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**Article**

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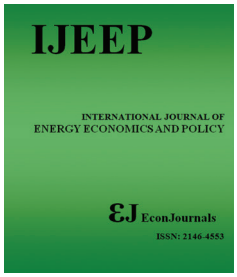

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# Impact of Green Fiscal Policy on Investment Efficiency of Renewable Energy Enterprises in Kazakhstan

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**ABSTRACT**

Years of industrialization and reliance on energies such as oil and coal have resulted in global pollution on an unprecedented scale. Carbon footprint, destruction of forests, melting away of ice caps in the North Pole, and climate change have persuaded many to adopt a more sustainable growth. In the wake of this catastrophe, "green" energy is a phenomenon that takes a step toward sustained development. Green energy consists of innovative and cost-effective ways to address the global consciousness by switching to renewable energy, water resources management, waste reduction, etc. Green Fiscal Policy aims to align prices and mobilize resources for climate change and sustainable development. Many developed and developing countries like Kazakhstan are taking the initiative towards zero carbon emission and renewable energy. The challenges of implementing the required policies include overcoming the barriers of the status quo to establish a new Geo-political and economic system in Kazakhstan. Political and economic challenges persist despite its vision for 2050 that Green Economy influences. This report focuses on Kazakhstan's natural resources, topography, and renewable energy enterprises. The Green Fiscal Policy is closely examined over Kazakhstan's current investment efficiency scenario.

**Keywords:** Green Fiscal Policy, Renewable Energy Investment, Kazakhstan
**JEL Classifications:** G18, D04, D22, D25, Q48

## 1. INTRODUCTION

Kazakhstan is located in west-central Asia. It was a Soviet Union republic from 1936 until 1991. With a total area of 2,717,300 kilometers, Kazakhstan is the 9th largest country in the world, having a population of 19 million. It is also a landlocked nation, with hardly fewer than six people per kilometer. It shares its national boundaries with China to the east, Russia to the north, Kyrgystan, Uzebekistan, and Turkmenistan to the south. Temperatures vary significantly between regions- from nearly –20° in winter to a maximum of 29° in summer (Kazakhstan, 1992).

Kazakhstan is rich in resources. Cotton cultivation is abundant in the southern part of the country on irrigated lands. The northern region sees an abundance of millet and wheat. Sheep and cattle grazing takes place in the dry central plateau (Kazakhstan, 1992). The country is resourceful in chromium, copper, iron ore, lead, nickel, petroleum, and zinc. It ranks amongst the highest in reserves for zinc, tungsten, and barite and second in the world for silver, lead, chromite, and uranium (PAGE, 2020).

Since the dissolution of the Soviet Union in 1991, Kazakhstan underwent a challenging economic transition to a GDP growth of 7% in the early 2000 s, primarily due to oil export. By 2018, there was a further 4.1% growth in economic development (PAGE, 2020). After a fall of 2.5% in 2020 due to the Covid pandemic, the economy expanded by 4% in 2021. This expansion was due to increased vaccination drives and ease of restrictions (ARIC, 2022). However, the ongoing Russia and Ukraine war and the economic sanctions on Russia will affect Kazakhstan's supply chain. Kazakhstan relies on 40% of its imports from Russia, according to a World Bank Article.

A slow-down of GDP growth to 1.5–2.0% in 2022 is predicted (The World Bank, 2022).

Kazakhstan's economy is heavily dependent on its high energy reserves. However, there is a shortage of technological lack of energy-intensive industries, state pricing, tariff policies, and communal prices (Dulambayeva et al., 2013). Although the energy intensity is twice as high as the world average, the country uses 2 times more natural resources for the production per GDP output (Bhattacharyya, 2022). For the government to produce products with higher added value, value chains that focus on processing raw materials and Research and Development are considered high-priority directions. Such priorities and Green Economy facilitate the opening of new opportunities (PAGE, 2020).

