

**Czech University of Life Sciences Prague
Faculty of Economics and Management**

Department of Economics



Bachelor Thesis

**Kazakhstan's international trade: uranium
exports**

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BACHELOR THESIS ASSIGNMENT

Gleb Ilin

Economics Policy and Administration
Business Administration

Thesis title

Kazakhstan's international trade: uranium exports

Objectives of thesis

The main objective of the bachelor's thesis is to assess the importance of foreign trade for the development of Kazakhstan, as well as explain what world trade is and what elements it includes.

Methodology

Data from books, articles, Internet resources, magazines and other sources will be used to write and explain the theoretical part of the work. The basic concepts and factors on which the world market is based underlie the theoretical part of the work.

The practical part will show the degree of importance and impact of the uranium industry on the economy and population of Kazakhstan. The practical part will be based on descriptive statistics and will include graphs and statistical tables. The work will also employ descriptive, analytic and comparative methods.

The proposed extent of the thesis

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Keywords

International trade, uranium, Kazakhstan, economy, export

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EVANS, V. – DOOLEY, J. – RODGERS, K. *Environmental engineering. Book 1-3*. Newbury: Express Publishing, 2013. ISBN 978-1-4715-1611-5.

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REINERT, K A. *An introduction to international economics : new perspectives on the world economy*. Cambridge: Cambridge University Press, 2021. ISBN 978-1-108-45516-9.

ROBINSON, E. *World economy : international trade, economic systems and development*. New York: Clarye International, 2019. ISBN 978-1632408945.

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Declaration

I declare that I have worked on my bachelor thesis titled “World trade in uranium and its impact on the economy and the environment” by myself and I have used only the sources mentioned at the end of the thesis. As the author of the bachelor thesis, I declare that the thesis does not break copyrights of any third person.

In Prague on 14th March 2022

Gleb Ilin

Kazakhstan's international trade: uranium exports

Summary

The major purpose of the bachelor's thesis is to analyze the importance of foreign trade for Kazakhstan's growth, as well as to provide an explanation of what world commerce is and what it entails.

The theoretical part of the research explains the fundamental principles and forces that support the global market. What organization is in charge of it, and what principles are used to govern it.

The practical section demonstrates the uranium industry's importance and influence on Kazakhstan's economy and population. The global uranium trade, major suppliers, and uranium market are all examined. It also explains the hazards that such trading entails and how they can be mitigated.

Keywords: International trade, uranium, Kazakhstan, economy, export;

Mezinárodní obchod Kazachstánu: export

uranu

Souhrn

Hlavním cílem bakalářské práce je analyzovat význam zahraničního obchodu pro růst Kazachstánu a zároveň poskytnout vysvětlení, co je světový obchod a co obnáší.

Teoretická část výzkumu vysvětluje základní principy a síly, které podporují globální trh. Jaká organizace to má na starosti a jaké principy se používají k jeho řízení.

Praktická část demonstruje význam a vliv uranového průmyslu na ekonomiku a obyvatelstvo Kazachstánu. Zkoumá se globální obchod s uranem, hlavní dodavatelé a trh s uranem. Vysvětluje také rizika, která takové obchodování přináší, a jak je lze zmírnit.

Klíčová slova: Mezinárodní obchod, uran, Kazachstán, ekonomika, export;

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1 Introduction

Energy is a very important thing for humanity. Also, especially electricity. She helps us illuminate our homes, streets, buildings, entire stadiums and cities. This allows us to prepare delicious meals and reheat food, as well as to protect them from spoilage in refrigerators and freezers. Electricity is used to heat our homes, as well as for heating and water supply. Humanity successfully uses electricity for the production and processing, assembly and creation of various things and materials, as well as in construction. It finds various uses in medicine. Subways, trams, trains, electric cars and other forms of transportation use electricity. Modern life and everyday life is almost impossible to imagine without electricity. Irons, washing machines, dryers, vacuum cleaners, phones, laptops and computers, walkie-talkies, televisions, radios, printers, scanners, robots, of course, the Internet and other everyday things work for us thanks to electricity.

People are wasting huge amounts of energy every day. It is logical that this should be taken from somewhere. Humanity has long been engaged in the search for a more powerful, environmentally friendly, reliable, and most importantly a cheaper and more accessible source of energy. After the industrial revolution, we began to make extensive use of charcoal and coal. In the modern world, traditional and economic wars are waged for control and ownership of oil and gas resources. Research is underway in the field of environmentally friendly and renewable energy sources, as well as their active implementation.

However, humanity is actively using another mysterious element for energy production. The name of this element is Uranium. Humanity has been using uranium as a fuel for electricity generation for a relatively long time. However, scientific development, exploration of new deposits, methods of extraction and use of uranium are still ongoing to unlock its full potential.

And where to get energy resources for countries in which they either do not exist or are extremely scarce. World trade comes to the rescue. People have been involved in international trade long before the existence of the World Trade Organization. Ancient civilizations have long understood that not all resources can be obtained through war, it is much more profitable to exchange those resources that are abundant in the country for those needed by neighbors. This is how ancient caravans, caravanserais, customs, foreign trade contracts and agreements and other elements of trade appeared. Modern trade occurs both between countries and between international companies, corporations and organizations. So

countries receive energy resources and other goods and services, and produce and provide their goods and services to the market, which are subsequently exchanged for money or resources that are beneficial to them. World trade allows you to improve the economy and welfare of developing countries that provide agricultural products, extracted useful resources, as well as energy resources and more to the world market. Where, with the help of money and international contracts, they exchange with developed countries for technologies, transport, spare parts for medicines and other manufactory things.

Since Kazakhstan is a developing country, participation in world trade benefits it, since a huge part of Kazakhstan's exports is concentrated in the export of useful energy resources such as oil, gas, coal and uranium.

Consideration of what is world trade, its aspects and features, as well as its impact and the impact of trade in uranium products on the economy and welfare of Kazakhstan, this is the main goal of this bachelor's work

2 Objectives and Methodology

2.1 Objectives

The main objective of the bachelor's thesis is to assess the importance of foreign trade for the development of Kazakhstan, as well as explain what world trade is and what elements it includes.

2.2 Methodology

Data from books, articles, Internet resources, magazines and other sources will be used to write and explain the theoretical part of the work. The basic concepts and factors on which the world market is based underlie the theoretical part of the work. What organization is in charge of it, and what principles are used to govern it.

The practical part will show the degree of importance and impact of the uranium industry on the economy and population of Kazakhstan. The global uranium trade, major suppliers, and uranium market are all examined. It also explains the hazards that such trading entails and how they can be mitigated.

Also, the information used in this work regarding the uranium industry and data on the economic performance of countries is taken from the official resources of the World Nuclear Association, Cameco, the World Trade Organization, World Bank and data from the National Atomic Company of Kazakhstan: KAZATOMPROM.

The practical part will be based on descriptive statistics and will include graphs and statistical tables. Graphs, charts and statistical tables show the world production of uranium by countries for 1945-2020, the amount of uranium reserves in countries, the share of countries in the uranium market in percentage terms, the amount of uranium mined by countries for 2011-2020, uranium prices for the period from 1990 until 2021 and other information. The work will also employ descriptive, analytic and comparative methods.

3 Theoretical part

The beginning of the theoretical part will include: definition of international trade, theories of international trade, export, import and other necessary economic vocabulary.

In addition, the theoretical part is devoted to the World Trade Organization and its principles, as well as the risks that arise for participants associated with international trade.

3.1 Introduction to international trade

The transfer of goods and services, including capital goods, from one country to another is referred to as international trade. In most countries, such trade accounts for a significant portion of their Gross Domestic Product (GDP). While international trade has existed for a long time, its economic, social, and political significance has grown in recent centuries. As a result, nations would be limited to the goods and services produced within their own borders if international trade did not exist (Hassan et al., 2014).

Global commerce allows wealthier countries to make better use of their resources, such as labor, technology, and capital. Distinct countries have different assets and natural resources, such as land, labor, capital, and technology, among other things. As a result, some countries are able to produce the same commodity more efficiently – that is, faster and at a cheaper cost. As a result, they may be able to sell it at a lower price than other countries. If a country is unable to manufacture an item efficiently, it can obtain it by trading with a country that can. In international trade, this is referred to as specialization. (INVESTOPEDIA, 2021)

International theory affects everyone, as every day we buy goods produced in different countries, use the services of foreign companies or listen to music and read books written by authors from different countries.

