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Green Entrepreneurship and Sustainable Business Development in Central Asian Emerging Economies: Evidence from the Green Entrepreneurship Development Index

Bakhtiyar Ruzmetov¹ , Dilnoza Ochilova² , Shakhzod Makhmatrayimov³ ,
Umud Odilov³  and Pardayev Anvarjon³ 

¹ Urgench State University named after Abu Rayhon Beruni, Urgench, Uzbekistan.

² Navoi Innovation University, Navoi, Uzbekistan.

³ Termez University of Economics and Service, Termez, Uzbekistan.

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Abstract

In recent years, climate change, the contraction of natural resources, and increasing ecological risks progress in the global economy stable development principles based new business models to the formation motivation This is giving. In this process, green entrepreneurship is a solution to ecological problems to reach directed innovative entrepreneurship activity as economic growth, resource-effective use, and environmental protection, to achieve goals, a crucial mechanism is considered. This research examines the development of green entrepreneurship in Central Asia. To evaluate the impact of complex to evaluate Research within Uzbekistan, Kazakhstan, Kyrgyzstan, Tajikistan, and Turkmenistan, green entrepreneurship development institutional, economic, and financial basics of green entrepreneurship development was also conducted. In the analysis of state politics, green financing mechanisms, the development level of renewable energy sources, institutional environment quality, and green business activity such as from indicators used. Research methodology, qualitative-comparative analysis, institutional assessment, and countries in the section, analytical rating based on the methods. Research results of Central Asian countries in the middle green entrepreneurship development at the level of noticeable differences showed. Kazakhstan and Uzbekistan green economy policy and investment environment according to relatively high the results demonstration reached if, Kyrgyzstan and Tajikistan again recovering energy potential with separated It is located in Turkmenistan. and institutional and financial restrictions green business development slowing down main factors as Also green financing instruments, in particular green loans, bonds and public-private partnership mechanisms development level green entrepreneurship to the activity directly impact to show was found. Research in the Central Asian countries for green entrepreneurship to encourage, to recover energy development, improve the institutional environment improvement and regional ecological cooperation aimed at practical recommendations was conducted. Taking results green to the economy to pass processes and in the region, long-term stable business development provides scientific and practical importance.

Keywords: green entrepreneurship; sustainable business development; green economy; Central Asia; developing economies; green innovations; re recovering energy; green financing; institutional environment; ecological sustainability; green investments; stable development goals (SDGs)

1. Introduction

One of the most pressing challenges facing the global economy in the first quarter of the 21st century is the issue of reconciling economic growth with the principles of environmental sustainability. Climate change, the decline in biodiversity, the depletion of natural resources, and the increase in environmental pollution are calling into question the long-term sustainability of the traditional model of economic development. The 2030 Agenda for Sustainable Development (SDGs) adopted by the United Nations, emphasizes the need to ensure a balance between economic growth, social well-being, and environmental protection. Therefore, many countries around the world are seeking to reformulate economic policies based on the concept of a “green economy”.

Green entrepreneurship occupies a special place in the transition to a green economy. Green entrepreneurship refers to innovative business activities aimed at solving environmental problems in addition to generating economic profit (Hall et al., 2010; Gast et al., 2017). This activity is based on increasing energy efficiency, using renewable energy sources, reducing waste, introducing the principles of a circular economy, and rational use of resources. As a result, green entrepreneurship not only creates new economic value but also serves to reduce environmental risks and ensure the long-term well-being of society.

In recent years, interest in studying the impact of green entrepreneurship on economic development has increased significantly among international organizations and academic circles. Studies show that enterprises that use eco-innovations and green business models achieve high competitiveness, investment attractiveness, and market stability in the long term. At the same time, green entrepreneurship is considered an important factor in creating new jobs, accelerating technological modernization, and reducing the carbon intensity of the economy (Acs et al., 2012; Hall et al., 2010). Especially for developing economies, green entrepreneurship can serve as an important source of economic diversification and innovative development, while solving environmental problems.

The Central Asian region is of particular scientific and practical importance in the transition to a green economy. The economies of Uzbekistan, Kazakhstan, Kyrgyzstan, Tajikistan, and Turkmenistan, which are part of the region, have long developed based on natural resources. In particular, hydrocarbon resources play an important role in the economies of Kazakhstan and Turkmenistan, agriculture and mineral resources in Uzbekistan and Tajikistan, and hydropower in Kyrgyzstan. Such an economic structure, on the one hand, has ensured economic growth, but on the other hand, it has increased the risk of environmental problems and inefficient use of resources.

In Central Asia, environmental problems such as water scarcity, increasing desertification, air pollution, and the Aral Sea crisis pose a serious threat to the sustainable development of the countries of the region. In particular, the drying up of the Aral Sea is recognized as one of the largest environmental disasters in the world, negatively affecting the socio-economic conditions of millions of people. In addition, the shrinking of glaciers and reduced water flows as a result of climate change are creating additional pressure on the agricultural and energy sectors. These factors are pushing the countries of the region to transition to an environmentally sustainable economic model.

At the same time, Central Asia also has great potential for the development of green entrepreneurship. The area is one of the most promising regions in the world in terms of solar radiation levels. Kazakhstan and Uzbekistan have extensive wind energy potential, while Kyrgyzstan and Tajikistan have large hydropower potential. In addition, areas such as eco-tourism, organic agriculture, waste recycling, and energy efficiency technologies are creating new segments of green business (Kirchherr et al., 2017; Gast et al., 2017). Effective use of these opportunities will not only increase the competitiveness of the region's economies but also contribute to environmental sustainability.

In recent years, Central Asian countries have adopted a number of strategic documents on the transition to a green economy. Kazakhstan is implementing the “Concept of Transition to a Green



Economy”, while Uzbekistan has identified energy efficiency and the development of renewable energy as a priority within the framework of the “Uzbekistan-2030” strategy. Kyrgyzstan has adopted a green economy concept, while Tajikistan and Turkmenistan are also gradually developing programs aimed at environmental sustainability. Nonetheless, the practical implications and effects of such policies and their contribution to the development of green entrepreneurship in different countries are very diverse.

The review of the current scientific literature suggests that the theoretical background of green entrepreneurship, the experience of developed countries, and green economy policy in general have been adequately researched. Nonetheless, the amount of comparative research regarding the level of development of green entrepreneurship in Central Asian countries, the institutional and financial factors influencing it, and the importance of the phenomenon for sustainable business development remains quite low. For example, there is a shortage of research comparing Central Asian countries using one analytical platform and revealing the major determinants of green entrepreneurship development.

Given this scientific gap, the main objective of this study is to comprehensively assess the impact of green entrepreneurship on sustainable business development in the developing economies of Central Asia. To achieve this goal, the following tasks were set:

- to identify the level of development of green entrepreneurship in Central Asian countries and differences between countries;
- to analyze economic, institutional, and financial factors influencing the development of green entrepreneurship;
- to assess the impact of public policies, green financing mechanisms, and the innovation environment on green business activities;
- to develop practical recommendations for accelerating the transition to a green economy and sustainable business development in the countries of the region.

The article has the following structure. The second section analyzes the theoretical and empirical literature on green entrepreneurship and the green economy. The third section covers the research methodology and data sources used. The fourth section presents the results of a comparative analysis of Central Asian countries. The fifth section discusses the results obtained in terms of international experience and theoretical approaches. The sixth section develops strategic recommendations for countries. The final section presents the main scientific conclusions of the study and future research directions.

2. Literature Review

2.1. Green entrepreneurship theoretical basics

Green entrepreneurship (or sustainable entrepreneurship) is the latest twenty years during which entrepreneurship and sustainable development theories intersected, forming a scientific direction. This concept provides economic benefits to take into account in line with the solution to ecological and social problems aimed at business activity. Traditional entrepreneurship theories mainly benefit from maximizing and marketing the possibilities aimed at, if yes, green entrepreneurship, ecological responsibility, and a reasonable business use model as an inseparable part.

Green entrepreneurship's theoretical foundation is based on many scientific approaches. Of them, one market imperfection, Cohen and Winn (2007) and Dean and McMullen (2007) have proposed ecological problems as a result of market failure result as explained. They're to the mind according to the environment delivered damage, often products and services, but the price reflection does not. As a result, ecological problems create new market opportunities, and entrepreneurs this from opportunities use through economic both beneficial and ecological to the result achievements possible (Cohen & Winn, 2007; Dean & McMullen, 2007).

The second important theoretical approach, stable innovations, Schaltegger and Wagner (2011), green entrepreneurship, economic, ecological, and social value to create, aimed at innovative activity as an interpretation. This approach to the "triple bottom line" principle is based on enterprises' activity, the results not only include financial indicators, but also ecological and social effects through the offer they will reach.

According to Porter and van der Linde (1995), working on the issue of the ecological competitiveness hypothesis, green entrepreneurship made an important contribution to the theory. This supports the hypothesis that, according to strictly ecological requirements, enterprises' innovations are forced to reach far within the period of their competitiveness. This approach is especially developing in economies with a green business policy to develop the impact that important professions will reach.

Institutional theory is also green. entrepreneurship explanatory main from concepts one North (1990) and Bruton and others (2010) entrepreneurship of activity success, institutional environment quality, with closely related concepts that emphasize. Legislation base, financial institutions, property rights, and state management quality green business initiatives formation, and to develop directly impact.

Table 1. Green entrepreneurship's main theoretical approaches

Approach	Main content	Authors	Importance for research
Market imperfection theory	Environmental challenges create new business opportunities	Cohen & Winn (2007); Dean & McMullen (2007)	Explains the economic foundations of green business formation
Sustainable Innovation Theory	Ecological, economic, and social values are created simultaneously	Schaltegger & Wagner (2011)	Allows you to assess green business performance
Ecological competitiveness hypothesis	Environmental requirements stimulate innovation	Porter & van der Linde (1995)	Explains the impact of government policy on business
Institutional theory	The institutional environment determines the development of entrepreneurship	North (1990); Bruton et al. (2010)	Explains the differences between countries

Source: Author by scientific literature based on compiled.

2. Green economy and sustainable business development

In recent years, the concept of a green economy has become one of the central elements of global economic policy. The United Nations Environment Programme (UNEP) views a green economy as one that fosters human well-being and social equity, while lowering the risk of environmental degradation and resource scarcity. The green economy perspective sees economic development in terms of making use of innovations in ecology rather than harming the environment in order to grow economically. Sustainable business development implies that enterprises implement environmental and social responsibility while maintaining long-term economic efficiency. International experience shows that enterprises that adopt energy efficiency, renewable energy, waste recycling, and the principles of the circular economy are more resilient to changes in market conditions.

OECD, World Bank, and EBRD studies show that the transition to a green economy creates jobs, stimulates innovation, and increases economic diversification. Green business activities are becoming an important tool for economic modernization, while solving environmental problems, especially in developing countries.

2.3. Green entrepreneurship experiences in developing economies

The development of green entrepreneurship in developing countries depends largely on government policies, financial support, and international cooperation. Countries such as China, India, Brazil and South Africa have been able to significantly expand their markets for renewable energy and environmental innovations by implementing green economy transition strategies (International Energy Agency, 2024; International Renewable Energy Agency, 2024).



International experience shows that the most important factors for the development of green business are:

- stability of public policy;
- availability of green financing instruments;
- support for research and innovation;
- quality of the institutional environment;
- effective application of environmental standards.

On the contrary, limited financing opportunities, underdeveloped regulatory frameworks, and institutional gaps remain serious obstacles to the expansion of green business activities.

2.4. Specific features of green entrepreneurship development in Central Asia

Central Asian countries are at different stages of transitioning to a green economy. Kazakhstan is the first country in the region to adopt the green economy concept and attract significant investments in renewable energy (Asian Development Bank, 2023; European Bank for Reconstruction and Development, 2024). Uzbekistan, on the other hand, has been implementing large-scale solar and wind energy projects in recent years (International Renewable Energy Agency, 2024; International Monetary Fund, 2024)..

While Kyrgyzstan and Tajikistan have high potential for hydropower resources, investment and infrastructure constraints are slowing down their green economy development. In Turkmenistan, the economy's high dependence on the hydrocarbon sector is somewhat hindering the development of green businesses.

The common feature of the region is that, despite the natural resource potential for the transition to a green economy, institutional and financial mechanisms are not yet sufficiently developed. Therefore, identifying the main determinants of green entrepreneurship development and assessing differences between countries is of scientific and practical importance.

3. Proposed Data and Research Methodology

3.1. Information sources and research coverage

This research evaluates the status of green entrepreneurship development and its impact on sustainable business in five Central Asian developing economies: Uzbekistan, Kazakhstan, Kyrgyzstan, Tajikistan, and Turkmenistan. Data was collected from international institutions, national statistical agencies, and government strategy documents.

Sources of home information include the World Bank, Asian Development Bank (ADB), European Bank for Reconstruction and Development (EBRD), United Nations Development Programme (UNDP), International Renewable Energy Agency (IRENA), OECD, and national development strategies of Central Asian countries on the concept of green economy.

The period of research, 2020–2024, was chosen. This period is characterized by an increase in the implementation of significant political and institutional reforms with regard to the transition of Central Asian countries to a green economy. Hence, this period allows studying modern trends in the development of green entrepreneurship.

Five countries were selected as research objects:

- Uzbekistan;
- Kazakhstan;
- Kyrgyzstan;
- Tajikistan;

Turkmenistan.

Even though the economic development status, natural resource base, and institutions are different in these countries, they possess certain similar characteristics in history and geography that allow for comparison.

3.2. Methodology for assessing the development of green entrepreneurship

To measure the degree of green entrepreneurship development in this research, an index called the Green Entrepreneurship Development Index (GEDI) was created by the author.

The GEDI includes five key components that determine the development of green entrepreneurship:

1. Public Policy and Strategic Support (PS);
2. Green Finance System (GF);
3. Renewable energy development (RE);
4. Institutional environment quality (IN);
5. Green business activity (GB).

The index is calculated based on the following generalized formula:

$$GEDI = \sum_{i=1} w_i K_i \quad (1)$$

here:

- K_i --normalized value of the component;
- w_i --component weight;
- $\sum w_i = 1$

In the study, all components were assumed to be of equal importance, and each indicator was assigned a weight of 0.20.

And so:

$$GEDI = 0.20PS + 0.20GF + 0.20RE + 0.20IN + 0.20GB \quad (2)$$

The index value ranges from 0 to 1. A value closer to 1 indicates a high level of green entrepreneurship development in the country.

3.3. Structural components of the GEDI index

Component 1. Public Policy (PS)

This component assesses the existence of national strategies, environmental policies, incentives, and government programs for the green economy.

Evaluation criteria:

- the existence of a green economy strategy;
- renewable energy targets;
- environmental regulatory framework;
- government subsidies and incentive programs.

Component 2. Green Finance (GF)

This component represents financing opportunities for green projects.

Evaluation criteria:



- green loans;
- green bond market;
- cooperation with international financial institutions;
- ESG financing mechanisms.

Component 3. Renewable Energy Development (RE)

The component reflects the level of "greenness" of the energy system.

Main indicators:

- share of solar energy;
- share of wind energy;
- share of hydropower;
- QTE contribution to the overall energy balance.

4th component. Institutional Environment (IN)

The institutional environment is one of the important factors determining the effectiveness of green business activities.

Evaluation criteria:

- quality of regulation;
- control corruption;
- protection of investors' rights;
- ease of doing business.

Component 5. Green Business Activity (GB)

This component represents the practical development of green entrepreneurship.

Indications:

- number of green startups;
- environmental innovations;
- number of processing plants;
- private sector participation in green projects.

3.4. Criteria for clustering countries

Based on the results of GEDI, Central Asian countries were divided into three development clusters.

Table 1. According to the GEDI clustering criteria

Cluster	Index range	Description
High development	0.67 – 1.00	Green entrepreneurship and green economy institutions have developed
Medium development	0.34 – 0.66	The green economy is taking shape, but the potential has not been fully realized
Low development	0.00 – 0.33	Countries with high institutional and financial constraints

Source: Author by scientific literature based on compiled.

This clustering will allow us to identify development gaps between Central Asian countries and develop country-specific strategic recommendations

3.5. Analysis methods

Three main methodological approaches were used in the study.

First, using the comparative analysis method, similarities and differences in the development of green entrepreneurship in Central Asian countries were identified.

Second, through an indicator-based assessment, the GEDI index was calculated, and a ranking of countries was formed.

Third, using a strategic analysis enriched with SWOT elements, each country's strengths, weaknesses, opportunities, and threats regarding green entrepreneurship were assessed.

