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ENHANCING THE GREEN ENERGY REVOLUTION: ANALYZING THE IMPACT OF FINANCIAL AND INVESTMENT PROCESSES ON RENEWABLE ENERGY PROJECTS IN KAZAKHSTAN

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Original article

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ABSTRACT

As a fossil fuel-dependent nation, Kazakhstan is caught between issues and possibilities in its search for a sustainable energy transition. Despite its tremendous resources, Kazakhstan's renewable energy capacity is 1%, much behind its non-renewable peers. According to this research, green fiscal policies in renewable energy firms are needed to reduce the country's political and economic dependence on the global oil sector. This report emphasizes regional collaboration and Kazakhstan's potential leadership in Central Asian Green Economy projects. Kazakhstan can promote renewable energy adoption and economic sustainability by forming regional alliances.

Challenges lie ahead on the green future path, so this paper addresses legislative, infrastructure, financial, and data barriers to green fiscal initiatives in Kazakhstan. It stresses the significance of holistically tackling these concerns, including banking and stock market reforms and sustainable planning. Policymakers and stakeholders in Kazakhstan can use the research findings to boost the economy, fight corruption, and increase political engagement. Upskilling the workforce to support green technology and local renewable energy production is recommended. The report recommends proactive global crisis prediction and management to help Kazakhstan handle economic and environmental challenges. Hence, the above actions are crucial to Kazakhstan's goal of industrialization by 2050. Kazakhstan can lead a world rapidly moving to green energy by committing to green fiscal methods, regional collaboration, and addressing the many obstacles to development. By doing so, it can safeguard its future and advance the global green energy revolution.

Keywords: *Kazakhstan, Green Economy, Renewable Energy, Investment, Economy Growth*

1. INTRODUCTION

Kazakhstan is the ninth-largest country in the world, with 19 million people and 2,717,300 square kilometers. It borders Russia, China, Uzbekistan, Kyrgyzstan, and Turkmenistan in Central Asia: north, east, and south. Kazakhstan's climate reflects its geographical diversity, with winter lows of -20°C and summer highs of 29°C (Kazakhstan, 1992). Southern Kazakhstan is rich in irrigated cotton, whereas the north grows wheat and millet. The large, arid central plateau is ideal for sheep and cow pasture (Kazakhstan, 1992). Kazakh reserves include lead,

nickel, petroleum, zinc, copper, iron ore, and chromium, ranking second globally in chromite, lead, silver, and uranium among the top nations for zinc, tungsten, and barite (PAGE, 2020).

Kazakhstan has had difficult economic adjustments since the 1991 Soviet Union collapse. Oil exports drove the country's 7% GDP growth in the early 2000s. GDP growth continued at 4.1% in 2018 (PAGE, 2020). After a 2.5% recession in 2020 due to the COVID-19 pandemic, the economy grew 4% in 2021 under relaxed restrictions and strong vaccination efforts (ARIC, 2022). The tourism business was devastated by the COVID-19 pandemic (Rozalia Gabor et al., 2023). External shocks, such as economic crises or pandemics, loom over sustainability and financial planning. The pandemic-induced drop in overseas visitors hurt industrial revenues and resonated across Asia, casting a shadow over Kazakhstan's economic resiliency (ARIC, 2022).

The Ukraine-Russia crisis and economic sanctions against Russia (Stepanenko et al., 2023) make Kazakhstan more vulnerable due to its large imports from its northern neighbor. Such complex relationships between businesses and the environment highlight the tight balance between sustainability and profitability. In Kazakhstan and nearby countries, the COVID-19 pandemic has shown the tourism industry's vulnerability and severe social, financial, and environmental impacts (Zhang Song et al., 2021).

Demand forecasts have altered Kazakhstan's economic sector as companies adapt their strategy. Government actions and corporate policies have helped Kazakhstan's environmental sustainability, although the tourism industry is the most vulnerable. The global pandemic showed how external variables might affect this industry, causing job losses and a drop in international visitors (Zhang, Song, et al., 2021).

Geopolitical tensions and global crises interrupt Kazakhstan's supply chain, requiring tourist firms to maximize resource use and sustainability. Kazakhstan must integrate sustainability into its enterprises to mitigate external influences and optimize commercial outcomes. The World Bank predicted 1.5%–2.0% GDP growth in 2022, but it reached 3.2%, demonstrating the nation's economic resiliency (The World Bank, 2023). Kazakhstan's energy reserves underpin its economy. Despite state, tariff, and public pricing differences, energy-intensive businesses have a technology gap. Kazakhstan requires twice as much energy as the world average to produce the same GDP (Dulambayeva et al., 2013).

The government has focused on value chains emphasizing raw material processing and R&D to boost the green economy and add value. These projects could create new opportunities while promoting sustainability (PAGE, 2020). Environmental activists and progressive governments are promoting carbon footprint reduction as worldwide awareness of carbon emissions grows. To boost renewable energy companies, international organizations are promoting energy-efficient markets, tax incentives, and green fiscal policies (Raihan & Tuspekova, 2022). However, each nation's political, economic, and social realities define its green energy goals (Selicati & Cardinale, 2023). Politically and economically, the oil industry's dominance as a non-renewable energy source is a major issue (Chien et al., 2022).

Kazakhstan and other countries with renewable energy goals must break free from the global oil industry to invest meaningfully. This requires reducing the oil industry's political and economic power to implement green fiscal measures (Saqlain, 2023). Kazakhstan pledged a "Green Economy" and renewable energy by signing the Paris Agreement in 2016 (Kalkabayeva et al., 2020). The nation established lofty goals to lower atmospheric sulfate and nitrogen oxide to European

levels by 2030. Kazakhstan plans to reduce its carbon footprint by 50% by 2050, which could improve GDP by 3% (Kalkabayeva et al., 2020).