3.2 Theories of international trade

3.2.1 Mercantilism

New doctrine arose at the end of the 15th century which is based on the desire to increase monetary resources and is characterized as early mercantilism. It was banned to export money out of the country in order to retain it in the country. Foreigners were required to use all of the revenues from the sale to buy local goods. (FOMICHEVA, 2001)

Late mercantilism developed from the second half of the 16th century until the middle of the 18th century. The active trade balancing system was at the heart of late

mercantilism. The core concept of mercantilism has not altered as it progresses from an early to a late stage. Only the methods for attaining the mercantilists' primary aim - the accumulation of monetary riches on their country's territory - have advanced and improved. (FOMICHEVA, 2001)

If you look at the period of world history from the 1500s to the late 1800s, it becomes clear why mercantilism was such a success. In the 1500s, new nation-states arose, with rulers seeking to strengthen their countries by constructing greater armies and national institutions. Such monarchs were able to collect greater gold resources for their kingdoms through boosting exports and commerce. For many countries, an effective way to increase exports was to introduce restrictions on imports. This strategy is called protectionism and is used in our time. (SAYLORDOTORG)

3.2.2 Adam Smith idea

Adam Smith highlighted the idea of rational international commerce during the shift of the major countries to large-scale machine manufacture. In his famous book *An Inquiry into the Nature and Causes of the Wealth of Nations* (1776), devoted to mercantilism criticism, he suggested that it might be profitable for the state not only to sell, but also to buy goods on the foreign market, and he attempted to determine which goods were profitable to export and which were profitable to import. (FOMICHEVA, 2001)

Businesspeople and economists criticized the high and stringent customs tariffs, calling for trade agreements with other countries. This shift resulted in a slew of accords incorporating new trade concepts, including the Anglo-French Treaty of 1786, which put an end to the two countries' economic war. (BRITANNICA)

3.2.3 Absolute advantage model

Adam Smith singled out some general principles that he considered characteristic of the activities of a prudent business entity, and transferred them to foreign trade. In the economic literature, this approach of his was called the absolute advantage model. (FOMICHEVA, 2001)

Based on this model, the country was forced to focus on the export and manufacturing of items in which it had a significant competitive edge. Also, to import commodities in which other nations have absolute advantages in the manufacturing process.

Countries will gain efficiency as a result of specialization since their labor force will become more skilled at executing the same activities. Manufacturing will become more efficient as a result of the motivation to develop quicker and better manufacturing processes in order to enhance specialization. (SAYLORDOTORG)

Table 1: Absolute advantage

	Country 1	Country 2
good X	4 hours	10 hours
good Y	7 hours	5 hours

Source: Created by author based on Fomicheva, N. V., 2001, International trade.

Consider an example (Table 1), Country 1 takes 4 hours to produce a unit of good X, while Country 2 takes 10 hours. Therefore, Country 1 has an absolute advantage in producing a unit of good X, as it spends less time on it. But also, Country 2 produces good Y faster than Country 1, which gives it an absolute advantage in the production of this good.

Smith believed that commerce stimulation and improving efficiency would benefit citizens in both nations. His idea was that a country's wealth should be measured by its people's level of life rather than its gold reserves. (SAYLORDOTORG)

3.2.4 Comparative advantage model

In the early 1800s, David Ricardo first demonstrated the relevance of comparative advantage, he addressed an issue that even Adam Smith had struggled with. When contrasted directly to the population of another country, comparative advantage explains why a country might manufacture and export something country's residents don't appear to be especially talented at producing. The seeming paradox is explained by the fact that the residents of the importing country must be even better at creating something else, making paying for labor done by the exporting country worthwhile. Even if one nation has an absolute advantage in manufacturing each item, inhabitants of each country are better off specialized in creating only the items at which they have a comparative advantage. (ECONLIB)

Table 2 : Comparative advantage

	Cost of production (labor time)	
	England	Portugal
x (m ² of cloth)	100 hours/year	90 hours/year
y (liters of wine)	120 hours/year	80 hours/year

Source: Created by author based on Fomicheva, N. V., 2001, International trade.

Table 2 illustrates that the manufacturing of a given amount of cloth in England will demand the annual effort of 100 people per year. England buys a certain amount of Portuguese wine in exchange for a certain amount of cloth, which requires the labor of 120 people every year to produce. As a result, it is profitable for England to buy wine from Portugal in exchange for selling her textile. Portugal spends 90 and 80 workers and a year on the manufacturing of the same items, thus it is profitable for her to import textile in return for wine. According to D. Ricardo, the uneven exchange of labor between 100 English workers and 80 Portuguese workers is attributable to the difficulty of shifting production inputs between countries. Following the model of David Ricardo, Portugal has an absolute advantage over England in the manufacture of both items, but it has a comparative advantage in the production of wine, which will need 67 percent ($80/120 \times 100$) of England's expenses, and 90 percent ($90/100 \times 100$) for the production of fabric. As a result, producing and exporting wine is more profitable for Portugal, whereas producing and exporting textile is more profitable for England. (FOMICHEVA, 2001)

3.3 World Trade Organization (WTO)

The official website of the World Trade Organization says: "The World Trade Organization (WTO) is the only global international organization dealing with the rules of trade between nations. At its heart are the WTO agreements, negotiated and signed by the bulk of the world's trading nations and ratified in their parliaments. The goal is to ensure that trade flows as smoothly, predictably and freely as possible."(WTO)

The General Agreement on Tariffs and Trade (GATT) and its successor, the World Trade Organization (WTO), were set up to promote world trade after World War II. On January 1, 1995, the WTO began its existence, but the trading system that it took as a basis appeared much earlier. The General Agreement on Tariffs and Trade (GATT) established the rules for the system in 1948. Following the agreement, was created an unauthorized

international organization known as GATT. This organization has changed throughout time as a result of various rounds of negotiations. The Uruguay Round, which ran from 1986 to 1994 and resulted in the establishment of the World Trade Organization, was the last and largest GATT round. The WTO and its agreements now cover trade in services as well as traded inventions, creations, and designs, whereas the GATT had primarily dealt with trade in goods (intellectual property). (WTO)

3.4 Principles of the WTO

The WTO agreements are complex and cover a wide range of activities, but some simple fundamental principles of the trading system can be identified:

- **Non-discrimination** - A state should not make distinctions between its economic partners or between its own and foreign products, services, or nationals.
- **Opening trade** - Reducing trade barriers that include customs duties (or tariffs) and measures such as import bans or quotas that selectively limit quantities.
- **Predictability and transparency** - Foreign investors, corporations, and governments must be confident that trade obstacles will not be imposed arbitrarily. Stable and predictable trade policies promote investment, job creation, healthy competition, and consumer satisfaction.
- **Fair competition** - Getting rid of "unfair" market-share-gaining activities including export subsidies and dumping goods at below-market pricing. And how governments can respond and repair the damage caused by unfair trade.
- **Support for less developed countries** - And over three-quarters of WTO members are nations in the process of developing or transitioning their economies. The WTO Agreements give them time to adjust to WTO provisions and, in the case of the Trade Facilitation Agreement, provide real assistance in putting the Agreement into effect.
- **Protection of the environment** - Members of the WTO can take steps to protect not only public, animal, plant and health, but also the environment.
- **Partnerships** - To improve cooperation and establish partnerships, the WTO

conducts continuous engagement with civic society, labor unions, colleges, and business.

- **Digital trade** - The World Trade Organization recognizes the growing importance of e-commerce. As a result, the organization provides frequent updates on the e-commerce work program and also leads the creation of global regulations for digital commerce.

(WTO)

3.5 Import

The procedure of receiving or transporting in items from another country for the purpose of trade is known as import. Individuals, businesses, and governments can receive these items, which are then used to process other products or resold to end users. Because import transactions include payments to sellers in another country, there is an outflow of money from the country. (CFI)

Imports are items or services that are necessary for a country's economic well-being or that are extremely appealing to customers but are unavailable on the home market.

3.6 Export

Export is the sale of products with the intention of exporting them beyond national borders. (ZAKHAROVA,2009). Because export transactions entail selling domestic products and services to foreign clients, exports result in an inflow of funds into the seller's country.

According to Andrew Gillespie (Head of Business and Marketing Director, d'Overbroecks, Oxford and Associate Lecturer, Oxford Brookes University) these factors can influence exports: Buyer preferences, average incomes in other countries, protectionism, exchange rates, market accessibility, the quality of products and services, subsidies for export. (GILLESPIE, 2016)

Protectionism: A foreign trade policy approach that entails state intervention in overseas commercial activity, as well as specific forms and methods of state control. (SHELEG, N., & ENIN, Y, 2021) Tariffs, subsidies, and quotas are all examples of protectionism. These strategies aim to eliminate inefficiencies in the global market. (INVESTOPEDIA, 2021)

Average incomes in other countries: We can expect increased potential demand for

things if income in other countries is high. People buy more things and services when they have greater discretionary income. In terms of export, income is really important. (GILLESPIE, 2016)

Buyer preferences: According to V. Pareto, “each consumer has his own order of preferences in relation to the totality of goods and services. When choosing goods, the consumer does not measure the utility of a particular product, but compares the utility of goods for yourself, matching your preferences and your budget” (HICKS D.R., ALLEN R.G., 1993)

Exchange rates: The value of a country's currency in relation to the country's currency or economic zone is known as a rate of exchange. Most exchange rates are free-floating, meaning they increase and fall in response to buyers and sellers. Some exchange rates are not free-floating and are tied to the value of other currencies. They may also be subject to regulations. For international transactions it is necessary to exchange currencies, therefore, the exchange rate directly affects world trade. (INVESTOPEDIA, 2021)

