab states institute embargo against countries supporting Israel in the Yom Kippur War
1978-1979 – Iran cuts production and export during revolution, cancels contracts with US companies
1980 – Iran-Iraq War begins
1980s – demand responds to supply shocks pushes prices down
1988 – Iran and Iraq increase output with end of War
1999 – Asian demand recover after 1997
2001-2003 – 9/11 and invasion of Iraq raise concerns about Middle East stability, Venezuela oil workers strike
2011 – Arab Spring, civil war disrupts Libyan output

In addition, you need to understand the relationship between the dollar and black gold. After all, this product is evaluated in relation to it. For example, the stronger the dollar position, the lower the price per barrel (more in section 3.5.2 US dollar exchange rate).

3.5.1 OPEC. OPEC oil basket

Organization of the Petroleum Exporting Countries (OPEC) is a permanent intergovernmental organization created by the five founding countries (Iran, Iraq, Kuwait, Saudi Arabia and Venezuela) in September 1960 during a conference in Baghdad. Currently, 14 countries are members of the organization. The founder countries already mentioned are joined by Qatar (in 1961), Libya (in 1962), the United Arab Emirates (in 1967), Algeria (in 1969), Nigeria (in 1971), Ecuador (in 1973), Angola (in 2007) Equatorial Guinea (2017) and Congo (2018). At one time, this organization also included: Indonesia (from 1962 to 2009) and Gabon (from 1975 to 1994). The OPEC headquarters in the first five years was located in Geneva (Switzerland), and from September 1, 1965 moved to Vienna (Austria), where it is currently located.⁴¹

The goal of OPEC is to coordinate and unify the oil policy of the organization's member countries in order to ensure fair and stable oil prices in the world market, effective economically sound and regular oil supplies to consumer countries, as well as to ensure investors who have invested in the development of the oil industry , fair return on investment.⁴¹ Thus, OPEC, making any decision to change quotas for oil production in order

⁴¹ OPEC [online] <https://en.wikipedia.org/wiki/OPEC>

to adjust world prices, actually only outlines a desirable direction for the movement of world prices. Players in the financial markets, especially those who are classified as “speculators,” actively promote and capitalize on fluctuations in oil prices, thereby seriously distorting the effect on which OPEC events were designed.

The attitude to OPEC on the part of the main consumers of oil - industrialized countries over the past more than forty years has changed, and dramatically. At first, in the West they were skeptical, wary, and even very hostile. After all, this organization was formed during a period of significant changes in the world economic system, during the collapse of the old world order, the transfer of control over the most important sources of strategic raw materials from international oil monopolies to national governments and companies.⁴²

The unification of oil exporting countries in OPEC allowed its member countries to formulate a single policy in the fight against the monopoly created by the cartel, and gradually the attitude to this organization in the international arena changed from initially skeptical to more serious. With the growth of authority, the number of member countries of the organization also grew.⁴³

In the Soviet Union in the 60s, the attitude towards OPEC was initially favorable - the organization served as a real counterweight to the oil monopolies of the "imperialists" in the context of the intensified struggle of developing countries for national independence. Soviet leaders then believed that if it were not for some kind of brake in the face of the "reactionary monarchist regimes" of a number of Middle Eastern states, the OPEC member countries could have taken almost the socialist path. This, as the future has shown, did not happen. For the first time, OPEC was brought to the top of world politics during the first energy crisis of 1973–74. This crisis erupted as a result of the oil embargo imposed by oil-producing Arab countries against Western countries - allies of Israel, and OPEC actively supported this action. Then world prices made a sharp three-fold jump and brought the world oil market to a new stage of its development.⁴⁴

The **OPEC Basket**, is a weighted average of prices for petroleum blends produced by OPEC countries members. It is used as an important benchmark for crude oil prices.⁴⁵ OPEC reference basket consist of a weighted average of this crudes: Saharan Blend, Girassol, Oriente, Rabi Lihght, Iran Heavy, Basra Light, Kuwait Export, Es Sider, Bonny Light, Qatar Marine, Arab Light, Murban and Mery. OPEC basket prices in 2019 is presented in Table 5.

The OPEC Basket reflects OPEC’s control of their oil supply. They restrict supply when prices get uncomfortably low, and loosen up that restriction when prices are high. By

⁴² OPEC Brief History [online] https://www.opec.org/opec_web/en/about_us/24.htm

⁴³ OPEC and Its Goals, Members, and History <https://www.thebalance.com/what-is-opec-its-members-and-history-3305872>

⁴⁴ How Will the U.S. Respond to Russia-OPEC Cooperation? [online] <https://www.cfr.org/in-brief/how-will-us-respond-russia-opec-cooperation>

⁴⁵ OPEC Basket [online] <https://www.investopedia.com/terms/o/opecbasket.asp>

keeping crude oil prices within an upper and lower bound, OPEC countries are not only protecting their own, but also holding the oil market at stable levels for the global market artificially. In October of 2019, the average price of the OPEC basket so far this month is 58.74\$ per barrel, while the price was 62.36\$ dollars per barrel in September of 2019. Over last twelve months the price has fallen 26.19%.⁴⁶

Tab. 5 OPEC oil basket prices in 2019 in \$ per barrel

Date	Octob.	Septem.	Aug.	July	June	May	April	March	Febr.	Jan.
Price, \$	58.74	62.36	59.69	64.71	62.92	69.97	70.73	66.37	63.82	58.74

Source: OPEC Reference Basket (ORB) US Dollars per Barrel

<https://countryeconomy.com/raw-materials/opec?dr=2019-08>

3.5.2 US dollar exchange rate

The relationship between the value of the dollar and oil prices is very complex. Although they can influence each other to create a vicious circle, their short-term relationships are different from their long-term relationships. In the short term, a depreciation of the dollar does not affect supply and demand, but it does affect speculation and investment in oil futures markets. As the dollar depreciates, commodities, including oil, are attracting investors. Investing in futures is becoming both a means of protection against a lower dollar, and a form of capital placement, which can bring significant profit, especially in the context of the disappearance of excess production capacity in the oil industry, rising demand, lower interest rates, a downturn in the real estate market and a crisis in the banking sector.

In the long run, however, a statistical analysis of various indicators of the oil industry indicates that a weaker dollar affects the supply of raw materials, leading to a decrease in production, regardless of whether the oil is owned and produced by domestic or international companies. A weak dollar also affects demand, leading to increased consumption. And the result of reduced supplies and increased demand is higher prices.⁴⁷

The depreciation of the dollar also reduces the purchasing power of oil exporters. Maintaining nominal prices for raw materials simultaneously with a depreciation of the dollar leads to a reduction in real incomes of oil-producing countries and oil companies, and consequently, to a reduction in investments in additional capacities and maintenance.

The reason for the relation of US dollar and crude-oil price lies quite deeply, but changes occur literally right away, since the market is inclined to react even before fundamental changes based on psychological factors. When considering the impact of oil

⁴⁶ OPEC daily basket price [online] https://www.opec.org/opec_web/en/5348.htm

⁴⁷ The relationship between the Brent crude oil price and the dollar exchange rate [online] <https://www.cnb.cz/en/monetary-policy/inflation-reports/boxes-and-annexes-contained-in-inflation-reports/The-relationship-between-the-Brent-crude-oil-price-and-the-dollar-exchange-rat>

prices on the dollar exchange rate, a rather ambiguous situation develops, because the USA is one of the largest producers of black gold, at the same time, it is the largest consumer of this type of raw material.

According to statistics, the United States economy lacks its own oil reserves to meet the needs of all production, while part of the oil produced domestically is exported. For this reason, America is forced to annually purchase about 9 billion barrels of oil, which is significantly reflected in the increase in the value of American goods both domestically and in foreign markets. And the increase in the cost of goods, as you know, always leads to negative consequences for the national currency.⁴⁸

Of course, a lower dollar means cheaper oil in Europe, Asia and all countries with growing foreign exchange rates. However, high oil prices did not reduce the demand for fuel in the United States for a number of reasons, including an increase in government spending, low interest rates, tax breaks and an increase in real incomes. Until the US consumption structure changes or an appreciation of the dollar leads to an increase in oil production, the Americans will bear the main burden of setting commodity prices in one currency.

3.5.3 Geopolitical events

The main difficulty is that the pricing of “black gold” depends on many factors, the development of which is the more difficult to predict, the further we look into the future. Here is the state of the world economy, demography, the balance of supply and demand, new technologies. In all this diversity, geopolitical factors occupy a special place. Suddenly flashing in different regions of the planet, hotbeds of tension unceremoniously play with a barrel of oil. It is impossible to prepare for unexpected geopolitical zigzags.⁴⁹ They cannot be calculated or planned in advance. It is impossible to completely insure against them. Contrary to consensus forecasts, “geopolitical surprises” are suddenly turning the oil market in the opposite direction. Today, eight major hot spots have formed on the political map of the world. The development of events in these energy-significant regions can dramatically change the current trajectory of oil prices. Here some of this major hot spots.⁵⁰

Sirya. The long-standing civil war in Syria has long outgrown the scale of the country and the Middle East region. The territory of the state is under the control of several opposing forces. In the West, government troops dominate. The north of the country is controlled by Kurdish formations. The territory adjacent to Iraq is occupied by an Islamic state. Other parts

⁴⁸ The link between the Brent crude oil price and the US dollar exchange rate, Filip Novotný, DOI: 10.18267/j.pep.420

⁴⁹ How Geopolitical Tensions May Impact Oil Prices and the Economy [online] <http://www.celiamueller.com/HOT-TOPIC-How-Geopolitical-Tensions-May-Affect-Oil-Prices-and-the-Economy.c9423.htm>

⁵⁰ US Energy Information Administration [online] https://www.eia.gov/finance/markets/crudeoil/spot_prices.php

of the territory are ruled by the Free Syrian Army. Syria is a strategically important corridor for transporting hydrocarbons from the Middle East to the European direction.⁵¹

Libya. Member of OPEC and until 2011, one of the largest oil producers in Africa. The main energy exports go to the countries of the European Mediterranean. External military intervention and the fall of Muammar Gaddafi's regime in 2011 drove the country into a state of territorial and political chaos. The state is actually in the acute phase of a civil war. The flow of refugees from the country is growing. Compared to the pre-revolutionary period, oil production collapsed by more than 75% - up to 0.4 million barrels per day.⁵² Sea ports and oil and gas infrastructure regularly become the target of attacks by warring forces. The government of national unity, the armed formations of the Islamic State (IS), as well as other local militarized forces, are fighting for power in the country.⁵³

Iran is one of the leaders of the Middle East with great regional ambitions. The main rivals of the country in the Persian Gulf are the Sunni rulers and the state of Israel. The United States and a number of Western nations have traditionally viewed Tehran as one of the main sources of instability in the world and the region.⁵⁴ The lifting of international sanctions from the country allowed the government to rapidly increase oil production by 25% to 3.5 million barrels per day. Iran is the world leader in proven gas reserves (34 trillion cubic meters or 18.2% of global reserves) and ranks 4th in terms of proven oil reserves (157.8 billion barrels or 9.3% of global reserves). In terms of oil production, the country is in 7th place with 4% of world production. The country also holds the 4th place in the world in gas production (192.5 billion cubic meters, or 5% globally). In addition, the Islamic Republic controls the northern coast of the Strait of Hormuz, through which about 40% of world oil exports by sea pass.⁵⁵

This is only three of the big number events that affected crude-oil prices and industry in last 10 years. More of these events are presented in the Table 5 Important dates in history of crude oil prices.