However, implementing these groundbreaking efforts takes much work, especially financially. Kazakhstan's oil industry accounts for 50% of government revenues (Soltangazinov et al., 2020). Given its history with Russia during the 2012 energy crisis, the country's economy is unstable (Orazgaliyev, 2018). As Kazakhstan faced uncertainty, its renewable energy regulations changed significantly.

Kazakhstan, the eleventh-largest oil producer and 54th-largest landmass has the second-highest oil reserves in the world (Zhanseitov et al., 2020). The Kazakhstani economy relies on energy and mining, which account for 33% of GDP and 82% of exports (Zhanseitov et al., 2020). As governments have become more aware of renewable energy's economic potential, they have created rules to regulate energy companies in Kazakhstan (Orazgaliyev, 2018). In this study, Kazakhstan's complex attempts to boost renewable energy are examined alongside the issues facing the non-renewable energy industry, which underpins the economy. This shift requires addressing this sector's deep-rooted political and economic dependencies to move to a green energy economy.

2. LITERATURE REVIEW

This literature review explores the various dimensions of sustainable development difficulties in Kazakhstan, focusing on the renewable energy industry and alternative strategies for addressing these challenges. The literature review is structured into two distinct sections. The initial section offers valuable insights into the contextual background and associated issues. Subsequently, the second section delves into a comprehensive exploration of specific solutions addressing these challenges.

2. 1. SUSTAINABLE DEVELOPMENT CHALLENGES IN KAZAKHSTAN

Distinct ecological concerns support the goal of sustainable development in Kazakhstan. Kazakhstan is currently confronted with the enduring consequences of the Soviet era, characterized by a substantial burden of industrial waste amounting to over 23 billion tons. This includes a significant portion of nine billion tons attributed to mineral formations resulting from nuclear testing and other related activities. In addition, the country is confronted with complex water challenges, which are further intensified due to its dependence on water resources that cross national boundaries (Diyar et al., 2014).

The COVID-19 pandemic has resulted in environmental repercussions at both the global and local levels. According to Jones and Comfort (2020), there was a transient decline in environmental waste due to reduced industrial and transportation activity during the pandemic. Nevertheless, the potential long-term sustainability benefits still need to be investigated (Avunduk, 2023). The crisis has potentially undermined environmental legislation and regulations in multiple nations, which could affect endeavors towards sustainable development (Moraliyska, 2023). Sustainable development is crucial to renewing and improving the tourism sector's connections to natural and human resources (Kuzmak and Kuzmak, 2023). Government involvement is crucial in addressing travel companies' current issues. Sustainable procurement, per the United Nations' Sustainable Development Goals for 2030, enables both domestic and foreign companies to embrace sustainability activities and provide transparency on their environmental sustainability statistics (Romana, 2018). As a result, the provision of government assistance, along with the dissemination of information regarding sustainable practices, can contribute to

the harmonization of tourist firms with the nation's ecological and sustainable development objectives.

The importance of high-quality data in facilitating accurate short-term external challenge analysis and anticipation is underscored by the findings of Wang et al. (2021) in their study conducted in Kazakhstan. The significance of projecting visitor demand data becomes apparent in enabling educated decision-making within the tourism industry.

Gbededo and Liyanage (2020) propose using the Delphi simulation approach to enhance the accuracy of inadequate baseline forecasts during times of global catastrophes, such as the COVID-19 pandemic. Furthermore, the issue of addressing shared boundary water treaties with adjacent nations arises as a matter of utmost importance. The Amudarya and Syrdarya rivers, the main Aral Sea tributaries, are vital to Central Asia's water resources. The Tajikistan-born Amudarya is Central Asia's largest river, flowing 79.4 km3 annually. The river in question flows through five nations before its discharge into the Aral Sea in Kazakhstan, spanning a cumulative length of 3019 kilometers. The Syrdarya River, which has its source in Uzbekistan, traverses a comparable trajectory (Diyar et al., 2014).

In the past, particularly during the Soviet era, downstream nations such as Kazakhstan, Uzbekistan, and Turkmenistan depended on upstream nations like the Kyrgyz Republic and Tajikistan to store river water for irrigation purposes. In the context of upstream nations, hydroelectricity assumed a subordinate position, predominantly functioning as a supplementary energy resource. Nevertheless, the alteration in priority was brought about by the altering geopolitical dynamics and evolving economies that ensued after the fall of the Soviet Union. While downstream nations maintained their reliance on irrigation, upstream nations opted to convert their river water storage reservoirs into hydroelectric generating facilities. The changing geopolitical landscape of developing nations and their growing self-reliance resulted in modifications to river flow patterns and increased hydropower generation to fulfill domestic and global needs (Zinganshina, 2009).

2. 2. RENEWABLE ENERGY IN KAZAKHSTAN: CHALLENGES AND OPPORTUNITIES

The present research shifts its attention towards the renewable energy industry in Kazakhstan, with a primary emphasis on evaluating the suitability of the existing renewable energy framework and exploring viable alternative approaches. In 2009, Kazakhstan enacted legislation to encourage the utilization of renewable energy sources (Laldjebaev et al., 2021). Following this, the government introduced an extensive strategy in 2013 to shift from an economy reliant on fossil fuels to an environmentally sustainable economy by the year 2050. The interim objectives encompass increasing the green economy's proportion to 30% by 2030 and 50% by 2050. The major purpose of this framework was to construct hydroelectric facilities that are cost-effective, reliable, and ecologically friendly. According to Laldjebaev et al. (2021), a legislative reform implemented in 2017 established a set tariff structure for auction trading in renewable energy sources. This development garnered attention from prominent commercial banks and foreign investors, with participation observed from 145 entities representing 12 countries.