Market accessibility: It is easier for nearby countries to trade with one other because they share similar cultural and political ideals. Goods and services in such countries find consumers faster due to similar languages, customs, lifestyles and cultures. (GILLESPIE, 2016, p. 585)

Subsidies for export: Countries compete with each other for favorable conditions in international markets. Therefore, export subsidies are attractive policy instruments. Since they in some way improve the position of the local firm in competition, without cooperating with foreign firms, as well as get more profit and take a larger market share. However, such trade provisions are not favorable to the subsidizing state. But with imperfect competition, the price is usually higher than the cost of exports, which improves the economic condition of the country. The international non-cooperative equilibrium implies such subsidies from producer countries, even if generally they are suboptimal. (BRANDER, J. A. ,1985)

The quality of products and services: A product's or service's quality is determined by a set of indicators that describe the attributes of the product or service. As a result, they are able to meet the consumer's requirements during usage and operation, including destruction and disposal. (The concept of product quality - Metrology, standardization and certification (DEMIDOVA N.V., 2010)

The most important way to increase production efficiency is to improve product quality. The ratio of the results obtained to the costs incurred determines production efficiency. Efficiency can be improved in two ways: by lowering production costs or by

increasing the social significance of labor results, which can be achieved not only by increasing product quantity but also by improving product quality. (STUDOPEDIA, 2015)

As the quality of the product improves, so does the value of the product, which makes the import of this product by other countries more feasible.

3.7 Necessary economic vocabulary

3.7.1 Alternative cost

The value assigned to the most highly valued of the rejected alternatives or opportunities is known as opportunity cost. That is the value that is lost or given up in order to protect the higher value that the chosen object reflects. The basic relationship between scarcity and choice is expressed by the concept of opportunity cost (also known as alternative cost). (BUCHANAN, J. M.,1991)

3.7.2 Gross domestic product (GDP)

GDP is the most used metric system for assessing a country's financial strength. (Van den Bergh, J. C. 2009). It's difficult to evaluate an economy's size and living standard without GDP. A high level of GDP is equivalent to a high standard of living in the country. As a result, all leaders want to boost their countries' GDP as much as possible. There are a variety of strategy to improve GDP, the easiest of which is exporting, second to government spending. (UDDIN, H., 2017).

3.7.3 Gross domestic product per capita (GDP per capita)

GDP per capita is calculated by dividing a country's economic production by its population. It's an excellent indicator of a country's living standards. It also describes how much the residents profit from the economy. Purchase power parity is a statistic that compares the economic output of different countries based on a similar market basket. (THEBALANCE, 2022)

3.7.4 Trade balance

The concept of "trade balance" describes the situation of an economy that interacts with other countries. The balance of trade indicator can provide a quick overview of a country's international trade profitability and stability in the global market. In value terms, the balance of trade is the ratio of products sold abroad (exports) to products sold in the territory of a specific country (imports) by foreign manufacturers. When exports surpass

imports, or the value of exported items exceeds the cost of exported goods, a country's trade balance could be considered as active. Imports exceed exports when trade balance is passive and condition can be reversed. In this instance, the surplus of imports has a negative impact on the national economy: the government acts as a borrower, and the trade balance deficit is financed through an external loan. (BEST STUDENT ARTICLE, 2018)

3.7.5 International trade risks and their types

In general, the concept of "risk" signifies "potential danger," and in economic terms, it means "possible loss or failure in commercial activity." The new concept is logically derived from the fundamental picture of a market economy that is uncertain. According to the experts, the main source is a general relationship, not natural variables. As a result, risks are an essential aspect in business for each of the players, and they must be factored into management calculations. (SABELNIKOV L.V., 2005)

3.7.5.1 Currency risk

Currency risk refers to the risk of financial loss resulting from fluctuations in the exchange rate when executing any operations involving currency or precious metal conversion. In other words, currency risks are the risks to which all entities that take part in foreign exchange transactions are exposed. All individuals and legal companies in the market who conduct foreign currency transactions are considered currency risk subjects. (KISHKO, O. D., 2020)

3.7.5.2 Regulatory(political) risks

Regulatory or political risks, the causes of which are a certain degree of state influence on certain economic activities by issuing orders for the confiscation of goods, revoking a license, imposing an embargo, obstructing import-export operations. (ICCWBO, 2016)

3.7.5.3 Entrepreneurial or economic risks

Entrepreneurial or economic risks are the most well-known sort of external risks, and they are described as unfavorable outcomes produced by changes in a country's or enterprise's economic climate. These are economic shifts that can result in a decrease in revenue or an increase in a company's expenses. The instability of the macroeconomic environment in the importing country: the structure of the economy, the quality of economic management, the dynamics and volume of production (competitive in the world market), stock prices, the decline in demand, the dynamics and volume of production of GDP, GNP

and many other factors that can affect the economy and profit. (N. KARPOVICH, 2020)

3.7.5.4 Logistical risk

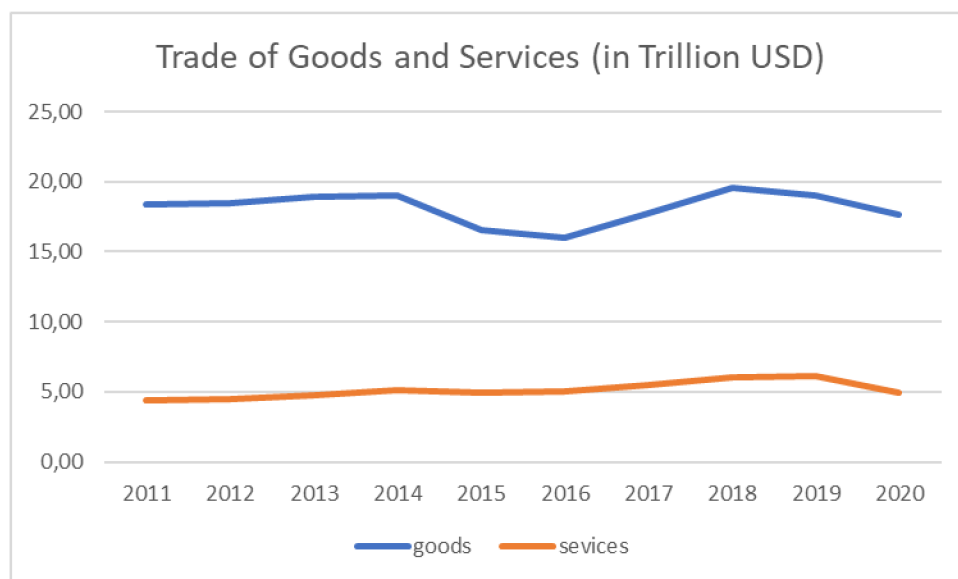
Because international transportation includes great distances and products are frequently passed from hand to hand or stored for extended periods of time, the danger of loss, damage, or theft of items is higher than in domestic trade. (ICCWBO, 2016)

4 Practical part

4.1 International trade

Trade in goods and services is the backbone of trade in our world. According to the World Trade Organization, the number of goods and services sold is growing. But despite the growth, trade in goods occupies a dominant part of world trade than trade in services. In 2020, global merchandise trade was \$17.62 trillion. This is a smaller figure compared to 2019 (\$19.02 trillion) and 2018 (\$19.56 trillion), but this is due to the consequences that the COVID-19 pandemic had on the economy. Global exports of commercial services are also below previous years, in 2020 the amount of exports was \$4.91 trillion, which is also lower than in 2019 (\$6.15 trillion) and 2018 (\$6.01 trillion) years (Figure 1). However, the situation is improving as the amount of exports of goods for 3 quarters in 2021 is higher than 3 quarters of the previous year by almost 4 trillion US dollars.(WTO,2020)

Figure 1: Trade of Goods and Services



Source: Created by author based on World Trade Organization data.