As other example from nowadays (October 2019) can be reviewed USA-China relationships.⁵⁶ On October 11, 2019, the price of December Brent crude futures on the London ICE Futures Exchange increased by 2.39%, to \$ 60.51 per barrel. Futures for WTI crude oil for November in electronic trading on the New York Mercantile Exchange (NYMEX) rose 2.15% to \$ 54.70 per barrel. In general, over the past week, Brent crude rose

⁵¹ Middle East institute [online] <https://www.mei.edu/publications/syrian-oil-crisis-causes-possible-responses-and-implications>

⁵² Likely impact of the Libyan crisis on oil prices [online] <https://www.sify.com/finance/likely-impact-of-the-libyan-crisis-on-oil-prices-imagegallery-1-others-ldxrudghdeesi.html>

⁵³ Oil prices.com [online] <https://oilprice.com/Energy/Energy-General/Is-Libya-Facing-A-New-Oil-Crisis.html>

⁵⁴ AJ Impact/UNITED STATES [online] <https://www.aljazeera.com/ajimpact/iran-sanctions-cost-market-27-million-barrels-oil-day-190820175146168.html>

⁵⁵ Investopedia.com [online] <https://www.investopedia.com/articles/investing/073115/how-iran-impacts-price-and-supply-oil.asp>

⁵⁶ REUTERS.com [online] <https://www.reuters.com/article/us-global-oil/oil-falls-more-than-2-on-u-s-china-trade-deal-doubts-stronger-dollar-idUSKBN1WT00V>

by 3.7%, WTI - by 3.6%. On October 14, 2019, oil prices are correctionally reduced. The cost of futures for Brent crude for December decreased by 1.29%, to \$ 59.73 per barrel. Futures for WTI crude oil in November at NYMEX electronic trading prices fell 1.22% to \$ 54.03 per barrel.⁵⁷

Investors were inspired by reports of an interim agreement between the United States and China. After meeting with Chinese Vice Premier L. Hae, US President D. Trump announced that a significant part of the first phase of the deal was completed. It will take up to 5 weeks to prepare the transaction documents. The United States will abandon the already planned increase in duties on Chinese exports worth \$ 250 billion/year in exchange for China to increase purchases of US agricultural products by \$ 40-50 billion/year. The conclusion of agreements in the field of intellectual property, financial services and agricultural procurement is expected.⁵⁸ Markets revived on this news, despite investors' doubts that the agreement could really be a turning point in the settlement of the US and China trade dispute and lead to a real improvement in the global economy and an increase in oil demand.

Thus, given the moderately deficit global balance of supply and demand, any reversal of sentiment makes the oil price very vulnerable to growth shocks in 2019.

3.6 Commodities exchanges

Both oil and its derivatives are one of the serious economic instruments. For the derivatives market, special indices are determined for oil and its refined products. To hedge risks associated with sharp fluctuations in the price of petroleum products, financial instruments such as futures contracts are used. In addition to the risk insurance function, futures are tools for various trading strategies.⁵⁹

The main global exchange trading in petroleum products is focused on:

- New York Mercantile Exchange. This largest trading platform was founded back in 1972, and now it is it - the largest commodity exchange in the world. By the volume of oil futures trading, this platform confidently ranks first in world stock trading.
- London International Petroleum Exchange. It was founded in the early eighties of the last century.
- Singapore Exchange (SGX). This trading platform owes its appearance to the merger of two Singapore exchanges - currency and stock. All trades here are held exclusively in electronic form.

⁵⁷ Oil prices up with US-China trade deal optimism <https://www.aa.com.tr/en/energy/international-relations/oil-prices-up-with-us-china-trade-deal-optimism/27249>

⁵⁸ Aboutenergy.com [online] https://www.aboutenergy.com/en_IT/topics/us-15-eng.shtml

⁵⁹ The Basics of Trading Crude Oil Futures [online] <https://www.thebalance.com/trading-crude-oil-futures-809351>

3.6.1 Exchange trading and the role of financial players

While long-term trends in oil prices are related to the impact of fundamental factors (dynamics of oil supply and demand, production costs, strategies of key players in the market, the degree of loading of transport and processing capacities), then the short-term and medium-term dynamics are significant degree is related to the behavior of financial market players. The development of oil derivatives trading has allowed the United States to strengthen its the role in the markets of the so-called “paper” oil through the mediation of American financial institutions. The average annual volume of open positions in oil futures increased with the development of financialization of the oil market. By the late 2000s, New York oil futures trading volumes many times exceeded the volume of world oil demand.⁶⁰

Speculation is traditionally understood as the acquisition (sale) of assets (in this case, oil derivatives), based on the expectation of an increase (decrease) in the price of an asset in order to obtain financial benefits. Unlike hedgers who insure the risks associated with activities in the physical oil market (for example, an oil company can “insure” itself against price risks by fixing the price of future oil deliveries to buyers through the sale of futures), speculators are not players in the physical oil market. Only a few percent of oil futures transactions end with a real supply of assets.⁶¹ At the same time, it is important to understand that this is not the only factor milking price changes. Any changes in one way or another affecting the oil market will lead to a certain change in the pricing scheme. Especially if investors believe in the reality of factors, the speculative moment is also very important.

So, the simplest form of speculation is the acquisition of oil futures in case of expectation of rising oil prices. Accordingly, if most market players expect prices to rise, then futures quotes will be increase. On the contrary, the fall in oil prices is more often associated with fundamental reasons. In the current situation, these include the increase in production and lower costs for shale oil in the United States, the decision of Saudi Arabia and OPEC on the reduction of oil production, the slowdown in economic growth in China, the lifting of sanctions on Iran in January 2016, as well as an increase in interest rates in the United States and an increase in the dollar exchange rate.

However, the role of speculators in oil pricing remains a matter of scientific debate. Existing econometric studies have not come to unambiguous results regarding the relationship between speculation with oil derivatives and price dynamics. However, from a practical point of view, the conviction that speculators made a significant contribution to oil price fluctuations contributed to the adoption of regulatory restrictions in key markets. So, in the

⁶⁰ How much speculators will collapse oil prices and the ruble [online/RU] <https://www.forbes.ru/finansy-i-investicii/369185-kak-silno-spekulyanty-obvalyat-ceny-na-neft-i-kurs-rublya>

⁶¹ Alquist, Ron, and Olivier Gervais. "The Role of Financial Speculation in Driving the Price of Crude Oil." *The Energy Journal* 34, no. 3 (2013): 35-54. <http://www.jstor.org/stable/41970496>.

USA in 2010, the Dodd-Frank Act was adopted,⁶² aimed at tightening the regulation of financial markets after the 2008 crisis. It is talking about the following changes: firstly, restrictions are introduced on the volume of open positions in futures; secondly, the Walker rule prohibits banks from trading derivatives in their own interests, as well as investing their own funds in hedge funds; and thirdly, restrictions are introduced on over-the-counter swap trading, which should lead to a rise in the cost of such transactions. The result of the latter is the actual transition of over-the-counter speculative swap operations in the more stringent regulatory framework of exchange trading.⁶³

4. Practical part

4.1 Crude-oil and gas market in Kazakhstan

The oil and gas industry of Kazakhstan in its development has passed through a centenary. During this period, discoveries were made, thanks to which the country became one of the world powers in terms of hydrocarbon reserves. Hydrocarbon resources are identified in six regions and distributed extremely unevenly across the Republic of Kazakhstan. The main oil and gas producing region of the country is Western Kazakhstan, the territory of which includes four administrative entities - Atyrau, Mangistau, West Kazakhstan and Aktobe regions. The main sources of prospective development of the industry are large hydrocarbon reserves discovered during exploration for a number of structures located in new zones.

In addition to proven reserves, the Republic of Kazakhstan has significant forecast resources. A special place among the identified oil-bearing territories of the republic is occupied by the shelf of the Caspian Sea, where the largest structures - Kashagan, Kairan and Aktoty are discovered. The estimated reserves of only one deposit in the eastern part of Kashagan are tentatively estimated from 25 to 60 billion barrels of recoverable oil volumes. The program for assessing the reserves of this structure, which includes the development of geological models, design options for wells, the technological scheme of operation will take from 3 to 5 years.⁶⁴

As of January 1, 2019 in Kazakhstan there are more than 250 oil and gas deposits, total. The volume of oil reserves is about 30.0 billion barrels, or 1.7% of world oil reserves. In explored reserves, the Republic of Kazakhstan occupies the twelfth place in the world, yielding to the countries of the Middle East, Latin America, as well as Russia and the USA.

⁶² Dodd-Frank act [online]

https://en.wikipedia.org/wiki/Dodd%E2%80%93Frank_Wall_Street_Reform_and_Consumer_Protection_Act

⁶⁴ SWOT-analysis of Oil and Gas Sector of Kazakhstan [online/RU]

<http://repository.kaznu.kz/bitstream/handle/123456789/1563/356-719-1-SM.pdf?sequence=1&isAllowed=y>

More than 90% of oil reserves are concentrated in the 15 largest fields - Tengiz, Kashagan, Karachaganak, Uzen, Zhetybai, Zhanazhol, Kalamkas, Kenkiyak, Karazhanbas, Kumkol, Northern Buzachi, Alibekmola, Central and Eastern Prorva, Kenbai, Korolevskoye. Deposits are located in six of the fourteen regions of Kazakhstan. These are Aktobe, Atyrau, West Kazakhstan, Karaganda, Kyzylorda and Mangystau regions. At the same time, approximately 70% of hydrocarbon reserves are concentrated in the west of Kazakhstan.⁶⁵

In general, the economy of Kazakhstan so far has a raw material orientation and, in the near future, the situation will not change significantly. State budget revenues and the volume of financial injections from foreign countries are directly dependent on the fuel and energy and extractive industries. Due to the income received from the oil and gas industry and exploration activities, the economic situation in the Republic of Kazakhstan has a positive focus.

4.2 Crude-oil and gas fields in Kazakhstan

A special place in the country's economy is played by the fuel and energy complex. Initial and residual oil reserves of industrial categories amount to more than 2.0 billion tons, while more than 70 oil fields are under development. About 90% of oil reserves were identified in subsalt deposits at 12 fields, in three of which (Tengiz, Karachaganak, Zhanazhol), the reserves exceed 100 million tons.⁶⁶

Figure 9. Map of main crude-oil and gas fields with pipelins for their export



Source: <http://large.stanford.edu/publications/power/references/levine1/>

Kazakhstan reportedly has the greatest number of super-giant oil fields outside the Persian Gulf. The largest oil reserves in the northern Caspian Sea are in Kazakh territory.

⁶⁵ Oil industry of Kazakhstan [online/RU] https://ru.wikipedia.org/wiki/Нефтяная_отрасль_Казахстана

⁶⁶ Kazakhstan: Refine and Expand [online] <https://www.theoilandgasyear.com/market/kazakhstan/>

There are three main oil fields: 1) Tengiz; 2) Karachaganak; and 3) Kashagan in the Caspian Sea. These three main crude oil fields are shown at the Figure 9.