2. 3. CHALLENGES OF HYDROPOWER DEVELOPMENT

According to Zhakupova et al. (2021), hydropower plays a significant role in Kazakhstan's renewable energy portfolio, representing 14% of its energy sources. Nevertheless, the prolifer-

ation of hydropower encounters numerous obstacles that emphasize the necessity of assessing its appropriateness as a catalyst for the environmentally conscious revolution.

Water resource geopolitics in Central Asia are a major issue. Upstream nations like Tajikistan and Kyrgyzstan used hydropower as a supplementary energy source and supplied water to downstream nations like Kazakhstan, Uzbekistan, and Turkmenistan for irrigation. However, upstream nations' focus on hydroelectricity generation and self-sufficiency alters river flow patterns and raises concerns about downstream water supply (Zinganshina, 2009).

Climate change-induced water shortages, droughts, and desertification threaten Kazakhstan's water resources and agricultural sector (Diyar et al., 2014). The steady shrinkage of the Aral Sea, once one of the world's largest lakes, exacerbates the above difficulties. Thus, it is crucial to determine if hydropower dependence is sustainable (Diyar et al., 2014).

2. 4. EXPLORING ALTERNATIVE RENEWABLE ENERGY SOURCES

In light of the inherent challenges posed by hydropower, it is crucial to contemplate alternate forms of renewable energy that might serve as the fundamental basis for Kazakhstan's transition towards sustainability. In his work, Bozkus (2018) offers an alternative viewpoint about the renewable energy potential of Kazakhstan. The author emphasizes the significance of global energy prospects and the establishment of alliances with nations like Turkey. This collaboration aims to mitigate energy rivalry among many regional stakeholders, encompassing the European Union, several nations in Central Asia, and Russia. The study conducted by Vakhguelt (2017) examines the potential of renewable energy in Kazakhstan, providing insights into the government's initiatives to promote renewable energy projects and decrease the country's dependence on external energy sources (Bozkus, 2018).

2. 5. CONCLUSION OF THE LITERATURE REVIEW

Kazakhstan faces distinctive challenges in achieving sustainable development due to its historical Soviet past, intricate water concerns, and the worldwide ramifications of events such as the COVID-19 pandemic. Although hydropower is a substantial component of the country's renewable energy portfolio, it is important to critically assess its role in the country's green transformation due to the obstacles and geopolitical factors involved with its development. Investigating alternative renewable energy sources is seen as a vital measure in harmonizing Kazakhstan's sustainability objectives with its energy regulations. The next sections will examine Kazakhstan's precise measures and endeavors to tackle these difficulties and shift towards an environmentally sustainable economy.

3. RESEARCH METHOD

This study utilizes a rigorous research technique to thoroughly examine the intricacies of Kazakhstan's energy economy, specifically emphasizing its renewable energy sector. The research design in this study generally follows a descriptive research approach, essential for providing significant insights into the unique qualities of the many aspects examined in this study. It uses descriptive research to collect and analyze Kazakhstan's energy landscape data. Nuclear energy output, fossil fuel utilization, hydroelectric power generation, and renewable energy potential

are included. The dataset contains several Kazakhstani energy consumption, production, and per capita indicators and analyzes consumption patterns.

Exploratory data analysis (EDA) is used to study Kazakhstan's renewable energy sector's complexity and green fiscal compatibility. This involves examining secondary data sources to inform green energy and sustainable finance strategies. This study explores Kazakhstan's energy consumption and production history. Data analysis using Excel and other statistical methods was used to improve result's dependability.

3. 1. THE RATIONALE FOR SELECTING KAZAKHSTAN

The energy landscape of Kazakhstan supports its selection as the study's main emphasis. The country has abundant energy, economic potential, and geopolitical importance. Its substantial conventional and renewable energy resources offer an intriguing chance to explore a sustainable and ecologically friendly economy. Given its strategic location and complex relations with neighboring countries, specifically Russia, Kazakhstan's energy revolution is important to research. This research aims to offer significant insights with larger significance for global sustainable development by analyzing Kazakhstan's experiences and problems in implementing green fiscal policies and switching to renewable energy sources.