4.2 World uranium market

One of the really important forms of strategic raw resources is uranium. This is a raw material used in the nuclear industry to make nuclear power plant fuel. Nuclear power generation has the following advantages: zero carbon footprint, high concentration of power, independence from weather conditions, unlike other green energy sources. The innovation and digitization have made it feasible to minimize the danger of nuclear power plant accidents to a minimal level. (MNIAP, 2021)

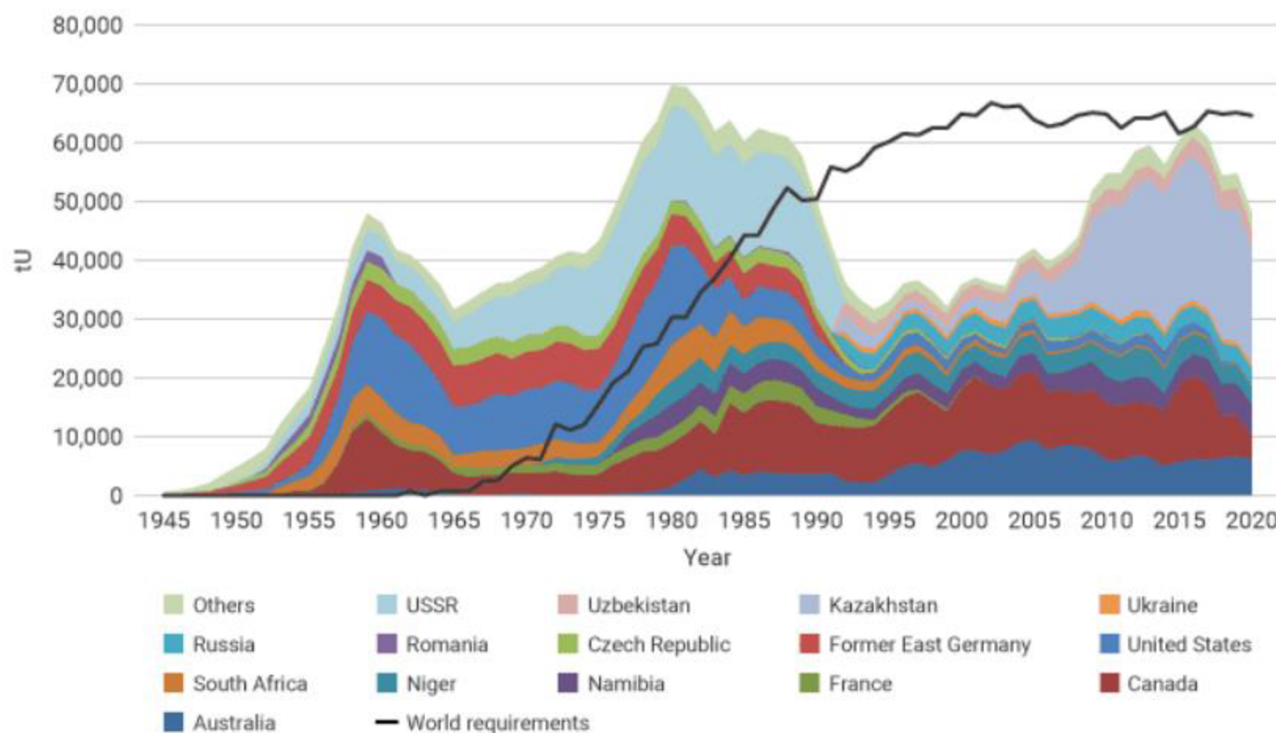
Uranium has been used in various areas of human life, and some areas find its use today. Glass containing uranium was produced until the mid-twentieth century and was known by various names depending on its color (NUREG, W. 1999). Also, depleted uranium can be used in the defense industry. The high density of uranium finds use as an inexpensive replacement for tungsten. For a variety of reasons, the US and UK military use depleted uranium in ammunition and projectiles, as well as in vehicle armor. (FAIRLIE, I., 2009) Depleted uranium is used for medical purposes in radiology and x-ray rooms. Uranium was also used in the manufacture of dental porcelain until the early 1980s to achieve natural color and fluorescence (SAIRENJI, 1982)

The whole complex of factors in the use of uranium creates, in the future, significant prerequisites for the growth of the world uranium market. Currently, the volume of world trade in uranium is more than \$3 billion, which is 7% - 10% more than in 2018-2019. It is also important that in the long term, the uranium market has shown significant volatility: the volume of foreign uranium trade has increased tenfold in the first decade of the twenty-first century, from 800 million US dollars in 2001 to \$7.6 billion in 2011. Further, the world trade in uranium gradually declined to a 2019 low. This was due, among many other things, to overly optimistic assessments of solar and wind energy production possibilities. 2020 has shown a resumption of growth. Many experts believe that the global commodity super cycle will restart, which will help the global uranium market grow. (MNIAP, 2021)

4.3 History of uranium production and trade

In Figure 2, we can see the historical development of world uranium production and trade, trends and reactions of the uranium market to events in the world from 1945 to 2020.

Figure 2: World uranium production and reactor requirements (tonnes U)



Sources: OECD-NEA/IAEA, World Nuclear Association.

All this can be conditionally divided into 4 separate stages:

- **From 1945 to the mid-1960s**, there was a military era. The nuclear arms race coincided with the generation of electricity from nuclear fuel. In the 1950s, production risen to fulfill the demands for highly enriched uranium and plutonium. Uranium demand fell sharply in the 1960s, and production was cut in half by the mid-1960s as a result.
- **From the mid-1960s to the mid-1980s**. Uranium production is up as reactor orders increased during a period of rapidly expanding civil nuclear power. Many new mines were opened, with long-term contracts to electricity utilities in North America, Japan, and Western Europe often supporting them. Western production peaked in 1980 and continued to exceed annual reactor needs until 1985.
- **From the mid-1980s to around 2002**. The nuclear construction program had been severely slashed by 1985. Many utilities had signed uranium contracts in preparation for the construction of new plants. Keeping these in mind resulted in a significant overhang. Many mines cut production or shut down as they became depleted. Utilities reached demand by depleting significant

inventories rather than resorting to new production. Due to the arrival of uranium from the former Soviet Union on the Western market in 1993, the supply overhang was extended.

- **From the beginning of 2000s to the present day.** The expectation that new primary production might be required to support a resurgence in nuclear growth sparked a strong market reaction. This occurred in the context of a uranium mining industry that had been suffering from unfavorable economic conditions for several years and needed to compensate for diminishing and finite secondary supplies. This reaction began in 2003 with a strong upward movement in world uranium prices that continued into 2007 (the spot market price increased by a factor of 13 between early 2003 and mid-2007), but then began to decline, exacerbated by the Fukushima disaster in 2011. Uranium prices have dropped to one of the lowest inflation-adjusted levels ever recorded since the accident.

(WORLD NUCLEAR ASSOCIATION, 2021)

However, at the present time, considering the policy of reducing carbon emissions into the atmosphere and the imperfection of systems for obtaining renewable energy (water, wind, sun), interest in uranium energy has again increased as a possible solution to problems with electricity and the environment.

4.4 Uranium Suppliers

Uranium is found in a variety of minerals on the surface of the earth. Tens of thousands of people work in the uranium industry. However, because its ore deposits are frequently found in remote locations, the deposits where its mining would be highly profitable are few and far between. The following countries have the largest natural deposits: Australia (29%), Kazakhstan (15%), Canada (9%), Russia (8%), Namibia (7%), South Africa (5%) and others as shown in Figure 3.

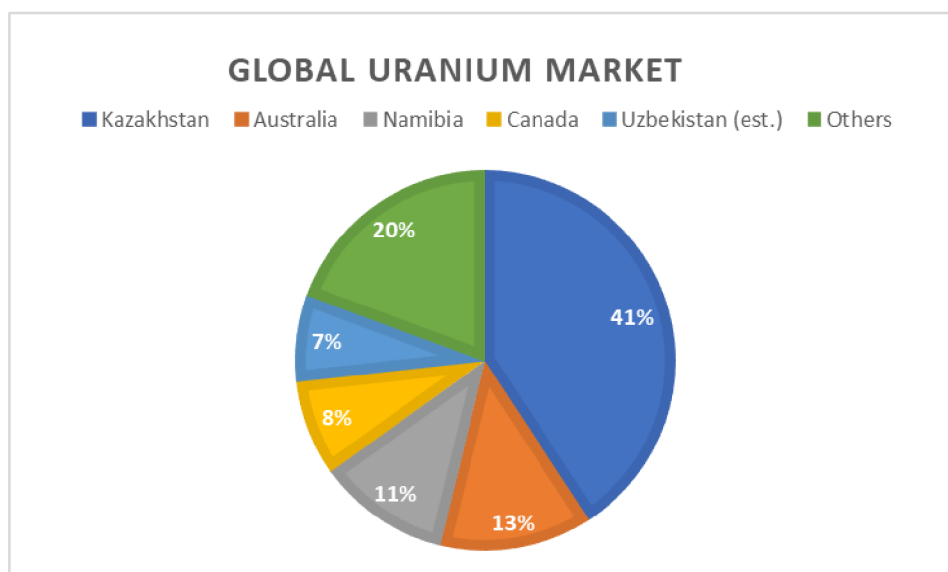
Figure 3: Uranium resources by country in 2019

	tonnes U	percentage of world
Australia	1,692,700	28%
Kazakhstan	906,800	15%
Canada	564,900	9%
Russia	486,000	8%
Namibia	448,300	7%
South Africa	320,900	5%
Brazil	276,800	5%
Niger	276,400	4%
China	248,900	4%
Mongolia	143,500	2%
Uzbekistan	132,300	2%
Ukraine	108,700	2%
Botswana	87,200	1%
Tanzania	58,200	1%
Jordan	52,500	1%
USA	47,900	1%
Other	295,800	5%
World total	6,147,800	

Sources: OECD-NEA/IAEA, Uranium 2020: Resources, Production and Demand ('Red Book').

According to the World Nuclear Association, Kazakhstan, Australia, Namibia, Canada and Uzbekistan produce 80 percent of the world's uranium production. Figure 4 shows the world ratio of mined uranium in percent.