The resounding message from environmental activists and concerned governments is for individuals and institutions to work on reducing their carbon footprint. International communities are thus pursuing energy economies by applying green fiscal policy and tax regulations that favor the development of the renewable energy sectors (Raihan and Tuspekova, 2022). While seeking a green energy economy is reasonable for the positive outcome for the environment, the efforts are subject to prevailing political, economic, and social circumstances in different nations. One aspect of the political and economic output is that the oil sector, which represents non-renewable energy, is predominant in most economies (Chien et al., 2022). The success of the green fiscal policies on the investment efficiency in the renewable energy enterprises will depend on Kazakhstan and similar global entities working on releasing their political and economic outcomes from the hold of the worldwide oil industry.

The Republic of Kazakhstan supported the concept of a transition to a Green Economy and the concept of renewable energy under the UN framework convention in 1995, the Kyoto Protocol in 2009, and the Paris Agreement in 2016 (Kalkabayeva et al., 2020). By 2030, the country aims to reduce sulphur and nitrogen oxides into the atmosphere on par with advanced European countries. By 2050, Kazakhstan expects to significantly reduce the carbon economy to 50%, thereby increasing the GDP by 3%. (Kalkabayeva et al., 2020). However, huge investments are required to finance these innovative programs that would help contribute positively to the environment and its economy.

In 2012, the international community grappled with an energy crisis that slowed economies. The crisis was severe in Kazakhstan because 50% of government revenue in the nation comes from the oil sector, accounting for a significant economic impact (Soltangazinov et al., 2020). For the country, the energy crisis of 2012 was an economic and political challenge considering the relationships it has with Russia (Orazgaliyev, 2018). During that period, government measures toward the renewable energy sector took a renewed direction to address any future challenges in the energy sector. The changes in governmental views on renewable energy, along with realizing the sector's potential for the economy, have resulted in the development of fiscal policies that determine the level of investment in the energy enterprises in Kazakhstan (Orazgaliyev, 2018). The research will focus on exploring the different steps that Kazakhstan has made in supporting the growth of the renewable energy sector. The analysis considers the challenges of the non-renewable energy industry, which is the cornerstone of the country's economy. The industry has created political and economic dependencies that Kazakhstan must overcome to realize a green energy economy.

## 2. LITERATURE REVIEW

Kazakhstan understands the need to promote a green economy and sustainable development. However, severe ecological problems threaten Kazakhstan, unlike other states. The effects of Soviet-era nuclear tests and industrial wastes amount to over 23 billion tons, out of which 9 billion tons of anthropogenic mineral formations are left undisposed. There are also water problems because Kazakhstan is highly dependent on border water sources (Diyar et al., 2014). The border water treaty between neighboring countries is another challenge. The Aral Sea has two main tributaries- the Amudarya and the Syrdarya, which form two main parts of the water network in Central Asia. The Amudarya, which originates in Tajikistan, is the largest Central Asian River, with an annual water runoff of 79.4 $km^3$. It passes through 5 countries before discharging into the Aral Sea in Kazakhstan. The Syrdarya that originates in Uzbekistan is about 3019 km long till it discharges into Kazakhstan.

During the Soviet empire, the upstream countries such as the Kyrgyz Republic and Tajikistan were used for river water reservoirs and for irrigation in downstream countries such as Kazakhstan, Uzbekistan, and Turkmenistan. Power generation via hydroelectricity in upstream countries was secondary. Instead, fossil fuels were used for power generation. With Soviet Union's dissolution, the interests shifted because of emerging economies and new Geopolitics. The upstream countries switched their river water reservoirs kept for irrigation to generate hydroelectricity, although downstream countries like Kazakhstan still relied on irrigation. This change in the Geopolitics of emerging markets and increased self-sufficiency disturbed the river flow patterns. To increase their demand, upstream countries even expanded their hydropower production so that they could be exported internationally besides satisfying domestic needs (Zinganshina, 2009).

Ecologists and scientific experts have warned Kazakhstan that global climate change would result in water shortage, droughts, and fertile lands turning into deserts in a matter of 20–30 years. At one point, the Aral Sea between Kazakhstan and Uzbekistan was the 4$^{th}$ largest lake in the world. Now it has shrunk and dried significantly. Therefore, adopting Green Economy would minimize such threats and risks (Diyar et al., 2014).