4.2.1 Kashagan field

The Kashagan field, one of the largest and most complex offshore fields discovered to date, is a single hydrocarbon deposit with geological reserves estimated at 4.65 billion tons (36.6 billion barrels) and covers an area of approximately 75 km x 45 km.⁶⁷ The complexity of the development of the field is due to both the physical properties of the reservoir - high reservoir pressure and high hydrogen sulfide content in the reservoir fluid, and the geographic location of the reservoir - the shallow shelf of the Caspian Sea, freezing in the winter season.⁶⁸

Due to the high complexity of the field, which required extraordinary technical and financial solutions for its development, in November 1997 a Production Sharing Agreement (PSA) was signed between the Government of the Republic of Kazakhstan and the international consortium OKIOC (Offshore Kazakhstan International Operating Company NV), of which includes representatives of major world companies with extensive experience in developing similar oil and gas fields.⁶⁹

In November 2012, CNN Money labeled the Kashagan oil and gas field as the most expensive energy project in the world. At the project has already eaten up \$116 billion. Tengri News reported: “The field is located in Kazakhstan in the northern part of the Caspian Sea which makes oil transportation challenging. The logistics of the land locked area requires a network of railroad lines, pipelines and sea routes. Local sharp continental climate makes it a problem as well.⁷⁰ When developing the field, it had to face many problems associated with shallow water, icing for 5 months a year, high reservoir pressure and its depth, as well as high sulfur content in hydrocarbons. The following is a sample of unique technological solutions used in the field:⁷¹

- simultaneous laying of trenches for the pipeline, laying of the pipeline and backfilling of the trench in order to reduce the phenomena of destabilization of the seabed and ecosystem;
- development of a new type of icebreaking vessel with autonomous oxygen supply for the evacuation of personnel in the event of an emergency with hydrogen sulfide (H₂S);
- development (jointly with Schlumberger) of a passive downhole monitoring system to minimize downtime in production and H₂S risks;

⁶⁷ Kashagan [online/RU] <https://neftegaz.ru/tech-library/mestorozhdeniya/141663-kashagan/>

⁶⁸ Kashagan field [online/RU] <https://energybase.ru/oil-gas-field/kashagan>

⁶⁹ Kashagan project [online/RU] <https://www.kbv.kz/project/>

⁷⁰ Kazakhstan's Kashagan tagged world's most expensive energy project https://en.tengrinews.kz/industry_infrastructure/kazakhstans-kashagan-tagged-worlds-most-expensive-energy-14913/

⁷¹ North Caspian Project [online/RU] <https://www.ncoc.kz/ru/ncoc/about>

- development of complex methods for the removal, storage and re-injection of H₂S;
- construction, equipment and operation of artificial “drilling” and technological islands while minimizing environmental impact; and

4.2.2 Tengiz

Tengiz is a giant oil and gas field located 160 km southeast of Atyrau. Opened in 1979. Refers to the Caspian oil and gas province. The upper oil-bearing subsurface reservoir lies at a depth of about 4 thousand meters, with a length of 19 km.⁷² According to Tengizchevroil, the total explored reserves in the drilled and undrilled sections of the reservoir are projected at 3.1 billion tons, or 26 billion barrels. Recoverable reserves are estimated from 750 million to 1.1 billion tons. The field provides about 30% of oil production from the republican level.

In 2015, TCO reached a record black gold production of 27.158 million tons. In the first half of 2016, crude oil production amounted to 14.4 million tons (114.8 million barrels) of oil, 673 thousand tons of liquefied natural gas, 3.67 billion cubic meters of dry gas and 1.2 million tons of sulfur. Production reaches 600 thousand barrels per day, or 75 thousand tons per day, and natural gas production - 22 million m³ per day. According to TCO, from 1993 to the first half of 2016, direct financial payments to Kazakhstan amounted to \$ 114 billion. The amount includes salaries to Kazakhstani employees, purchases of goods and services of domestic producers and suppliers, payments to state enterprises, dividends to Kazakhstani partners, as well as taxes and royalties transferred to the state budget. At the same time, in the first half of 2016, direct payments amounted to \$ 2.6 billion, which is 68% lower than the same indicators of 2015 (\$ 8.2 billion). In 2017, TCO plans to invest in expanding the project to \$ 37 billion to increase production. This will allow to increase recoverable volumes in Tengiz from 2022.⁷³

4.2.3 Karachaganak

Karachaganak is a Kazakhstan oil and gas condensate field located in the West Kazakhstan region, near the city of Aksai. Opened in 1979. The project’s reserves are estimated at 1.2 billion tons of oil and 1.35 trillion cubic meters of gas. According to KPO, production at the field accounts for 45% of all gas and 16% of all liquid hydrocarbons in the country.⁷⁹

In 2015, KPO produced 141.7 million barrels of oil equivalent of stabilized and unstabilized liquid hydrocarbons, gas and fuel gas. In 2015, 11.9 million tons of oil was produced at the Karachaganak field, which is 95% of the plan for the previous year. Gas

⁷² Tengiz oil field [online/RU] <https://neftegaz.ru/tech-library/mestorozhdeniya/141433-tengizskoe-neftegazovoe-mestorozhdenie/>

⁷³ HOW MUCH OIL IN KAZAKHSTAN [online/RU] <https://www.oil-gas.kz/ru/press-tsentr/novosti/novosti-blog/344-skolko-nefti-v-kazakhstane>

production reached 18.2 billion cubic meters, or 105% of the plan. According to KPO, in June 2016, since the signing of the FPSA in 1997, \$ 20.6 billion was invested. At the same time, the company entered the payback period in 2012. In January of the same year, about \$ 38 billion was received from oil and gas sales, of which \$ 17.3 billion was reimbursed to the contractor. The net income of the project amounted to \$ 20.7 billion a year. At the same time, the republic was supposed to receive \$ 13 billion: \$ 9.1 billion in taxes, \$ 4.1 billion in the share of profitable hydrocarbons.⁷⁴

In November 2016, according to the President of Kazakhstan Nursultan Nazarbayev, the government is conducting an investigation against the developers of the Karachaganak field. At the end of December 2016, Minister of Energy Kanat Bozumbayev noted that the Kazakh side appealed to the arbitration court on the distribution of funds. According to him, during the work of KPO, Kazakhstan received less than billions of US dollars. Earlier, LUKOIL said that Kazakhstan requires \$ 1.5 billion from the consortium.

4.3 Production of crude-oil and gas in Kazakhstan. Market overview

The contribution of the oil sector to the country's economic activity has undergone significant changes since 1993, when a historic agreement was signed between the Government of Kazakhstan and Chevron on the development of the Tengiz field. This agreement was the first major contract of a new independent country. This agreement increased the confidence of international investors and triggered a period of significant FDI flows to Kazakhstan. However, remoteness, technical problems and underdeveloped market mechanisms required tremendous efforts and resources to prepare the oil fields of western Kazakhstan for operation.⁷⁵

To develop the potential, the oil and gas sector needed the creation of a legislative framework, the development of a tax and regulatory system, the creation of the necessary infrastructure, the production and transportation of sophisticated equipment, and the training of personnel.

Initially, the limited oil supply potential to international markets was the main barrier to the growth of the sector. However, by the mid-2000s, the construction of the Caspian Pipeline Consortium and the connection to the Russian pipeline system facilitated access of Kazakhstani oil and gas producers to the international market. Between 1994 and 2011, the level of oil and gas condensate production increased four times, which significantly increased the contribution of the oil and gas sector to overall economic activity. Between 1994 and 2014, the share of oil and gas exports in the value of national exports increased from 8% to 63%. In addition, the share of oil and gas revenues in total government revenue increased from 17% in 1999 to 54% in 2011. The share of oil rent in GDP increased from 3% in 1991

⁷⁴ KPO [online] <https://www.business-humanrights.org/en/karachaganak-petroleum-operating-kpo>

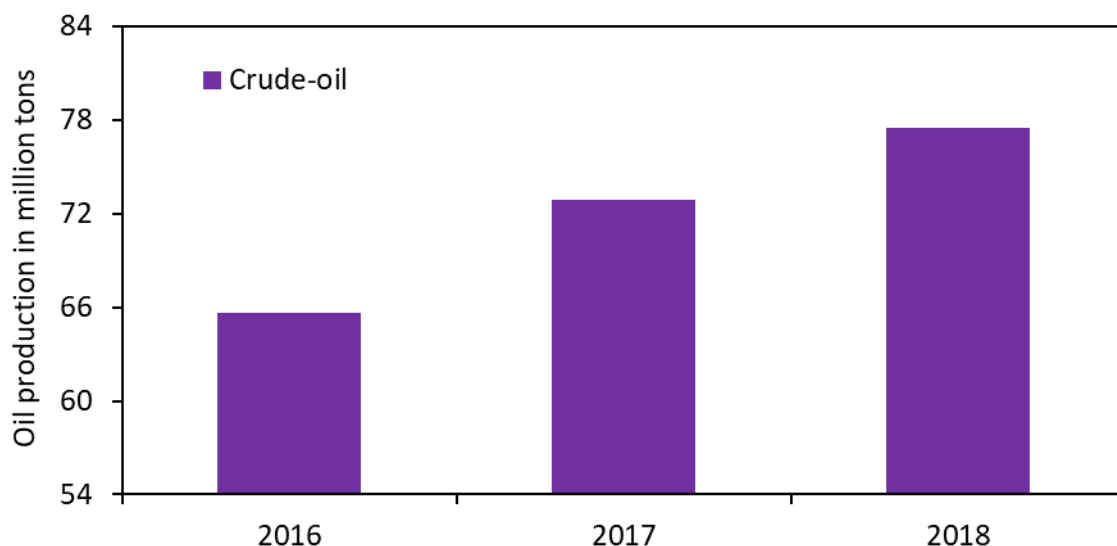
⁷⁵ Role of crude oil in Kazakhstan economy [online/RU] <https://articlekz.com/article/8172>

to a peak of 21% in 2005, and fell to 5.6% in 2015 as a result of falling world oil prices since 2014 (World Bank, 2017).

In 2018 crude oil production (Figure 10) in physical terms amounted to 77.5 million tons, in 2017 - 72.9 million tons, in 2016 - 65.6 million tons. Crude oil production in 2018 increased compared to 2016 by 16.4% (by 11.9 million tons). The average price of Brent oil in 2016 was \$ 45, in 2017 - about \$ 54 per barrel. The forecast for 2018 is about \$ 55-60 per barrel. On November 30, 2017, at the OPEC + meeting, participants agreed to extend the limitation of oil production until the end of 2018. Despite efforts by the government to diversify and modernize the economy, the oil and gas sector is still the foundation of Kazakhstan's economic and industrial development. Although the share of oil production in GDP has been steadily declining in recent years, its decline is primarily due to the delay in the commissioning of new fields Kashagan, as well as a significant decrease in world oil prices in 2014-2015. Another limiting factor in production growth is the limited ability of export transport infrastructure.⁷⁶

The increase in oil production is mainly associated with stable growth at the Kashagan (2018 - 13.2 million tons), Tengiz (2018 - 28.6 million tons) and Karachaganak (2018 - 11 million tons). The total indicators of these three assets only at the end of 2018 amounted to 58% of the total oil production in the Republic of Kazakhstan.⁷⁷

Figure 10. Crude-oil production in million tons for the period 2016-2018



Source: http://kase.kz/files/presentations/ru/KASE_OilGas_industry_2019.pdf

According to the Committee on Statistics of the Republic of Kazakhstan, the volume of natural gas production (Figure 11) in 2018 amounted to 55.5 billion m³ in physical terms,

