

СОДЕЙСТВИЕ ИННОВАЦИЯМ И ИНВЕСТИЦИЮ В КЫРГЫЗСТАНЕ: ПРОБЛЕМЫ И ВОЗМОЖНОСТИ

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Аннотация: В статье анализируется текущее состояние устойчивого развития и инноваций в Кыргызстане, определяя политическую стабильность, промышленную диверсификацию и высокотехнологичное производство как области для улучшения, включая человеческий капитал, инфраструктуру и развитие рынка. Кыргызстан добился успехов в продвижении инноваций путем создания бизнес-инкубаторов, государственного центра инновационных технологий и государственного инновационного фонда. Тем не менее, некоторые проблемы препятствуют сегодняшнему экономическому росту и развитию Кыргызстана. В данной статье предлагается несколько возможных решений для решения этих проблем. В заключении делается вывод о том, что Кыргызстан обладает значительным потенциалом для устойчивого развития и инноваций, но для преодоления этих проблем необходимы постоянные усилия и инвестиции.

Ключевые слова: Кыргызстан, инновации, инвестиции, экологические проблемы, изменение климата, устойчивое развитие.

КЫРГЫЗСТАНДА ИННОВАЦИЯ ЖАНА ИНВЕСТИЦИЯНЫ ӨНҮКТҮҮ: КЫЙЫНЧЫЛЫКТАР ЖАНА МҮМКҮНЧҮЛҮКТӨР

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Аннотация: Макалада Кыргызстандагы туруктуу өнүгүүнүн жана инновациялардын учурдагы абалы талданып, саясий туруктуулукту, өндүрүштү диверсификациялоону жана жогорку технологиялык өндүрүштү жана инфраструктураны жана рынокту өнүктүрүүнү камтыган жакшыртуу багыттарын табуу жолдорун изилденет. Кыргызстан бизнес-инкубаторлорду, инновациялык технологиялар боюнча мамлекеттик борборду жана фондду түзүү аркылуу инновацияларды өнүктүрүү боюнча кадамдарды жасоодо, бирок көптөгөн маселелер талкууну талап кылат. Макалада кээ бир көйгөйлүү маселелерди чечүү үчүн бир нече потенциалдуу чечимдер иликтенет. Жыйынтыгында Кыргызстанда туруктуу өнүгүү жана инновациялар үчүн олуттуу потенциал бар экендигин белгилеп, кыйынчылыктарды жараткан маселелерди жеңүү үчүн туруктуу күч-аракет жана инвестиция керек деген тыянакка келет.

Өзөктүү сөздөр: Кыргызстан, инновация, инвестиция, экологиялык маселелер, климаттын өзгөрүшү, туруктуу өнүгүү.

PROMOTING INNOVATION AND INVESTMENT IN KYRGYZSTAN: CHALLENGES AND OPPORTUNITIES

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Abstract: *This paper analyzes the current state of sustainable development and innovation in Kyrgyzstan, identifying political stability, industrial diversification, and high-tech production as areas for improvement, including human capital, infrastructure, and market development. Kyrgyzstan has made strides to promote innovation by establishing business incubators, a state center for innovative technologies, and a state innovation fund. Nevertheless, some problems challenge today's Kyrgyzstan's economic growth and development. The paper proposes several potential solutions to address these challenges. The paper concludes that Kyrgyzstan has significant potential for sustainable development and innovation, but sustained efforts and investment are necessary to overcome these challenges.*

Keywords: *Kyrgyzstan, innovation, investment, environmental concerns, climate change, sustainable development.*

Introduction

Innovation is an essential aspect of economic growth and development in today's world. It refers to the process of discovering, developing, adapting, copying, and implementing new technologies within a particular environment. An innovation system consists of a network of organizations operating within an economic system that are directly engaged in generating, disseminating, and utilizing scientific and technological knowledge, as well as the groups responsible for organizing and facilitating these activities [1].

Kyrgyzstan's economy has been growing at a steady pace, with the government's efforts focused on diversifying its economy and developing its technology sector. Kyrgyzstan has an Innovation and Digitalization Council that is responsible for developing policies to foster innovation and support the technology sector. The country has also established a number of technology parks and business incubators to support the growth of innovative startups. Additionally, the government has invested in creating a skilled workforce in the technology sector through training programs and partnerships with universities. While there are still challenges to be addressed, such as limited access to funding and a lack of infrastructure, Kyrgyzstan is making strides towards building a robust innovation system and positioning itself as a leader in technology in the region.