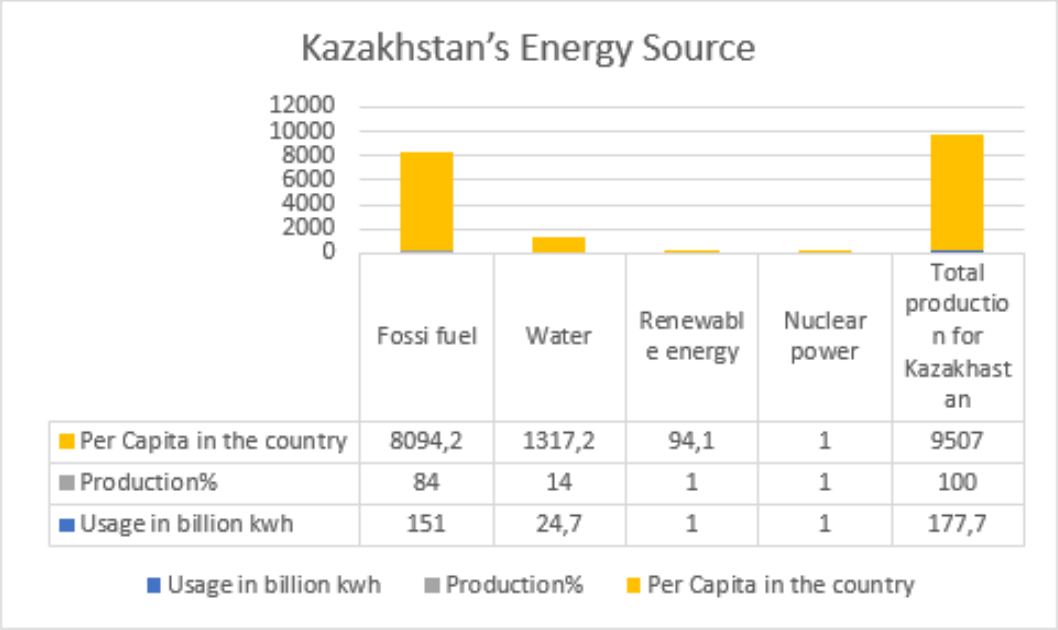
Therefore, the research methodology utilized in this work adopts a holistic strategy that integrates descriptive research methodologies with exploratory data analysis. These methodologies enable a comprehensive examination of Kazakhstan's energy landscape and its transition towards sustainability, providing insights into its unique position within the global context. The report produced by the descriptive research design is displayed in Table 1 and illustrated visually in Figure 1 below.

Table 1. Kazakhstan's Energy Source Profile

Energy Source	Usage in billion kWh	Production (%)	Per Capita in the Country
Fossil Fuel	151.0	84	8094.2
Water	24.7	14	1317.7
Renewable energy	1.8	1	94.1
Nuclear Power	1	1	1
Total Production for Kazakhstan	178.5	100	9506
Total	178.5	100	9506

Source: data calculated from https://ourworldindata.org/energy/country/kazakhstan (Hannah et al., 2022)

Figure 1. Kazakhstan's Energy Source



	Fossi fuel	Water	Renewable energy	Nuclear power	Total production for Kazakhstan
Per Capita in the country	8094,2	1317,2	94,1	1	9507
Production%	84	14	1	1	100
Usage in billion kwh	151	24,7	1	1	177,7

Source: data calculated from https://ourworldindata.org/energy/country/kazakhstan (Hannah et al., 2022)

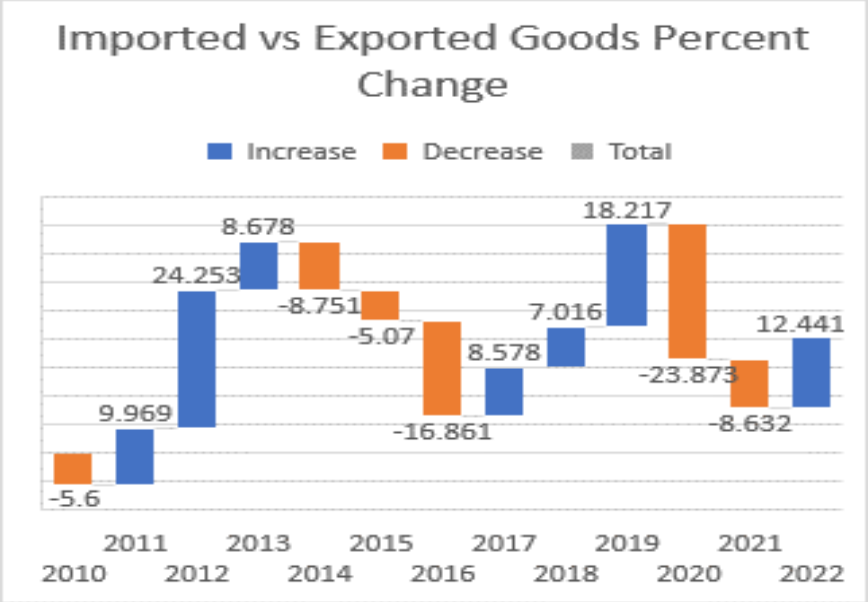
Figure 2. Percent Change of Imports Visualization



Source: data calculated from https://ourworldindata.org/energy/country/kazakhstan (Hannah et al., 2022)

Figure 2 illustrates the difference between the volume of imports and exports in Kazakhstan. In recent years, imports have reduced compared to the year 2012. Exports have a lower percent change. Kazakhstan must avoid importing more than it exports to prevent trade deficits. Trade deficits lead to the decline of a country's currency value. Kazakhstan ought to strive to export more to create a trade surplus, which will ultimately benefit the citizens.

Figure 3. Volume of Imported vs. Exported Goods Percent Change



Source: From the Central Bank's newest available data: 2022, 2005, is a baseline year—weighted chain: No Trading Method: General Trade Primary or unrefined products for oil coverage. Free on board (FOB) is used to value exports. Estimating the value of imports: cost, insurance, and freight (CIF), Kazakhstani tenge is the official currency. Latest data update:03/2023

Figure 3. was plotted using secondary data from the Central Bank's newest available data: 2022 and 2005 are the baseline years—weighted chain: No Trading Method: General Trade Primary or unrefined products for oil coverage. Free on board (FOB) is used to value exports. Estimating the value of imports: cost, insurance, and freight (CIF), Kazakhstani tenge is the official currency. Latest data update: 03/2023.

Figure 3 shows that the largest increase in the volume of exports and imports was in 2012, while the largest decrease was in 2020.