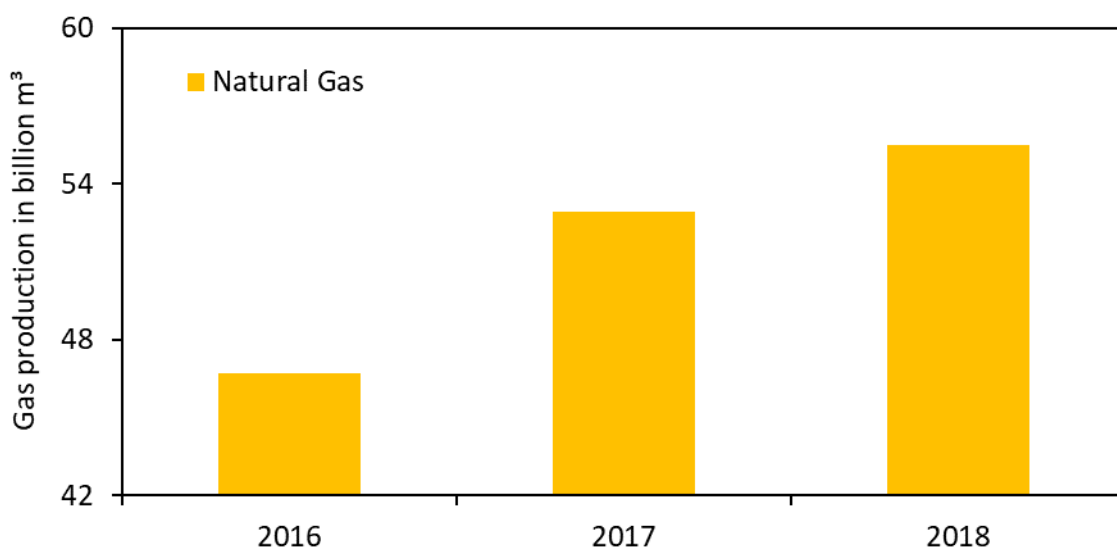
⁷⁶ Kazakhstan crude oil complex [online/RU] <http://www.investkz.com/journals/36/260.html>

⁷⁷ KASE [online/RU] http://kase.kz/files/presentations/ru/KASE_OilGas_industry_2019.pdf

52.9 billion m³ in 2017, and 46.7 billion m³ in 2016. Natural gas production in 2016–2018 increased by 18.8% (by 8.8 billion m³).

According to the Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan, the number of oil and natural gas production enterprises for 2016-2018 increased and as of January 1, 2019 amounted to 104 enterprises (as of January 1, 2018 - 100 enterprises, as of January 01, 2017 - 99 enterprises). According to the Committee on Statistics of the Republic of Kazakhstan, crude oil production in the Republic of Kazakhstan at the end of 2018 in monetary terms amounted to 18.8 billion USD, in 2017 – 23.7 billion USD, in 2016 – 18.8 billion USD. In 2018, natural gas production in monetary terms amounted to 0.52 billion USD, in 2017 – 0.5 billion USD and in 2016 – 0.3 billion USD. However, already for the first quarter of 2019 this value was 0.42 billion USD.

Figure 11. Gas production in billion m³ for the period 2016-2018



Source: http://kase.kz/files/presentations/ru/KASE_OilGas_industry_2019.pdf

For the 6 months of 2019 in the oil and gas industry in physical terms the following amount of main industrial products was produced:

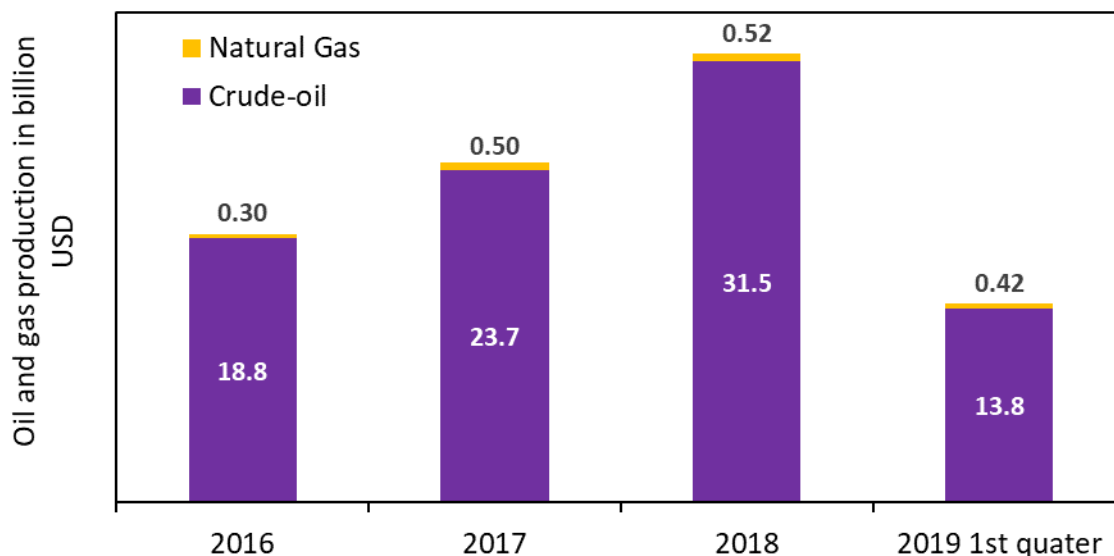
- crude-oil production, including oil obtained from bituminous minerals - 38.0 million tons;
- gas condensate - 6.3 million tons;
- natural gas in liquid or gaseous state - 28.1 billion cubic meters. m

As of January 1, 2019, the share of oil and natural gas production in the republican volume of industrial production amounted to 44.3%. Oil and gas production in billion USD for period 2016-2019 1st quarter are presented at Figure 12.

The pressing need for government intervention and economic regulation of oil and gas enterprises is obvious. At the beginning of the reform period, some industry leaders hoped for

economic self-sufficiency in the market. It turned out that under market conditions there are even more problems than under a planned economy.

Figure 12. Oil and gas production in billion USD for period 2016-2019 1st quarter



Source: http://kase.kz/files/presentations/ru/KASE_OilGas_industry_2019.pdf

It must be remembered that private ownership of fixed assets does not cancel the state tasks of managing production capacities, developing and updating the industry.⁷⁸ Ensuring the country's energy security is entirely a direct state task, and not of individual private entrepreneurs. You must also understand that the transition from resource-oriented economic growth to growth based on high productivity and innovation is a complex problem. This requires the creation of a high-quality educational system that encourages creativity and supports breakthroughs in science and technology. To avoid the middle-income trap, a transition to an innovation implementation strategy and an increase in domestic demand for high-quality innovative products are necessary. In 2018, Kazakhstan ranks 87th in the innovation index (2017 - 87th) among 140 countries, education 57th, compared with 2017, a decrease in the rating is observed, i.e. 52 places. In Kazakhstan, it is necessary to develop not only resource-oriented areas of the economy, but also more high-tech and innovative components that can ensure the economic, energy, environmental and economic security of the state.⁷⁹

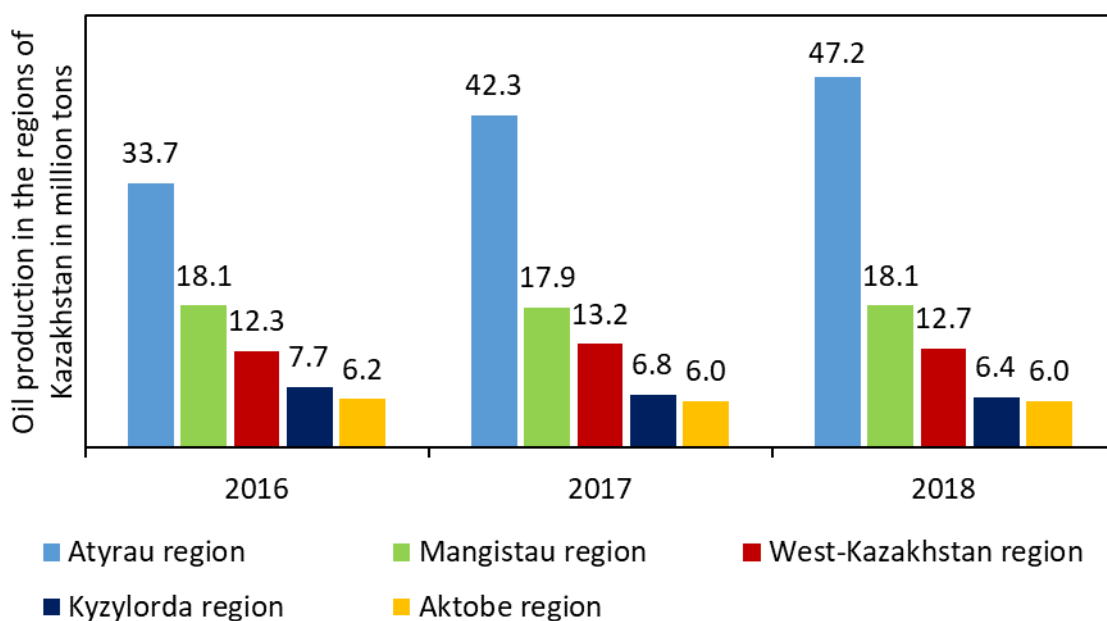
The oil and gas industry is a sector where process innovations have a huge impact not only on the end results of individual companies, but also on the state of the national economy as a whole. Many countries have realized the advantages of innovation and have begun to implement innovative innovative solutions, adopting the experience of major international oil

⁷⁸ Oil and gas sector is the basis of stability of the economy of Kazakhstan [online/RU] http://bertys-m.kz/ru/news/490-neftegazovyy_sektor_osnova_stabilnosti_ekonomiki_kazahstana/

⁷⁹ Global innovation index 2017 [online/RU] <https://www.ictsd.org/bridges-news/>

companies and innovation development leaders from other industries. Thus, it is necessary to achieve highly productive, energy-efficient, resource-saving and geo-ecological production, this is possible through innovation. They contribute to the search for new oil and gas fields, increase the coefficient of extraction of reserves and the depth of processing of raw materials, and reduce losses during production and transportation.