Figure 4: Global uranium market 2020 in %



Source: Created by author based on World Nuclear Association data

Since 1954, three uranium mines (Olympic Dam, Ranger, Four Mile) have been operating in Australia. There will be more to come. Australia has the world's largest known uranium reserves, accounting for nearly a third of total global reserves. Australia produced 7798 tons of U₃O₈(6612 tU) in 2019. After Kazakhstan and Canada, it is the world's third-largest producer. The entire output is exported. Uranium accounts for roughly a quarter of all energy exports. Australia is a preferred uranium supplier to global markets, particularly in East Asia, where demand is increasing rapidly. Despite the fact that Australia is one of the world's largest uranium suppliers, the country generates most of its energy from coal instead of nuclear power. However, with the promotion of a global policy to cut carbon emissions, everything could change dramatically. (WORLD NUCLEAR ASSOCIATION, 2021)

Canada is the world's second-largest uranium producer, accounting for 13% of global output in 2018. The McArthur River and Cigar Lake mines in northern Saskatchewan province, which are the world's largest and highest-grade mines, provide the majority of production. Canada has a significant role to play in achieving future world demand, with known uranium resources of 606,600 tons of U₃O₈ (514,400 tU) and ongoing exploration. (WORLD NUCLEAR ASSOCIATION, 2021)

Canada exports mined uranium mainly to the US, Europe and Asia. Exports represent nearly 85% of Canada's uranium production. The remaining uranium is used to power CANDU's internal reactors, which generate about 15% of the country's electricity. 18 of Canada's 19 operational CANDU reactors are in Ontario, with one in New Brunswick. Canada is well positioned to maintain its uranium production leadership in the future, given its resource base and current output. (Natural Resources Canada website, 2020)

Nowadays, uranium mining methods have changed, while in 1990 underground and open-pit mines accounted for about 55% of all uranium production in the world. However, today more than half of the world's uranium production is carried out using leaching (Figure 5).

Figure 5: Modern mining methods in %

Method	tonnes U	%
In situ leach (ISL)	26,402	55%
Underground & open pit (except Olympic Dam)	18,017	38%
By-product	3312	7%

Source: World Nuclear Association, World Uranium Mining Production.

This is influenced by the fact that in 2020 Kazakhstan has become the world leader in uranium mining, where most of the mining is done by this method. Based on the data in Figure 6, Kazakhstan, Australia and Canada have been the world leaders in uranium mining over the past 10 years. In 2020, Kazakhstan accounts for 41% of world uranium production, Australia for 13% and Canada for 8%. (WORLD NUCLEAR ASSOCIATION, 2021)

Figure 6: Production from mines (tons U)

Country	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Kazakhstan	19,451	21,317	22,451	23,127	23,607	24,689	23,321	21,705	22,808	19,477
Australia	5983	6991	6350	5001	5654	6315	5882	6517	6613	6203
Namibia	3258	4495	4323	3255	2993	3654	4224	5525	5476	5413
Canada	9145	8999	9331	9134	13,325	14,039	13,116	7001	6938	3885
Uzbekistan (est.)	2500	2400	2400	2400	2385	3325	3400	3450	3500	3500
Niger	4351	4667	4518	4057	4116	3479	3449	2911	2983	2991
Russia	2993	2872	3135	2990	3055	3004	2917	2904	2911	2846
China (est.)	885	1500	1500	1500	1616	1616	1692	1885	1885	1885
Ukraine	890	960	922	926	1200	808	707	790	800	744
India (est.)	400	385	385	385	385	385	421	423	308	400
South Africa (est.)	582	465	531	573	393	490	308	346	346	250
Iran (est.)	0	0	0	0	38	0	40	71	71	71
Pakistan (est.)	45	45	45	45	45	45	45	45	45	45
Brazil	265	326	192	55	40	44	0	0	0	15
USA	1537	1596	1792	1919	1256	1125	940	582	58	6
Czech Republic	229	228	215	193	155	138	0	0	0	0
Romania	77	90	77	77	77	50	0	0	0	0
France	6	3	5	3	2	0	0	0	0	0
Germany	51	50	27	33	0	0	0	0	0	0
Malawi	846	1101	1132	369	0	0	0	0	0	0
Total world	53,493	58,493	59,331	56,041	60,304	63,207	60,514	54,154	54,742	47,731
tonnes U ₃ O ₈	63,082	68,974	69,966	66,087	71,113	74,357	71,361	63,861	64,554	56,287
% of world demand	87%	94%	91%	85%	98%	96%	93%	80%	81%	74%

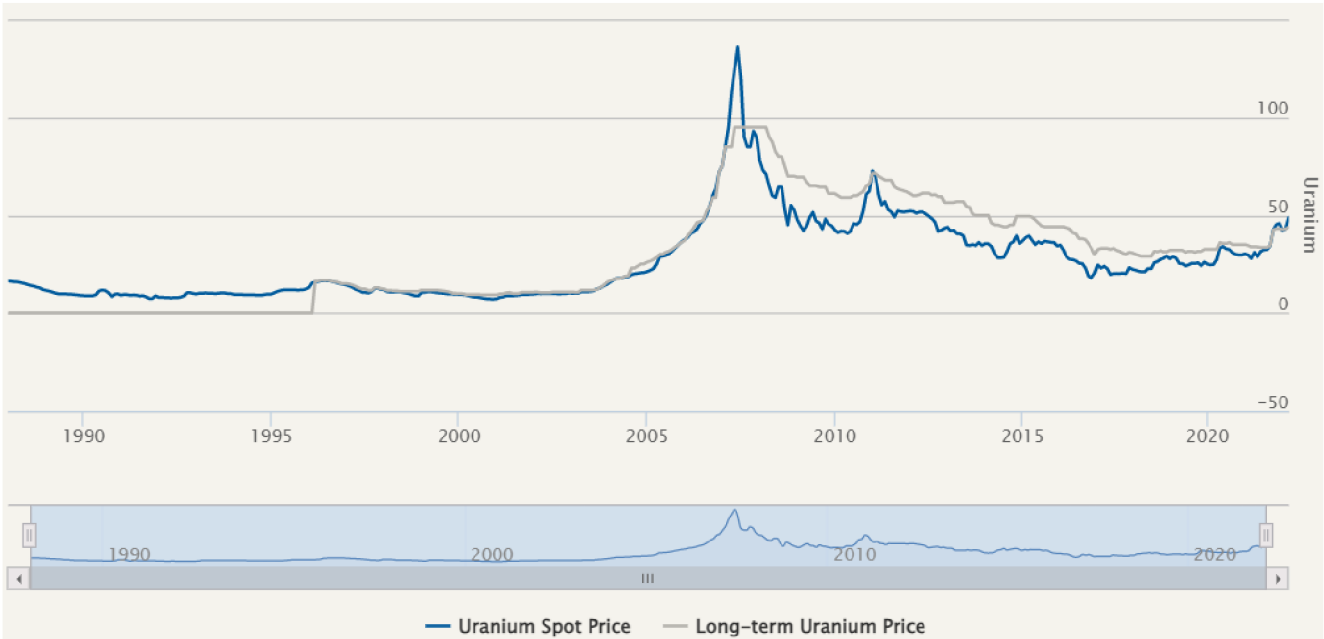
Source: World Nuclear Association, World Uranium Mining Production.

4.5 International uranium market prices

The majority of mineral markets are cyclical, which means that prices fluctuate significantly over time. These spikes are usually accompanied by a long-term decline in real prices. Because the cost of ore mining in mines is decreasing as a result of technological advancement. (WORLD NUCLEAR ASSOCIATION, 2021)

Uranium does not trade like other commodities on an open market. Contracts are negotiated in private between buyers and sellers. Independent market consultants UxC, LLC (UxC) and TradeTech publish prices. (CAMECO,2022)

Figure 7: Spot and long-term uranium prices (1990-2021)



Source: Cameco, UxC, TradeTech.

In the uranium market high prices in the late 1970s gave way to depressed price levels throughout the 1980s and 1990s, with spot prices for all but the lowest-cost mines falling below the cost of production. From 2003 to 2009, spot prices rose, but after words gone down. (WORLD NUCLEAR ASSOCIATION, 2021)

In 2007, the historically highest price on the market was recorded (Spot price for uranium: 136 US\$/lb., long-term price was: 95 US\$/lb.). (CAMECO, 2022).