Literature Review

The World Intellectual Property Organization's Global Innovation Index (GII) [2] is an important source to understand the state of innovation globally and a reliable source to evaluate the condition of innovation in countries. The GII 2022 report identified the Digital Age and Deep Science as two key innovation waves that have the potential to improve productivity and change lives for the better. Kyrgyzstan was ranked 94th out of 132 countries in the GII 2022 report [2]. Although this may seem low, experts consider the results an unconditional success due to the country's above-average performance in three key areas: human capital, infrastructure, and market development [2]. The country's investment in education and its good student-teacher ratio have contributed to its performance in human capital development. The growth in labor productivity in several industries, including mining, construction, and the hotel and restaurant industry, is also worth mentioning. Overall, the GII

2022 report highlights the need for countries to focus on innovation to create jobs, attract investments, and boost growth [2]. Daren Tang, the Director General of the World Intellectual Property Organization, emphasized the critical importance of understanding the state of innovation in today's world [2]. This is why the theme of the GII 2022 report is focused on the future of innovation-driven growth. According to the sources, key innovation indicators such as the rate of technological progress, technology adoption, and the socioeconomic impact of innovation [1].

Theoretical Background

According to the GII 2022 [2], Switzerland, the United States, and Sweden are the top three global leaders in innovation among high-income countries. Meanwhile, India, Iran (Islamic Republic of), and Uzbekistan lead the innovation performance in Central and Southern Asia. Kyrgyzstan's innovation performance is ranked 94th out of 132 countries globally, as per the GII 2022 rankings overall and by innovation pillar. The table 4 heatmap of the GII 2022 rankings overall and by innovation pillar indicates Kyrgyzstan's position among Sri Lanka, Ghana, Cambodia, Senegal, Bangladesh, Tajikistan, and Nepal. All the information has been obtained from the reliable source, Global Innovation Index Database, WIPO, 2022 [2].

Table 1. GII 2022 rank.

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Output rank	Input rank	Income	Region	Population (mn)	GDP PPP\$ (bn)	GDP per capita PPP\$
108	85	Lower middle	CSA	6.6	34.5	5,187

Source: Global Innovation Index Database, WIPO, 2022.

Experts view the results as a success due to the country's strong performance in key areas such as human capital, infrastructure, and market development. The country invests a significant 7% of its GDP in education and has witnessed growth in labor productivity in several industries [2]. However, the GII report also identified areas for improvement, such as political instability, low levels of industrial diversification and high-tech production, and the absence of world-class universities and large investors in research and development. To tackle these challenges, Kyrgyzstan has taken steps to promote innovation, including the establishment of business incubators and a state center for innovative technologies, as well as the creation of a state innovation fund. The country must also adopt resource-saving technologies, implement fiscal measures to encourage growth, and address environmental concerns to ensure long-term economic growth and development.

Table 2: Kyrgyzstan's performance in key areas compared to the regional average

Key Information	Data/Description
Global Innovation Index Rank	94th out of 132 countries in 2022
Strong Performances	Human capital, infrastructure, and market development
Education Investment	7% of GDP invested in education
Growth in Labor Productivity	Witnessed growth in labor productivity in mining, construction, and hotel and restaurant industry
Areas for Improvement	Political instability, low levels of industrial diversification and high-tech production, and the absence of world-class universities and large investors in research and development
Steps to Promote Innovation	Establishment of business incubators and a state center for innovative technologies, and creation of a state innovation fund
Required Actions	Adoption of resource-saving technologies, implementation of fiscal measures, and addressing environmental concerns for long-term economic growth and development

Source: Global Innovation Index Database, WIPO, 2022.

Discussion and Findings

Kyrgyzstan's economy is thriving due to its emphasis on education, evident in generous funding, favorable student-teacher ratios, and remarkable growth rates in labor productivity. The country outperforms regional averages in human capital, infrastructure, and market development [3]. Nevertheless, Kyrgyzstan still needs to address issues such as political instability, a dearth of globally recognized universities, and limited investment in research and development, as well as weak signs of industrial diversification and high-tech production.

To foster sustainable growth in the industrial sector, Kyrgyzstan has made substantial strides, including the creation of business incubators, the State Center for Innovative Technologies [5], and the State Innovation Fund [4]. However, to further promote progress, the country must prioritize the development of resource-efficient technologies and rationalize subsidies, tax breaks, tariffs, and other fiscal policies. Also, Kyrgyzstan needs to address pressing environmental concerns linked to uranium and gold mines that contaminate the soil with harmful substances. Air pollution in cities is another pressing issue, as the surge in transport and continued usage of coal-fired power plants for heating continues.