Figure 13. Oil production in the Kazakhstan regions since 2016



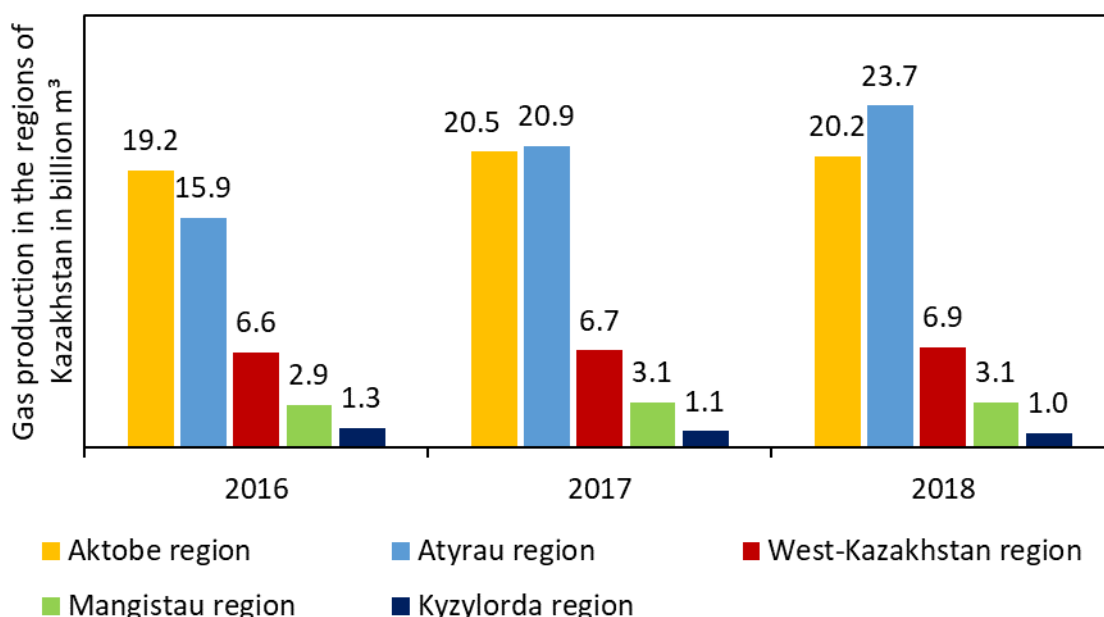
Source: http://kase.kz/files/presentations/ru/KASE_OilGas_industry_2019.pdf

According to the Committee on Statistics of the Republic of Kazakhstan as of June 1, 2019, 52.1% of oil production (including gas condensate) was in the Atyrau region (19.0 million tons), 20.3% - in the Mangystau region (7.4 million tons) and 14.2% - in the West Kazakhstan region (5.2 million tons) (see Figure 13).⁷⁷

Today, the Atyrau region possesses the most explored oil reserves, in the territory of which more than 75 fields with reserves of industrial categories of 930 million tons are discovered. The largest field in the region is Tengiz (initial recoverable reserves - 781.1 million tons). The remaining fields of the region account for about 150 million tons, of which more than half are in two fields: Korolevskoye (55.1 million tons) and Kenbai (30.9 million tons).⁸⁰

⁸⁰ Atyrau crude oil region [online/RU] <https://www.oil-gas.kz/ru/press-tsentr/novosti>

Figure 14. Gas production in the Kazakhstan regions since 2016



Source: http://kase.kz/files/presentations/ru/KASE_OilGas_industry_2019.pdf

Among the local administrative units in 2016-2018, the oil-producing regions of Atyrau and Mangistau made up half of the transfers from the sector to the national budget. At the same time, two other oil producing regions, Aktobe and West Kazakhstan, received subventions from the national budget, although this amounted to only 6% of the total subventions in all regions. Another sign of the importance of the oil and gas sector from a financial point of view is its role in the national welfare fund, in the National Fund of the Republic of Kazakhstan (National Fund). The assets of the National Fund were estimated at \$ 75 billion in 2014 and \$ 64 billion in 2016. Tax payments of the oil and gas sector form 99% of all annual revenues to the National Fund.⁸¹

As of June 1, 2019, 43.3% of natural gas production (Figure 14) was in the Atyrau region (23.7 billion m³), 36.6% in the West Kazakhstan region (20.0 billion m³) and 12.6% in Aktobe region (6.9 billion m³).

4.4 Development of crude-oil sector and investments

The state program for the development of the Kazakhstan sector of the Caspian Sea aims to transform the Caspian Sea into the main hydrocarbon production zone in the republic. Exploration work carried out to date on the territory of the Kazakhstan shelf of the Caspian Sea, together with materials from exploration work on land adjacent to the sea, allows to identify zones containing large hydrocarbon reserves with a high degree of reliability.⁸²

⁸¹ Atyrau [online] <https://energycities.org/member-cities/atyrau-kazakhstan>

⁸² Crude oil and gas industry [online/RU] <https://ibrain.kz/ekonomika-kazahstana/neftyanaya-i-gazovaya-promyshlennost>

The main goal of the program is the accelerated expansion of the mineral resource base of the oil industry of the republic.

The main program tasks are:

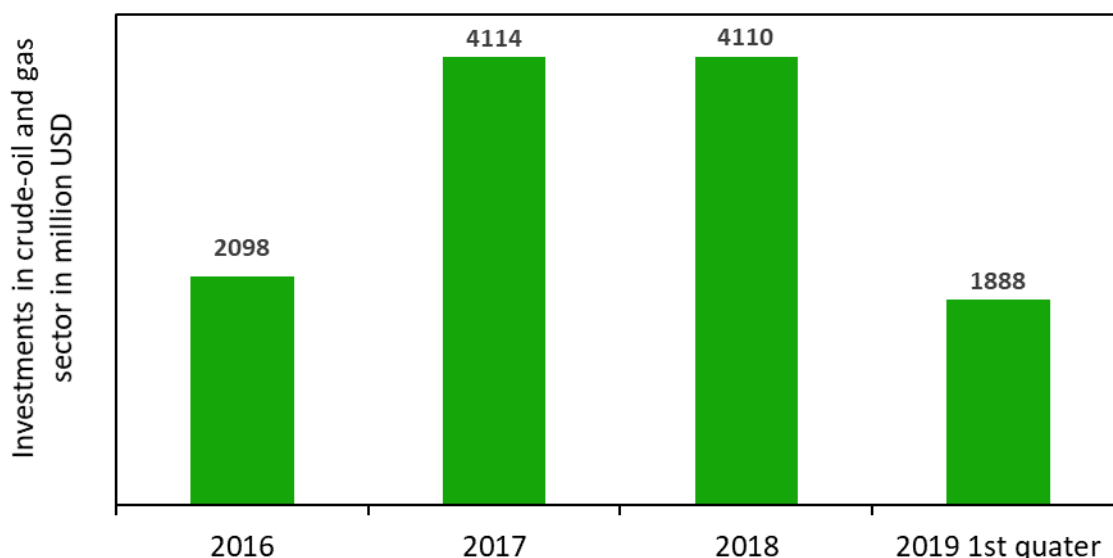
-Assessment of the hydrocarbon potential of each of the license blocks to more accurately determine the compensation that companies will pay Kazakhstan for providing them with the right to participate in the exploration and development of these blocks.

-Optimization of the processes for preparing oil and gas prospective structures for prospecting drilling, and deposits for calculating reserves, drilling exploratory and production wells, commissioning oil production capacities, a line for laying offshore oil and gas pipelines for transporting oil and gas, while minimizing the environmental impact of the work.

-Attracting maximum investment to develop the rich oil and gas natural resources of the Kazakhstan sector of the Caspian Sea.

-Improving the environmental situation of the Caspian Sea and the rivers flowing into it by attracting investment funds and funds that will be received from the development of oil resources.

Figure 15. Investments in crude-oil and gas sector in million USD since 2016



Source: http://kase.kz/files/presentations/ru/KASE_OilGas_industry_2019.pdf

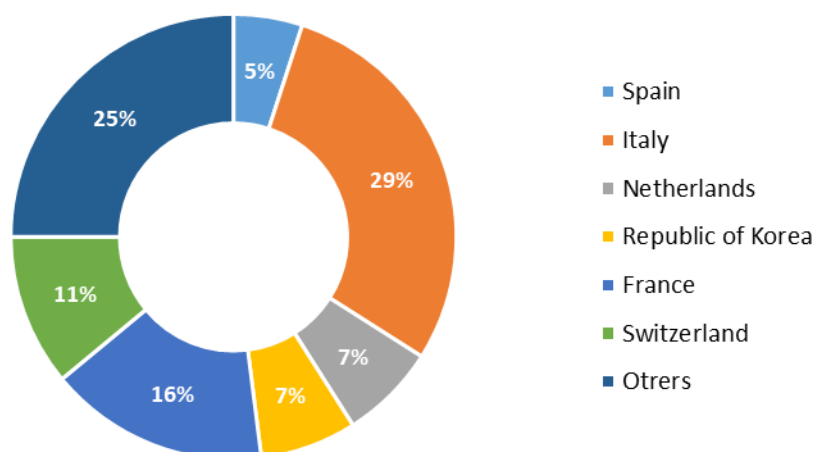
Current trends suggest that the oil and gas industry in Kazakhstan continues to be in the zone of active growth, while maintaining its high investment attractiveness (see Figure 15). According to the National Bank of the Republic of Kazakhstan, for the first quarter of 2019, the net inflow of direct investment in the oil and gas industry of the Republic of Kazakhstan amounted to USD 1,888.2 million, or 77.8% of the total direct investment in

Kazakhstan. Between 2016 and 2018, the inflow of investments in the oil and gas industry of the Republic of Kazakhstan increased by 95.9% (by \$ 2,012.2 million).^{76, 83}

4.5 Export of crude-oil and gas from Kazakhstan and role in GDP and National Fund

In the first quarter of 2019, Kazakhstan sold over 16 million tons of crude oil abroad. The total volume of transactions amounted to 7 billion 447.8 million dollars. Another 233.4 million was brought by the export of oil and petroleum products obtained from bituminous rocks. And this is much less than a year earlier. In the "top three" of the largest buyers of Kazakhstani crude oil over the year, changes have taken place, France has joined the TOP-3, having displaced Switzerland from this position. In particular, this year, French enterprises bought crude oil from the Republic of Kazakhstan in the amount of \$ 2.1 billion. This is 69.6% more than the amount for January-September 2016. At the same time, the price of a ton of raw materials for France increased by 28%.⁸⁴

Figure 16. Crude-oil export in 2018



Source: http://kase.kz/files/presentations/ru/KASE_OilGas_industry_2019.pdf

Italy remains the largest buyer on the market, over 9 months 16 million tons were bought for \$ 6.2 billion. For the year, the amount of hydrocarbon exports to Italy increased by 19.3%, although the volumes of supplies in physical terms decreased by 1.8%. Main Kazakh crude oil buyers are presented at Figure 16.

⁸³ Investments in crude oil sector [online/RU] <https://365info.kz/2019/02/interesy-investorov-v-kazahstane-zatocheny-tolko-na-neft-i-metally>

⁸⁴ Kursiv.kz [online/RU] <https://kursiv.kz/news/otraslevye-temy/2018-11/eksport-nefti-iz-rk-uvelichilsya-na-6-v-obyome-i-srazu-na-45-v-dengakh>

In January-March 2018, \$ 8.25 billion was sold in crude oil, and \$ 336.6 million from bituminous rocks. Over the year, sales of the main Kazakhstani goods fell by more than \$ 900 million.

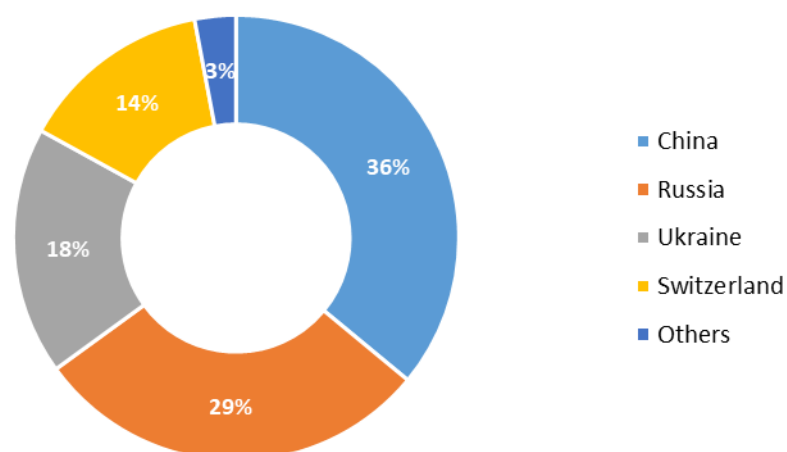
One reason is the reduction in physical supplies. Compared to the first quarter of 2018, exports decreased by 3.1% (more than half a million tons). At the same time, production during this time increased by 4.2%. That is, the extraction of "black gold" in the country is growing, but less has begun to go abroad.⁷⁷

The second reason is the decline in oil prices. In the first quarter of 2018, the average price of exported tons of oil was \$ 498.3. A year later, the figure fell to 464.1. In March, Kazakhstan even sold its main product at \$ 406 per ton.