The use of such methodologies enables conducting a comprehensive evaluation of the trends of development of green entrepreneurship in Central Asia and creating strategic recommendations to ensure its sustainable development.

4. Discussion: Expected Relationships and Policy Implications

4.1. Comparative assessment of green entrepreneurship development in Central Asian countries

Green Entrepreneurship Development Index (GEDI) was elaborated during this research in order to measure the level of development of green entrepreneurship in Central Asia. It appears that there are some considerable differences between countries within this region. These differences can be attributed to different policies, financial infrastructure, renewable energy potential, and institutional environment.

As per estimations, Kazakhstan leads in this region because of its early green economy policy, international investments, and numerous renewable energy projects. Uzbekistan takes second position because of the large-scale economic reforms and programs on the modernization of the energy sector.

Table 2. GEDI indicators of Central Asian countries

<i>Countr y</i>	<i>.S.</i>	<i>F</i>	<i>E</i>	<i>N</i>	<i>B</i>	<i>EDI</i>	<i>G</i>
<i>Kazakh stan</i>	.80	.70	.65	.75	.78	.74	0
<i>Uzbeki stan</i>	.78	.55	.60	.62	.65	.64	0
<i>Kyrgyz stan</i>	.58	.45	.55	.48	.52	.52	0
<i>Tajikist an</i>	.52	.42	.70	.45	.46	.51	0
<i>Turkme nistan</i>	.30	.25	.28	.22	.24	.26	0

Source: Author's calculations.

4.2. Key factors influencing the development of green entrepreneurship

The analysis showed that among the factors influencing the development of green entrepreneurship, state policy and financing mechanisms are the most important determinants. The presence of green economy strategies in countries and their implementation in practice significantly accelerates the pace of formation of green businesses.

In Kazakhstan and Uzbekistan, government-provided tax breaks, subsidies, and investor-friendly conditions for renewable energy projects are helping to boost green business activity. Conversely, the limited availability of green financing instruments is a major obstacle to development in Kyrgyzstan, Tajikistan, and Turkmenistan.



There was also a strong correlation between the quality of the institutional environment and the development of green entrepreneurship. Countries with higher regulatory quality were also found to have higher levels of eco-innovation and green startups.

From the findings, Kazakhstan belongs to the group of highly developed countries. Uzbekistan, Kyrgyzstan, and Tajikistan belong to the medium group of development countries, whereas Turkmenistan belongs to the low development group.

4.3. Priority areas of green entrepreneurship in Central Asia

As a result of the analysis, it was possible to determine the most promising areas of development of green businesses in the countries of the region.

The first is renewable energy sources. Central Asia is one of the most promising regions in the world regarding the potential of solar and wind energy. The construction of solar and wind power stations in Uzbekistan and Kazakhstan is opening up new prospects for green businesses.

The second is water-saving technologies in agriculture. With the growing scarcity of water resources in the region, the use of drip irrigation, smart irrigation, and water-saving agro-technologies becomes a promising business segment.

The third is the recycling industry and circular economy initiatives. Population growth and the increasing pace of urbanization lead to the growth of waste management issues. These circumstances create new opportunities for the development of the recycling industry.

The fourth is eco-tourism and the green service sector. The mountainous regions of Kyrgyzstan and Tajikistan, as well as the rich tourism potential of Uzbekistan, can be used for this purpose.

4.4. Swot Analysis of Green Entrepreneurship Development in Central Asia

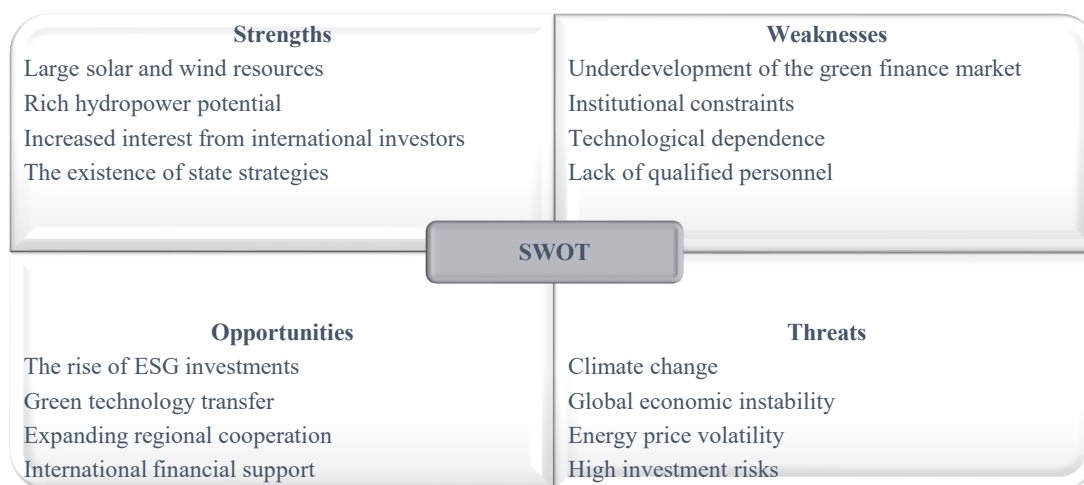


Figure 1. SWOT analysis of the Central Asian green business sector

Source: Author by scientific literature based on compiled.

The results of the SWOT analysis show that Central Asian countries have significant resources and opportunities for the transition to a green economy. However, to fully utilize the existing potential, it is necessary to develop financial infrastructure, deepen institutional reforms, and improve mechanisms to support green innovation.

5. Discussion

Findings of this research indicated that the degree of green entrepreneurship development in Central Asia is rather heterogeneous. The findings were interpreted in accordance with the current theory on the green economy and entrepreneurship in relation to the specifics of the region under consideration.

5.1. Institutional environment and green entrepreneurship development

It was found out that one of the crucial aspects affecting the development of green entrepreneurship is the quality of the institutional environment. This is in line with the theoretical framework of institutional economics elaborated by North (1990). According to this theory, economic development and entrepreneurship are highly dependent upon the efficiency of both formal and informal institutions.

The presence of governmental strategies for the green economy in Kazakhstan and Uzbekistan, a more favorable investment environment, and implementation of environmental reforms contribute to creating a favorable environment for the development of green entrepreneurship. On the contrary, in countries with a high level of institutional constraints, the development of green entrepreneurship is rather slow.

This finding is also consistent with the perspective on institutional determinants of entrepreneurship developed by Bruton et al. (2010). It was found out that the success of green business is not only affected by financial issues, but also by such aspects as efficient governance and legal protection of investors.

5.2. Public Policy and Environmental Competitiveness

Indeed, according to the analysis conducted, one can notice that public policy plays a crucial role in the creation of green entrepreneurship. These findings correlate with the ecological competitiveness theory introduced by Porter & van der Linde (1995). The theory postulates that strict ecological regulations and standards motivate firms to innovate and improve their competitiveness in the long run.

In the Central Asian region, particularly in Uzbekistan and Kazakhstan, there is evidence supporting these theoretical approaches from the practical side. Recent adoption of various regulations and legislative acts concerning renewable energy, energy efficiency, and waste management stimulates private investment.

Nevertheless, the implementation of environmental standards in some countries of the region faces certain restrictions. This fact makes it impossible to use the economic potential of green entrepreneurship. Thus, in developing a green economy strategy, it is necessary not only to approve various regulatory documents, but also to ensure their practical implementation.

5.3. The role of green finance

One of the key findings of the study is the direct link between green finance and green business development (North, 1990; Bruton et al., 2010). It was observed that green entrepreneurship activity is higher in countries with developed markets for green loans, green bonds, and ESG investments.

International experience shows that the transition to a green economy requires the active participation of private capital, along with public funds. Reports from the OECD, EBRD and World Bank also emphasize the crucial role of green financing instruments in economic transformation (European Bank for Reconstruction and Development, 2024).

In Central Asian countries, the green finance market is still at an early stage of development. In particular, the green bond market and mechanisms for financing environmental innovations are not sufficiently developed. Therefore, it is necessary to expand special financial platforms and public-private partnership mechanisms for green investments in the region.



5.4. Regional cooperation and prospects for a green economy

One of the distinguishing characteristics of Central Asia is the interdependence of its economy and ecology. In terms of water resources, the energy sector, and various ecological challenges, the region has a number of transboundary issues.

Aral Sea problem, water shortage, and climate change effects are examples of the problems that are hard to solve for separate countries. Hence, the role of regional cooperation becomes especially important for making the transition towards a green economy.

As follows from the research findings, the joint development of programs in relation to solar and wind energy, hydroelectric projects, green transport routes, and eco-innovation can speed up the green transition of the region.

5.5. Scientific and practical significance of the research

The importance of this work from a scientific point of view is determined by the fact that the Green Entrepreneurship Development Index (GEDI) is designed to measure the development of green entrepreneurship in Central Asian countries. The GEDI enables a uniform evaluation of the institutional, financial, and economic characteristics of the development of green entrepreneurship.

In practice, the results of the research may be useful for government bodies, international financial organizations, investors, and the representatives of the business community to enhance the policy of the green economy and create supporting measures for green businesses.

The results of the research may be used as the scientific and methodological ground for the fulfillment of Central Asian countries' commitments according to the framework of the Sustainable Development Goals (SDGs), the Paris Agreement, and the decarbonization strategy.

6. Strategic Recommendations and Policy Directions

Conclusions drawn from the results of the research indicate that the emergence of green entrepreneurship in Central Asian countries is largely determined by institutional, financial, and technological factors. Consequently, in order to speed up the process of the transition towards a green economy, different approaches should be applied according to the specifics of each country.

6.1. Strategic directions for Kazakhstan

Kazakhstan is one of the countries in Central Asia with the most developed institutional base for a green economy. The country's main advantages are a developed financial market, foreign investment flows, and renewable energy potential.

Therefore, the following priority areas are recommended:

- expanding the market for green bonds and ESG investments;
- Accelerate the strategy of phasing out coal power;
- development of wind and solar energy clusters;
- improving carbon trading mechanisms;
- supporting the export of green technologies.

A priority goal for Kazakhstan is to become a regional center for the green economy.

6.2. Strategic directions for Uzbekistan

Uzbekistan is one of the countries actively implementing reforms to transition to a green economy. In recent years, modernization projects in the energy, agricultural, and industrial sectors are creating new opportunities for green entrepreneurship.

The following strategic priorities are proposed for the country:

- expanding green lending programs for small and medium-sized businesses;
- establishing funds to support green startups;
- popularization of water-saving agricultural technologies;
- development of the waste processing industry;
- strengthening energy efficiency standards;
- establishment of green industrial zones.

The strategic goal for Uzbekistan is to form a center for green industry and green innovation in Central Asia.

6.3. Strategic directions for Kyrgyzstan

Kyrgyzstan's main advantage is its rich hydropower resources and ecotourism potential. However, the investment climate and underdeveloped infrastructure hinder the full use of these opportunities.

Therefore, the following measures are recommended:

- encourage the construction of small and medium-sized hydroelectric power plants;
- development of ecotourism clusters;
- attracting international green investments;
- support for ecological business projects in mountainous areas;
- expanding public-private partnership programs for green energy.

A priority goal for Kyrgyzstan is to develop an economy of ecological services and green tourism.

6.4. Strategic directions for Tajikistan

Despite Tajikistan's enormous hydropower potential, it is unable to fully utilize these opportunities due to investment and technological constraints.

The following strategic directions are recommended for the country:

- attract large-scale international investments in hydropower projects;
- modernization of energy infrastructure;
- development of green agriculture projects in mountainous areas;
- introduction of environmental certification systems;
- creating special financial programs that support green entrepreneurship.

The priority goal for Tajikistan is to ensure a green economic transformation based on hydropower.

6.5. Strategic directions for Turkmenistan

Turkmenistan's economy is highly dependent on the natural gas sector, and the transition to a green economy has been slower than in other countries in the region.

In this regard, the following priority areas are recommended:

- introduction of energy efficiency standards;
- development of solar energy projects;
- implementing institutional reforms that encourage private sector activity;
- improving the investment climate for environmental innovations;
- development of a national strategy for a green economy.

The main goal for Turkmenistan is to gradually reduce dependence on hydrocarbons and increase economic diversification.

6.6. Regional strategic model for Central Asia

In light of the results of the research conducted, the model of Green Entrepreneurship Regional Cooperation (GERCM) is developed in order to promote green entrepreneurship and sustainable business



development in the countries of Central Asia. The model is built according to four consecutive phases that will allow enhancing the cooperation of the regions and promoting a green economy transition.

The first phase is called the Institutional Integration. It is intended to establish the common institution for green development of the region. The activities that should be performed at this stage include the establishment of the regional green economy platform, the creation of the unified environmental standards, and the creation of the regional green business registry.

Financial Integration is focused on the provision of additional opportunities for accessing finance for investments into green projects and business operations in sustainable industries. The main actions in this phase should be the creation of the Central Asia Green Investment Fund, the development of the common green bond program, and the financing of cross-border green investment projects. All of these tools will help to involve both public and private investments, reduce risks for investors, and promote the implementation of sustainable development projects at the national level.

Technological Integration is associated with the emphasis on innovation and knowledge exchange as one of the main factors in the green economy transformation. The creation of the centers for transferring green technologies, the creation of the network of innovative start-ups, and the conducting of joint scientific research programs are the main actions in this phase. Thanks to such cooperation, Central Asian countries can quickly introduce new technologies and become more competitive in the green market environment.

Phase Four, Sustainable Development Monitoring, is meant to guarantee the effectiveness and accountability of regional green development policies. It involves the creation of the regional green economy indicator system, the monitoring of SDG indicators, as well as the evaluation of the development of green entrepreneurship within the region. The adoption of such a monitoring system would help in evidence-based decision-making and the assessment of sustainable economic transformation.

The GERCM that is to be developed could create an effective framework for institutional, financial, technological, and monitoring cooperation between Central Asian states. Thus, the model could become a powerful tool for the development of green entrepreneurship and sustainable business development.

Table 3. Strategic priorities matrix

Countr y	Priority sector	Main instrument	Strategic goal
Kazakhstan	Renewable energy	Green bonds	Regional Green Finance Center
Uzbekistan	Green industry and agrotechnology	Green loans and startups	Green Innovation Center
Kyrgyzstan	Ecotourism and hydropower	Public-private partnership	Ecosystem services economics
Tajikistan	Hydropower	International investments	Green energy transformation
Turkmenistan	Energy efficiency	Institutional reforms	Economic diversification

Source: Author by scientific literature based on compiled.

Therefore, the development of green entrepreneurship in Central Asia should not take place via one unified policy but rather through a differentiated approach that will consider the structure of the economy, the resource potential, and the capabilities of each individual country. At the same time, improved mechanisms of regional cooperation may play a significant role in increasing the efficiency of such a transition.

7. Methodological Innovation and Conceptual Model

7.1. Green Entrepreneurship Sustainable Development Framework (GESDF)

Based on the research results, a conceptual model, the Green Entrepreneurship Sustainable Development Framework (GESDF), was developed. This model systematically explains the mechanism of green entrepreneurship's impact on sustainable business development.

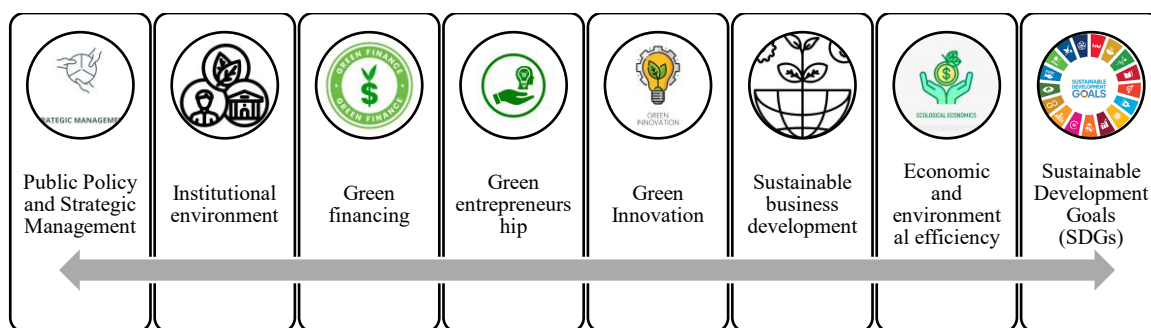


Figure 2. Green Entrepreneurship Sustainable Development Framework (GESDF)

Source: Author by scientific literature based on compiled.