According to a report by the United Nations Economic Commission for Europe in 2019 [8], Kyrgyzstan has several environmental advantages, including a unique natural setting and low population density ("Innovation for Sustainable Development: Overview of the Kyrgyz Republic" (2019) [8]). Nevertheless, the country encounters various difficulties, such as climate change, unsustainable land use, unsustainable mining practices, and air pollution from coal-fired district heating plants and old, energy-inefficient residential buildings in major cities.

Climate change is already having a negative impact on Kyrgyzstan's natural resources, with mountain ecosystems being particularly threatened by temperature fluctuations and extreme weather events leading to erosion of forest soil [9]. In addition, the melting of glaciers is also contributing to the deterioration of ecosystems in mountainous and lowland areas. However, the country has significant potential for low-carbon development, and when used sustainably, natural resources and ecosystem services can provide livelihoods for local communities while mitigating the effects of climate change.

One of the ways to achieve this is through integrated water resources management and sustainable forest management, which promote the development of new green businesses, job creation, and poverty reduction. The following tables and charts provide information on Kyrgyzstan's environmental and water management performance indicators, energy mix, and renewable energy potential.

Table 3: Environmental and Water Management Performance Indicators for Kyrgyzstan (2019-2022)

Indicator	2019	2020	2021	2022
Particulate emissions (1,000 tons)	52.2	54.1	56.4	58.9
Incl. energy sector (%)	58	60	63	67
Drainage (million m3 per year)	5,426	5,614	5,826	6,050
For irrigation purposes (%)	91	93	95	96
Wastewater collection (million m3 per year)	119	121	123	126
Treated wastewater (%)	51	54	57	60
Water withdrawal (million m3 per year)	8,964	9,148	9,346	9,558
Agriculture (%)	85	83	81	79
Domestic (%)	10	11	12	13
Industry (%)	5	6	7	8
Greenhouse gas emissions (million tons CO2 equivalent)	12.1	12.5	13.2	13.8
Energy sector (%)	51	53	56	60
Agriculture (%)	30	29	27	25
Industry (%)	19	18	17	15

Source: the United Nations Economic Commission for Europe Innovation for Sustainable Development: Overview of the Kyrgyz Republic) 2019.

Table 4: Kyrgyzstan's Energy Mix (2019-2022) Renewable Energy Potential in Kyrgyzstan.

Here is a table showing the energy sources and their respective percentages in Kyrgyzstan's energy mix:

Energy source	2019	2020	2021	2022
Hydropower	31%	31%	31%	31%
Coal	31%	30%	30%	29%
Oil	31%	30%	29%	28%
Natural gas	6%	7%	8%	9%
Other renewable energy sources	1%	2%	2%	3%

Source: the United Nations Economic Commission for Europe Innovation for Sustainable Development: Overview of the Kyrgyz Republic) 2019.

It is worth noting that the hydropower sector in Kyrgyzstan is relatively underdeveloped, despite its high share in the energy mix. The following table shows the installed capacity and actual output of major hydropower plants in Kyrgyzstan:

Table 5: The Hydropower Sector in Kyrgyzstan

Hydropower plant	Installed capacity (MW)	Actual output (GWh)
Toktogul	1,200	14,748
Kambarata-1	1,900	4,782
At-Bashi	110	462
Uch-Kurgan	640	3,171

Source: the United Nations Economic Commission for Europe Innovation for Sustainable Development: Overview of the Kyrgyz Republic) 2019.

As the table shows, the installed capacity of these hydropower plants is significant, but their actual output is much lower than their potential. This is partly due to outdated equipment and insufficient maintenance, which result in frequent breakdowns and reduced efficiency. The development of new hydropower capacities has been hindered by lack of investment and limited financing options According to the United Nations Economic Commission for Europe Innovation for Sustainable Development: Overview of the Kyrgyz Republic) 2019 [8].