Along with oil, sales of fuel oil, one of the main Kazakhstan export goods, also declined (7th in terms of transactions in 2018). The decrease occurred both in physical terms (610 against 963 thousand tons a year earlier) and in monetary terms (218.2 against \$ 320.3 million).

According to the Committee on Statistics of the Republic of Kazakhstan, natural gas exports (Figure 17) in January 2019 in natural expression amounted to 3.1 billion m³. At the same time, the main buyers of natural gas are China, for which 36% (1.1 billion m³), Russia - 29% and Ukraine - 18% (566.9 million m³). The price of oil around the world is changing daily. The main factors in changing oil prices are the current supply and demand, the budget of the leading oil exporting countries, and the political factor. In turn, changes in oil prices affect many sectors of the economy, and one of them is industry.⁷⁷

Figure 17. Natural gas export in 2018



Source: http://kase.kz/files/presentations/ru/KASE_OilGas_industry_2019.pdf

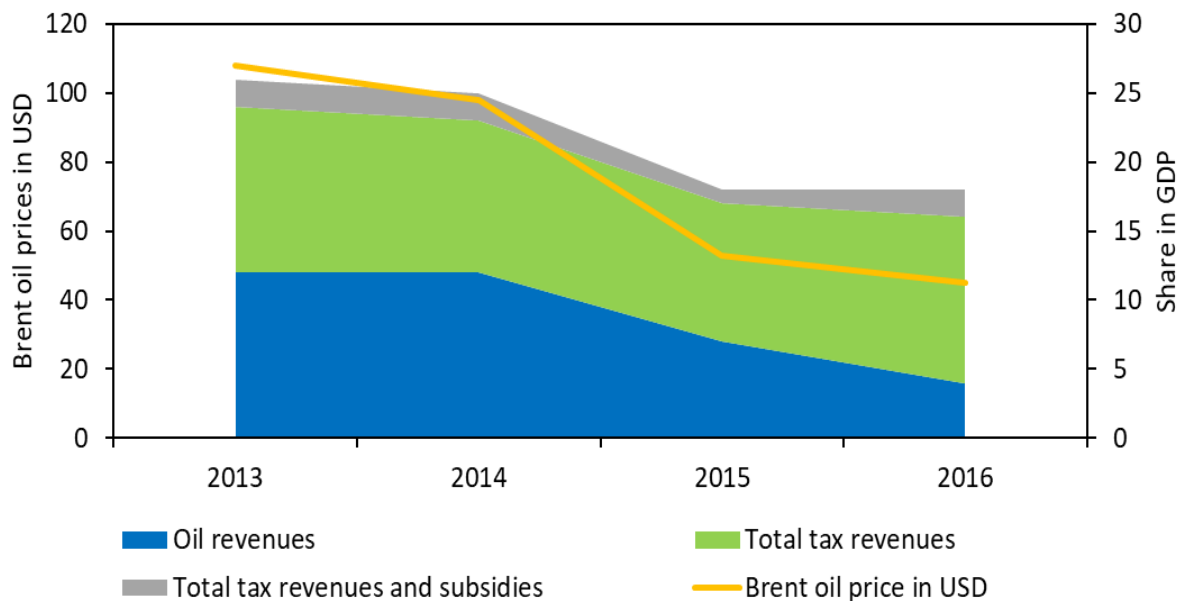
During the first half of 2019, oil prices fluctuated in the range of 21,633 - 28,870 tenge. One of the main factors shaping global demand for oil and gas is the growth of the

global economy and in the medium term, oil will remain the most important source of energy, therefore, a drop in oil demand is not expected. The economy of Kazakhstan today has a raw material orientation, and, soon, the situation will not change significantly.

Periods of high oil prices allowed the government to achieve a regular budget surplus (for example, in 2013-2014). But if we exclude the oil sector from the budget balance, it turns out that Kazakhstan is constantly experiencing a non-oil budget deficit. Indeed, in recent years (for example, in 2015-2017), the budget of Kazakhstan was formed with a deficit as a result of falling world oil prices.

The role of the oil and gas sector is especially noticeable in the revenue side of the state budget. Figure 18 shows that until 2014, oil revenues accounted for approximately 50% of all government revenue. This ratio caused a significant vulnerability to changes in world oil prices, and the path of total government revenues followed the path of fluctuations in oil prices in 2013-2016.⁸⁵

Figure 18. Total tax revenues and subsidies vs Brent oil prices for 2013-2016



Source: https://www.ebrd.com/documents/environment/1395279731444.pdf?blobno_cache=true&the-fiscal-implications-for-kazakhstan-of-worldwide-transition-to-a-gree...-ru.pdf

The oil and gas sector operates under a tax and royalty regime. Changes in oil and gas prices on the world market affect the volume of industry production in monetary terms (in other words, the tax base), which, in turn, affects the volume of tax revenues. Changes in the state's oil revenues in response to the price of oil were largely due to taxation conditions in the oil sector. This is due to the fact that oil and gas fields (for example, Kashagan), operating

⁸⁵ EBRD.com [online/RU] article https://www.ebrd.com/documents/environment/1395279731444.pdf?blobno_cache=true&the-fiscal-implications-for-kazakhstan-of-worldwide-transition-to-a-gree...-ru.pdf

on the basis of a production sharing agreement, have only recently begun production. Therefore, the impact on the budget for the sale of profitable oil will increase over time as production increases at these fields.

The results of 2018 and eight months of 2019 indicate that fluctuations in the oil market still affect the economic structure of Kazakhstan. The reason is that oil and gas, according to the Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan (CC MNE of the Republic of Kazakhstan), account for about 36% of the republican budget revenues (or 10.6% of GDP) and almost 62% of exports. It is worth recalling that in 2013 and 2014, hydrocarbon exports reached record levels of 70% of the country's total exports, in 2016 - black gold accounted for 52% of Kazakhstan's foreign sales, in 2017 - it rose again, already to 54 %, and at the beginning of 2018 - immediately up to 62%. Consequently, almost two-thirds of all sales generating the largest inflow of foreign currency are so far ensured by the country's main raw materials — oil and gas.⁸⁶

The oil and gas industry is one of the main drivers of the country's GDP growth, reflecting the significant dependence of the economy on industry revenues (see Figure 19). The decline in world oil prices from \$ 98 in 2014 to \$ 53 in 2015 and \$ 44 in 2016 and a slight decline in its production slowed economic growth from 4.1% in 2014 to 1.2% and 1% in 2015 and 2016. years.

In general, the dynamics of GDP growth in Kazakhstan can be divided into three separate periods: from 1990 to 1999, almost zero growth; the period from 2000 to 2014, when the positive dynamics of oil prices, the influx of investments and growth in production contributed to an annual increase in Kazakhstan's GDP by an average of 7-8%, except for the period of the global crisis in 2007-2009; the period 2015-2017, characterized by a steady and sharp drop in oil prices, a decrease in production and investment in the sector.

According to the statistics department of the Atyrau region, this is the result of increased production in the mining and quarrying industries by 11.2%, crude oil production increased by 11.8%, food production increased by 3.8%, and 59, 5% - production of canned meat, beverage production increased by 57.3%, textile production by 2.9%. The volumes of machine-building production also increased by 3.9%, and coke and oil products by 8.7%.⁸⁷

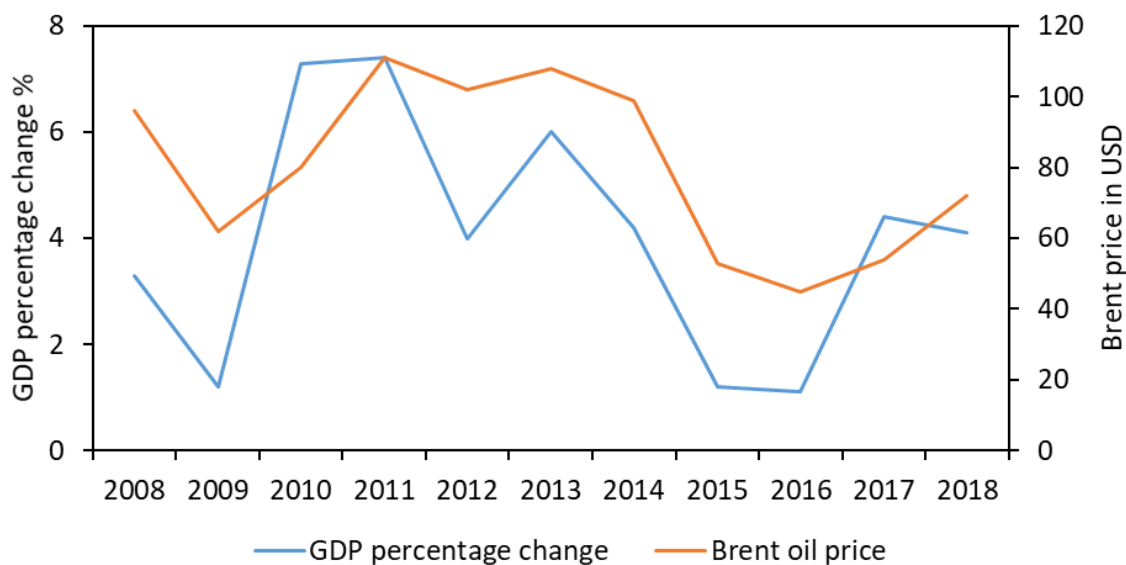
The increase in production will be due to the expansion of the Tengiz, Karachaganak, Kashagan fields and the commissioning of offshore fields. Nominal GDP will amount to 75 trillion tenge in 2020, and in 2024 - 106 trillion tenge. GDP per capita will be 10.5 thousand US dollars in 2020, with an increase to 14.3 thousand US dollars in 2024.

⁸⁶ kursiv.cz [online/RU]

<https://kursiv.kz/news/ekonomika/2019-11/vosstanovlenie-neftedobychi-uskorilo-ekonomicheskii-rost-v-kazahstane>

⁸⁷ Atyrau oil and gas <https://www.oil-gas.kz/ru/press-tsentr/novosti>

Figure 19. GDP changes vs Brent oil prices changes



Source: <https://www.ebrd.com/documents/environment/1395279731444.pdf?blobnocache=true&the-fiscal-implications-for-kazakhstan-of-worldwide-transition-to-a-gree...-ru.pdf>

In January-September 2019, the country's GDP growth was 4.3%, while on the eve of the Kazakh Ministry of Energy raised the forecast for annual oil production from 89 million tons to 90.5 million tons, considering the current growth in the industry. If the annual amended plan is implemented, this will be a record for the country, which so far amounted to 90.4 million tons in 2018.

The oil and gas industry continue to form a fifth of our country's GDP, 60% of export earnings, 99% of the National Fund. This is an extremely important resource for the current and future socio-economic development of the republic. But without adequate organization of work on the search and development of new deposits, we will begin to lose this resource in a decade.⁸⁸

According to these data, in 2018 the National Fund of the Republic of Kazakhstan received 1.63 trillion tenge, of which:

- 1.61 trillion tenge - this is direct taxes from organizations of the oil sector (excluding taxes credited to local budgets), including - 0.9 trillion tenge (equivalent to \$ 4.42 billion)
- receipts in foreign currency credited to the corresponding account of the National Fund in tenge by conducting a sequential conversion operation day to day
- other income from operations carried out by organizations of the oil sector (excluding income credited to local budgets) –16.67 billion tenge

⁸⁸ Heading for the oil channel [online/RU] <http://www.kazenergy.com/ru/press-center/interviews-and-performances/799/>

- proceeds from the sale of agricultural land - 1.17 billion tenge⁸⁹

By the method of exclusion, it can be assumed that other income, which includes income from investment activities, amounted to 2.16 billion tenge. Thus, more than 99% of the revenues of the National Fund of the Republic of Kazakhstan for 2017 are direct “oil” money.