According to the model, green entrepreneurship is seen as a central transformative element of the economic system. Public policies and institutional mechanisms encourage green financing, and financing, in turn, drives green innovation. As a result, sustainable business development and environmental efficiency are ensured.

7.2. Green Entrepreneurship Monitoring System (GEMS)

During the study, a Green Entrepreneurship Monitoring System (GEMS) was proposed to monitor the development of green entrepreneurship.

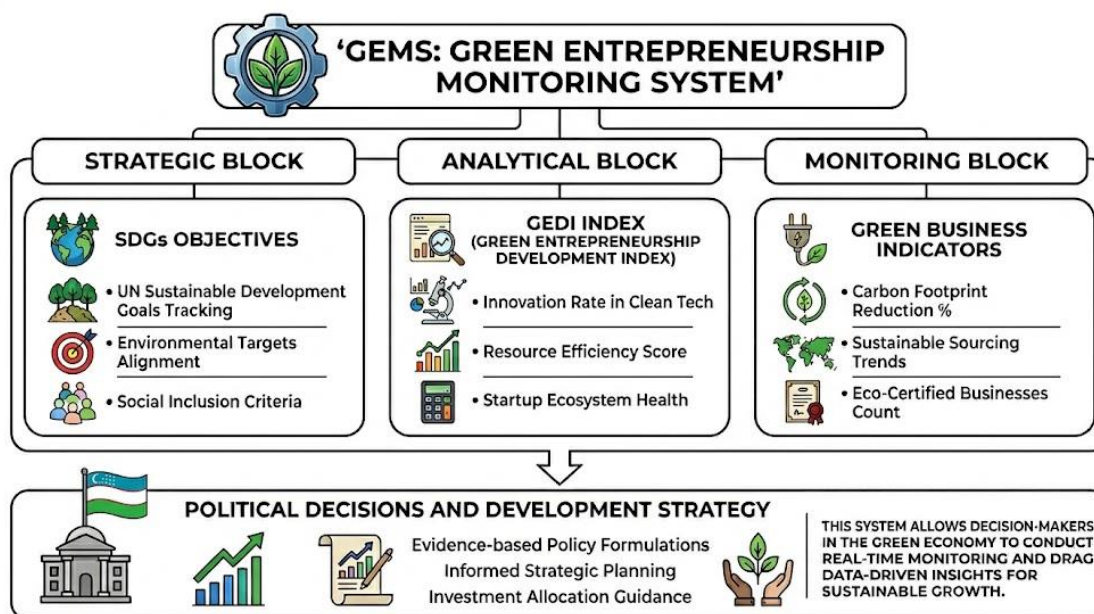


Figure 3. GEMS monitoring system

Source: Author by scientific literature based on compiled.

This system allows decision-makers in the green economy to conduct real-time monitoring.



7.3. Theoretical and practical contribution of the research

The theoretical contribution of the study is explained by the development of a conceptual approach that integrates the institutional, financial, and innovative determinants of green entrepreneurship into a single system. In practical terms, the GEDI, GESDF, and GEMS instruments can be used by government agencies, investors, international financial institutions, and researchers to assess and manage the development of the green economy.

8. Conclusion

In the course of this research, the place of green entrepreneurship within the sustainable development of businesses in Central Asian countries was considered, and the most important trends and problems of the transition to the green economy in this region were revealed. In the course of this research, the theoretical approaches, the experience of other countries, and the specifics of development in the region were studied, and the significance of green entrepreneurship was justified.

In accordance with the findings of this research, the following scientific conclusions can be made.

Firstly, green entrepreneurship is one of the key factors that will ensure sustainable development in the countries of Central Asia. This is becoming an effective approach combining the ideas of economic growth, environmental sustainability, and innovations. Green business, especially those that develop renewable energy sources, resource-efficient agriculture, waste recycling, and environmental services, helps to diversify the economies of the region.

Secondly, considerable disparities in the degree of green entrepreneurship development in the region were revealed. By the results of the Green Entrepreneurship Development Index (GEDI), Kazakhstan proved to be the country with a comparatively highly developed green entrepreneurship ecosystem. Uzbekistan can be classified as a country with a medium-high level of development of green entrepreneurship, and the reforms conducted in recent years create favorable conditions for its development. Kyrgyzstan and Tajikistan, despite their high potential in green energy, can be classified as countries at a medium level of development of green entrepreneurship because of financial and institutional limitations. Finally, Turkmenistan was placed in the low level of development cluster due to the underdevelopment of green economy institutions.

Thirdly, public policies, institutional framework quality, green finance system, and innovation infrastructure were identified as important factors influencing the development of green entrepreneurship. Specifically, it was found that green loans, green bonds, and public-private partnership mechanisms positively affect the level of green entrepreneurship development.

Fourth, the need for a differentiated strategic approach, taking into account the economic structure, resource potential, and institutional capabilities of the countries, rather than a single development model for the Central Asian countries, was substantiated. Within the framework of the study, separate strategic priorities were developed for each country, and their practical significance was demonstrated.

Fifth, as a methodological innovation of the study, the Green Entrepreneurship Development Index (GEDI) and the Green Entrepreneurship Sustainable Development Framework (GESDF) conceptual model were developed. This model allows for a systematic explanation of the interrelationship of green entrepreneurship with public policy, financial infrastructure, innovation, and sustainable development outcomes.

Sixth, the Green Entrepreneurship Regional Cooperation Model (GERCM) was suggested as an alternative option for Central Asian states to develop green entrepreneurship. The suggested model is intended to speed up the formation of the green economy through regional integration, cooperation on investments, technologies, and innovations in the sphere.

Seventh, to be able to efficiently control and assess the activity of green entrepreneurship, the idea of the Green Entrepreneurship Monitoring System (GEMS) has been formulated. Such a system provides possibilities to monitor, assess, and predict the green economy indicators.

To sum up, the results of research demonstrate that the formation of green entrepreneurship in the Central Asian region is not only a way out of environmental problems, but also the tool of modernization, investment attraction, employment creation, and sustainable development in general. Consequently, the further improvement of institutions, finance, and innovation instruments of support of green entrepreneurship in the process of transition to the green economy is to become one of the key aspects of the economic policy of the countries of the region.

It is recommended for future studies to optimize the index GEDI by applying more comprehensive statistical information, to estimate the effect of green entrepreneurship on economic development by means of econometrics, and to conduct empirical studies within each sector mentioned above (renewable energy, green industry, eco-tourism, and circular economy).

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The Impact Of Sustainable Tourism Marketing on Tourist Behavior in Cultural Heritage Destinations

Nazmiye Sonar 

Tourism Strategies, Cultural Heritage and Made in Italy Program, Faculty of Humanities and Philosophy, University of Rome Tor Vergata, Rome, Italy

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Abstract

It is an undeniable fact that the tourism industry is increasing rapidly in states and other countries every year due to its contribution to the economy. The sector's contribution to the economic growth and development of countries through foreign exchange earnings and employment generation has made a significant contribution to the global travel market. Protecting the tourist destination's resources and ensuring its sustainability is essential for achieving a sustainable competitive advantage. Given the increasing pressure on natural and environmental resources today, the management of natural and cultural relics, which are more important than those of tourism, is one of the key issues to ensure competitiveness. Therefore, it is important to consider infrastructure at the destination, and the infrastructure approach provides an appropriate theoretical framework. Globalization, technological advances, and increasing numbers of tourists have stiffened competition among destinations and necessitated the modification of itineraries according to the tourist experience. Cultural destinations are of particular interest to tourists due to their history, culture, and traditions; This makes protecting their assets even more difficult. In this context, sustainable tourism emerges as a strategy not only for the promotion of destinations but also for the preservation of their natural and cultural heritage. This study aims to examine the effects of sustainable tourism behavior of consumers in historical contexts. At the research level, the concepts of sustainable tourism, sustainable space tourism, contextual characteristics, and tourism behavior are presented, and a conceptual analysis is carried out based on a review of national and international literature.

Keywords: Sustainability, Tourism, Marketing, Cultural Heritage, Tourist, Behavior

1.Introduction

Cultural heritage tourism is one of the growing fields with various new tourist destinations. Tourism helps in creating awareness among the people and strengthens the cultural identity of the people. Recent research shows that cultural tourism has become a key segment of the international tourism market, and interest in this category is increasing along with the rise of cultural activities. The cultural significance of tourism is not only the relics of the past but also the transmission of attachments and identities. In this context, historical sites function not only as abstractions but also as sites where people interact and create meanings. Though all traditions change with time and place, the uniqueness of each gives rise to its own meaning and spirit; It also made him popular. Biodiversity is as essential to nature as diverse world cultures are to humanity. Therefore, cultural diversity is a humanitarian concern and should be identified, supported, and protected for the sake of current and future generations.

When the cultural heritage tourism literature is examined, it is revealed that it has an interdisciplinary structure. Fields such as tourism studies, cultural studies, sociology, anthropology, and psychology address cultural heritage tourism with their own philosophical and methodological approaches. With the spread of

the experience economy in recent years, qualitative methods have increased in heritage tourism research. These methods focus on understanding the multifaceted nature of tourists' experiences at heritage sites.

Culture is an important and influential concept that shapes how people live, what they value, what they believe, and how they live their daily lives. This is the subject of debate in tourism theory and practice. How people travel depends heavily on their culture. This is especially true for cultural heritage tourism because history, symbolism, and cultural aesthetics play a crucial role in shaping individual and collective identities. Another important aspect of cultural heritage tourism is identity construction. Rapid changes in the contemporary world threaten people's sense of self, which further emphasizes the need to connect with the past. Heritage sites are important places where these connections can be re-established. In these spaces, tourists interact with cultural experiences while making meaning of the past and participating in the symbolic reconstruction of identity.

While economic benefits are the driving force behind tourism development, it comes at the expense of environmental, social, and cultural degradation. Visitors can help in many ways. They contribute to the local economy by purchasing local goods and services. They help the environment by being eco-friendly and choosing pleasure responsibly. They also contribute to socio-cultural sustainability through their experiences of the destination and their interactions with locals. Thus, visitors can contribute to the development of sustainable tourism, both physically and spiritually. According to research, visitors' positive attitudes increase their support for sustainable tourism. Indeed, sustainability can only be achieved if it supports the responsible behavior of visitors and their choices regarding sustainable products/services. Therefore, it is important to understand the impact of tourism and how to support sustainable tourism development. This knowledge will help to develop a more comprehensive approach to sustainability that incorporates the supply (presentation) and demand (visit) aspects of tourism.

2. Conceptual Framework

2.1. Sustainability and Sustainable Tourism

Changes in the world over the past 20 to 30 years have also affected mobility. The political and economic changes in the world have also contributed to the growth of tourism. A focus on sustainable growth is one of the key factors accelerating the pace of change in the industry. Sustainable development refers to the process of changing management, economy, technology, and institutions, transforming organizations to meet the needs of the present and the future (Budeanu, 2005). As best understood and defined, sustainable development is meeting present needs without compromising future benefits. One of the necessities for sustainable development is public transportation. After all, to create sustainable tourism at home or abroad, natural resources and sustainable tourism traditions can be completely destroyed. This undermines future tourism and undermines sustainable development. Sustainable tourism is an approach that emphasizes the importance of local communities and promotes the economic development of tourism. Since then, certification programs based on environmental performance and under various names have been established, with various awards/labels awarded to hotels, travel agencies and/or tourism associations. Since then, sustainable tourism has evolved into a more comprehensive approach, which refers to a fundamental understanding of the environment, which can be considered as a tool for economic growth, social well-being and environmental protection. As society has become aware of this, tourism policies and organizational initiatives have influenced all regions, allowing the concept to spread and to be given meaning and significance. (Kuşat, 2012: 228).

Tourism is an industry that relies heavily on data. While tourism is a tool for the development and protection of cultural heritage, the protection and enhancement of these heritage resources are essential for tourism purposes (Cherplan, 2013: 51). We cannot talk about tourism where cultural heritage is being destroyed. The growth of the tourism industry in a country leads to social and economic changes. Furthermore, the environmental impact of tourism was found to be increasing as the world population increases. The development of the tourism movement has also affected the environment, and the increasing



focus on the economic aspects of tourism has led to a focus on the relationship between tourism and the environment. (Wall, 2002: 90).

Sustainable tourism is a positive approach to reducing the negative impacts on the tourism industry, visitors, the environment, and host communities. This approach involves ensuring the sustainability of both natural and human resources. The concept of sustainable tourism refers to the relationship between tourism and the environment. Tourism is the largest consumer of natural resources compared to other sectors of the economy. (Kahraman & Türkay, 2014: 95). The environmental resources of a destination are among the most important factors driving tourist demand. These resources are an important factor in people choosing a destination, and if these resources are degraded, the attractiveness factors of the destination will be disrupted. The long-term continuation of destination attractiveness will be possible with the development of environmentally sustainable tourism.

2.2. Cultural Heritage

Traditional culture provides access to valuable studies from areas of interest, to strengthen people's connections with local environments and resources, promotes the advancement of knowledge and cultural development, and guides development. Hire a colleague or mentor, or a traditional practice facilitator in a traditional community, to be a strong role model, and attend spiritual healing regularly. Culture is a collection of unconscious and conscious beliefs about what is known, what can be proven, and what is most important. This is the richness and diversity of the city, including its artistic and cultural heritage, and its unknown cultural heritage such as language, culture, or football, music, and local entertainment (Fitri vd., 2015).

In treaties and international legal texts developed by international organizations such as UNESCO and ICOMOS, the concept of cultural heritage is divided into tangible cultural heritage, intangible cultural heritage, and maritime cultural heritage. Cultural heritage is divided into tangible and intangible cultural heritage. Movable cultural heritage includes paintings, sculptures, seals, manuscripts, and archaeological artifacts; intangible cultural heritage includes monuments, archaeological sites, historic city buildings, and other structures; maritime cultural heritage, including sunken ships, sunken cities, and towns; intangible cultural heritage includes oral traditions, performing arts, and festivals; And natural heritage includes cultural lands, cultural landscapes, and natural areas, which include physical, biological, and geological formations. (UNESCO, 2024).

2.3. Sustainable Tourism Management and Marketing in the Context of Tourist Destinations

Tourism operates within a complex environment of economic, social and political incentives that influence politics and business activity, crossing traditional institutional boundaries and connecting various stakeholder groups. Because the tourism industry crosses boundaries and is socially embedded, it affects collaboration and entrepreneurship. It's also harmful to the environment. Sustainable development requires the integration of various environmental, social, and economic factors in order to be sustainable. (Kernel, 2004: 151).

Tourism is a growing industry | The number of tourism products and services is increasing. Tourism is becoming more and more important, and tourism is becoming more and more important every year. This rapid growth has created a wide range of tourism products and destinations. Therefore, there is a need for new forms of tourism, such as microtourism, experiential tourism and rural "experience" tourism. (Lordkipanidze et al., 2005:788). The search for alternatives in tourism is seen as a new policy to prevent the rapid destruction of the environment and social fabric. Tourism, which is mainly based on natural resources, is very compatible with the concept of sustainable development. However, Butler also points out that the need for sustainable development and tourism to coexist makes the facts acceptable. Butler reveals two sides of the truth.

Sustainable tourism concepts have been developed and applied in tourism for decades and are widely discussed in national and international literature, books, and policies. It has become a popular tool in

tourism planning, development, and conservation, covering all aspects of tourism (protected area tourism, hotel management, whale watching, scuba diving, space tourism, etc.). Although recent developments in economics demonstrate the economic importance of the environment and the availability of environmental solutions, a new way of thinking about environmental impacts is needed. (Garrod & Fyall, 1998: 203).

Today, sustainability is one of the new development trends in all forms of development, including tourism. The concept of sustainability has been applied to the tourism sector in a variety of ways: internationally, nationally, and locally, at the public and private levels. Some private companies are more environmentally conscious in their policies. However, it's unclear whether this is based on a genuine concern for the environment or just a business strategy to appeal to customers and try to delay corporate regulation. For example, Butler argues that the tourism industry has embraced sustainability for many reasons beyond marketing (Kuo & Hsiao, 2007: 8).