4. RESULTS AND DISCUSSION

This section's results and discussion are structured around three main focal points. First, Kazakhstan's fossil fuel dependence and economic effects are examined. Second, hydropower's position as a major renewable energy source, including its limitations and potential for growth. Finally, we address electricity source restructuring difficulties and options. This structured approach aims to bring clarity and organization to the presentation of results while also improving the scientific structure of the research.

4. 1. THE DEPENDENCE OF KAZAKHSTAN ON FOSSIL FUELS AND ITS ECONOMIC IMPLICATIONS

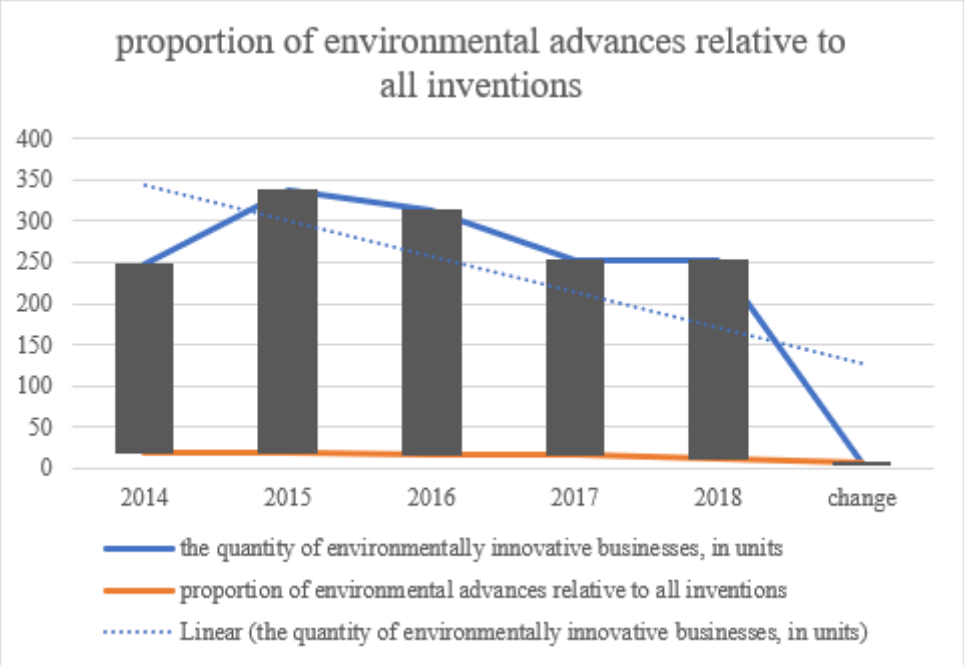
Table 1 presents an overview of Kazakhstan's energy sector, emphasizing a notable reliance on the oil industry. This sector contributes to a remarkable 86% of the country's economic output. On average, this corresponds to an energy production of 8,094.19 kWh per person. The figures highlight the significant reliance on non-renewable fossil fuels in Kazakhstan's energy composition. It is concerning that renewable energy production is currently only at 1%, leading to a per-person energy consumption of just 94.12 kWh. The excessive dependence on non-renew-

able energy sources presents economic challenges and highlights the urgency for a transition (Grabara et al., 2021).

4. 2. HYDROPOWER: LIMITATIONS AND POTENTIAL AS A LEADING RENEWABLE ENERGY SOURCE

Kazakhstan generates 14% of its energy from hydropower. It produces 1,317.66 kWh per person, second only to the oil industry. While hydroelectric generating has made important contributions, data reveals it has limitations. This finding raises crucial questions about hydropower's position in the country's greener economy and future development.

Figure 4. Proportion of environmental inventions



Source: IMF. (2022)

Figure 4 illustrates the proportion of environmental advances relative to all inventions. It is clear that the quantity of environmentally innovative businesses has significantly declined from 2014 onwards. Figure 5 paints a picture of Kazakhstan's focus on environment-friendly business activities. The visualization shows that the focus on maintaining environment-friendly businesses declined significantly. The issue of pollutant emissions in Kazakhstan can be addressed and dealt with through the implementation of green fiscal policies.

Representing Kazakhstan's energy profile reveals a disconcerting reality for the country's renewable energy industry. The situation is concerning, as seen in Figure 1's green column indicating the country's per capita measurements of various energy sources. Figure 1's most extended column, which depicts the contribution of non-renewable fossil fuels to overall output, shows the per-person energy production that is the most significant. The figure further details the nation's reliance on fossil fuels for energy. The findings also indicate that the nation produces less water power, highlighting problematic issues.

The explanation is that the region needs a lot of water power generation as a backup energy source during prolonged periods of regional electricity interruption. In addition to producing

energy, hydropower aids society by assisting with irrigation, flood control, and clean water supply.

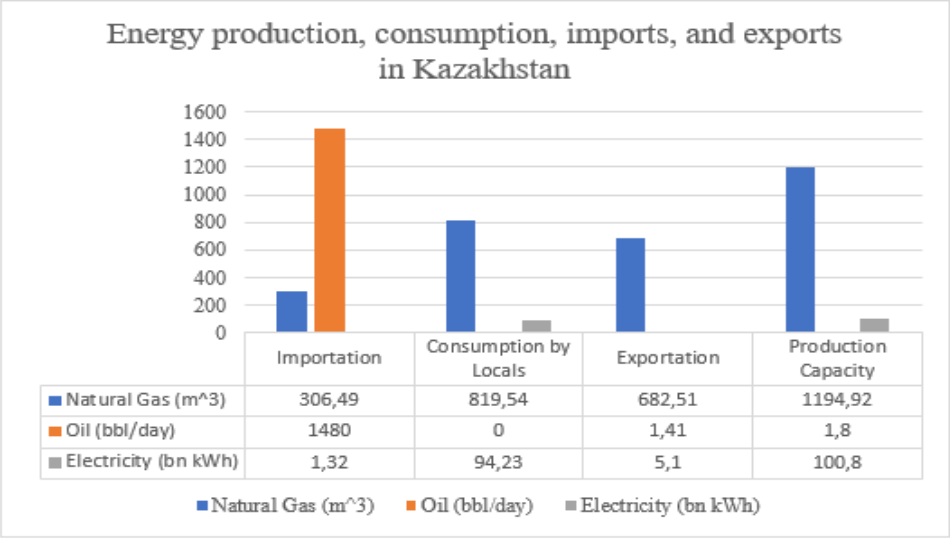
Table 2. Energy production, consumption, imports, and exports in Kazakhstan