4.6 Issues of crude-oil and gas industry in Kazakhstan

The current state of the economy of Kazakhstan actualizes the need to rethink the strategy of economic development. The main problems in the field of extraction and processing of oil and gas raw materials today include the shortage of Kazakhstan specialized personnel, a small number of processing enterprises for hydrocarbon raw materials and a relatively low coefficient of hydrocarbon recoverability. The government is taking measures to solve problems in the oil and gas sector of the Republic of Kazakhstan. These include a change in the legislation of the Republic, in part related to the oil and gas industry, this is an investment aimed at oil refining centers and projects related to geological and technical measures.

One of the central issues unresolved today is the shortage of qualified specialists in the oil and gas sector. The indicated problem is directly interconnected with the problems of the education system of the Republic of Kazakhstan. The elimination of errors in the education system is necessary not only to improve the functioning of the Kazakhstan oil and gas industry, it is necessary to achieve the state strategic goals, one of which is Kazakhstan's entry into the thirty most competitive countries in the world. The personnel shortage of oil workers, immigrants from Kazakhstan, was felt at almost all times. Now, as before, this problem is being solved by inviting specialists from foreign countries to leading positions. There are not so many local workers with specialized education and knowledge. Personnel experts explain this by the fact that newly-minted Kazakhstani specialists who graduated from the corresponding universities are not competent in many issues. These include the knowledge of English required by specialists of this level in connection with many Kazakhstani oil and gas organizations collaborating with American or European companies. If a potential employee, a native of the Republic of Kazakhstan, has all the necessary knowledge, then his wage expectations are higher than real possibilities.

Lack of oil refineries in Kazakhstan. In fact, this problem is relative. Compared to other oil producing countries, the three oil refineries that operate in Kazakhstan are too small for the volumes of oil and gas produced in the country. But at the same time, this year, Kazakhstani refineries faced difficulties in selling finished products. Due to low prices for

⁸⁹ Why is Norway's oil fund nearly 20 times larger than Kazakhstan? [online/RU] https://forbes.kz//process/expertise/pochemu_neftyanoy_fond_norvegii_pochti_v_20_raz_bolshe_kazahstanskogo/

fuel imported to Kazakhstan from Russia, the products of Kazakhstani oil refineries were out of demand in the fuel and lubricants market, which led to a partial halt in production at refineries.⁹⁰

To reduce the real cost of production from "mature" fields, a special approach to each of the wells and adjustment of technological programs, optimization of mechanized oil production are necessary. At the same time, it is necessary to increase the recoverability coefficient in the most profitable way from a financial point of view. For this, it is simply necessary to carry out thorough preliminary calculations. Usually the most cost-effective options are using the latest oil technology. To analyze existing fields, it is necessary to create an expert group, headed by an experienced engineer, preferably invited from a successful European or American company, familiar with promising oil production methods.⁹¹

The average cost of oil production in Kazakhstan averages \$ 50 per barrel, and we can say that today oil production in Kazakhstan is approaching the point after which it will become unprofitable. Therefore, the negative consequences of a significant decline in world oil prices can lead to a decrease in oil production. Other oil producing countries, where the cost of oil production is high, also have such problems. According to many analysts, at a price of \$ 45 per barrel, more than half of the world's oil fields become unprofitable. Due to falling prices, oil revenue is lower, causing a drop in GDP. What our country experienced in 2008-2009 is practically repeated. Then, in 2009, the average annual oil price was \$ 65 per barrel, at times it fell to \$ 35 or lower per barrel. If the average annual GDP growth rate in Kazakhstan for the previous period from 2000 to 2007 was 10.08%, then in 2008 GDP growth was 3.3%, in 2009 - 1.2%. GDP growth in subsequent years was again due to a significant increase in oil prices.

⁹⁰ Zakon. kz [online/RU] <https://www.zakon.kz/4919261-deputat-rasskazal-o-problemah.html>

⁹¹ Kursiv.kz [online/RU] <https://kursiv.kz/news/otraslevye-temy/2019-05/problemy-dobychi-na-zrelykh-neftyanykh-mestorozhdeniyakh-obsudili-v>

4.7 SWOT analysis of crude oil sector in Kazakhstan

In this section will be analyzed all knowledges from previous sections to build SWOT analysis and summarize current state of crude-oil and gas sector in Kazakhstan. Detailed issues of this sector is presented in previous section.

Tab. 6 SWOT analysis of crude oil and gas industry of Kazakhstan

Strengths	Weaknesses
<ul style="list-style-type: none"> • Low field depletion • Strong material and technical base • Low level of technological losses and losses during transportation • A dynamic and constructive domestic and foreign policy of the Republic of Kazakhstan, ensuring political stability and contributing to maintaining high rates of economic development • Favorable investment climate and high level of investment activity • Rich natural mineral resources and their economically attractive composition for advanced processing • The presence of an integrated oil and gas transport infrastructure connecting the markets of Asia and Europe. Potential for the development of new oil and gas transportation capacities • Developed legal framework in the field of subsoil use • An established contractual system for regulating subsoil use • Large oil company customers • Recognition and compliance with the qualification requirements of customers - operators of oil projects (Chevron, Shell, Agip, Petronas) 	<ul style="list-style-type: none"> • imperfect government regulation in the maritime industry • limited access to borrowed capital due to the low borrowing limit • Remote markets and, as a result, high transportation costs • Problems of historical pollution, utilization of associated petroleum gas and components • Dependence on transit countries to enter the markets of Europe and third countries • Shortage of investment resources due to the high capital intensity of projects and the crisis in the financial markets • High deterioration of fixed assets of oil and gas pipelines, oil refineries. • Low depth of oil refining and non-compliance of oil products with Euro standards • Dependence on the supply of Russian oil and natural gas from Uzbekistan and Russia. • A low share of the national company in the development of oil and gas fields • Lack of enough legislative framework to ensure effective development of the gas industry of the republic • Lack of refineries

Opportunities	Threats
<ul style="list-style-type: none"> • Development of the network of trunk pipelines through commissioning the second phase of the pipeline to China, as well as construction Kazakh-Caspian transportation system • Expansion to Iran • Reconstruction of the Batumi port to improve patency • Partnerships with leading international vertically integrated shipping companies, providing the opportunity to exchange experience and management technologies • The presence of projected demand for petrochemical products in the regional international market (Central and East Asia), including off-take deliveries. • The desire of major global oil producers to provide an economically viable level of prices. • High demand for hydrocarbons as a resource for various types of transport, petrochemical production • Release of high value-added products, including consumer goods. • Development and modernization of related industries - engineering, construction industry, service companies, navy 	<ul style="list-style-type: none"> • Risks of technological accidents. • Strengthening antitrust regulation • Slowdown in oil production in Kazakhstan; • Decrease in demand for oil from the main sales markets which will negatively affect transportation volumes; • Significant acceleration of inflation in the Republic of Kazakhstan • Decline in world oil prices • Adverse legislative changes • Natural disasters that can cause production shutdown, as well as financial and reputational loss • Growing global search trends alternative energy sources • Oil production in the ecologically sensitive zone of the Caspian. • Delays in the timing of the implementation of projects and the cost of their cost. • Development of gas transportation projects bypassing the territory of the republic. • The increase in the number of commissioned petrochemical industries in the regional context causes increased competition

5. Conclusion

Kazakhstan oil and gas industry are divided into four main sub-sectors: oil-producing and oil-refining, gas-producing and gas-processing. The sub-sectors are mutually intertwined and complement each other in the process of extraction and processing. The total reserves of Kazakhstan oil is very difficult to estimate, since a significant part of it is concentrated in the shelf of the Caspian Sea. The natural resource potential in the oil and gas complex is determined by the quantity and reserves of oil and gas fields and the conditions for their production and transportation.

Kazakhstan today is the owner of the richest hydrocarbon reserves that can have an impact on the world energy market. According to confirmed oil reserves, Kazakhstan is among the 15 leading countries of the world, having 3% of the world oil reserves. Oil and gas regions occupy 62% of the republic's area and have 250 oil fields. The geography of oil production in the Republic of Kazakhstan is very extensive.

Kazakhstan is extremely interested in the stability of world oil prices and taking into account a certain pricing mechanism prevailing in the world oil market, republic should take into account the high levels of costs in the oil industry, which may cause a possible loss of competitiveness in the world oil market and in the market for investment in oil industry. Almost 99% of National fund is created from the tax revenue of oil and gas industry. The growth of republic GDP is closely related with crude oil prices and follows them. This year, the oil factor will be key for indicators of the final growth of the Kazakhstani economy, even more significant than last year, amid a decrease in the influence of some other factors (primarily budget expenditures and transfers to the budget from the National Fund). True, this year the key will be not the increase in the physical volumes of oil production, but the price of oil.

A sharp drop in world oil prices in 2014–2015 led to a decrease in GDP, and, consequently, in the filling of the budget of Kazakhstan. This has not yet caused significant difficulties in ensuring social guarantees by the state in relation to its citizens, but has made it possible to significantly reduce other government spending. This system is good at transitional stages, but it can pose a potential threat to the economy, expressed in periodic crises, if its reform is delayed.

The solution to the main problems arising in the oil and gas sector is very important for the economy of the whole Republic of Kazakhstan, given its raw material orientation. In this regard, clear strategies are needed regarding personnel shortages, hydrocarbon production and the regulation of oil refining processes. These strategies should be supported and controlled by the state, this will allow to bring the economy of Kazakhstan to a new world level of development.