Until around 2007, quoted spot prices were only used for day-to-day marginal trading and represented a small portion of supply; however, since 2008, the proportion has nearly doubled, to about one-quarter of total supply in the last decade. The majority of trade is conducted through 3- to 15-year contracts, with producers selling directly to utilities at a higher price than the spot market, indicating supply security. The contract price is frequently linked to the spot price at the time of delivery. Primary market participants, such as utility companies and manufacturers, accounted for 95% of the spot market in 2000. By 2005, it had dropped to two-thirds, then one-third by 2011, and it has remained between 30 and 40 % since then. The remainder comes from the financial community, specifically traders and financiers who have entered the market to increase liquidity and efficiency. Mineral prices fluctuate due to supply and demand, as well as perceptions of scarcity. The price will not be able to stay below the cost of production indefinitely, nor will it be able to stay at extremely high levels for much longer than it takes for new producers to enter the

market and supply concerns to dissipate. (WORLD NUCLEAR ASSOCIATION, 2021)

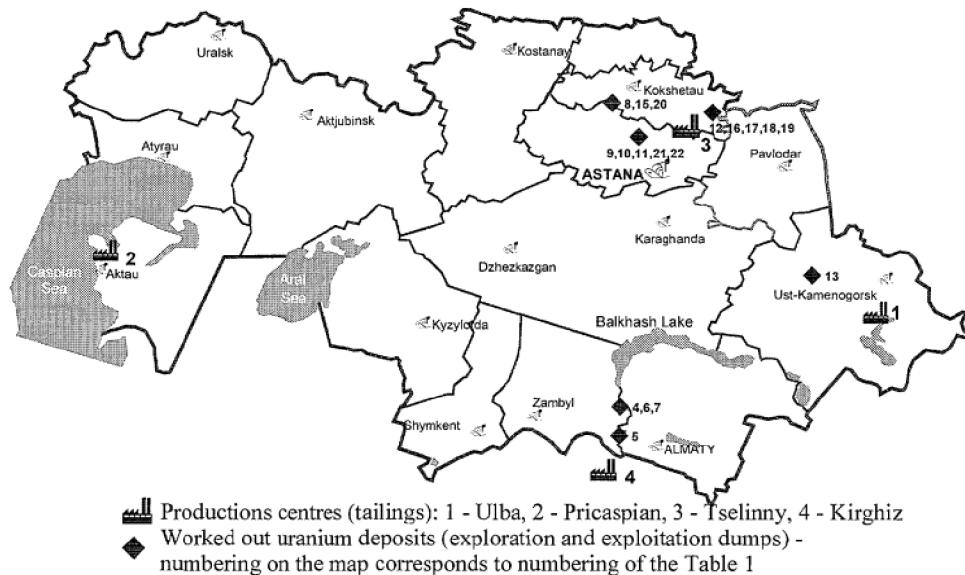
Today's uranium spot price is 48.75 US\$/lb., while the long-term price is 43.88 US\$/lb. (CAMECO,2022) There is an increase in the prices of the uranium industry associated with the interest of market participants.

4.6 Kazakhstan

4.6.1 History of Kazakh uranium

As uranium deposits were discovered in Kazakhstan in the 1950s, mining complexes and uranium ore processing centers were built. In 1956, the Kirghiz Production Centre was built to process the first uranium ore discovered in Kazakhstan, at the Kurday deposit, in 1954. (Figure 8). (G.V. FYODOROV)

Figure 8: Distribution of Radwaste storages in Kazakhstan



Source: G.V. Fyodorov, Uranium production and the environment in Kazakhstan, IAEA-SM-362/20

The Tselinny Production Centre in Stepnogorsk began operations in 1957, backed by the resources of Kazakhstan's huge Kokshetau ore region in the north. The Pricaspian Production Centre, which began operations in 1959 in Kazakhstan's west, processed the unique ores of the Pricaspian region. Ulba Production Centre, located in Kazakhstan's east, was built. Fuel pellets are currently manufactured at this facility. As a result, the Kazakhstan power industry was created for the extraction and processing of uranium ores, as well as the fabrication of uranium products, for a short time. There were four large Production Centres in this industry. These centers produced more than 70 000 t U from nine deposits using underground mines and open pits before the USSR collapsed in 1991. The uranium

Production Centres' activities had a positive impact on the economies of the regions where they were located. Near the mines, new settlements were built. New town construction accompanied the production centers. Other industries, such as the petroleum in Aktau and biological and other industries in Stepnogorsk, were established in the new cities with uranium production. New roads and power lines were constructed. This industrial activity brought new regions of Kazakhstan into the picture. After the collapse of the Soviet Union, uranium production from underground and open-pit mining in Kazakhstan began to decline. The low uranium content of Kazakhstan ores, falling prices in the global uranium market, and the ability to extract uranium using the more profitable ISL method were all factors in the decline. (G.V. FYODOROV)

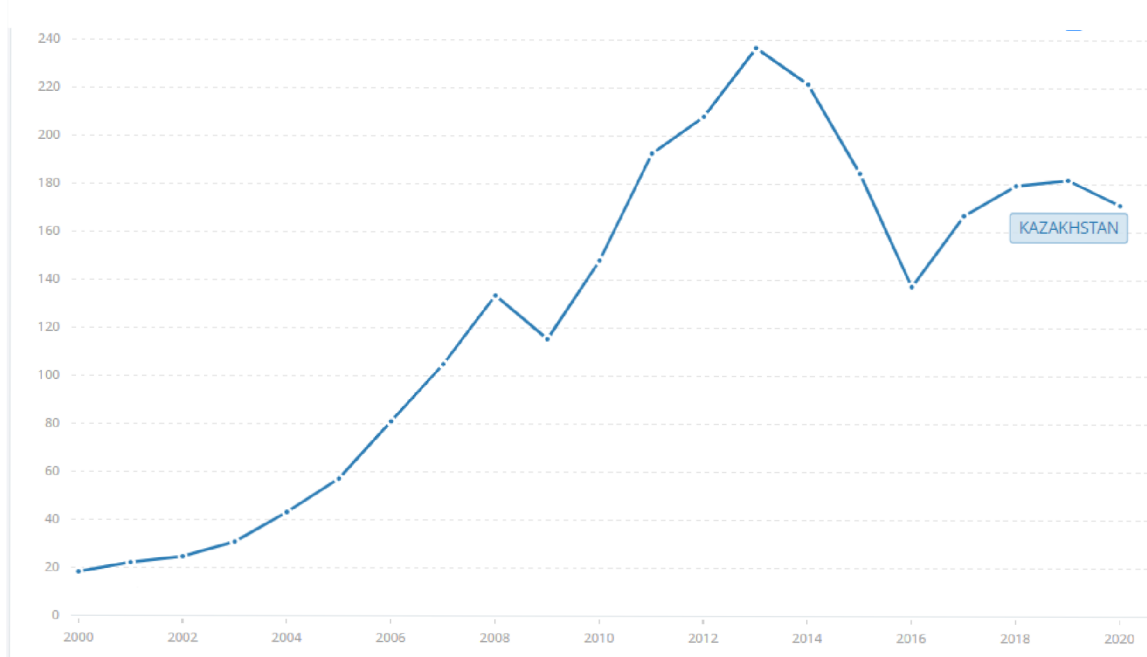
Only the In-Situ Leaching (ISL) method is currently used in Kazakhstan to extract uranium. This method offers a variety of financial and environmental benefits. Kazakhstan has been a significant uranium supplier for more than 50 years, and in 2009 it became the world's largest uranium producer. Annual production increased from 2114 tU in 2001 to 24,689 tU in 2016, before slightly decreasing due to low uranium prices. Production was 22,808 tU in 2019, up 5% from the previous year, but dropped to 19,477 tU in 2020 due to the coronavirus pandemic. Kazatomprom Joint Stock Company (Kazatomprom) stated that production in 2021 will be between 22,500 and 22,800 tU. Three of Kazatomprom's 13 mine projects are wholly owned by the company, while the other ten are joint ventures with foreign investors. (WORLD NUCLEAR ASSOCIATION, 2021)

4.6.2 Economy of Kazakhstan

In 2015, Kazakhstan became the 162nd member of the World Trade Organization (WTO, 2015). Kazakhstan is a country of upper-middle income, with a population of 18.8 million people and a GDP of US\$171.082 billion, according to the World Bank (Figure 9). Kazakhstan has made significant political progress and has responsibly absorbed huge resource revenues by implementing a rules-based fiscal system over the last decade. Diversification is still a challenge for the country with the world's ninth largest crude oil reserves, as petroleum production accounted for 21% of GDP and 70% of exports in 2020. Kazakhstan had a 4.9 percent unemployment rate in 2020. (The World Bank, 2021)

The share of Kazakhstan in world exports was 0.26 in 2020, which is 46.44 billion US dollars. (WTO, 2020)