Energy profile	Natural Gas (m^3)	Oil (bbl/day)	Electricity (bn kWh)
Importation	306.49	1480	1.32
Consumption by Locals	819.54	___	94.23
Exportation	682.51	1.41	5.1
Production Capacity	1194.92	1.8	100.8

Source: data calculated from https://ourworldindata.org/energy/country/kazakhstan (Hannah et al., 2022)

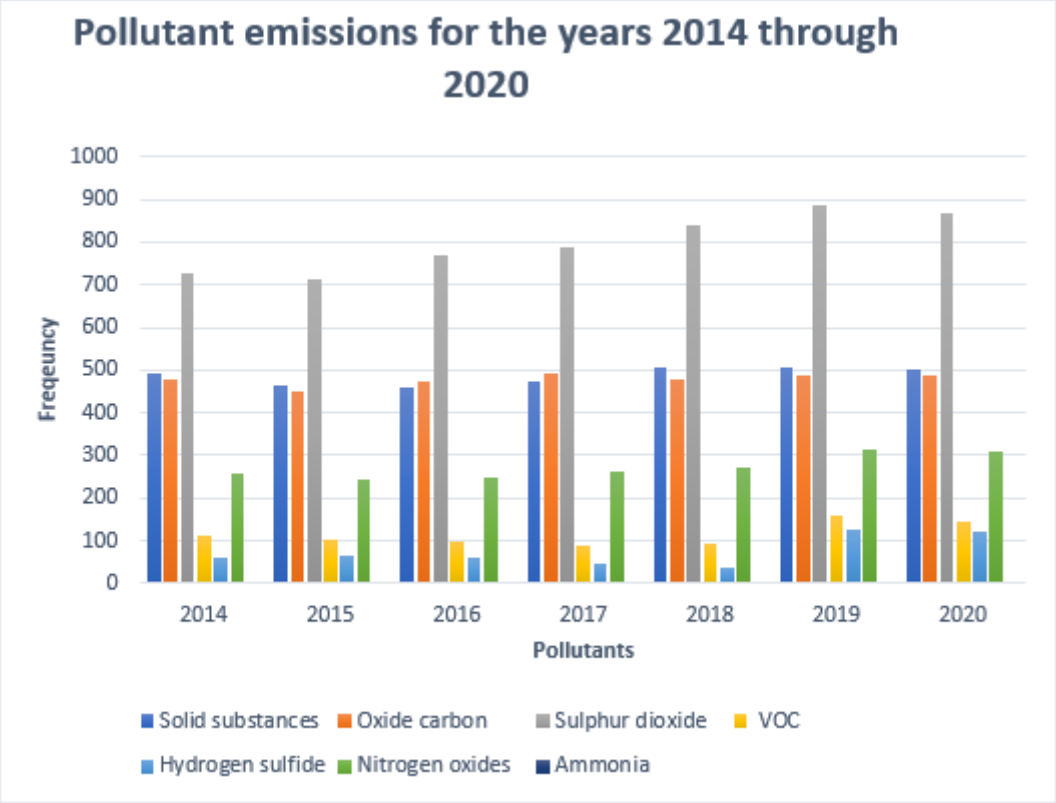
Table 2 contains data on Kazakhstan's energy profile, including statistics on the importation, local consumption, production, and exportation of common kinds of power in the country. Metrics in Table 2 demonstrate that Kazakhstan's energy sector exploration is more advanced than its importation of fossil fuels, with the statistics for electricity being the opposite. The fact that consumption is lower than output capacity across all sectors is another advantage for the nation (Dyussembekova et al., 2019). The graphic illustrates the effects on the economy because Kazakhstan is the region's largest importer of oil and also the largest user of it. The oil exports column in Figure 5 has the most extraordinary exportation. Energy production, consumption, imports, and exports in Kazakhstan are also shown graphically in this Figure.

Figure 5. Energy production, consumption, imports, and exports in Kazakhstan



Source: data calculated from https://ourworldindata.org/energy/country/kazakhstan (Hannah et al., 2022)

Figure 6. Pollutant emissions from stationary sources, in thousands of tons, for the years 2014 through 2020



Source: IMF. (2022)

Figure 6 visualizes the pollutant emissions for the years 2014 through 2020 from stationary sources in thousands of tons. From the figure, it is evident that sulfur dioxide has been the dominant pollutant through the years. Sulfur dioxide is followed by solid substances, which are followed closely by carbon oxides, such as carbon dioxide. Ammonia is the least pollutant emission.

The topic of discussion pertains to the management of carbon emissions and the control of air pollution.