Over the past decades, individuals, organizations, and governments have made considerable efforts to identify resilience factors and to develop methods for assessing and implementing these factors. The recruitment process has become an important part of this process. Based on the research adopted as principles of sustainable tourism in different regions, they have been widely applied and further developed in different regions of the world. This is especially important when launching sustainable tourism programs in new destinations. To demonstrate the effectiveness of a program, it's important to have detailed knowledge of your current practice and regularly evaluate its use (Twynam & Johnston, 2002: 1165). Another aspect of the sustainable tourism management framework is the concept of sustainable infrastructure. However, the concept of sustainable products, in and of itself, has been considered a marginal economic benefit considering the "quality of life" rather than the taxation of the quality of life. Typically, this stems from the strength of conservation issues in areas where cultural and environmental sites are protected rather than a conflict of interest. Although several studies have discussed the importance of ensuring cultural, social, and environmental sustainability in tourism sectors, such funding has not been proposed. A systems perspective that encompasses the tourist destination and emphasizes the relationships between tourists has not been well developed in the literature (Nortcote & Macbeth, 2006: 200).

It is in the teaching done through short training sessions that input analysis presents a problem. The concept of carrying capacity, a term that refers to a specified limit, is characteristic of the view of the installation. McCool argues that a good evaluation plan requires an evaluation plan that focuses not only on clarity of purpose in terms of inputs, but also on outputs. Clearly, an evaluation framework should give inputs and outputs equal consideration, and treating a phenomenon as part of a broader research-based framework is the best way to address this (Tosun, 2001: 290–291).

2.4. Destination Marketing

There are various debates on the concept of destination in the tourism literature, and it is not possible to discuss a standard definition of destination. Destination can be defined as: (i) destination, delivery or pickup, (ii) specific travel purpose (2021). On the other hand, a tourist destination can be defined as: (i) an attractive place that offers tourists recreation and leisure opportunities due to its demonstrated natural or cultural value, historical significance, natural or built tourist cultural value or beauty, and is exciting, (v) a place where tourists can spend the night (Fyall vd., 2012).

The World Tourism Organization defines regional tourist destinations as physical places that encompass tourist experiences and services, such as tourist services and entertainment. They have physical and administrative features that define their leadership positions, and images and perceptions that define their competitiveness in the marketplace. Community tourism brings together a variety of stakeholders, often including host communities, and they can cooperate and collaborate to create larger destinations. They are important centers for importing tourism goods and enforcing tourism policies (Susila vd., Alıntı 2024).

Tourism destinations are among the most difficult to market, involving many stakeholders and brands over which the tour operator has very little influence. (Xu vd., Alıntı 2020). Place loyalty is a key indicator



of successful destination marketing because it predicts customer loyalty and interpersonal behaviors such as ambassadorship and advocacy in commercial settings. On the other hand, the determining factor for a geographical location to obtain the status of a tourist destination is not its size or geographical boundaries, but its ability to attract tourists and satisfy their needs. A tourist destination consists of several parts, such as (Aktan vd., 2022).

- Attraction: encourages tourists to visit a specific tourist destination.
- Their proper services: accommodation, food, recreation, entertainment, and other services.
- Accessibility: In addition to visiting certain cultural attractions in the city,
- Development and landing of the transportation future associated with the destination.
- No affinity: pre-arranged packages from tourist vendors and businesses.
- Activities - All non-host disadvantages that users can benefit from when visiting a specific tourist destination.
- Support services - base developed ideas that are carried out by designated organizations to meet the needs of tourists (Aktymbayeva vd., 2023).

2.5. Anti-Marketing Approach and Sustainable Tourism

When examining the relevant literature, scholars studying scarce resource management and the scarce demand generated by mass tourism generally suggest more appropriate and viable markets for supplementary activities. However, common to all cases is the natural environment, and many recreational and tourism activities based on the natural environment have been encouraged for tourists to use, in response to the problems encountered. A growing concern for environmental sustainability, and therefore the various measures taken for the experience of nature, is to maintain the recyclability of the resources used in tourism experiences at an acceptable and sustainable level so that future generations will be able to use those resources. With the growing demand for nature-based tourism destinations, non-marketing has become an important control tool and has allowed these destinations to be environmentally and economically sustainable. (Magalhães vd., 2017).

Beaton (2001), from a tourism perspective, defines more than sustainability as a place that has exceeded its capacity in terms of visitor numbers before reaching a suitable level of regeneration. While increasing visitor numbers increase revenue, the pursuit of financial gain often leads to environmental degradation. Access control of nature-based tourism is important because the sustainability of nature depends on the number of visitors, and disturbance of nature will represent a detriment to tourism in nature-based tourism. (Beaton, 2001).

Wearing and Neal (2009) propose non-marketing as a control tool in ecotourism management. He considers the non-marketing concept to be a very effective strategy as it will allow visitors to have controlled access to ecotourism destinations with limited resources. Ware and Neal (2009) listed the most important non-marketing practices that can be adopted in these destinations, such as fixing prices, restricting access through queuing, and encouraging various negative promotional strategies. In terms of environmental management and sustainable tourism, the National Parks Canada Environmental Sustainability Panel has recognized non-marketing as a management tool recommended by Parks Canada (Wearing & Neil, 2009).

2.6. The Impacts of Sustainable Tourism Marketing on Cultural Heritage Destinations

It is generally accepted in the tourism literature that destination image plays an important role in destination choice. A well-coated floor is preferable to a bare or rough floor. (Kotler et al., 2017). Understanding the attitudes and perceptions of the people in the target market is important for marketers to promote the destination to the target audience through appropriate communication channels. Methods of communication and access to information have changed dramatically over the past two decades. This

change has been driven by advances in technology, changes in tourist behavior, the emergence of new tourist destinations, and increased competition among tourist destinations. (Echtner & Ritchie, 2003).

A review of the cultural heritage tourism literature reveals an interdisciplinary structure. Fields such as tourism, culture, sociology, anthropology, and psychology address cultural heritage tourism with their theoretical and methodological approaches. (Timothy and Boyd, 2003). Recreational motivation is important in the development of cultural heritage tourism. In postmodern tourism, cultural experiences are increasingly related to entertainment (Richards, 2020). Through tools such as participatory workshops, digital navigation applications, and interactive exhibits, visitors are educated and entertained. At the same time, they can build deeper connections to heritage. This change is driven by new methods that allow for more powerful conversations, especially with a new generation of tourists interested in social media. (Richards, 2018).

To gain a competitive advantage in the tourism market, it is important to have a good understanding of the potential impact of a destination on tourist demand. Tourism wealth in a destination can be said to be a comparative advantage. The comparative advantage of international firms will provide a competitive advantage in the future. However, environmental protection plays an important role in the use of these materials. For unless a permanent discovery is made, it is impossible to speak of the competition and profitability of tourism. Our sustainability depends on the efficient and sustainable use of these resources. Preserving the history, culture, and natural resources of the tourist area will continue to attract tourists in the future. Meanwhile, destinations' ability to translate their comparative advantages into competitive advantages will enable them to continue to increase their share levels and competitiveness. (Chen & Tsai, 2007).

Tourists' environmental and cultural awareness has increased significantly in recent years. This trend has led to an increase in demand for travel destinations that incorporate environmental principles. Tourists don't just want to see the past; They also want to experience local culture, support environmentally responsible businesses, and contribute positively wherever they go. Moreover, vulnerability assessment is crucial to understanding the impacts of climate change (Font and McCabe, 2017). Tourism plays a crucial role in preserving, restoring, and passing on cultural heritage sites to future generations. It brings many benefits such as strengthening the destination brand, increasing tourist satisfaction, building loyalty to the destination, supporting local communities, and protecting the environment. Therefore, economic models applied to cultural heritage sites should be regulated according to conservation principles. This approach is essential not only for long-term tourism but also for the effective management of cultural heritage. (UNESCO, 2023).

3.Conclusion

In recent years, concepts such as environmental awareness, environmental values, and environmental sensitivity have gained importance in tourism demand and are seen as effective. Therefore, care should be taken to develop and increase the diversity of eco-friendly tourism products and values while protecting the natural values influencing the demand of the target audience. Environmentally conscious tourists will look for alternative destinations with untouched natural structures. It is therefore important to identify the environmental resources of places and prevent their misuse for tourism purposes. It is not possible to protect environmental resources without the involvement of destination stakeholders (tourism businesses, local government, and local people).

Sustainable cultural heritage management is a process that seeks to recognize the overall value and importance of a cultural heritage site, preserve, protect, and value it through a sustainable and accessible approach, improve current resources and fulfill needs, and establish policies, plans, and outcomes for the short, medium, and long term. Updates to research and education. Management plans for protecting and preserving cultural heritage sites aim to protect and develop the outstanding universal value of the site for



present and future generations and take action to achieve it. Basic strategies and action plans should be determined to achieve these goals.

Therefore, the physical, economic, and social carrying capacity must be determined by seeking the views of stakeholders. But it's not easy. In particular, the environmental damage caused by industrial activities in Poland that occurs at certain times of the year can be overlooked. This condition can exceed the carrying capacity. Exceeding carrying capacity will lead to lower projects, more construction, higher prices, and ultimately a poor tourist experience. Improving the content of your marketing destination and ensuring a positive visitor experience are as important as maintaining a competitive advantage. In order to sustain the competitive advantages of tourism destinations, it is important to identify and define primarily regional and local unique attraction resources. In particular, it should not be forgotten that natural and developed resources are attractive elements that drive the demand for a tourist destination. Environmentally friendly new products should be developed to increase the diversity of products while protecting the environmental values that the tourism destination has, and which enhance the motivation of the target audience. In doing so, quality and price superiority should also be ensured. When evaluating the competitiveness of a destination, threats to the rare and inimitable resources of the region should be neutralized, and strategies should be developed that will give an advantage over competitors.

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Environmental Innovation and Sustainable Business Performance Among SMEs in Kyrgyzstan

Batyrkul Baetov¹ , Bolot Toksobaev² 

¹Research Institute of Economics, Kyrgyz Economic University named after M. Ryskulbekov, Bishkek, Kyrgyz Republic.

²Institute of Continuing Open Education, M. Ryskulbekov Kyrgyz Economic University, Bishkek, Kyrgyzstan.

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Abstract

Small and medium-sized enterprises (SMEs) account for the bulk of employment and value added in the transition economy, but their environmental footprint and opportunities for environmental innovation have not been explored outside the context of the OECD. This article develops a conceptual framework and proposes a research methodology for studying environmental innovations, including processes, products, and organizational aspects. Building on Porter's hypothesis, the firm's natural resource-based vision, and the literature on determinants of environmental innovation, the paper synthesizes existing theoretical and empirical research to produce a set of testable propositions that link the implementation of environmental innovation to the firm's financial and non-financial performance, driven by access to finance and innovation. regulatory pressure. The article examines these proposals in the institutional context of Kyrgyzstan, including the Green Economy Development Program (2019-2023) and donor-supported green finance tools. Instead of reporting the results of an initial survey, the paper suggests a differentiated cross-sectional design of the study, operates with appropriate constructs, and identifies an appropriate analytical strategy for future empirical testing. The discussion examines the obstacles that Kyrgyzstan expects from SMEs-limited capital, information gaps, and weak executive capabilities - and leads to the implications of the initial policy. This paper presents a context-sensitive conceptual model and a recurring methodological roadmap for future firm-level research on environmental innovation and SME performance in Central Asia.

Keywords: environmental innovations; SMEs; sustainable development; green economy; Kyrgyzstan; Central Asia; resource efficiency

1. Introduction

Small and medium-sized enterprises (SMEs) form the backbone of most transition economies, accounting for a significant portion of employment, gross domestic product, and entrepreneurial activity outside of mining and large-scale industry. In the Kyrgyz Republic, SMEs are widely recognized by national authorities and international financial institutions as a central part of economic diversification, but their environmental performance and ability to implement sustainable innovations receive relatively little systematic and rigorous attention in the academic literature. This gap is notable because the impacts of environmental pressures, including water stress, air pollution, energy density, and climate-related shocks, are increasingly recognized as structural challenges for the Kyrgyz economy (UNECE, 2024).

Over the past decade, the Kyrgyz Government and its international partners have implemented a number of policies and financing tools aimed at promoting environmentally sound practices at the firm level. The Green Economy Development Program of the Kyrgyz Republic for 2019-2023 identified seven priority sectors as targets for environmentally oriented investments, including green energy, green industry, and Waste management (Government of the Kyrgyz Republic, 2019). In parallel, the European Bank for Reconstruction and Development (EBRD) has funded several phases of the Kyrgyz Sustainable Energy Finance Facility (KyrSEFF), helping local banks to invest in credit lines in energy efficiency and resource efficiency, climate change resilience, and environmental pollution reduction (EBRD, 2025). These initiatives suggest that SME greening policies are gaining momentum; it is unclear whether environmental innovations will actually lead to better business performance for the firms that implement them.

The international literature on environmental innovation, often referred to as ECO-innovation, provides a rich but mostly Western European and East Asian evidence base on the determinants and consequences of green innovation at the firm level (Horbach, 2008; Horbach, Rammer, & Rennings, 2012). However, Central Asian SMEs operate in a special environment: smaller domestic markets, relatively undeveloped green finance ecosystems, and regulatory regimes are still being strengthened following the implementation of national green economy strategies. The relationships identified in OECD studies — for example, between technological ECO-innovations and cost savings, or between product ECO-innovations and market differentiation-retention in the context of SMEs in Kyrgyzstan- were an open empirical question, and the author's knowledge was regularly tested at the firm level.

This document does not provide new primary data; rather, it performs a narrower, but necessary, previous function. The aim of the paper is to develop a conceptual framework that links environmental innovation to sustainable business performance among Kyrgyz SMEs and to propose a reliable, reproducible research methodology that can test this framework as soon as primary data collection becomes possible. In particular, the article aims to: (1) synthesize theoretical foundations related to environmental innovation and efficiency relations; (2) review the determinants of environmental innovation and known productivity effects, focusing on evidence from SMEs; (3) positioning the base within the framework of Kyrgyzstan's green economy policy; and (4) launching structures and creating a future firm offer a sample, toolkit, and analytical strategy for the level survey.

The rest of the article is structured as follows. Section 2 reviews the theoretical and empirical literature on environmental innovation and sustainable functioning, focusing on the institutional conditions of SMEs in Kyrgyzstan. Section 3 suggests a research design that includes a sampling strategy, variable operationalization, and an analytical strategy. Section 4 discusses expected relationships based on the literature and examines their policy implications. Section 5: Conclusion.

2. Literature Review

2.1 Conceptualizing Environmental Innovations

Environmental innovation is usually described as the introduction of new or significantly improved products, processes, organizational practices, or marketing approaches that reduce environmental damage compared to appropriate alternatives (Renning, 2000). The OECD Oslo Guidelines place environmental innovation in a broader taxonomy of innovation in products, processes, organizations, and marketing, while emphasizing that the hallmark of environmental innovation is its environmental outcome, not technological innovation (OECD, 2005). Based on this taxonomy, the literature generally identifies three categories relevant to firm-level analysis: technological ECO-innovations (e.g., energy-efficient production technologies, waste reduction techniques), product ECO-innovations (e.g., environmentally friendly goods and services), and organizational ECO-innovations (e.g., environmental management systems, resource



efficiency (Horbach, 2008). This three-way distinction underlies the conceptual model proposed in section 3.

2.2 Theoretical basis: competitiveness compared to the price of conformity

Two competing theoretical perspectives define the expected relationship between environmental innovation and firm performance. The first is related to Porter and van der Linde (1995), who argue that well-designed environmental regulation and voluntary environmental innovation can drive efficiency gains, reduce resource losses, and open up new markets, thereby increasing rather than reducing competitiveness – a proposition commonly referred to as the Porter hypothesis. Second, based on the neoclassical costs of regulatory compliance, environmental investments divert capital and management attention away from core production activities, especially burdening small firms with limited Slack resources. An additional perspective, the firm's natural resources-based vision (Hart, 1995), suggests that opportunities built on pollution prevention, product management, and sustainable development can eventually become a source of competitive advantage, but the realization of this advantage depends on additional organizational capabilities. These three points of view are not mutually exclusive: further empirical work has shown that the impact of environmental innovation is heterogeneous by type of innovation, sector, and firm size – a model relevant to the SME-specific proposals developed below (see, for example, evidence for heterogeneous effects considered in the study of different shades of green ECO-innovation).

2.3 Determinants of environmental innovation in firms

Empirical studies of drivers of environmental innovation, most of which are based on data from innovation research in the German community, identify three broad clusters of determinants: regulatory push / pull factors (current and expected environmental regulation), technology push factors (R & D opportunities, previous innovation experience, knowledge capital), and market factors. engagement factors (consumer demand for eco-friendly products, cost savings due to resource efficiency) (Horbach, 2008; Horbach, Rammer, & Rennings, 2012). Regulatory pressures have been found to be particularly important for emissions-and hazardous substance-oriented innovations, while the motivations for market engagement and cost savings seem to be more obvious for resource efficiency and energy efficiency innovations (Horbach et al., 2012). It has been shown that perceptions of customer interests and regulatory threats together shape the likelihood that a firm will introduce environmentally friendly product innovations (Kammerer, 2009). Partnerships with suppliers, customers, or research institutes further increase the likelihood of environmental innovation, and firms with limited internal R & D, unique to SMEs, may rely disproportionately on external sources of knowledge (de Marchi, 2012).