Laldjebaev et al. (2021) mention that in 2009, Kazakhstan adopted a law to support using renewable energy sources. In 2013, the Government of Kazakhstan, to reduce its dependence on coal, introduced a plan that transitions from fossil fuel to a green economy by 2050. It first aims to increase the share of the green economy by 30% by 2030 and 50% by 2050. There are plans to construct low-cost, reliable, and environmentally friendly hydroelectric plants. In 2017, an amended law introduced a fixed tariff mechanism for auction trading on renewable

energy sources, leading to tariff reductions for Solar power. This subsequently generated the interest of large private banks and international private investment (collectively, 145 companies from 12 countries).

### 2.1. Green Fiscal Policy in Kazakhstan

Chien et al. (2022) assess fiscal policies and their association with energy poverty. From the analysis, the authors find that a green fiscal policy that includes public support for renewable energy projects and tax rebates significantly reduces energy poverty (Zhakupova et al., 2021). In the case of Kazakhstan, the target is to realize a green energy economy by 2050.

Poberezhskaya and Bychkova (2021) analyze some of the fiscal policies in Kazakhstan concerning green energy projects to create an association between green fiscal policies and energy poverty reduction in the case study. The authors find that with the nation's heavy reliance on fossil fuels, the renewable energy sector remains weak. The interconnection in the article comes from the non-renewable energy industry shaping the political context in the nation, with the outcome of impacting the green energy policies. While the prevailing situation shows a promotion of non-renewable energy sectors, Poberezhskaya and Bychkova (2021) point out that since 2012, the nation has been advancing its renewable energy sector through reliable partnerships with the international audience.

### 2.2. State of Energy Investments in Kazakhstan

Poberezhskaya and Bychkova (2021) indicate a deficiency in the political alignment that promotes the green energy sector in Kazakhstan. It is thus imperative to analyze the progress so far in the nation and take the argument in an alternate direction. According to Kanapiyanova (2019), Kazakhstan's energy potential is the nation's largest distributor of oil resources in Central Asia, particularly in the areas around the Caspian Sea (Mantel, 2015). A different factor in the energy sector in Kazakhstan is that the importation of crude oil from Russia poses an economic and political risk. Kanapiyanova (2019) thus determines that the nation is analyzing its energy potential, including assessing the green energy capacity to minimize the political and economic risks.

Bozkus (2018) provides a different perspective on the renewable energy potential in Kazakhstan by pointing to the international energy potential and collaborations with nations like Turkey. As the article notes, such a collaboration is in place to minimize the energy competition in the region, including Russia, the EU, and other nations in Central Asia. Despite the reliance on the oil sector for energy, Vakhguelt (2017) explores the renewable energy potential of Kazakhstan. From Azhgaliyeva et al. (2020), it is evident that measures from the central government in supporting renewable energy projects have the potential to spur the industry. Further, with the incentive to minimize reliance on external sources, the nation will embrace the energy production process (Bozkus, 2018).

### 2.3. Drawbacks in Renewable Energy Investments in Kazakhstan

Azretbergenova and Syzdykova (2020) provide an assessment based on the recent drop in international oil prices that set the nation in an economic struggle with a weakened economy. From the analysis, the crisis resulted from reliance on the oil sector, with the nation's budget retrieving 50% of its revenues from the oil sector (Soltangazinov et al., 2020). The depreciation of the oil sector by up to 20% in payments in 2020 prompted the initiative in Kazakhstan to focus resources on non-oil sectors with recommendations to develop the sector and its exports (Yarova, et al., 2017). In the analysis by Atakhanova and Howie (2022), the authors follow the gender issue, which presents additional challenges in the energy sector. The effects of gender analysis from the article present the image of a lack of incentives for skill development across different sectors, which hinders progress in the renewable energy sector.

### 2.4. Theoretical Framework

The implementation of the green fiscal policies encourages investment in the renewable energy sectors in the nation. Considering the energy crisis of 2012, the outcomes favor international and local developments. In international results, the success of renewable energy enterprises in Kazakhstan is bound to set the pace for implementation in other global entities in Asia and the EU (Mantel, 2015). For the local communities in Kazakhstan, the success of renewable energy enterprises in applying the principles of the theory of utility will include avoiding the political and economic risks that come with reliance on oil importation and the potential for oil shortages globally.