The research findings underscore the imperative of tackling the issue of air pollution in Kazakhstan, with particular emphasis on mitigating carbon emissions. Kazakhstan is positioned at the 14th rank on a global scale, and it holds the distinction of being the primary source of carbon dioxide emissions in the Central Asian region. The nation's gross domestic product (GDP) demonstrates a carbon intensity that is twice as high as the worldwide average and three times more than that of the European Union (EU). Carbon emissions are predominantly ascribed to extensive mining operations, exploration of oil and gas reserves, industrial endeavors, electricity production, economic growth, and the escalation of traffic levels. The leading pollutants over the years are depicted in Figure 6, with particular emphasis on sulfur dioxide as the primary environmental problem. Additional noteworthy pollutants consist of particulate matter and carbon oxides, particularly carbon dioxide. The mitigation of these challenges and the promotion

of sustainable development necessitate the implementation of air pollution control measures (Yourieva et al., 2020).

This section establishes a coherent linkage between Kazakhstan's energy profile, its economic reliance on fossil fuels, the potential of renewable energy sources, and the urgent necessity for green fiscal policies and air pollution control by organizing the discussion around these three pivotal issues. The implementation of a structured approach in this study serves to bolster the reliability of the findings and subsequent analysis, providing significant insights into the progress of Kazakhstan's transition towards a sustainable and environmentally conscious economy.

4. 3. REGRESSION ANALYSIS MODEL

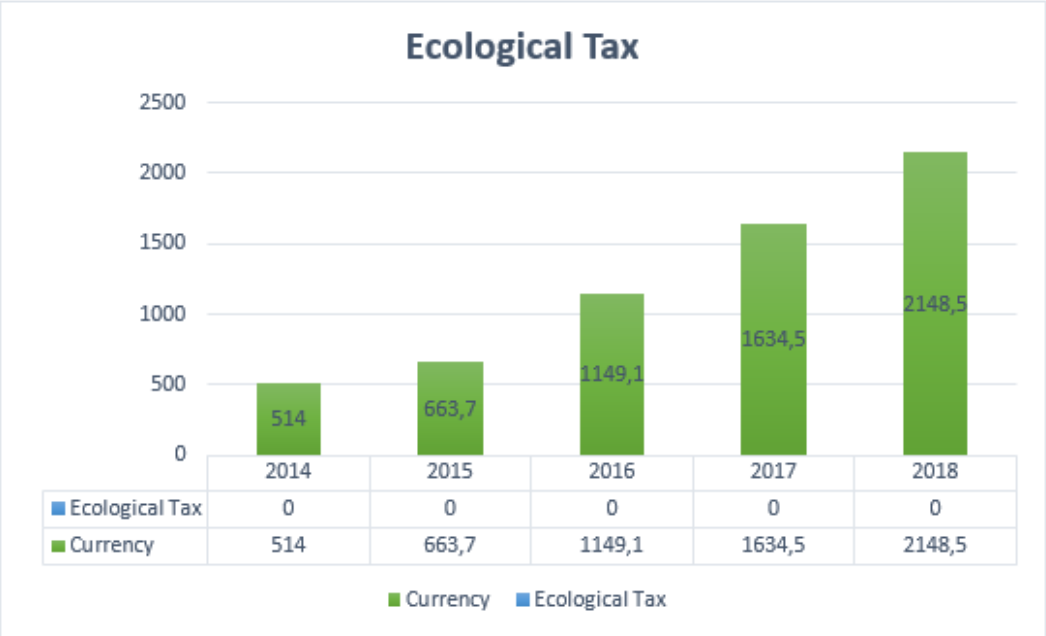
The data and sample used in this study are crucial components for doing rigorous academic research. The data refers to the information collected or seen during the research process while the sample is (Puška et al., 2020).

The objective of the regression analysis model is to examine the influence of Kazakhstan's green fiscal policies on the efficacy of renewable energy firms throughout five years, specifically from 2014 to 2018. This study examines the correlation between the quantity of enterprises in Kazakhstan, which is measured as an interval variable, and the degree of environmental progress. The dataset comprises measurements for the aforementioned variables within the designated period.

The evaluation of statistical parameters and model fit assessment.

In order to enhance the dependability and resilience of the regression analysis (Puška et al., 2018), statistical parameters and evaluations of model fit have been integrated. The topic of discussion is the multiple linear regression model.

Figure 7.The Ecological Tax



Source: IMF. (2022)

This study uses a multiple linear regression model to examine the relationship between environmentally innovative enterprises (y) and key predictors, such as renewable energy capacity (measured in megawatts), green fiscal policy expenditure (as a percentage of GDP), and ecological taxes. The model is formulated as follows:

The equation is represented as y equals beta zero plus beta one times x one plus beta two times x two plus beta three times x three plus epsilon. The effect of Kazakhstan's green fiscal policies on the enterprise effectiveness of renewable power enterprises is examined using a regression model.

$$y = mx + c \quad \text{(The linear regression model)} \tag{1}$$

Table 3. IMF Republic Kazakhstan April 2022

Energy Source	The potential of renewable Energy (MW)	Funding needs (% of GDP)	Green fiscal policy investment in billion-dollars	Ecological taxes (%)
Wind	384	27.5	1.5	2.4
Solar	884	27.5	1.5	2.4
Bioenergy	8	27.5	1.5	2.4
Small scale hydropower	225	27.5	1.5	2.4

Source: IMF. (2022)

In equation 1, *m0* is the potential for renewable energy, *x1* is the investment in green fiscal policy (an independent variable), and c is made up of ecological taxes (a measure of the barrier). *y* is the dependent variable. Results from each renewable energy source's model are obtained by applying the data from Table 3 to the model.

$$y1 = 225*1.5 + 0.024 = 337.524 \quad \text{(Hydropower energy)} \tag{2}$$

is the total investment for the small hydropower energy enterprise.