2.4 Environmental innovation and firm performance: mixed evidence

The relationship between environmental innovation and reliable performance is not so positive in the empirical literature. Research conducted using panel data at the level of German firms shows that environmental innovation is associated with employment growth in some technology sectors, but not in others, and these productivity effects differ depending on the type of environmental innovation and the sector in which the firm operates (Horbach & Rennings, 2013). This heterogeneity warns against considering environmental innovations as a single undifferentiated construct when modeling their impact on productivity and supports processes, products, and organizational environmental innovations considered separately in the framework proposed in Section 3.

2.5 loophole in SME and eco-innovation resources

SMEs face structural disadvantages compared to large firms in implementing environmental innovations: limited internal R & D budgets, limited access to long-term financing, weak management

capabilities in environmental regulation, and weak bargaining power with suppliers and certification bodies. These constraints help to understand that blue environmental innovations often depend more heavily on external factors-supplier and customer relationships, industry associations, and, more importantly, specialized green financial institutions-than on large internal resource firms (de Marchi, 2012). This consideration applies directly to Kyrgyzstan, where donor-supported credit lines are clearly intended to fill the funding gap that restricts environmental investment at the KyrSEFF SME level.

2.6 Transition to a green economy in Kyrgyzstan

Over the past decade, Kyrgyzstan's policy of greening economic activity has made significant progress. The 2019-2023 Green Economy Development Program sets priorities in seven sectors, including green energy, green agriculture, green industry, low-carbon transport, sustainable tourism, waste management, and green cities (Government of the Kyrgyz Republic, 2019). Complementing this domestic policy architecture, the EBRD country strategy for the Kyrgyz Republic is to expand green finance programs for SMEs and households, manage climate risks, and support investment in resource savings (EBRD, 2024), while Kirseff's sequential steps aim to assist in financing through local banks. Resource efficiency and adaptation to climate risks (ETTB, 2025). In the United Nations Economic Commission for Europe, the third Review of Kyrgyzstan's Environmental Performance (2024) documents institutional progress — such as the introduction of automated air quality monitoring and the establishment of a climate finance center-and current structural challenges, including high energy density and dependence on imports. Energy mix (UNECE, 2024). Taken together, this institutional context shows that there are prerequisites for environmental innovation at the SME level in Kyrgyzstan-policy signaling and special financing-but firms remain open to whether these enabling conditions translate into accepted innovation and whether adoption is associated with increased productivity. An empirical question that motivates the proposed research project is given below.

2.7 Economic profile of SMEs: scope, structure, and limitations of financing

Official statistics on the economic weight of SMEs in Kyrgyzstan vary significantly depending on the definition and reflect a methodological point relevant to the current framework. Using a narrow definition restricted to officially registered small and medium-sized enterprises, the World Bank's independent assessment group reports that such firms accounted for only 4% of employment and 12-13% of GDP between 2013 and 2021.less than 800. National medium-sized enterprises-just 0.1% of registered enterprises-represent a net "missing middle" in the distribution of enterprise size (IEG World Bank, 2023). Using a broader definition that includes individual entrepreneurs and peasant farms, the National Statistical Committee of Kyrgyzstan reports that a significant contribution was made: small and medium-sized enterprises gross value added amounted to 664.6 billion kg in 2024, equivalent to 43.6% of GDP, and the sector's share in official relations increased even more, to 51%, in early 2026 (Akchabar, 2025; Kabar, 2026). As of 2024, the National Statistics Committee registered 18,139 small businesses paying taxes, employing about 585,000 people across the country, while private entrepreneurs accounted for about 65 percent of agricultural output and 26 percent of industrial output, and small and medium-sized businesses accounted for about 80 percent. Chui region (Central Asian period, 2024). This urban concentration is directly related to the regional stratification proposed for the sample range in Section 3.2, as this means that a proportional regional sample may underestimate the activities of SMEs in Osh and Southern oblasts compared to their significance for development.

The financing conditions facing SMEs in Kyrgyzstan represent another structural feature related to the field of environmental innovation. The ratio of domestic private credit to GDP rose from about 16 percent in 2013 to 28 percent in 2020-a marked improvement, but still below the 43 percent average seen in middle-income countries-while informal economic activity exceeds 30 percent of GDP (World Bank). IEG, 2023).



The relatively shallow formal credit market, partly combined with a large informal sector operating outside of business registers and tax-related statistics, has two effects on the current framework: first, it reinforces the theoretical expectation that external, dedicated (section 2.5) green finance tools such as Kirseff plays a big role in internal profitability or traditional loan capital well-banking Second, it is the restriction on public recognition in Section 3.6, implying that a case-based structure built solely on official business records (Section 3.2) excludes businesses that regularly operate informally.

Table 1 summarizes these economic indicators along with the baseline and annual ones, clearly showing differences between the economic weight of a narrow (officially registered) and broad (including individual entrepreneurs and peasant farms) SME sector.

Table 1. Selected economic indicators-SME sector in Kyrgyzstan

Indicator	Indicator value /	Period source
share of officially registered SME GDP (narrow definition)	12-13% (Aug 2013-2021)	World Bank IEG (2023)
share of SMEs in official employment registration	~4% (avg. 2013-2021)	World Bank IEG (2023)
medium-sized enterprises (number/share of all enterprises)	<800 firms; 0.1% (2013-2021)	World Bank IEG (2023)
SMEs Gross value added, broad definition (GDP %)	43.6% (2024); 51% (early 2026)	Akchabar (2025); Kabar (2026)
2026), registered 18,139 (2024) Small enterprises-taxpayers in Central Asia (number)	18,139 (2024)	Central Asian Time (2024),
employment in Central Asian SMEs based on NSC, broad definition	~585,000 people (2024) times (2024),	Central Asian SMEs: Geographical concentration
(Bishkek + Chui)	~	80% of all SME periods in Central Asia (2024),
domestic private GDP credit	16% (2013) → 28% (2020)	World Bank IEG (2023)
Informal sector, share of GDP	> 30% (2015 estimate)	Izvorski et al. (2020), to the World Bank IEG (2023)

Note: the "narrow" figures apply only to officially registered small and medium-sized enterprises; The "broad" figures include, among other things, individual entrepreneurs and peasant (farm) farms, which significantly increase the contribution of small business activity to GDP. Two sets of numbers are not directly comparable and should not be combined without matching definitions in subsequent empirical work.

2.8 Energy structure and ambient pressure indicators

Since the ECO-innovation process in the proposed framework (Section 3.3) focuses heavily on energy efficiency and resource efficiency, the structural features of the Kyrgyz energy system are directly relevant to the context. Fossil fuels accounted for 72% of Kyrgyzstan's total energy supply in 76-2022, while oil and coal together accounted for more than 65% of the energy mix, although hydropower provided most - about 85-86% - of electricity generation (UNECE, 2024). Seasonal fluctuations in river flow lead to a compensatory increase in coal-fired generation, which has reached approximately 13 percent of electricity, especially during the winter months (UNECE, 2024). Kyrgyzstan also remains highly dependent on liquid fuel imports: more than 90 percent of petroleum products and natural gas consumed domestically are imported mainly from the Russian Federation and Kazakhstan (IEA, 2022). According to the national development strategy 2018-2040 (UNECE, 2040), the goal is to increase the use of renewable energy sources to 10% of the total energy supply by 2024. These structural features — the lack of electricity use, the impact of imports, and the dependence on fossil fuels for seasonal supply fluctuations-make the process of environmental innovations related to energy consumption (for example, insulation modernization, efficient boilers and engines, and renewable generation) particularly significant for Kyrgyzstanis. Estimated cost-effectiveness of environmental innovations in section 4.1 for SMEs compared to firms operating in countries with cheaper or more sustainable energy supply.

Table 2. Energy and environmental context indicators-Kyrgyzstan

Indicator	Indicator value /	Period source
fossil fuels, share of total energy supply	72-76% (2022)	UNECE (2024)
hydropower, share of electricity production	85-86% (2022)	UNECE (2024)
coal, share of electricity production	~13% (2022, Winter peak)	UES (2024)
dependence on petroleum and natural gas imports	>90% of domestic consumption	IEA (2022)
non-renewable energy target	10% of the total energy supply	National Development Strategy for 2040 2018-2040, in UES (2024)

The figures reflect the latest year (mainly 2022) for which cross-validated data is available, which is being compared at the time of writing, and should be updated to match the main national statistics before applying for logging.

3. Proposed Data and Research Methodology

This section outlines a research project designed to launch the conceptual framework developed in Section 2 and test it empirically in subsequent studies. Primary data has not yet been collected; the design is presented here to create a transparent and repeatable stylistic roadmap.

3.1 Research Approach

Following a deductive approach, in which suggestions derived from the literature on environmental innovation (section 2) act as testable hypotheses, a quantitative, cross-sectional study design is proposed. Given the lack of available firm-level panel data on environmental innovation for SMEs in Kyrgyzstan, a cross-sectional design is appropriate as the first step of the study; panel expansion is defined in section 5 as a pathway for future research.

3.2 Population and recommended sampling strategy

The target population includes registered SMEs in Kyrgyzstan, differentiated by two parameters: sector (manufacturing and agro-processing; trade and services; Construction) and region (Bishkek City, Osh City, and Osh Oblast, with the remaining provinces grouped as "other regions"), reflecting the concentration of registered SME activity in two major urban centers. A differentiated random sampling approach is proposed based on the national register of small and medium-sized businesses, which is supported as a sampling structure by lists of members of the state Tax Service and/or the Chamber of Commerce. We propose a target sample of approximately 350-400 firms that support multivariate regression or partial structural Least Squares equation modeling (PLS-SEM) with the number of implicit constructs specified in Section 3.3, while allowing for the expected survey. 30 to 40 percent of failures are typical for SME research in the region.

3.3 Operation of structures

Table 3 summarizes the proposed structures, their dimensions, and the basis for their measurement, adapted to the indicators of environmental innovation and firm performance set out in the literature, discussed in section 2.



Table 3. Construct Operationalization

Construction of production	Measurements/indicators	Fundamentals of measurement/indicators
Process	Introduction of environmentally innovative energy-saving technologies; emission reduction practices;	water and material efficiency adapted from Horbach (2008) and horbach, Rammer, and Rennings (2012), environmentally innovative
Product type classification	Introduction of environmentally friendly products/	Kammerer (2009) product ECO-innovation measures
Adapted from organizational eco-innovation environmental management systems, reforming to reduce environmental impact;	Personnel environmental education; supplier environmental screening	adapted from Horbach (2008), organizational innovation measure
Sustainable job performance	Financial: revenue growth, profitability; non-financial: up to SMEs with eco-innovations, moderation efficiency research	Multi-element scale of self-message processing-
Moderation	of access variables to green finance variables, moderation of variables (for example, use of the KyrSEFF credit line), regulatory perception pressure, and firm size	and firm characteristics in the sector and financing source of objects specific to the institutional context of Kyrgyzstan

Source: Horbach (2008), compiled by the author on the basis of Horbach, Rammer, and Rennings (2012) and Kammerer (2009).

3.4 Recommended Data Collection Tool

Five-point Likert scales offer a structured survey containing closed-loop elements measured for attitude constructs and practice acceptance, supplemented by categorical and constant elements for firm characteristics (sector, size, age, location, ownership structure) and for the self. Financial indicators are reported. The tool is translated into Kyrgyz and Russian, translated back for consistency, and tested with a small convenience sample consisting of 15-20 SME managers to assess accuracy, response load, and face validity before full deployment.

3.5 Recommended Analytical Strategy

The proposed analytical strategy for the next empirical stage includes: (i) descriptive statistics and reliability assessment for multi-element scales (Cronbach's Alpha, composite reliability); (ii) correlation analysis between environmental innovation measurements and performance indicators; (iii) the measurable nature of multiple regression or implicit and multiple structures, partly due to the fact that most of them are small-square structural equation modeling (PLS-sem), which is well suited to the relatively modest sample sizes typical of SME research; and (iv) the general method is misdiagnosis, based on data reported by one respondent. Sector and region are introduced as control variables, and the moderation analysis checks whether introducing green finance strengthens the relationship between environmental innovation and productivity, which is consistent with the resource gap argument developed in section 2.5.

3.6 Limitations of the proposed design

The proposed design is subject to constraints that must be recognized in advance. Self-assessment data cannot establish a causal relationship between the implementation and effectiveness of eco-innovations; an inverse causal relationship (well-functioning firms that are able to invest in eco-innovations) cannot be excluded without panel data or instrumental variable approaches. Using the register of enterprises as a sampling structure may underestimate informally operating micro and small enterprises, which make up a significant part of the private sector in Kyrgyzstan. These constraints drive the agenda for future research outlined in Section 5.

4. Discussion: Expected Relationships and Policy Implications

4.1 Expected relationship between types of environmental innovation and productivity

Based on the evidence for the heterogeneous effect discussed in Section 2.4, the framework does not predict a single positive relationship between environmental innovation and productivity. The process of environmental innovation (energy efficiency and resource efficiency) is expected to be most closely linked to financial performance through cost savings, which is consistent with the efficiency-oriented logic of Porter's hypothesis. Differences in environmental product innovation are expected to be more strongly related to non-financial, market-oriented performance indicators (perceptions of competitiveness, customer retention), reflecting mechanisms for shrinking the economy instead. Organizational environmental innovation is expected to function as a prerequisite favorable to the other two dimensions, rather than as an independent driver of productivity, which is partially consistent with the emphasis on additional opportunities based on natural resources (Hart, 1995). Table 4 summarizes these theoretically derived, yet untested proposals; the hypotheses that the indicated areas need to be validated or supported by empirical work proposed in section 3 are the results that have not been reported.

Table 4. Hypothetical Eco-innovation-productivity relationships (theoretical, untested)

Type of Eco-innovation	Primary mechanism	Expected productivity channel	Support the theory process
ECO-innovation costs	and resource efficiency	financial indicators (cost reduction, margin improvement)	<i>Porter and van der Linde (1995)</i>
market differentiation of eco-product innovation	; without customer benefit	-financial performance (market share, customer retention)	<i>Kammerer (2009)</i>
Building organizational ECO-innovation	capacity;	indirect coordination / Hart impact of product processes and channels	<i>(1995)</i>

Note: Directions and channels are theoretical suggestions from the literature discussed in section 2; they are not statistical assumptions and must be tested against the primary data before they can be considered as results.

4.2 The moderator's role in access to green finance

Given the resource constraints typically documented for small and medium-sized enterprises (section 2.5), access to specialized green financial instruments, such as KyrSEFF, is expected to soften attitudes towards environmental innovation and productivity: firms that can use preferential or guaranteed green credit lines should better adapt to the introduction of capital-intensive technological innovations (such as green loans). as energy) - efficient equipment) No penalty for execution related to the interest in unique domestic capital. This proposal, if supported by future data, will provide an evidence base for continuing or expanding the direction of green financial facilities in Kyrgyzstan to SMEs.

4.3 Obstacles for SMEs in Kyrgyzstan

Based on the institutional review of Section 2.6, several obstacles are expected to limit the adoption of eco-innovation among independent Kyrgyz SMEs ready for the corporate level: limited awareness of existing green finance tools outside of large urban centers; weak regulatory capacity to regulate the environment, which reduces the regulatory push incentives highlighted in the decision. (Horbach, 2008); and its continued reliance on renewable energy sources based on fossil fuels, which limits the feasibility of certain technological environmental innovations at the firm level (UNECE, 2024). These expected obstacles should be tested directly as part of a future research tool, and not as intended.



4.4 Preliminary Policy Results

Expected empirical confirmation, the framework offers several tentative, conditional policy directions. First, raising awareness of existing green financial facilities may be a prerequisite, especially outside of Bishkek and Osh, rather than the wider adoption of environmental innovations by SMEs. Second, given the expected complementarity between organizational and other forms of environmental innovation, technical assistance programs that create basic environmental management capabilities (for example, simplified templates for environmental management systems for SMEs) can have a multiplicative effect on the return to the next process and product innovation. Third, strengthening the monitoring and enforcement capabilities identified as a national priority (UNECE, 2024) may be necessary to activate a regulatory channel that has proven effective in other contexts (Horbach, Rammer and Rennings, 2012). These areas should be considered as hypotheses for policy development, awaiting confirmation by the empirical studies proposed in Section 3.