## 3. RESEARCH METHODS AND DATA COLLECTION

It is vital to indicate the research method applied in this study to acquire critical results in the descriptive research design. This essential research method mainly describes different aspects' different characteristics. In this study, the descriptive research design will provide systematic information on the energy sector in Kazakhstan with a vital focus on the renewable energy sector. The descriptive design is also critical in this study because it allows an individual to collect and analyze the information describing the case study's phenomenon. The information collected in this case is the amount of nuclear power energy, fossil fuel amount in Kazakhstan, water power production, and renewable energy potential. The data collected is about the total usage, percentage production, and per capita in Kazakhstan. The design also analyzes about the rate of consumption, production capacity, importation, and exportation

The data analysis process in the study first relied on secondary data collection to obtain statistical information on the subject of renewable energy in Kazakhstan and the implementation of green fiscal policies in the nation. The statistical information included energy usage and variations in production over the years. The data was then subjected to statistical tools that included using Excel to perform analyses. This element enabled significant results to be obtained.

The below Table 1 shows the report obtained from the descriptive research design.

**Table 1: Energy profile of Kazakhstan**

| Energy source in Kazakhstan | Total usage (bn kWh) | Percentage production (%) | Per capita in Kazakhstan (kWh) |
|---|---|---|---|
| Fossil fuels in Kazakhstan | 151.8 | 86 | 8094.19 |
| Nuclear power energy | 0 | 0 | 0 |
| Water power production | 24.71 | 14 | 1317.66 |
| Renewable energy potential | 1.77 | 1 | 94.12 |
| Total production for Kazakhstan | 176.51 | – | 9411.85 |
| Total | 100.8 | 57.1 | 5374.73 |

**Figure 1:** Representation of the energy profile of Kazakhstan

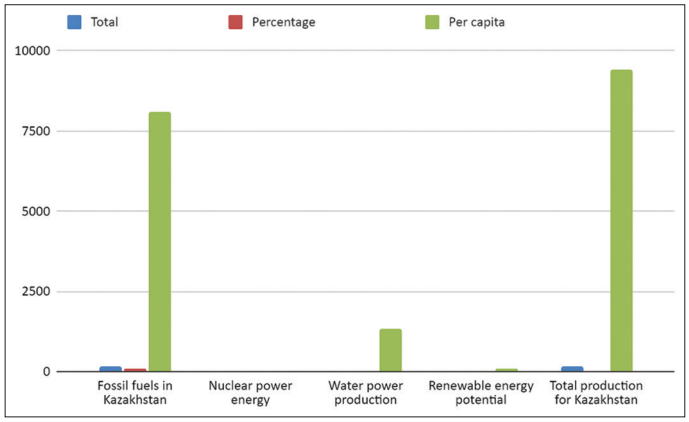
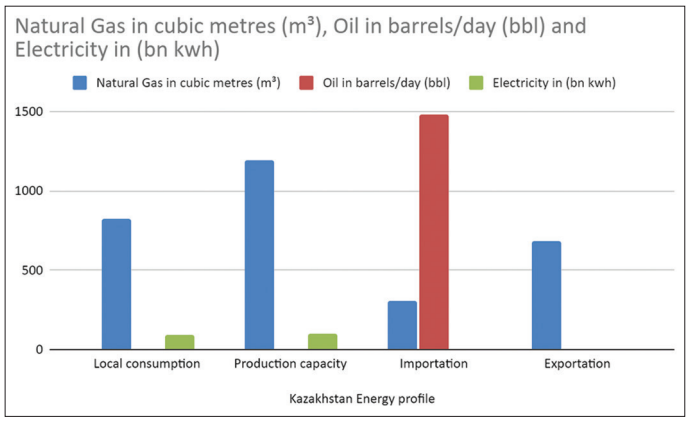