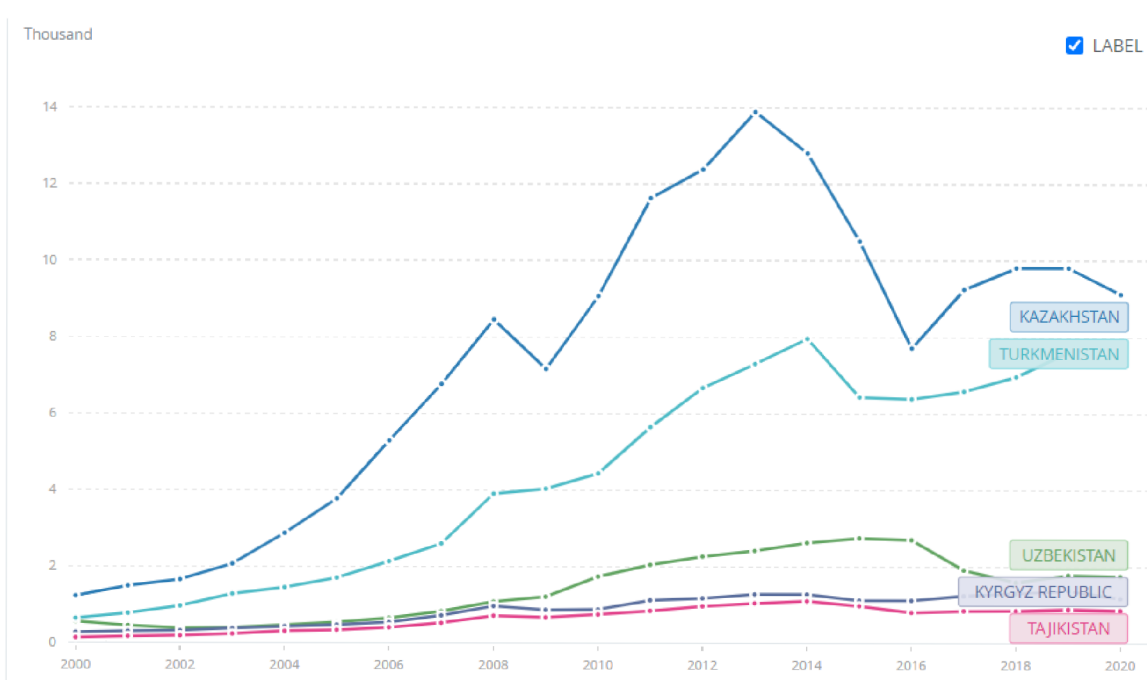
Figure 9: GDP (US\$) - Kazakhstan



Source: The World Bank, World Data Bank.

Household consumption, an easing of COVID-19 restrictions, and fiscal support measures all helped to boost GDP by 2.3 percent in the first half of 2021. In addition, when compared to its Central Asian neighbors, Kazakhstan is the toughest country with the highest GDP per capita, which is 9122 US dollars. (Figure 10) (The World Bank, 2021)

Figure 10: GDP per capita (US \$)



Source: The World Bank, World Data Bank

Trade partners of Kazakhstan are: Russia, USA, Switzerland, Spain, Uzbekistan, Turkey, the Netherlands, France, China, South Korea and others. Countries import from Kazakhstan oil, gas, lead, semi-finished products from iron and steel, aluminum, uranium and other goods. In the agricultural and livestock sector, Kazakhstan exports: wheat, cattle, flour, sunflower seeds, etc. (Inbusiness,2019) (inbusiness.kz/ru/news/glavnye-torgovye-partnery-kazahstana-10-stran-s-naibolshim-tovarooborotom)

4.6.3 Comparative advantage

Favorable environment for the uranium industry

As mentioned above, Kazakhstan has extensive uranium deposits, 15% of all the world's proven uranium reserves (906,800 tons of uranium). This advantage becomes even more significant given Kazakhstan's geographic proximity to new nuclear energy development centers, because other countries are interested in the development of uranium mining and industry, as it is a strategic raw material with limited reserves. This allows Kazakhstan to establish long-term contracts with other countries. To develop such an expensive uranium industry, Kazakhstan uses not only national financial resources, but also attracts foreign partners' funds. Kazakhstan's uranium mining is done by Kazatomprom's subsidiaries and joint ventures. In Kazakhstan, 12 companies are producing uranium, with 11 joint ventures with Russia, China, France, Canada, Japan, and Kyrgyzstan. Also, Kazakhstan supplies all uranium for export, so there is no use of uranium products in the domestic market. Which means that the country can sell more uranium reserves and make more profit. (ZAKON).

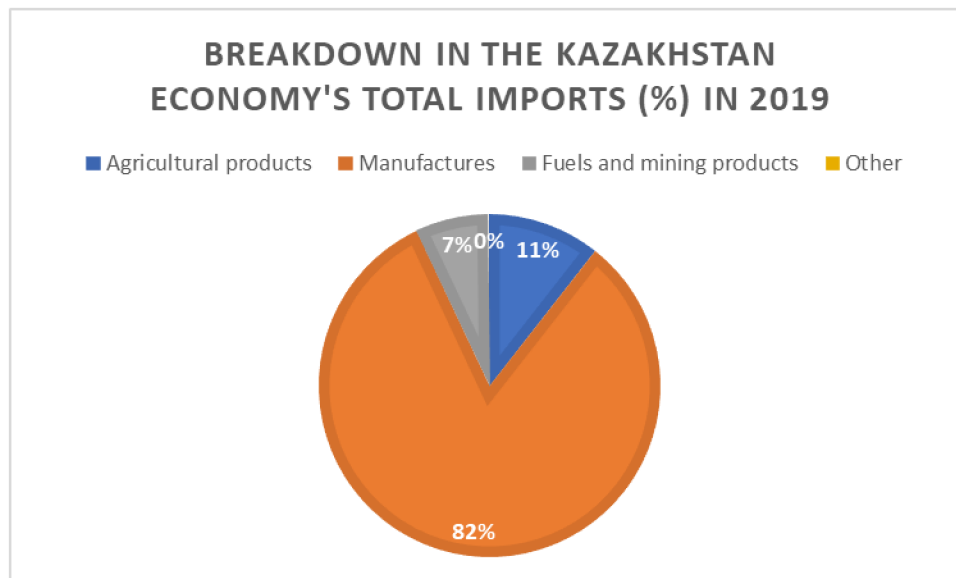
Human Resources

Kazakhstan is a developing country with widely available human resources. Because salaries in developing countries are typically lower than in developed countries, people in these countries rarely have the opportunity to earn more money for their efforts. Kazakhstan's minimum wage increased from 42.5 thousand tenge (\$81.58) to 60 thousand tenge (\$115.18) in January 2022. However, it is still less than wages in Canada (\$4,847) and Australia (\$4,789). As a result, hiring people in Kazakhstan is less expensive than in developed countries. (CAPITAL, 2022) (<https://kapital.kz/finance/101627/minimal-naya-zarplata-v-kazahstane-uvelichilas-na-41.html>)

4.6.4 Import in Kazakhstan

Imports are important for Kazakhstan and the rest of the world. Trade provides countries with a great opportunity to sell goods that are abundant on the market and to buy goods that are in short supply or unavailable on the domestic market. Furthermore, Kazakhstan is depending on goods imported from other countries, just as other countries are depending on Kazakh uranium.

Figure 11: Breakdown in the Kazakhstan economy's total imports (%) in 2019



Source: Created by author based on World Trade Organization data.

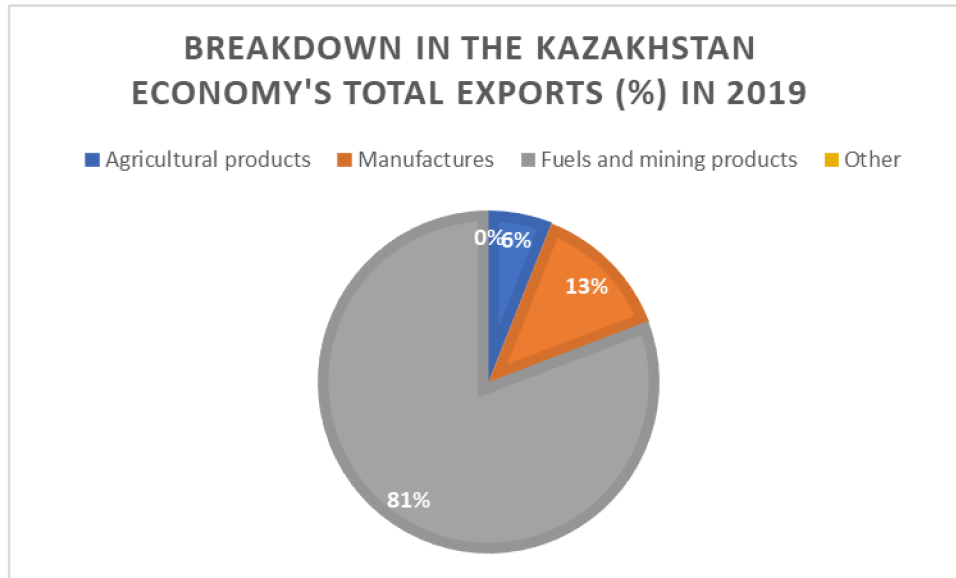
The total value of goods imported into Kazakhstan in 2020 was 37.22 billion US dollars. Figure 11 depicts the total value of all imported goods by sector. The Manufacturing sector accounts for 82% of Kazakhstan's exports, followed by the Agricultural Products sector (11%), the Fuels and Mining Products sector (nearly 7%), and the Other sector (less than 1%). This means Kazakhstan will require more industrial goods (radio-telephony transmission tools, measured-dose medicines, machinery, and plant equipment, among other things). Imports from Russia accounted for 36.7 % of total imports, followed by China (17.1%), the European Union (16%), South Korea (8.9%), America (3.5%), and others (17.7%). (WTO, 2020)

4.6.5 Export of Kazakhstan

The fuel and extractive industries are very important in Kazakhstan, and they are also Kazakhstan's main exports (81%). The manufacturing industry (a little more than 13%) is next, followed by the agricultural industry (6%). Kazakhstan's exports to the European

Union account for 42% of total exports, followed by China, Russia, and other countries. Figure 12 depicts the percentage performance of export sectors. (WTO, 2020)

Figure 12: Breakdown in the Kazakhstan economy's total Exports (%) in 2019



Source: Created by author based on World Trade Organization data.