The total investment for the solar energy company is

$$y2 = 884 * 1.5 + 0.024 = 1326.024 \quad \text{(Solar Energy)} \tag{3}$$

The investment total for the wind energy business is

$$y3 = 384 * 1.5 + 0{,}024 = 576.024 \quad \text{(Wind energy)} \tag{4}$$

$$Y3 = 8*1.5 + 0.024 = 12.024 \quad \text{(Bioenergy)} \tag{5}$$

is the total investment for the bioenergy business.The above regression equations show the best of each renewable-energy source model that can best fit Kazakhstan in the period of green fiscal policy implementation. The equations show that the green fiscal policies will be beneficial to Kazakhstan in the long run.

5. CONCLUSION

The research findings provide insight into the interplay between Kazakhstan's economy, which heavily relies on fossil fuels, and the urgent necessity to shift towards renewable energy sources. The results above are based on an extensive examination of the current body of literature, highlighting the considerable importance of fossil fuel income, which constitutes nearly 50% of the federal budget of Kazakhstan. The extensive ramifications of this economic reliance have significant effects on governmental policy and the efficacy of firms working in the renewable energy industry.

Furthermore, the analysis of sustainable financial practices highlights the crucial interaction between financial management and environmental preservation in the contemporary global landscape. Organizations that use strategies focused on resolving social and ethical problems have been found to have enhanced financial performance while also making positive contributions to societal well-being and environmental conservation. The case study of Kazakhstan exemplifies a variety of effective strategies and governmental measures that are targeted toward promoting enduring sustainability. However, persisting challenges may hamper commercial growth.

Since renewable energy accounts for only 1% of energy production, the data shows a huge discrepancy. Kazakhstan has ample hydropower, solar, and wind energy, but the mismatch persists. The research and literature review emphasizes the need for a deliberate shift away from non-renewable energy sources to improve renewable energy policies. Due to its nuclear resources, Kazakhstan can study cutting-edge technologies like nuclear fusion to maximize its potential. The transition holds significant importance for Kazakhstan and other countries seeking to diminish their economic dependence on multinational oil companies and achieve the potential benefits of a sustainable economy.

Although Kazakhstan has achieved considerable progress in the implementation of many policies aimed at promoting a Green Economy, there are still practical obstacles pertaining to legal frameworks, infrastructure, funding, support mechanisms, data availability, and information distribution that need to be addressed. The report posits that Kazakhstan's endeavors towards establishing a green economy and promoting sustainable development might be enhanced through the cultivation of mutually advantageous trade agreements, the implementation of water treaties, and the nurturing of regional collaboration.

Moreover, the banking sector in Kazakhstan is currently facing the challenge of increasing loan volumes, which in turn is contributing to the escalation of economic hazards. The efficacy of bank loans in providing financial support for eco-friendly initiatives is constrained. Hence, it is imperative to secure more financial resources to bolster policies driven by incentives, particularly in light of the significant rise in ecological taxes. Moreover, the need for more momentum in the stock market is a formidable obstacle to pioneering renewable energy initiatives. Kazakhstan is currently endeavoring to establish a framework for promoting the expansion of renewable energy. However, the country has encountered obstacles in the form of historical management practices within the ecological, social, and environmental spheres, which have impeded progress. These challenges include the exploitation of natural resources, fluctuations in global raw material prices, and the need for comprehensive sustainable planning.

6. RECOMMENDATIONS

Economic stagnation may be experienced in Kazakhstan's major trading partners, including China, Europe, Japan, America, and Russia. To manage such an external danger, Kazakhstan

has to grab this chance to develop a strong, independent, adaptable, and creative economy. For higher living standards for its people and total economic development to place Kazakhstan in the top thirty completely developed nations, the country must improve its governance, reduce corruption, and at the same time engage in more active political engagement.

According to independent research, for Kazakhstan to realize the goal of joining the developed nations by 2050, seven issues must be resolved: the urban and regional economies, green economy, global and regional integration, energy resources, human resources, institutions, and knowledge economy.

To address the challenges identified and capitalize on opportunities, Kazakhstan must consider the following recommendations, which emerge from the research and analysis:

- Diversification of the Economy: Kazakhstan should actively diversify its economy to reduce dependence on major trading partners like China, Europe, Japan, America, and Russia. This diversification should focus on fostering a strong, independent, adaptable, and creative economy to weather external economic risks effectively.
- Good Governance and Anti-Corruption Efforts: To achieve higher living standards and comprehensive economic development, Kazakhstan must prioritize good governance, reduce corruption, and engage in more active political engagement.
- Seven Key Sectors for Development: Independent research suggests that Kazakhstan should focus on seven critical sectors to achieve its goal of joining developed nations by 2050. These sectors include:
- Skilled Labor Force: Training the unskilled labor force to acquire specialized skills and promoting entrepreneurship with minimal state intervention.
- Renewable Energy Technology: Promoting local participation and knowledge transfer in renewable energy technology.
- Green Economy: Supporting analysis, incentivizing local and foreign investors, and funding renewable and environmentally friendly energy initiatives.
- Global Energy Transition: Emulating successful models like the Energy Information Administration (EIA) to effectively transition to renewable energy sources.
- Adaptive Planning: Implementing adaptive planning strategies, like the Delphi simulation approach, to address global crises and emerging challenges.
- Human Resource Forecasting: Utilizing human resources for forecasting financial hardships and risks, particularly in the tourism industry, to ensure the viability of banking organizations.

These recommendations are rooted in the research and analysis conducted throughout the article and are intended to guide Kazakhstan towards a sustainable and prosperous future.

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