**Figure 2:** Visual representation of the energy potential of Kazakhstan

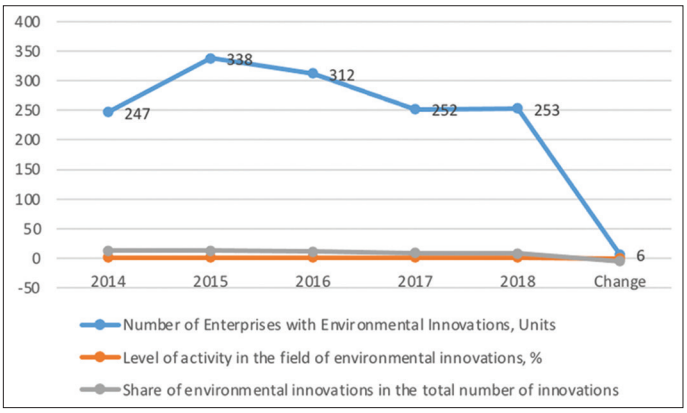



## 4. RESULTS AND DISCUSSION

From the Table 1 presentation, the highest stake in the economy of Kazakhstan goes to the oil sector at 86%, with a total production of 8.094.19 per capita of kWh for the nation's fuel supply. The alarming information from the chart is that while the nation has considerable potential in renewable energy production, the figures remain at 1% of production to capture a total per capita kWh of only 94.12. Another source of energy in the country is hydropower supply from water production. The sector is second to the oil production in the nation with a percentage of 14 and a per capita production of 1,317.66 kwh. The indication from the figures is that the nation has a considerable reliance on the oil sector, which is a non-renewable source of energy, thus making the penetration of renewable sources into the economy daunting (Grabara et al., 2021).

The visualization of information on the energy profile of Kazakhstan presents a disturbing reality for the renewable energy

**Figure 3:** Number of Enterprises in Kazakhstan with environmental innovations




*Compiled according to the Statistics Committee of the Ministry of National Economy of the Republic of Kazakhstan. Retrieved March 2020, from https://stat.gov.kz/official/industry/157/statistic/7
Data: Number of enterprises in Kazakhstan and environmental innovations for 5 years. They are both interval variables
Sample: 5 years from 2014 to 2018 with three measures of indicators (number of enterprises)
Purpose: To find out the number of enterprises in Kazakhstan with environmental innovations.

sector in the nation. As shown in Figure 1, the green column representing the per capita measures for different energy sources in the nation, the situation is worrying. The most significant per capita energy production is realized in the most extended column in Figure 1, which represents non-renewable fossil fuels and their contribution to total production. The chart elaborates on the nation's dependence on fossil fuels in the energy sector. The results also show less water power production in the country, which shows challenging aspects. This is because the water power production is required to be high to backup power during major electricity outages disruptions in the region. Beyond electricity generation, Hydropower provides benefits by providing flood control, irrigation support, and clean drinking water.

Table 2 captures information on the nation's energy profile, such as the production, consumption, importation, and exportation of common forms of energy in the nation. The measures in the table 2 show that the exploration of the energy sector in Kazakhstan is higher than importation in the fossil fuel sectors, with the figures reversing for electricity. The country is also at an advantage because the level of consumption is lower than the production capacity for all sectors (Dyussembekova et al., 2019).

Since Kazakhstan is the highest consumer of oil in the region, with importations from Russia, the chart demonstrates the impact

**Table 2: Production and consumption parameters of energy in Kazakhstan**

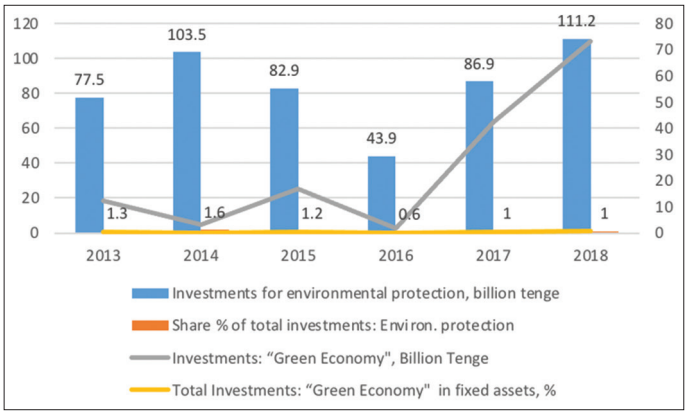
| Kazakhstan energy profile | Natural gas in cubic meters ($m^3$) | Oil in barrels/day (bbl) | Electricity in (bn kWh) |
|---|---|---|---|
| Local consumption | 819.54 | | 94.23 |
| Production capacity | 1194.92 | 1.8 $m^6$ | 100.8 |
| Importation | 306.49 | 1480.00 | 1.32 |
| Exportation | 682.51 | 1.41 m | 5.1 |