5. Conclusion

This paper developed a conceptual framework linking environmental innovation, divided into processes, products, and organizational metrics, to sustainable business performance among SMEs in Kyrgyzstan, and proposed a research methodology that can test this structure empirically. Three contributions will be made. First, the document mainly synthesizes the OECD literature on environmental innovation and precisely adapts to the institutional conditions of the Central Asian transition economy, including the Green Economy Development Program (2019-2023) and donor-supported green finance facilities. Second, it classifies environmental innovations by type, rather than as a single design, according to the evidence that environmental innovations are heterogeneous by type (Horbach & Rennings, 2013). Third, it becomes a concrete, reproducible research plan that includes a sampling strategy, scale construction, and an analytical strategy designed to guide the next empirical phase of this research program.

The main limitation of this paper by design is the lack of primary empirical results: the proposals put forward in section 4 are based on theory and evidence gathered in other institutional settings, and require direct testing using data from SMEs in Kyrgyzstan. Treat them as fixed outputs. The next logical step is to complete the proposed query and then test the hypothesis using the analytical strategy presented in Section 3.5. Future studies that expand this agenda may also consider collecting panel data to address causal problems and the quality of small and medium-sized enterprises using green finance tools to shed light on the potential impact of green finance on the future. Mechanisms by which environmental innovations do not or do not lead to increased productivity.

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The Impact of Legal Regulation of the Green Economy on the Development of the Business Environment

Natiq Mirzayev¹ , Rasim Abbasov² , and Ilgar Safarov³ 

¹ Dean of the School of Business and Local Governance, Western Caspian University, Baku, Azerbaijan

² Head of the Department of Master's and Doctoral Studies, Western Caspian University, Baku, Azerbaijan

³ Master's degree in Business Administration, Western Caspian University, Baku, Azerbaijan

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Abstract

In modern times, the increase in environmental problems, the limitation of natural resources, and the impact of climate change on the global economy have increased the relevance of the green economy model. The green economy is considered an economic model aimed at ensuring a balance between economic development and environmental protection. For business, a green economy is a sustainable development model in which revenue growth is achieved through reducing environmental risks and rational use of resources. It is worth noting that this combines solving environmental problems with increasing the financial efficiency of companies. The article examines the impact of the green economy on the development of the business environment, its role in increasing the competitiveness of enterprises, the application of innovative technologies, the expansion of investment opportunities, and the formation of sustainable development principles. The research used comparative analysis, statistical analysis, and scientific generalization methods. As a result of the research, it was determined that the green economy, in addition to increasing the long-term economic efficiency of business entities, creates new employment opportunities and leads to the strengthening of environmental responsibility. At the same time, the application of green technologies increases energy efficiency and reduces production costs.

Keywords: green economy, business environment, sustainable development, green technologies, innovation, energy efficiency

1. Introduction

Acceleration of economic development in the context of globalization has led to an increase in negative impacts on the environment. The intensification of the industrialization process, the increase in carbon emissions, and the depletion of natural resources have led countries around the world to search for a new economic model. In this regard, the concept of a green economy is of great importance for ensuring both environmental safety and the sustainability of economic development.

Sustainable development should lead to a transition to a new level of quality in economic growth, an inclusive society, and the environment through joint efforts to build an inclusive, sustainable, and safe future that will not create problems for future generations. (Rasul Balayev et al., 2021)

A narrower interpretation of the “green” economy is considered more significant and includes the reduction and control of pollutants and greenhouse gas emissions, monitoring and forecasting climate change, energy- and resource-saving devices and technologies, and the development, production, and

operation of technologies and equipment for renewable energy sources. In addition, the "green" economy also includes the development, production, and use of technologies and materials to protect buildings and structures from sudden changes in temperature, humidity, wind loads, etc. These are types of economic activity that, in addition to modernization and increasing production efficiency, contribute to improving (or protecting) the living environment of people, including reducing technogenic emissions and adapting the population and the economic complex to changing climatic conditions. The application of green economy principles in the modern business environment has created significant changes in the business strategies of enterprises. By investing in environmentally friendly technologies, companies gain an advantage in market competition and increase consumer confidence. In particular, energy efficiency, waste management, and the use of renewable energy sources are considered among the main factors in the long-term development of business entities.

The methodological basis of the study was a systematic approach, comparative analysis, statistical analysis, and scientific generalization methods. When assessing the impact of legal regulation of the green economy on the business environment, reports of international organizations, regulatory and legal acts of the Republic of Azerbaijan, and the experience of foreign countries were comparatively examined. In addition, statistical data were analyzed in order to determine the dynamics of the development of the green economy (World Bank, Inclusive Green Growth: The Pathway to Sustainable Development, 2012).

2. Theoretical foundations of the green economy

Active practical efforts to green economic relations and turn them into a "green" (i.e., environmentally friendly) basis require a theoretical basis developed over several centuries. A study of the evolution of economists' views on the environment, covering the 17th-20th centuries, shows that for a long time, environmental problems remained outside the scope of research, since no significant changes in the environment were observed.

The concept of a green economy first began to take shape at the end of the 20th century against the background of the impact of environmental problems on economic growth. This concept is based on the theory of sustainable development and implies the implementation of economic activity within environmental constraints.

Currently, there is no universally accepted definition of a "green" economy, but according to a widely accepted interpretation compiled by UNEP experts, a "green" economy refers to economic activity that improves human well-being, ensures social justice, and at the same time significantly reduces environmental risks and depletion of nature (UNEP, 2011).

The main principles of the green economy include:

- Efficient use of natural resources;
- Energy conservation and efficiency;
- Carbon emissions reduction;
- Waste minimization;
- Development of renewable energy sources;
- Increasing social welfare and employment.

The implementation of these principles leads to the expansion of innovative approaches in the business sector. In particular, the concept of "green innovation" encourages enterprises to produce environmentally safe products and services. Porter and Van der Linde note that tightening environmental standards increases the competitiveness of enterprises by directing them to innovative activities (Porter M.E., 1995). In modern times, many developed countries have identified green economy policies as one of the main directions of their national development strategies. The European Union's Green Deal program serves to ensure carbon neutrality and develop a green business model. (European Commission. The European Green Deal (2019).



3. Impact of the green economy on the business environment

3.1. Increased competitiveness

Today, the competitiveness of enterprises and regions, including the Republic of Azerbaijan, is largely determined by their impact on the environment. That is why the concept of “green economy” has become widespread.

In recent years, in the context of the increasing frequency of economic, energy, and environmental crises, the competitiveness of enterprises and regions is becoming even more important. At this stage, the competitiveness of enterprises, including in Azerbaijan, is largely determined by their impact on the environment, which is characterized by the volume of harmful emissions and greenhouse gas emissions. The green economy has a significant impact on increasing the competitiveness of business enterprises. The production of products in accordance with environmental standards expands the opportunities for companies to access international markets. Since modern consumers prefer environmentally friendly products, green marketing strategies increase the sales volume of enterprises.

Studies show that companies that invest in green technologies achieve higher profitability in the long term (OECD, Green Growth Indicators 2023, 2023). The main reason for this is the reduction in production costs as a result of reduced energy and resource consumption.

4. Innovation and Technological Development

The development of the green economy, as well as the development of the production and trade of environmentally friendly products, contributes to solving the most important problems of modern society, namely, improving the quality of life, protecting the environment, and attracting investments in environmentally friendly technologies. A concept of sustainable development is being developed without harming future generations. It should be noted that the economic model that exports raw materials will be replaced by a “green economy” that meets the following main criteria:

- creates qualitatively new directions of development and economic growth;
- ensures environmental protection.

The green economy accelerates the development of innovative technologies. Businesses are operating more efficiently by implementing energy-efficient equipment, environmentally friendly production methods, and digital management systems.

Innovations are particularly widespread in the following areas:

- Solar and wind energy technologies;
- Electric vehicles;
- Smart energy management systems;
- Waste recycling technologies;
- Production models that reduce carbon emissions.

These technologies both increase environmental safety and lead to the emergence of new business areas.

5. Expanding investment opportunities

The green economy is in the focus of attention of international financial institutions and investors. The rapid flow of investment and the rapid development of the green economy have created significant expectations in developed market economies. However, the development of the process of “greening” the economy has revealed a number of problems. A number of factors hindering the development of the green economy can be identified, which can be grouped according to the degree of impact on the external and internal investment environment.

The factors of the external investment environment are as follows:

- market imperfections in the environmental sphere;
- the highly conservative nature of the economy, development arising from the inertia of its institutional and technological base;
- difficulties in accurately measuring “green” growth.

Factors of the internal investment environment:

- weak development of knowledge and skills in the financial sector;
- lack of an effective system for monitoring and controlling the compliance of financial institutions with “green finance” policies;
- poor diversification of financial sources for “green investments”.

In recent years, green investments and “green finance” instruments have developed rapidly. The World Bank and the International Monetary Fund pay special attention to the financing of green projects (World Bank, *Inclusive Green Growth: The Pathway to Sustainable Development*, 2012). Green bonds and ecological investment funds expand the access of business enterprises to financial resources. This has a positive impact, especially on the development of small and medium-sized enterprises.

6. Green economy and employment

In modern conditions, the principles of the “green economy” act not only as a means of ecological modernization but also as an important factor in the transformation of the labor market. The development of the “green economy” requires and creates conditions for the formation of new areas of economic activity related to the use of renewable energy sources, the application of technologies for saving resources, the greening of industry, and their utilization. All this involves taking initial steps to create new jobs, expand the professional skills of the population, and improve the quality of employment. As a result, structural changes occur, and specialists with modern knowledge and skills in the field of sustainable development, environmental management, and new technologies are in demand.

The green economy also has a significant impact on the creation of new jobs. Employment opportunities are expanding in areas such as renewable energy, ecological construction, waste management, and ecotourism. According to the International Labor Organization, millions of new jobs can be created as a result of the development of the green economy. (International Labor Organization. *World Employment and Social Outlook: Greening with Jobs*, 2018)

The main characteristics of green employment are:

- Environmentally safe working conditions;
- Application of high-tech skills;
- Sustainable production processes;
- Strengthening social responsibility.

This direction has a positive impact on poverty reduction and the acceleration of regional development, especially in developing countries.

7. Prospects for the development of the green economy in Azerbaijan

Azerbaijan has taken important steps in the field of green energy and sustainable development in recent years. The development of alternative energy sources in the country is one of the priorities of state policy. In particular, the implementation of solar and wind energy projects serves to ensure energy security and reduce carbon emissions.

Against the background of environmental pollution in the world, dwindling natural resources and increasing demand, measures taken to expand the “green” economy are of great importance in order to achieve sustainable development. It is no coincidence that in the “Azerbaijan 2030: National Priorities for



Socio-Economic Development” approved by President Ilham Aliyev, the 5th priority is called “A clean environment and a country of ‘green growth’”. The document sets specific tasks related to giving significant importance to the application of environmentally friendly technologies, promoting waste recycling and restoration of contaminated areas, and expanding the application of environmentally friendly “green” technologies. (Ministry of Economy of the Republic of Azerbaijan. "Green economy" priorities, 2021)

The declaration of the liberated territories of the Republic of Azerbaijan as a “green energy zone” is an important strategic step in terms of implementing the green economy model. The application of smart city and smart village concepts in these territories creates conditions for the formation of an environmentally sustainable business environment.

8. Theoretical foundations of legal regulation of the green economy

In the modern era, the concept of a green economy is considered one of the important directions not only from an economic but also from a legal point of view. The formation of normative-legal mechanisms by states for the implementation of the principles of sustainable development is considered a necessary condition.

Table 1. 5-year statistical table of measures taken in Azerbaijan related to the green economy (2020–2024)

Years	Key statements made	Statistical indicator	Result
2020	Expansion of renewable energy projects, preparation of a “green energy” strategy	Share of renewable energy in electricity production – 5.5%	Initial development stage in the green energy sector
2021	Launch of the “Green Energy Zone” project in Karabakh and East Zangezur	Share of renewable energy – 5.8%	Investments in alternative energy projects increased
2022	Green economy measures within the framework of the “Socio-economic Development Strategy 2022–2026”	Share of renewable energy – 6.7%	Interest in solar and wind energy increased
2023	Contracts with foreign investors for the construction of solar and wind power plants	Share of renewable energy – 7.2%	The role of alternative sources in energy production increased
2024	Increasing green energy capacity, expanding energy efficiency projects	Share of renewable energy – 13.5%	Green energy production increased by approximately 2.5 times compared to 2020

Sources: State Statistical Committee of the Republic of Azerbaijan, Ministry of Energy of Azerbaijan – Renewable energy data, State Agency for Renewable Energy Sources, Renewables az

As can be seen from the table, as a result of the operational and strategic measures taken, green energy production has increased many times over the past 5 years. This is a positive result in both economic and environmental terms. At the same time, measures that meet the requirements of the modern era are being continuously implemented to increase the use of green energy and diversify the green economy.

9. Theoretical foundations of legal regulation of the green economy

The Sustainable Development Goals adopted by the UN envisage ensuring the interrelationship between economic development, social well-being, and ecological balance (United Nations. Transforming our World: The 2030 Agenda for Sustainable Development, 2015).

In particular, Goal 7 (accessible and clean energy), Goal 8 (decent work and economic growth), Goal 9 (industry, innovation, and infrastructure), Goal 12 (responsible production and consumption) and Goal 13 (combating climate change) are considered the main directions for the formation of a green economy. The Paris Climate Agreement, adopted in 2015, aims to limit global temperature increases and reduce carbon emissions. (United Nations Framework Convention on Climate Change. Paris Agreement, 2015)

This document plays an important role in strengthening the legal basis for the green economy at the international level. The European Union's "European Green Deal" strategy envisages achieving carbon neutrality by 2050 and a green transformation of all sectors of the economy. (European Commission. The European Green Deal 2019)

10. Regulatory and legal basis of the green economy in Azerbaijan

The development of the green economy in Azerbaijan has become one of the priority directions of state policy. Legal regulation of this area is carried out through a number of regulatory and legal acts.

Article 39 of the Constitution of the Republic of Azerbaijan establishes the right of every person to live in a healthy environment. At the same time, the duties of the state in the field of protection of natural resources and ensuring ecological safety are determined.

The Law of the Republic of Azerbaijan "On Environmental Protection" determines the main legal mechanisms for ensuring ecological safety. The Law envisages the efficient use of natural resources, compliance with environmental standards, and state control over environmental protection.

The Law of the Republic of Azerbaijan "On Efficient Use of Energy Resources and Energy Efficiency" has created an important legal basis for ensuring energy saving and expanding the application of modern technologies. (Law of the Republic of Azerbaijan. "On the efficient use of energy resources and energy efficiency", 2021)

In addition, the Law "On the promotion of the activities of investors in the field of electricity production from renewable energy sources" serves to attract investments in the alternative energy sector. In the document "Azerbaijan 2030: National Priorities for Socio-Economic Development", approved by President Ilham Aliyev, "A country with a clean environment and green growth" was identified as a strategic priority. (Ministry of Economy of the Republic of Azerbaijan. "Green economy" priorities, 2021)

11. Legal impact of the green economy on the business environment

Legal regulation of the green economy has a direct impact on the activities of business entities. Regulatory documents adopted by the state stimulate the application of environmentally friendly technologies, increasing the competitiveness of enterprises.

Enterprises that comply with environmental standards expand their access to international markets and gain the trust of foreign investors. (OECD. Green Growth Indicators 2023 2023)

In addition, the development of green financing instruments is ensured through legal mechanisms. Green bonds, carbon credits, and environmental investment funds facilitate access to financial resources for business entities. (World Bank. Inclusive Green Growth: The Pathway to Sustainable Development 2012)

In modern times, ESG (Environmental, Social, and Governance) principles have become an important element of corporate governance. Companies operating in accordance with ESG standards have higher investment attractiveness and long-term economic efficiency.



12. Experience of foreign countries

The experience of foreign countries in the “green economy” model is based on the transition to renewable energy sources, increased energy efficiency, a clean economy, and reduced carbon emissions, where GDP growth is ensured through environmentally friendly technologies. Different countries use unique approaches tailored to their specific economic and geographical circumstances.

Foreign models of the "green economy" can be divided into the following main concepts applied by economically developed countries:

- European model (Germany, Denmark, Sweden);
- Asian model (China, South Korea, Japan);
- Natural resource model (Norway);
- North American model (USA, Canada).