Petroleum oils, crude, petroleum gases, radioactive chemical elements, and others are the most popular export commodities. Wheat and meslin, Barley, Wheat or meslin flour, Linseed, whether broken or not, and Sunflower seeds are all examples of agricultural products. For the year 2020, total exports totaled 37.22 billion dollars. (WTO, 2020)

4.7 The uranium industry's impact on Kazakhstan's well-being and the opportunity cost

The impact of the uranium industry on Kazakhstan's economic well-being can be calculated using GDP and export indicators. Kazakhstan's GDP for 2019 was 181.6 billion US dollars, according to the World Bank. (The World Bank, 2021) The proceeds from the sale of uranium products totaled 502.3 billion tenge, or 1.34 billion dollars, according to NAK KAZATOMPROM (National operator of the Republic of Kazakhstan for the export and import of uranium). (KAZATOMPROM, 2019) The uranium industry contributes 0.74 percent of Kazakhstan's GDP, which is not a large percentage and has little impact.

An Opportunity Cost option could also be considered if the uranium industry disappears due to the depletion of all uranium reserves in Kazakhstan. Kazakhstan's economy and exports are heavily dependent on mining. However, the uranium industry in the country is not as large as the oil industry, which accounted for 21% of GDP and 70% of

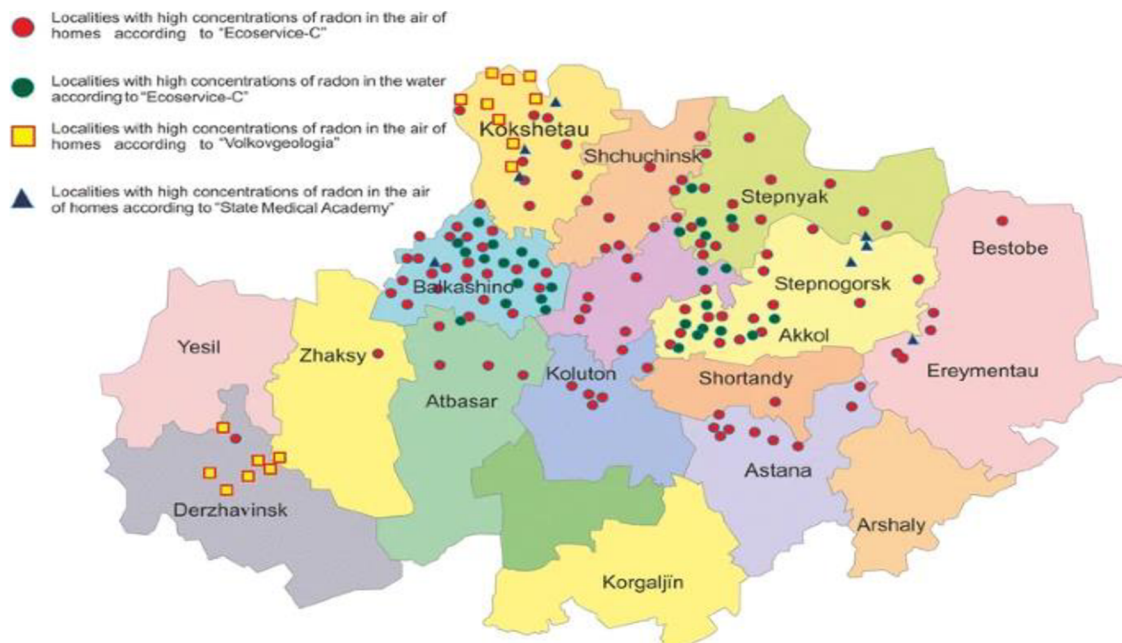
exports in 2020. (The World Bank, 2021) The uranium industry employs 20,592 people, and their job cuts will cost the state \$19.7 million, or 10.3 billion tenge. (KAZATOMPROM, 2019) This sum is definitely unpleasant, but it is not critical for Kazakhstan's economy. And, because the uranium industry primarily employs qualified specialists, after retraining, they may be able to find work in other industries, including mining.

4.8 Risks of the uranium industry

Uranium pollution and health effects

The environment and human health are both affected by radioactive contamination. Human exposure to natural sources of radiation is primarily caused by radon and its decay products. Chronic residential exposure to radon and its decay products, according to the World Health Organization, is the second leading cause of lung cancer after tobacco use, and a bigger risk for never smokers. Large - scale analysis of abnormally increased natural radioactivity, uranium deposits, and long-term activities of uranium mines and enterprises for the extraction of other minerals associated with uranium mineralization are all examples of areas in Kazakhstan with a number of factors leading to natural and man-made increased radioactivity. (Figure 13) (Bersimbaev, R.I., Bulgakova, O., 2015)

Figure 13: The level of radon in North Kazakhstan



Source: From Ministry of Environmental Protection of the Republic of Kazakhstan data.

External factors

There are also always factors of external interference, natural disasters and the human factor. History knows enough examples of uranium catastrophes: on November 29,

1955 (“the human factor” led to the accident of the American experimental reactor EBR-1 (Idaho, USA)), on September 29, 1957 (there was an accident called “Kyshtymskaya”), on the night from April 25 to April 26, 1986 (the largest nuclear accident in the world occurred at the fourth unit of the Chernobyl nuclear power plant (Ukraine), with partial destruction of the reactor core and the release of fission fragments outside the zone), March 11, 2011 (in Japan, the most powerful nuclear accident occurred in the entire history of the country earthquake. Turbine was destroyed at the Onagawa nuclear power plant. (RIA News,2011)

Although uranium energy is considered fairly clean and safe, however, as history shows, it needs tight control, and sometimes this is not enough. Therefore, the above reasons can make people think about the need for the uranium industry and energy.

5 Results and Discussion

Kazakhstan is a resource-rich country that belongs to the developing world. Many advances have already been accomplished in economic and legal aspects, but there is still much more to be done and improved in order to earn the designation of developed country. Where a country's exports and economy are dependent not only on resource extraction and export, but also on the development of innovative technologies and the manufacturing of competitive industrial products.

In terms of uranium, we can confidently state that Kazakhstan is first in the extraction of this ore and second in terms of uranium deposit reserves. The sale of this raw material, which is practically not used in the domestic market and all uranium products are exported, brings the government a substantial income. Kazakhstan does not have nuclear power facilities, despite the fact that questions concerning their construction are increasingly being raised in the country's modern society. Of course, the uranium industry cannot be called as fundamental and weighty as the oil industry. However, the limited nature of such important strategic resources in the world and the imperfection of renewable energy sources encourage countries to purchase uranium ore and products, as well as enter into long-term mutually beneficial contracts with Kazakhstan for the mining and development of the uranium industry as a whole.

However, not everything looks to be as smooth as it appears at first glance. There are a number of issues that could stymie the industry's growth and lead to the abandonment of uranium extraction and use as a source of energy.

One such problem is pollution by uranium compounds and by-products of the environment and the harm they cause to the human body. To solve these problems, the state should be concerned and find more reliable methods for disposing of uranium waste, as well as moving storage sites for depleted uranium and radioactive waste away from cities and towns, for example, to former nuclear test sites.

The next factor affecting the industry is the possibility of a man-made and nuclear disaster, which is enough in history. This can happen for various reasons, military operations, natural disasters or the human factor. To do this, it is necessary to create more stringent requirements and conditions for observing safety at the objects of production, storage and disposal of uranium products. Conduct regular inspections of equipment and convey to personnel the importance of the necessary rules for working with uranium. And also provide staff with high-quality personal protective equipment.

6. Conclusion

In conclusion, we can say that the accession of Kazakhstan to the WTO in 2015 benefited the state. Any country that wants to follow the path of progress and increase wealth must open its economy to international transactions. This will allow state not only to sell goods and services, but also to import the goods it needs from other countries into the domestic market.

Thus, Kazakhstan exports oil, gas, uranium and other goods, and imports equipment, vehicles, spare parts and other necessary things into the country, thereby creating diversity in the market and increasing the level of satisfaction of citizens. And international agreements and contracts attract foreign investors and help develop science, infrastructure, construction and other important areas.

With the help of an extensive trading network, Kazakhstan has achieved success and become the most stable country, and also has a high GDP and GDP per capita in all of Central Asia and ranks 1st in the world in the export of uranium products.

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