**Table 3: International Monetary Fund: Republic of Kazakhstan April 2022**

| Renewable energy resources in Kazakhstan | Renewable energy potential in Units (MW) $b_1$ | Funding needs ($b_0$) as a percentage of GDP (%) | Green fiscal policy investment ($x_1$) | Ecological taxes (μ) (%) |
|---|---|---|---|---|
| Small scale hydropower | 225 | 27.5 | $1.5 Billion | 2.4 |
| Solar | 884 | 27.5 | $1.5 Billion | 2.4 |
| Wind | 384 | 27.5 | $1.5 Billion | 2.4 |
| Bioenergy | 8 | 27.5 | $1.5 Billion | 2.4 |

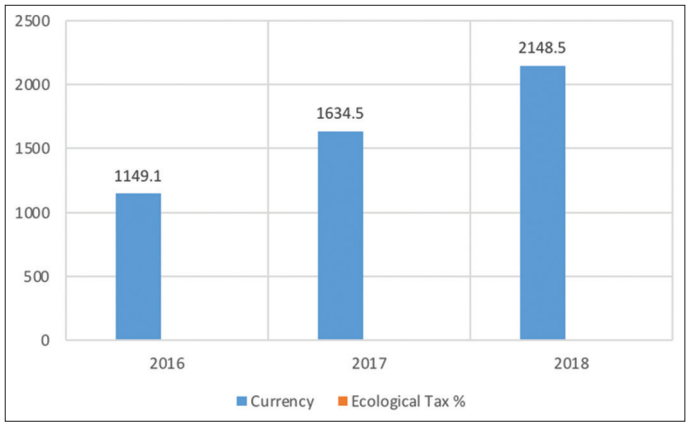
Sources: International Monetary Fund: Republic of Kazakhstan April 2022 (IMF, 2022). Renewable Energy in Central Asia: An overview of potentials, deployment, outlook, and barriers (Lldjebaev, 2021). Pg. 3129. The Fiscal Implications of Kazakhstan of the worldwide transition to a greener global economy (European Bank for Reconstruction and Development, 2022), Pg. 33

**Figure 4:** Number Investments in Green Economy in Kazakhstan




*Compiled according to the Statistics Committee of the Ministry of National Economy of the Republic of Kazakhstan. Retrieved July 2022, from https://stat.gov.kz/official/industry/157/statistic/7
Data: Different investments that are carried out each year for a period of 6 years. They are both interval variables
Sample: 6 years from 2013 to 2018 with four measures of indicators (different investment indicators)
Purpose: To find out about the Investments in Green Economy in Kazakhstan.

**Figure 5:** Ecological tax




*Based on data from the statistics Committee of the Ministry of National economy of the Republic of Kazakhstan
Data: 3-year period and tax percentage on different amounts. They are both interval variables
Sample: Percentage of tax imposed (measure) over 3 years from 2016 to 2018 (sample)
Purpose: To find out the rate of ecological taxes in Kazakhstan over 3 years.

on the economy. The visualization in Figure 2 shows that high dependence on the oil sector results in increased importation. The Figure 2 is a visual representation of energy production, consumption, importation, and exportation in Kazakhstan. From the Figures 3-5, the highest level of exportation is for oil which is the most extended column.

### 4.1. Econometric Model using Regression Analysis

Data: Number of enterprises in Kazakhstan and environmental innovations for five years. They are both interval variables.

Sample: 5 years from 2014- 2018 with three measures of indicators (number of enterprises)

Purpose: To find out the number of enterprises in Kazakhstan with environmental innovations

### 4.2. Econometric Model

A simple regression model is used to test the effect of the Green Fiscal Policy on the Investment Efficiency of Renewable Energy Enterprises in Kazakhstan.

$$Y = b_1 x_1 + \mu$$

Y is the dependent variable, $b_0$ is the renewable energy potential, $x_1$ (independent variable) is the Green Fiscal Policy Investment, and μ comprises Ecological Taxes (a measure of the barrier). The data from Table 3 is applied to receive results from the model taken for each renewable energy source.