Special attention is paid to the development of modern infrastructure, which is the basis for ensuring sustainable development in the transition to a green economy through the application of all models. Such relationships also increase the efficiency of investments. (Pahomova N.V. et al., 2012; Smagulova Z.B. et al., 2015)

Germany has achieved the development of the renewable energy sector through the “Energiewende” program. As a result of this policy, the share of wind and solar energy in the total energy production in the country has increased significantly.

The “Green New Deal” program implemented in South Korea has accelerated the application of innovative technologies and created conditions for the creation of new jobs. In China, the green development strategy has ensured the ecological modernization of industrial enterprises and has achieved significant results in reducing carbon emissions. (Barbier E.B., 2010)

In the Republic of Azerbaijan, the declaration of Karabakh and East Zangezur as a “Green Energy Zone” has given impetus to the sustainable development of the region and the formation of a new business ecosystem.

13. The role of ESG principles in the business environment

In modern economic relations, ESG principles have become an integral part of corporate governance. Reducing environmental impacts, increasing social responsibility, and implementing transparent management mechanisms have a positive effect on increasing the market value of companies. Studies show that companies that operate in accordance with ESG criteria have higher indicators in terms of financial sustainability. (Sachs J.D. et al., 2024).

14. Tax policy and the impact of the green economy on the business environment

Tax policy plays an important role in the development of the green economy. Modern states use various tax incentives to stimulate the application of environmentally friendly technologies. These incentives serve to increase green investments, improve the energy efficiency of enterprises and reduce carbon emissions.

In most developed countries, green tax policy is implemented in two main directions. The first direction is the application of an additional tax burden on activities that have a negative impact on the environment. The second direction is to support enterprises that apply environmentally friendly technologies through tax incentives.

Carbon tax is one of the most widespread financial instruments in the development of the green economy. The application of this tax encourages enterprises to switch to less energy-consuming

technologies. At the same time, funds obtained from the carbon tax can be directed to financing green projects.

In the Republic of Azerbaijan, the application of certain incentives for enterprises operating in the field of energy efficiency and alternative energy has a positive impact on the formation of a green business environment. In the future, the creation of carbon markets and the improvement of green tax mechanisms can further accelerate the development of the green economy in the country.

According to the theory put forward by Porter and Van der Linde, properly established environmental regulatory mechanisms increase the innovation potential of enterprises and lead to an increase in their international competitiveness. (Barbier, E.B., Burgess, J.C., 2023)

15. Green financing mechanisms and entrepreneurship development

In recent years, green financing has become an important tool in the transformation of the economy. Green finance refers to the financing of projects aimed at protecting the environment, increasing energy efficiency, and reducing carbon emissions.

Green financial instruments include the following:

- Green bonds;
- Green loans;
- ESG investments;
- Carbon funds;
- Sustainable investment portfolios;
- Climate funds.

The World Bank and other international financial institutions consider the financing of green projects as one of the main directions of sustainable development. (World Bank. Inclusive Green Growth: The Pathway to Sustainable Development 2012)

Green bonds are a financial instrument that has become especially widespread in recent years. The funds raised through these bonds are directed exclusively to the financing of environmental projects. For this reason, the green bond market is considered one of the fastest-growing segments of the global financial system.

Green financing creates new development opportunities for small and medium-sized enterprises. Enterprises can implement innovative technologies through low-interest loans and special financial programs. This leads to increased production efficiency and increased competitiveness of the product.

16. The interrelationship of digitalization and the green economy

There is a close connection between digital transformation and the green economy. Modern technologies allow for more efficient use of resources and the reduction of environmental impacts. Artificial intelligence, big data (Big Data), Internet of Things (IoT), and blockchain technologies play an important role in the development of the green economy. These technologies make it possible to monitor energy consumption, manage waste, and optimize production processes.

The smart city concept is one of the most successful examples of integrating digitalization with the green economy. In smart cities, transport systems, energy networks, and utilities are managed using digital technologies. The “Smart City” and “Smart Village” projects implemented in the liberated territories of the Republic of Azerbaijan can be considered as an example of the joint application of green economy and digital transformation.



17. Corporate social responsibility and green business model

Corporate social responsibility (CSR) is an approach in which companies voluntarily take on social and environmental issues, going beyond their economic interests. In such environments, corporations fulfill their responsibilities to society and the environment by improving working conditions, investing in charitable programs, adhering to environmental standards, participating in educational and cultural programs, and using other means.

Corporate social responsibility has become an important aspect for many companies around the world. There are several CSR models that companies can implement. The most common CSR models in global practice are European, American, and Japanese models, with British and Canadian models also distinguished. (Travkina, E.A., 2024)

In modern times, corporate social responsibility has become one of the main elements of the green economy. Companies are no longer trying to make only a profit, but also to be responsible to society and the environment.

Corporate social responsibility covers the following areas:

- Environmental protection;
- Support for social projects;
- Protection of labor rights;
- Implementation of transparent management systems;
- Increasing energy efficiency.

The implementation of a CSR strategy strengthens the reputation of companies and increases investor confidence. Modern investment funds increasingly prefer ESG criteria. Studies show that companies that adhere to the principles of social and environmental responsibility achieve higher financial results in the long term. (Sachs J.D. et al., 2024)

18. Future development directions of legal regulation of the green economy

In modern times, the development of a green economy requires constant improvement of legal mechanisms. Climate change and the increase in environmental threats prompt states to introduce new regulatory and legal instruments.

The following areas may be considered priorities in the future:

1. Formation of carbon trading markets;
2. Expansion of tax breaks for green investments;
3. Mandatory application of ESG reporting;
4. Improvement of green finance standards;
5. Integration of international environmental law norms into national legislation;
6. Strengthening legal mechanisms for adaptation to climate change.

These areas will create conditions for increasing environmental responsibility in the activities of business entities and strengthening the institutional foundations of the green economy.

19. Conclusion

The conducted research shows that the legal regulation of the green economy is of great importance in the sustainable development of the business environment. Improving legal mechanisms creates conditions for the expansion of the application of green technologies, strengthening innovative activity and improving the investment climate.

The green growth policy implemented in the Republic of Azerbaijan and the adopted regulatory and legal acts serve the development of the alternative energy sector, strengthening environmental safety, and stimulating entrepreneurial activity.

In order to develop the green economy in the future, it is considered appropriate to expand tax breaks, develop green financial instruments, accelerate the application of innovative technologies, and strengthen the integration of international environmental standards into national legislation.

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Socio-Economic Significance of Intelligent Cities

Gulnisa Mustafayeva¹  and Kamal Niftaliev¹ 

¹Department of Marketing and Management, School of Business and Local Governance, Western Caspian University, Baku, Azerbaijan

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Abstract

This article examines the socio-economic significance of the Smart City concept in the context of global urbanization and digital transformation. Based on an analysis of international experience and data from leading analytical agencies, the key economic and social effects of implementing smart technologies in the urban environment are systematized. Issues related to improving the quality of life of the population, the development of digital infrastructure, and electronic public governance are considered. Special attention is given to the role of management as a system-forming factor in the implementation of Smart City projects. The author proposes a system of key performance indicators (KPIs) for smart city management across six domains, verified in accordance with ISO 37120 standards and international best practices.

Keywords: intelligent city, Smart City, digital transformation, socio-economic effects, e-government, urban governance, KPIs, management

1.Introduction

Over the past two decades, the Smart City concept has evolved from a futuristic idea into one of the central directions of public policy and urban studies. The rapid growth of the global urban population — according to UN projections, by 2050 approximately 68% of the world's population will live in urban areas (DESA, 2020, p. 67) — is placing unprecedented pressure on infrastructure, transport systems, resource bases, and governance institutions.

Traditional approaches to urban governance are proving insufficient to address these challenges. In this context, smart cities are emerging as a strategic response to the problems of urbanization: the integration of digital technologies, big data, the Internet of Things (IoT), artificial intelligence, and platform-based solutions into the urban environment is intended to fundamentally enhance the efficiency of resource management and improve the quality of life of citizens.

However, at the same time, an essential part of scientific research is devoted to the technological aspects of Smart Cities, neglecting any consideration of their socio-economic impacts and management tools. The purpose of this paper is to address this problem by systematizing the existing information about the economic and social impact of smart cities and by defining the role of management in the implementation of smart city projects using the example of Azerbaijan. The Concept of the Smart City: Evolution and Contemporary Understanding. The definition of the term “smart city” has never been universal. Scholars have frequently questioned whether the “smart city” label aligns with actual urban needs or remains a marketing construct that overlooks social and cultural complexities (Hollands, 2008). The notion was introduced into academic literature in the late 1990s in works devoted to the issue of information technologies in the urban environment.

The definition of Caragliu, Del Bo, and Nijkamp presents the classical interpretation of the phenomenon: smart city is defined as an environment, where investment in human and social capital as

well as traditional (transportation) and modern (ICT) communication infrastructure ensures sustainable economic development and high quality of life, while preserving natural resources effectively (Caragliu et al., 2011, p. 70).

In the process of development, the following generations can be identified: technological determinism that prevailed in the first generation of the concept (2000s). A good example is the city of Songdo in South Korea, constructed from scratch as an ideal smart city, but criticized for disregarding the organic nature of the urban environment.

The second wave (2010s) changed the emphasis from development for the sake of development to generating value for the citizens – open data, platforms, and ecosystem, City OS of Barcelona. The third and current generation (2020s) puts man at its heart: digital citizens' rights, data sovereignty, artificial intelligence ethics, and inclusiveness.

The most important lesson from this evolution is that technology is just a tool, not an ultimate goal. The question "Which technologies are to be deployed?" becomes secondary to the question "Which issues of the urbanites need to be addressed?" This is the very approach that makes the best contemporary Smart City strategies work.

2. Economic Dimension of Smart Cities

The economic potential of smart cities is considered highly significant. According to estimates by the McKinsey Global Institute, Smart City technologies are capable of generating an additional economic impact equivalent to 1–3% of a city's gross regional product annually. This estimate is supported by an analysis of specific implementation areas. Let us consider the main economic effects by key domains.

Table 1. Economic effects of Smart City technologies

Direction	Economic effect	Source
Intelligent Transport Systems (ITS)	Reduced congestion losses by 15–25%; fuel savings of up to 12%	McKinsey, 2018
Predictive maintenance of housing and communal services (HCS)	Reduce maintenance costs by 10-25%; reduce downtime by 35-45%	Deloitte, 2020
Smart Grid (intelligent power grids)	Reduce network losses by 10–15%; save up to 50% on lighting	IEA, 2022
Digital government services	Reducing administrative costs by 15–30%; de-shadowing the economy	БЭФ, 2021
Waste management	Reducing operating costs for waste collection and disposal by 30–40%	Waste360, 2019

(Source: compiled by the author based on data from McKinsey GI, Deloitte, IEA, and WEF.)

The integration of digital technologies into urban governance is a critical driver for achieving sustainable development, as strategic deployment of these solutions helps align local infrastructure with broader global economic goals (World Economic Forum, 2020). The return on investment (ROI) analysis



for individual areas deserves special attention. Smart lighting (approximately 200%), telemedicine (175%), and predictive utility services (165%) demonstrate the highest ROI over a five-year period. A medium-term return on investment horizon is typical for intelligent transport systems (5–9 years), while Smart Grid infrastructure and digital service platforms are focused on long-term effects (8–12 years) with maximum synergy potential (McKinsey, 2018, p. 152).

Most importantly, making use of the economic opportunities of smart cities will require not just having appropriate technologies, but the appropriateness of organizational mechanisms that implement those technologies. The absence of such mechanisms results in failures in achieving the expected outcomes of the projects implemented, as proven by the research on Smart City failures.

Social Implications of Smart Solutions. The social aspect of smart cities is as important as the economic one. It includes four major fields: healthcare, public safety, mobility, and the environment. In healthcare, intelligent monitoring and telemedicine systems can reduce ambulance response times by 25–35%, reduce mortality from acute cardiovascular events by 15–20% (according to The Lancet, 2021), and decrease the number of planned hospitalizations by 15–20% through remote patient management. (Dorsey & Topol, 2016, p. 159).

These results have been achieved, in particular, through smart healthcare programs in Copenhagen and Amsterdam. In the area of public safety, the use of video analytics and predictive policing systems has reduced street crime by 10-15%, traffic accidents by 20-30%, and emergency response times to less than 7 minutes in several UK cities and Singapore.

Transport mobility is one of the most tangible impacts of smart technologies for city residents. According to INRIX (2022), losses from traffic congestion in the world's 50 largest cities exceed \$200 billion per year. Intelligent transport systems (ITS) can reduce traffic jams by 20–30% and lower fuel consumption by up to 12%. First of all, it is necessary to mention that with the help of intelligent optimization of traffic lights, Barcelona has managed to reduce the time spent on moving by 21%.

Smart technologies show great achievements in the field of ecology. The European Environment Agency (EEA, 2022) says that PM2.5 concentration in cities where there is a highly developed environmental monitoring system has dropped by 8-12%. Copenhagen has managed to decrease CO₂ emissions by 42% compared to 2005. Barcelona saves €37 million per year on lighting due to the use of adaptive control systems (European Environment Agency, 2022, p.148).

On the other hand, it is necessary to emphasize a crucial problem in most Smart Cities – the fact that the benefits of using digital technologies are unequally distributed. Those citizens who have low digital skills, the elderly, and low-income people may get into a "second-order digital divide". The necessity of inclusive design and digital literacy programs should be mentioned in order to guarantee social justice.

3. The Role of Management in Smart City Development

The analysis of international experience shows quite clearly that the quality of management becomes much more important in terms of the success or failure of the Smart City project compared to the choice of technology used. This hypothesis is proven by several examples of failures.

Firstly, the project Sidewalk Toronto of Google was suspended in 2020, not because of any problems with technology, but because of the failure of dialogue with the civil society regarding the use of data and digital rights. Secondly, the Smart Cities Mission project in India faced certain systemic challenges in the coordination of federal, regional, and municipal governments. Thirdly, PlanIT Valley in Portugal remained only at the conceptual level, among other things, because of the overestimation of technology's development and lack of attention to the naturalness of urban communities.

The identified failure patterns allow us to formulate key management requirements for the implementation of Smart City projects. First, a "needs-driven approach" is essential: the strategy must be

based on the actual needs of city residents, rather than on the desire to implement advanced technologies for the sake of implementation.

Secondly, interdepartmental coordination is crucial: a smart city permeates all city systems, so fragmented departmental governance (the "silo problem") leads to incompatible decisions and duplicated costs. Thirdly, an institutional coordination mechanism is necessary—the creation of a Smart City project office with cross-departmental authority and direct reporting to the head of administration.

This article proposes a proprietary system of smart city management KPIs, structured across six domains (Table 2), developed on the basis of ISO 37120 and ISO 37122 standards, as well as methodological documents of the World Economic Forum. The development of a balanced framework for assessing urban intelligence is essential, as foundational studies have highlighted the multidimensional nature of smart city ranking and performance criteria (Giffinger et al., 2007).

Table 2. Author's system of KPIs for smart city management

Domain	Key Performance Indicators
Digital services	Share of online services $\geq 95\%$; NPS index > 70 ; average service provision time < 1 business day
Transport	Increase in average speed by 15% ; decrease in the number of accidents by 25% ; share of passengers in public transport $> 50\%$.
Energy and housing and communal services	Reduction of specific energy consumption by 20% ; network losses $< 7\%$; reduction of accidents by 30%
Safety	15% reduction in crime; emergency response time < 7 minutes
Environment	PM _{2.5} concentration $< 15 \mu\text{g}/\text{m}^3$; CO ₂ emissions reduction by 20% by 2030
Civic participation	Coverage of participation platforms by $\geq 20\%$ of residents; implementation of at least 30% of civic initiatives

(Source: developed by the author based on ISO 37120, ISO 37122, WEF (2021).)

4. Conclusion

The analysis allows us to formulate the following conclusions.

1. The smart city has evolved from technological determinism to a human-centered paradigm. The modern concept of Smart City views technology as a tool for solving specific urban problems, rather than as an end in itself.
2. The economic potential of smart cities amounts to $1\text{--}3\%$ of GRP annually and is realized through the reduction of transaction costs, optimization of resource consumption, and increased productivity of urban systems.
3. Social advantages include health care, safety, transportation, and environmental concerns; however, such advantages are not equally shared. An inclusionary strategy is important for the social sustainability of the Smart City initiative.