6. Bibliography

1. History of oil [online] <https://www.ektinteractive.com/history-of-oil/>
2. Petroleum industry in Azerbaijan [RU/online] https://en.wikipedia.org/wiki/Petroleum_industry_in_Azerbaijan
3. The history of the discovery and use of oil and gas, and their origin [RU/ online] <http://energetika.in.ua/ru/books/book-1/part-2/section-8/8-1>
4. History of crude oil [online] <https://www.ig.com/au/commodities/oil/history-of-crude-oil-price>
5. History of Texaco [online] http://www.texacobaltic.eu/en/texaco_history
6. The Seven Sisters: The Great Oil Companies and the World They Shaped [online] <https://www.energytoday.net/conventional-energy/the-seven-sisters-the-great-oil-companies-and-the-world-they-shaped/>
7. Oil and gas production in South and Central America [online] <https://www.iogp.org/bookstore/product/global-energy-brief-latin-america/>
8. A brief history of oil [RU/online] <http://www.hsib.msu.ru/library/oil.html>
9. US Oil Market: EIA Report [RU/online] <https://www.vestifinance.ru/articles/59821>
10. Crude-oil market [RU/online] <http://www.iccwbo.ru/blog/2016/mirovoy-rynok-nefti-razvitiie-tseny-i-moshenniki/>
11. Crude Oil Across the Asia Region [online] <https://www.cmegroup.com/education/courses/introduction-to-energy/introduction-to-crude-oil/learn-about-crude-oil-across-asia-region.html>
12. Asia grows as a crude oil price maker [online] <https://www.ft.com/brandsuite/cme-group/asia-grows-as-a-crude-oil-price-maker/index.html>
13. Introduction to European Crude Oil [online] <https://www.cmegroup.com/education/courses/introduction-to-energy/introduction-to-crude-oil/introduction-to-european-crude-oil.html>
14. Oil Producing Countries 2019 <http://worldpopulationreview.com/countries/oil-producing-countries/>
15. Oil well [online] https://energyeducation.ca/encyclopedia/Oil_well
16. Top 10 Oil-producing Countries <https://investingnews.com/daily/resource-investing/energy-investing/oil-and-gas-investing/top-oil-producing-countries/>
17. Top ten countries by oil production <https://www.offshore-technology.com/features/oil-production-by-country/>
18. Global oil demand to disappoint [online] <https://www.petroleum-economist.com/articles/markets/trends/2019/global-oil-demand-to-disappoint>
19. Global Energy & CO₂ Status Report [online] <https://www.iea.org/geco/oil/>
20. OPEC website https://www.opec.org/opec_web/en/
21. Major Crude Oil Reserves, 2000-2018 [online] https://transportgeography.org/?page_id=6828
22. Oil Reserves, Their Categories, and the World's Largest [online] <https://www.thebalance.com/oil-reserves-definition-categories-world-s-largest-3305873>

23. Oil sands facts and statistics [online] <https://www.alberta.ca/oil-sands-facts-and-statistics.aspx>
24. Oil and Gas Trends 2018-19 [online] <https://www.strategyand.pwc.com/gx/en/insights/industry-trends/2018-oil-gas.html>
25. The world's biggest natural gas reserves [online] <https://www.hydrocarbons-technology.com/features/feature-the-worlds-biggest-natural-gas-reserves/>
26. BP Statistical Review of World Energy 2018. <https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2018-full-report.pdf>
27. Blažek J., Rábl V.: Základy zpracování a využití ropy. 2. vyd. Vysoká škola chemicko-technologická v Praze, Praha 2006. ISBN 80-7080-619-2
28. API gravity [online] https://www.engineeringtoolbox.com/api-gravity-d_1212.html
29. Crude oil characterization [online] https://petrowiki.org/Crude_oil_characterization
30. Brent Crude Oil Analysis [online] <https://www.ivoryresearch.com/writers/paula-wright/>
31. Brent Crude – Definition [online] <https://thebusinessprofessor.com/knowledge-base/brent-crude-definition/>
32. Benchmark Oils: Brent Blend, WTI and Dubai [online] <https://www.investopedia.com/articles/investing/102314/understanding-benchmark-oils-brent-blend-wti-and-dubai.asp>
33. West Texas Intermediate [online] https://en.wikipedia.org/wiki/West_Texas_Intermediate
34. Benchmark Oils [online] <http://www.petroleum.co.uk/benchmarks>
35. Bonny Light crude [online] <https://www.mckinseyenergyinsights.com/resources/refinery-reference-desk/bonny-light-crude/>
36. Urals oil [RU/online] <https://ru.wikipedia.org/wiki/Urals>
37. Cost, Insurance and Freight – CIF Definition [online] <https://www.investopedia.com/terms/c/cif.asp>
38. What determines oil prices? [online] <https://www.investopedia.com/articles/economics/08/determining-oil-prices.asp>
39. What Affects Oil Prices? Three Critical Factors [online] <https://www.thebalance.com/how-are-oil-prices-determined-3305650>
40. TIMELINE: The tumultuous 155-year history of oil prices <https://www.businessinsider.com/timeline-155-year-history-of-oil-prices-2016-12>
41. OPEC [online] <https://en.wikipedia.org/wiki/OPEC>
42. OPEC Brief History [online] https://www.opec.org/opec_web/en/about_us/24.htm
43. OPEC and Its Goals, Members, and History <https://www.thebalance.com/what-is-opec-its-members-and-history-3305872>
44. How Will the U.S. Respond to Russia-OPEC Cooperation? [online] <https://www.cfr.org/in-brief/how-will-us-respond-russia-opec-cooperation>
45. OPEC Basket [online] <https://www.investopedia.com/terms/o/opecbasket.asp>
46. OPEC daily basket price [online] https://www.opec.org/opec_web/en/5348.htm

47. The relationship between the Brent crude oil price and the dollar exchange rate [online] <https://www.cnb.cz/en/monetary-policy/inflation-reports/boxes-and-annexes-contained-in-inflation-reports/The-relationship-between-the-Brent-crude-oil-price-and-the-dollar-exchange-rat>
48. The link between the Brent crude oil price and the US dollar exchange rate, Filip Novotný, DOI: 10.18267/j.pep.420
49. How Geopolitical Tensions May Impact Oil Prices and the Economy [online] <http://www.celiamueller.com/HOT-TOPIC-How-Geopolitical-Tensions-May-Affect-Oil-Prices-and-the-Economy.c9423.htm>
50. US energy information administration [online] https://www.eia.gov/finance/markets/crudeoil/spot_prices.php
51. Middle East institute [online] <https://www.mei.edu/publications/syrian-oil-crisis-causes-possible-responses-and-implications>
52. Likely impact of the Libyan crisis on oil prices [online] <https://www.sify.com/finance/likely-impact-of-the-libyan-crisis-on-oil-prices-imagegallery-1-others-ldxrudghdeesi.html>
53. Oil prices.com [online] <https://oilprice.com/Energy/Energy-General/Is-Libya-Facing-A-New-Oil-Crisis.html>
54. AJ Impact/UNITED STATES [online] <https://www.aljazeera.com/ajimpact/iran-sanctions-cost-market-27-million-barrels-oil-day-190820175146168.html>
55. Investopedia.com [online] <https://www.investopedia.com/articles/investing/073115/how-iran-impacts-price-and-supply-oil.asp>
56. REUTERS.com [online] <https://www.reuters.com/article/us-global-oil/oil-falls-more-than-2-on-u-s-china-trade-deal-doubts-stronger-dollar-idUSKBN1WT00V>
57. Oil prices up with US-China trade deal optimism <https://www.aa.com.tr/en/energy/international-relations/oil-prices-up-with-us-china-trade-deal-optimism/27249>
58. Aboutenergy.com [online] https://www.aboutenergy.com/en_IT/topics/us-15-eng.shtml
59. The Basics of Trading Crude Oil Futures [online] <https://www.thebalance.com/trading-crude-oil-futures-809351>
60. How much speculators will collapse oil prices and the ruble [online/RU] <https://www.forbes.ru/finansy-i-investicii/369185-kak-silno-spekulyanty-obvalyat-ceny-na-neft-i-kurs-rublya>
61. Alquist, Ron, and Olivier Gervais. "The Role of Financial Speculation in Driving the Price of Crude Oil." *The Energy Journal* 34, no. 3 (2013): 35-54.
62. Dodd–Frank act [online] https://en.wikipedia.org/wiki/Dodd%E2%80%93Frank_Wall_Street_Reform_and_Consumer_Protection_Act
63. <https://informburo.kz/stati/chto-budet-s-ekonomikoy-kazahstana-esli-neft-snova-vyrastet-do-100-dollarov.html>

64. SWOT-analysis of Oil and Gas Sector of Kazakhstan [online/RU]
<http://repository.kaznu.kz/bitstream/handle/123456789/1563/356-719-1-SM.pdf?sequence=1&isAllowed=yhttp://www.jstor.org/stable/41970496>
65. Oil industry of Kazakhstan [online/RU]
https://ru.wikipedia.org/wiki/Нефтяная_отрасль_Казахстана
66. Kazakhstan: Refine and Expand [online]
<https://www.theoilandgasyear.com/market/kazakhstan/>
67. Kashagan [online/RU] <https://neftegaz.ru/tech-library/mestorozhdeniya/141663-kashagan/>
68. Kashagan field [online/RU] <https://energybase.ru/oil-gas-field/kashagan>
69. Kashagan project [online/RU] <https://www.kbv.kz/project/>
70. Kazakhstan's Kashagan tagged world's most expensive energy project
https://en.tengrinews.kz/industry_infrastructure/kazakhstans-kashagan-tagged-worlds-most-expensive-energy-14913/
71. North Caspian Project [online/RU] <https://www.ncoc.kz/ru/ncoc/about>
72. Tengiz oil field [online/RU] <https://neftegaz.ru/tech-library/mestorozhdeniya/141433-tengizskoe-neftegazovoe-mestorozhdenie/>
73. HOW MUCH OIL IN KAZAKHSTAN [online/RU] <https://www.oil-gas.kz/ru/press-tsentr/novosti/novosti-blog/344-skolko-nefti-v-kazahstane>
74. KPO [online] <https://www.business-humanrights.org/en/karachaganak-petroleum-operating-kpo>
75. Role of crude oil in Kazakhstan economy [online/RU] <https://articlekz.com/article/8172>
76. Kazakhstan crude oil complex [online/RU]
<http://www.investkz.com/journals/36/260.html>
77. KASE [online/RU]
http://kase.kz/files/presentations/ru/KASE_OilGas_industry_2019.pdf
78. Oil and gas sector is the basis of stability of the economy of Kazakhstan [online/RU]
http://bertys-m.kz/ru/news/490-neftegazovyy_sektor_osnova_stabilnosti_ekonomiki_kazahstana/
79. Global innovation index 2017 [online/RU] <https://www.ictsd.org/bridges-news/>
80. Atyrau crude oil region [online/RU] <https://www.oil-gas.kz/ru/press-tsentr/novosti>
81. Atyrau [online] <https://energycities.org/member-cities/atyrau-kazakhstan>
82. Crude oil and gas industry [online/RU] <https://ibrain.kz/ekonomika-kazahstana/neftyanaya-i-gazovaya-promyshlennost>
83. Investments in crude oil sector [online/RU] <https://365info.kz/2019/02/interesy-investorov-v-kazahstane-zatocheny-tolko-na-neft-i-metally>
84. Kursiv.kz [online/RU] <https://kursiv.kz/news/otraslevye-temy/2018-11/eksport-nefti-iz-rk-uvelichilsya-na-6-v-obyome-i-srazu-na-45-v-dengakh>
85. EBRD.com [online/RU] article
<https://www.ebrd.com/documents/environment/1395279731444.pdf?blobnocache=true&he-fiscal-implications-for-kazakhstan-of-worldwide-transition-to-a-gree...-ru.pdf>
86. kursiv.cz [online/RU] <https://kursiv.kz/news/ekonomika/2019-11/vosstanovlenie-neftedobychi-uskorilo-ekonomicheskiy-rost-v-kazahstane>

87. Atyrau oil and gas <https://www.oil-gas.kz/ru/press-tsentr/novosti>
88. Heading for the oil channel [online/RU] <http://www.kazenergy.com/ru/press-center/interviews-and-performances/799/>
89. Why is Norway's oil fund nearly 20 times larger than Kazakhstan? [online/RU] https://forbes.kz//process/expertise/pochemu_neftyanoy_fond_norvegii_pochti_v_20_r_az_bolshe_kazahstanskogo/
90. Zakon. kz [onlinr/RU] <https://www.zakon.kz/4919261-deputat-rasskazal-o-problemah.html>
91. Kursiv.kz [online/RU] <https://kursiv.kz/news/otraslevye-temy/2019-05/problemy-dobychi-na-zrelykh-neftyanykh-mestorozhdeniyakh-obsudili-v>