## 5. RESULTS

Total Investment for Small Scale Hydropower Energy Enterprise is $y_1 = 225*1.5 + 0.024 = = 337.524$

Total investment for solar power energy enterprise is $y_2$= 884 * 1.5 + 0.024=1326.024

Total investment for wind power energy enterprise is $y_{3=}$ 384 * 1.5 + 0,024=576.024

Total investment for bioenergy enterprise is $y_{3=}$ 8* 1.5 + 0.024= 12.024

## 6. CONCLUSION AND RECOMMENDATIONS

The results indicate that the nation of Kazakhstan and its economy significantly benefit from the fossil fuel sector. The information from the literature review corroborates the findings by showing that 50% of the government budget in Kazakhstan comes from the oil energy sector. Since the government's fiscal policies and investment efficiency toward the renewable energy sector is dependent on the budget arising from fossil fuels, the outcome is counterintuitive.

The study shows that the production capacity of the renewable energy sector presently stands at only 1%. The low percentage is despite the vast natural resources that include wind energy, solar energy, and hydropower that can produce more in kWh than the non-renewable energy sectors in the economy. From the literature review and the data collection in the study, green energy policies and their success in renewable energy enterprises will depend on a deliberate effort from the nation to go against the established non-renewable energy sector. Due to access to their nuclear-based natural resources, for instance, they could generate electricity through nuclear fusion technology if used efficiently and in a contained manner.

The success of the green fiscal policies on the investment efficiency in renewable energy enterprises will depend on Kazakhstan and similar worldwide entities working on releasing their political and economic outcomes from the influence of the global oil sector. So far, the progress has been in minimal efforts since the renewable energy sector is yet to match the non-renewable energy sector in production, despite the exponential capacity of the renewable energy sector.

Kazakhstan is the forerunner amongst other neighboring Central Asian countries in implementing various Green Economy policies. However, realistically, there are challenges to realizing a fully functional Green Fiscal Policy primarily due to issues in the regulatory framework, infrastructure, finances, support, data, and information. Kazakhstan's Green Economy and sustainability progress could enhance via mutually agreeable water treaties, trade agreements, and regional co-operation.

The banking sector in Kazakhstan is overwhelmed with loans and increasing economic risks. Thus banking loan plays a limited role in financing eco-friendly innovations. The ecological taxes have been higher from 1500 to over 2000 billion Tenge. The financial sector is ill-equipped to support incentive-sensitive measures. Stock markets are insufficiently liquid and inactive to fund innovative renewable energy enterprise projects.

Kazakhstan is searching for a model that exploits renewable energy sources and sustainable development. However, a history of social, ecological, and environmental management prevented any sustainable action due to the rising prices for raw materials on the world market, exploiting their natural resources, and state planning and forecasting for sustainable planning-related issues.

Kazakhstan's main trading partners, such as Russia, China, Europe, America, and Japan, may face economic stagnation for a while. Kazakhstan must seize this opportunity to build a resilient, self-sufficient, flexible, and innovative economy to manage such an external risk. Kazakhstan must strengthen its governance, minimize corruption, and engage in more proactive political participation to provide a better quality of life for its citizens and for overall economic growth to be amongst the top 30 nations of developed countries.

Independent research concluded that to achieve the vision of 2050 of entering the league of developed nations, seven areas need to be addressed: Green Economy, Energy Resources, Urban and Regional Economies, Knowledge-economy, Regional and Global Integration, Institutions, and Human Resources. These seven areas feature:

- Support for entrepreneurship with minimal state government intervention.
- Training the unskilled workforce to develop specialized skills
- Technology for extracting renewable energy by capitalizing on indigenous talent rather than relying only on importing technical know-how
- Encouraging research, incentivizing domestic and international players, and adapting to a Green Fiscal Policy by investing in eco-friendly and renewable energy projects. (Aitzhanova et al., 2014).

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