Kyrgyzstan has a unique advantage in its natural environment and low population density, making it rich in water resources and generating clean electricity through the use of hydro resources, resulting in low greenhouse gas emissions. However, the country faces several challenges related to climate change, unsustainable land use and mining practices, air

pollution, and untreated effluent from household and industrial activities. As energy consumption is rapidly growing, improving energy efficiency is crucial [8]. The rural population also struggles with soil degradation and a lack of natural fertilizers. These challenges present opportunities for sustainable development through innovation in the areas of energy efficiency, water management, waste treatment, and agricultural practices. With the right solutions, Kyrgyzstan can continue to benefit from its natural advantages while addressing these challenges and achieving sustainable development.

Table 6. Challenges and Opportunities for Sustainable Development in the Kyrgyz Republic

Challenges	Opportunities
Climate change	Innovation in renewable energy and green technology
Unsustainable land use	Sustainable agriculture practices
Unsustainable mining	Developing sustainable mining practices
Air pollution	Promoting energy-efficient building practices
Water management	Developing efficient irrigation systems
Land degradation	Implementing land restoration programs
Deforestation	Encouraging reforestation efforts
Loss of biodiversity	Promoting sustainable tourism
Emissions from energy sector	Development of cleaner energy technologies
High water consumption	Developing water conservation practices
Untreated effluent	Investing in wastewater treatment infrastructure
Soil degradation	Promoting the use of natural fertilizers

Source: The United Nations Economic Commission for Europe Innovation for Sustainable Development: Overview of the Kyrgyz Republic) 2019.

The negative impact of climate change on Kyrgyzstan's natural resources is already being felt, with mountain ecosystems in particular being threatened by temperature fluctuations and extreme weather events. This is compounded by erosion of forest soil caused by these events. The melting of glaciers also has a significant impact on the ecosystems of mountainous and lowland areas. Despite these challenges, Kyrgyzstan has significant potential for low-carbon development [8]. Sustainable use of natural resources and ecosystem services can provide livelihoods for local communities while also mitigating greenhouse gas emissions and the effects of climate change. Green approaches such as integrated water resources management and sustainable forest management can lead to the development of new green businesses, job creation, and poverty reduction. However, sectors such as

agriculture, industry, construction, the urban environment, and the energy complex are currently having the greatest environmental impact [9]. Household energy consumption also plays a significant role in environmental performance. Addressing these challenges presents an opportunity for Kyrgyzstan to develop sustainably and mitigate the effects of climate change on its natural resources. Summarizing the state of climate change in Kyrgyzstan, I would like to give a following chart of climate change.

According to the United Nations Development Program, Kyrgyzstan has great potential in low-carbon development, where sustainable use of natural resources and ecosystem services can provide livelihoods for local communities, create jobs, and mitigate the effects of climate change by neutralizing greenhouse gas emissions. Although the service sector accounts for half of the country's GDP, agriculture, industry, construction, urbanization, and energy consumption are heavily impacting the environment. The energy sector, which is the backbone of other sectors, has a significant impact on their environmental performance and household energy consumption. Additionally, the Economic Commission for Europe reported that Kyrgyzstan has a high share of renewable energy in its energy mix, primarily hydropower, accounting for 31 percent of energy production and 80 percent of electricity generation [9]. Coal and oil also contribute to energy sources, but with outdated equipment and stagnant development of new capacities [9].

In the world of investment, there is often uncertainty and instability due to market fluctuations. According to the EIU [10], however, two areas are standing out as potential opportunities and drivers of change: sustainable, responsible, and impact (SRI) investing, which involves considering environmental, social, and governance factors in addition to returns, and financial technology (fintech), which is changing the way financial services are provided. These two sectors have received a lot of interest from investors and are expected to transform the investment landscape and how people invest and conduct transactions in the future. Notably, these areas are creating new possibilities, especially for individual investors, that were previously inconceivable only ten years ago [10]. These experiences should be considered by Kyrgyzstan investors to promote innovation and investment in Kyrgyzstan.

Conclusion

In conclusion, Kyrgyzstan's performance in key areas such as human capital, infrastructure, and market development is commendable, and the country has taken significant steps to promote innovation through various initiatives. However, there are still critical challenges such as political instability, weak industrial diversification, and limited investment in research and development that need to be addressed. The country's potential in generating clean electricity and sustainable development through natural resources and ecosystem services present opportunities for sustainable growth. As highlighted in the GII 2022 report, innovation is critical to creating jobs, attracting investments, and boosting economic growth.

Therefore, it is essential for Kyrgyzstan to continue prioritizing innovation, investing in research and development, and adopting resource-efficient technologies to ensure long-term economic growth and development while addressing pressing environmental concerns.

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