4. Management is a systemic element that influences more the success or failure of the smart city initiative than the technological selection process itself. Establishment of the project office with the cross-departmental mandate is an important organizational step.
5. The proposed proprietary KPI system in six areas (digital services, transportation, energy, security, ecology, and participation) provides the means to measure the effectiveness of the implementation of the Smart City strategies.

Suggestions that would be applicable for government organizations can be outlined as follows: using the "needs-driven approach" as the foundation for city strategy methodology; establishing project offices for digital transformation with inter-departmental authority; developing a KPI framework for the suggested six domains; and using open standards and APIs for platform selection. Furthermore, the institutionalization of smart city projects should be guided by internationally recognized standardization frameworks, such as ISO 37120, to ensure the comparability and sustainability of urban performance metrics across different regions (ISO, 2018).

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Legal Mechanisms in the Implementation of Stock Exchange Transactions, Current Problems and Proposals for Improvement

Afaq Hesenova¹  and Ariz Mustafayev² 

¹Dean of the School of Economics, Western Caspian University, Baku, Azerbaijan

²Master's Student, Department of Economics, Western Caspian University, Baku, Azerbaijan

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Abstract

Legal regulation of stock exchange transactions is one of the most important mechanisms ensuring the sustainable development of the economy and the free and safe movement of capital. The presented research work is devoted to a comprehensive analysis of the existing legal mechanisms regulating the implementation of stock exchange transactions in the Republic of Azerbaijan. The article examines the national legislative framework, including the Civil Code and the application aspects of the Law "On Securities Market". At the same time, the activity of institutional mechanisms (clearing, settlement, brokerage, and listing) in the stock exchange trading process is analyzed. As a result of the research, a number of conceptual problems were identified, such as gaps in the legal regulation of derivative financial instruments, incomplete formation of the central counterpart (CCP) institution, ineffectiveness of legislation against insider trading, and violation of the rights of minority investors. In order to solve the problems, specific proposals for the modernization of legislation and ways to improve legal mechanisms were submitted, taking into account international experience, in particular the MiFID II directive of the European Union and the practice of advanced developed countries.

Keywords: stock exchange transactions, legal mechanism, securities market, central counterparty, insider trading, investor protection, derivative financial instruments

1.Introduction

One of the most important attributes of the global economy in the modern era is efficient and flexible financial markets. Stock exchanges, which constitute the core of financial markets, play an irreplaceable role in directing free capital to the real sector, ensuring transparency of the investment environment, and financing economic entities (El Wassal, 2013). The success of stock exchange activities depends on the perfection of the legal framework on which it is based, the effectiveness of regulatory mechanisms, and, at the same time, the freedom it provides to market participants. Each transaction, whether spot purchase or sale or complex derivatives, takes place within a strictly structured legal framework.

After the restoration of independence in the Republic of Azerbaijan, the formation of the financial sector, including the securities market, was one of the priority directions in the process of transition to a market economy. Although the establishment of the Baku Stock Exchange in 2000 was an important step in this area, the fact that the trading volume in the market was limited mainly to government securities for a long time and the weak integration of the corporate sector into this process required the revision of legal and institutional mechanisms. This necessity resulted in the adoption of the new Law "On the Securities Market" in 2015. However, the existence of a legislative framework does not guarantee the ideal functioning

of all mechanisms in practice. In this regard, the analysis of existing legal regulatory mechanisms and the search for ways to bring them into line with international standards is extremely relevant.

The main object of this article is the legal mechanisms of stock exchange transactions carried out in the Republic of Azerbaijan. The purpose of the study is to reveal the shortcomings of the existing system, analyze persistent problems such as legal regulation of derivatives, sanction mechanisms against insider trading, central counterparty (CCP) functions, and protection of minority investors' rights, and provide real legal proposals for improvement.

2. The Concept and Legal Nature of Stock Exchange Transactions

Stock market transactions are civil-legal transactions concluded between trading participants on an organized and licensed platform, the stock exchange, within predetermined rules, standards, and time frames. However, unlike classical civil law contracts, stock market transactions are governed by a synthesis of both private (civil) and public (state regulation) legal norms (Azərbaycan Respublikasının Mülki Hüququ, 2008). The subject of such transactions, the method of price formation, the registration of the parties, and the process of execution of the transaction are completely subject to the internal regulations of the exchange and the instructions of the state financial control bodies.

From a legal point of view, the main features of stock exchange transactions include mass, standardization, transparency, and centralized execution. Behind each transaction is a chain of issuers, brokers (investment companies), clearing houses, depositories, and investors. The rights and obligations of each of these entities are regulated by specific legal documents - brokerage agreements, clearing rules, and exchange regulations. According to the terms of execution of transactions, they are divided into two main groups: spot (cash) transactions and forward (derivative) transactions. If in spot transactions the transfer of ownership and settlement occur in a short time ($T+1$, $T+2$), then in forward transactions (futures, options) the execution of the transaction is postponed to a future date (Hull & Basu, 2016).

3. Existing Legal Mechanisms in the Republic of Azerbaijan

The regulation of stock exchange operations in the Republic of Azerbaijan is based on a hierarchical legal system (Abbasov, 2007). The basis of this hierarchy is the Civil Code, which establishes the general principles of civil circulation of securities. More specific regulation is carried out through the Law "On the Securities Market" dated 2015. This law includes such fundamental issues as the provision of investment services, the establishment and management of the stock exchange, and the organization of post-trade infrastructure. The most important links that ensure the functioning of legal mechanisms are listing, brokerage, and clearing and settlement institutions.

The listing mechanism is the process of admitting securities to stock exchange trading (Qasımov & Həziyev, 2017). The Baku Stock Exchange (BSE) "Rules for Listing, Delisting and Organization of Trading" imposes strict financial, corporate governance, and accountability requirements on issuers. These requirements are designed to protect the interests of shareholders, in particular the general public. As for the intermediary mechanism, the legislation allows only licensed investment companies to participate directly in the stock exchange. Investors carry out their activities under civil law contracts concluded with these companies. The "Rules for the Implementation of Investment Services", approved by the Central Bank, precisely regulate how brokers should handle client funds.

The listing mechanism is the process of admitting securities to stock exchange trading. The Baku Stock Exchange (BSE) "Rules for Listing, Delisting and Organization of Trading" imposes strict financial, corporate governance, and accountability requirements on issuers. Such requirements were developed in order to safeguard the interests of shareholders, primarily, of the general population. Speaking about the intermediary mechanism, the law provides that participation in the stock exchange is possible only for those investment companies that have licenses. All investors operate through civil-legal contracts with these



companies. There are special rules concerning investment services, "Rules for the Implementation of Investment Services", adopted by the Central Bank, which regulate the activities of the brokers.

4. Clearing, Settlement, and Electronic Trading Platforms

The most complicated aspect from the legal side of stock exchange operations is the post-trade settlements (Qasimov & Həziyev, 2017). While the conclusion of the agreement is only the beginning, the actual transfer of property rights and money takes place during the process of clearance and settlement. At the moment in Azerbaijan, the function of clearance and settlement is provided by the National Depository Center (NDC) in line with the legal procedure defined by law. The key legal element of the work of the NDC is the "Delivery Versus Payment" (DVP) rule. It provides legally that the transfer of the securities to the buyer's deposit is done only after the total transfer of his money to the seller's account, reducing the risk of default of one of the parties to zero.

In addition, the introduction of the electronic trading systems (like the CETA system) led to the creation of new legal facts. Every order submitted into the system is legally considered an offer, and the deal is considered made when it is automatically combined in the system with the counter-offer. Legal protection of electronic signatures and digital audit trail serves as irrefutable proof in courts and arbitrations.

The most complicated legal procedure in stock exchange transactions is the post-trade settlement. It is not enough that a deal is done between the parties – the real property rights and money are transferred after the clearance and settlement procedure. In Azerbaijan, this procedure is conducted through the National Depository Center (NDC), according to the law-governed procedure. The key element of this process is the "Delivery Versus Payment" (DVP) rule. This rule legally guarantees that the securities are transferred from the seller's account to the buyer's only if the buyer transfers all his money to the seller's account, thus ensuring no chance of default by either side.

The introduction of electronic trading platforms (such as the CETA platform) has introduced certain legal procedures as well. Each electronic order put into the system is a legally valid offer, and the deal is considered concluded when it is automatically matched in the system with the corresponding counter-order. The recognition of electronic signatures and audit trails of deals is guaranteed by law and serves as irrefutable evidence in courts or arbitration of disputes.

5. Current Problems in the Legal Regulation of the Stock Market in Azerbaijan

However, in spite of the accomplished efforts and regular amendments to the legislation, there are some serious normative and practical issues in the Azerbaijani capital market, which hinder its development at the international level. The existing legal problems can be divided into four main categories: [9]

The first is the incompleteness of the regulation of derivative financial instruments (derivatives). Futures and options account for the majority of liquidity on modern stock exchanges. Although the Law of Azerbaijan "On Securities Market" provides a definition of derivatives, their trading procedures, margin (collateral) requirements, options execution mechanisms, and netting (mutual termination of obligations) system are not sufficiently codified. For this reason, local investors and corporate enterprises experience legal hesitations in insuring currency and commodity risks (hedging) through the national stock exchange.

Secondly, the mechanisms for combating the use of inside information and market manipulation are weak. The most important principle of stock exchange trading is equality of access to information (Bhattacharya & Daouk, 2002). The legislation prohibits the dissemination of inside information and the use of it to make a profit (Bhattacharya & Daouk, 2002). There are also appropriate sanctions in the Administrative Offenses and Criminal Codes. However, in practice, technological monitoring, investigation, and proof of such cases require extremely complicated legal procedures (Coffee, 2006). The almost complete absence of judicial precedents for insider trading in the country indicates that the legislation in this area is highly declarative.

Third, there are gaps in the real protection of the rights of minority shareholders (Gompers et al., 2003) (small investors who constitute a minority). The absolute power of majority (controlling) shareholders in listed joint-stock companies in management leads to the violation of the rights of minority investors (Gompers et al., 2003) when distributing dividends and concluding large transactions. Although civil legislation gives them the right to receive certain information and to apply to the court, the lack of a collective lawsuit (class action) mechanism makes it economically inefficient for small shareholders to protect their rights.

Fourth, the institution of the central counterparty (CCP) is not fully functioning. In international practice, the CCP assumes the settlement risks by acting as a buyer for the seller and a seller for the buyer for all transactions concluded between the parties. Although there are grounds for the establishment of this institution in national legislation, a special regulatory framework has not been formed on the limits of its legal liability, the rules for the formation of insurance funds, and legal protection in bankruptcy.

6. Comparative International Experience in the Legal Regulation of Stock Exchange Transactions

An examination of international practices reveals important aspects of how sophisticated capital markets have managed to deal with issues analogous to those faced by Azerbaijan today. A comparative study of the legislation in the sphere under consideration in the leading financial centers provides a solid basis for effective legislative changes (Kraakman & Armour, 2017).

The Markets in Financial Instruments Directive II (MiFID II), which came into force in 2018, is among the most extensive frameworks regulating the securities market in the European Union (Moloney, 2023). The main features of the directive include the stringent measures concerning pre- and post-trade transparency, algorithmic trading, product governance, and investor protection. In particular, the mandatory reporting for OTC derivatives via recognized Trade Repositories and the best execution obligation for investment firms are directly connected to the regulatory deficiency in Azerbaijan concerning derivative financial instruments.

In addition, the U.S. serves as an example in this regard, specifically with the implementation of the Dodd-Frank Wall Street Reform and Consumer Protection Act (2010) in reaction to the 2008 global financial crisis. Dodd-Frank requires the standard derivatives to be centrally cleared through CCPs; it implements powerful measures to protect whistleblowers, including monetary compensation of up to 30% of sanctions above one million dollars, and increases the powers of investigation of insider trading by the Securities and Exchange Commission (SEC). The whistleblower protection program of the SEC has been very successful: over five billion dollars in financial penalties have been obtained due to this program since its implementation. The above-mentioned example is directly related to the legislative suggestions made in the context of capital market reforms in Azerbaijan.

The regulatory sandbox initiative of Singapore also deserves mention. The Monetary Authority of Singapore (MAS) regulates the activities of FinTech firms in the regulatory sandbox regime established by the FinTech Regulatory Sandbox Guidelines of MAS. This approach has attracted numerous international fintech enterprises to Singapore's financial ecosystem and could serve as a direct template for Azerbaijan's proposed regulatory sandbox for digital assets and tokenized securities.

The example of Kazakhstan in terms of setting up the Astana International Financial Centre (AIFC) should be taken into consideration in the post-Soviet region. The AIFC runs according to a different set of laws and regulations based on the English common law system, with the existence of an independent court and arbitration center. Even though a complete implementation of this type of system is unlikely to happen in Azerbaijan anytime soon, some aspects, such as applying international standards for contract law and establishing an independent mechanism for dispute resolution for capital market players, can be used as near-term targets.



Finally, it is important to consider the experience of a neighboring country, Turkey, that has a similar legal tradition and a developing capital market. In 2012, the new capital markets legislation (Law No. 6362) was adopted in Turkey, which created a modernized legal system with increased protections for minority shareholders, wider CMB rights to prosecute market manipulations and insider trading, and solid legal ground for establishment of central clearing facilities. As a result, there has been a significant growth in participation of domestic retail investors and international institutional investors in the capital market of Turkey.

In conclusion, the examples of international practice analyzed above confirm that the efficiency of stock exchange regulation not only lies in the presence of laws but also is affected by the quality of their implementation mechanisms and the level of compliance with internationally recognized standards. The legislative reform in Azerbaijan should systematically take into account such precedents in order to promote the development of a competitive capital market.

7. Proposals for Improving the Legal Regulation of Stock Exchange Transactions

In order to resolve current problems and make the Baku Stock Exchange more attractive both on the local and regional levels, the country's laws need to be adjusted according to the advanced international legislation (for instance, the MiFID II directives of the European Union). The following legal adjustments need to be made:

1. Standardization of Derivatives Legislation: It is necessary to create a new chapter named "Derivatives Trading" within the Law "On Securities Market". The said chapter will contain all the regulations for managing margin accounts, the mandatory closure (margin call) procedure, and obligatory registration of OTC derivatives within the exchange system. In particular, the "Netting" transactions' priority in case of bankruptcy law needs to be established.

2. Legalization of the Central Counterparty (CCP) Mechanism: Legislative acts should be adopted to establish a full-fledged Central Counterparty based on the National Depository Center. The formation of guarantee funds for this institution, the legal consequences arising in the event of default by members, and legal ring-fencing to prevent these consequences from spreading to other market participants should be clearly stated.

3. Strengthening Control over Insider Trading: The Central Bank should be given administrative-investigative powers (e.g., access to subjects' communication traffic by court order, confiscation of computer records) to investigate market manipulation. Also, special norms on "whistleblower protection" should be adopted, and a mechanism for protecting the employment and financially rewarding individuals who report illegal activities within a company to the regulatory body should be established. Fines for market manipulation in the Criminal Code should be set at an amount that is several times the amount of illegally obtained profit.

4. Strengthening the Protection of Minority Shareholders: In publicly listed companies, it should be mandatory by law that at least one-third of the Supervisory Board members are independent directors. In addition, the application of norms limiting the participation of majority shareholders in voting when approving large-scale transactions and transactions with related parties will ensure the rights of minority shareholders.

5. Establishment of a Regulatory Sandbox for Digital Assets: A special legal regime should be created that provides for temporary and controlled exemption from licensing requirements for testing technological innovations, tokenized shares, and blockchain-based clearing systems. This will directly facilitate the attraction of foreign fintech companies to the Azerbaijani stock exchange ecosystem.

8. Conclusion

The conducted research and analysis show that the legal regulation of stock exchange operations in the Republic of Azerbaijan is being updated in parallel with the state's economic diversification goals. The 2015 legislation and subsequent regulatory steps taken by the Central Bank have significantly strengthened the foundation of the system. However, the existing legal framework is designed mainly for traditional spot markets and remains insufficient for complex derivatives, high-frequency electronic trading, and fully automated central counterparty systems that determine the dynamics of the global capital market.

It is necessary to implement the proposed legal reforms - in particular, tightening the legislation against insider trading, improving the mechanisms for protecting minority investors, and providing the Central Counterparty institution with full legal protection - in a phased manner. These improvements will not only fill legal gaps in the domestic market but will also foster the trust of foreign portfolio investors in our country, providing the Baku Stock Exchange with a reliable legal platform to become one of the leading financial centers of the Caspian region.

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E-mail: www.businessjournal@wcu.edu.az

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Tel: +994 12 565 39 77

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