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THE IMPACT OF GREEN FINANCE INSTRUMENTS ON ENVIRONMENTAL INVESTMENTS IN KAZAKHSTAN

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Abstract. *The relevance of the topic is driven by the intensification of environmental challenges, including climate change, depletion of natural resources, and loss of biodiversity, which necessitate a transition to a sustainable development model. The article examines the impact of green financing instruments on the dynamics, structure, and sustainability of environmental investments in Kazakhstan. The aim of the study is to assess the influence of green financing mechanisms on investment activity in key environmental sectors of the economy. The hypothesis suggests that the expansion of green financing instruments contributes to the growth of environmental investment volumes; however, it does not guarantee their stability under conditions of institutional and economic constraints. The methodological framework of the study is based on statistical and comparative analysis of data for Kazakhstan covering the period 2018-2022, as well as the generalization of selected elements of international practice. The results reveal uneven dynamics of environmental investments: periods of growth alternate with decline, indicating insufficient institutional stability of the financing system. Key barriers to the development of green financing are identified, and directions for enhancing its role in ensuring stable and balanced investments in Kazakhstan's environmental sector are substantiated.*

Keywords: *green economy, green finance, sustainable development, environmental investments, climate change.*

Main provisions. The study assesses the impact of green finance instruments on the dynamics, structure, and stability of environmental investments in Kazakhstan based on statistical data for 2018–2022. The results show that the development of green finance contributed to the growth of investments in wastewater treatment, renewable energy, and waste management, while investment flows in biodiversity conservation, greenhouse gas reduction, and energy efficiency remained unstable and uneven. The calculated Green Investment Stability Index indicates a moderate level of stability of green investments and confirms the presence of significant fluctuations in financing. The article substantiates that the expansion of green finance in Kazakhstan is accompanied by institutional and structural constraints and proposes measures aimed at strengthening the long-term sustainability and effectiveness of environmental investment policy.

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Introduction. Ecological economics is a direction in which the main priority is the preservation of natural resources and the reduction of environmental risks accompanying economic activity. The key goal of ecological economy is to ensure economic growth and human well-being without limiting the ability of future generations to meet their needs.

Important provisions of this transformation include countering climate change by reducing greenhouse gas emissions and developing sustainable ways of producing and using energy, as well as incentivising projects that support nature conservation. The concept of green economy takes into account not only environmental but also social aspects such as job creation, poverty reduction and social justice. Its fundamental mission is to achieve long-term social sustainability with a harmonious interaction between economic growth, ecological balance and social policy.

Green finance is the financing of initiatives that contribute to minimising environmental risks and transition to energy-efficient innovative technologies. They are designed to support projects that aim to reduce negative impacts on climate, ecology and society, and to create environmentally friendly and innovative solutions.

Despite the growing importance of green economy and green finance, the issue of their practical effectiveness remains insufficiently studied, particularly in developing and resource-oriented economies such as Kazakhstan. In particular, there is a lack of empirical assessment of how green finance instruments influence the dynamics and structure of environmental investments.

In this regard, the scientific problem of this study lies in identifying and evaluating the relationship between the development of green finance and investment activity in environmental sectors. The object of the study is the system of environmental investments in Kazakhstan, while the subject is the impact of green finance instruments on their volume, structure, and stability. The aim of the study is to assess the impact of green finance on the dynamics of environmental investments in Kazakhstan. To achieve this aim, the study examines how the development of green finance affects the volume, structure, and stability of environmental investments. The hypothesis of the study is that the expansion of green finance instruments contributes to the growth of environmental investments, but does not ensure their stability due to institutional and economic constraints.

Key areas of the green economy model include ecological modernisation of the energy sector, transition to renewable energy sources, and reduction of pollutant emissions. At the same time, social justice remains an important component, ensuring equal opportunities and inclusive development.

Ecologically innovative processes in green sectors of the economy act as a basis for the formation of a sustainable labour market focused on environmental sustainability. In this context, green finance becomes a crucial mechanism for mobilising investment resources and supporting environmentally oriented economic transformation.

Materials and research methods. The empirical base of the study is formed by official statistical data of the Bureau of National Statistics of the Republic of Kazakhstan for the period 2018–2022, reflecting investments in key environmental sectors (air protection, wastewater treatment, waste management, renewable energy, energy efficiency and others). Additional analytical materials from international organizations and reports on green finance development were also used.

The data processing procedure included several sequential stages. At the first stage, data collection and verification were carried out, including consistency checks and elimination of incomplete or missing values. At the second stage, the data were systematized and grouped by

areas of environmental investment. At the third stage, analytical processing was performed, including the calculation of dynamic indicators and structural changes.

To assess the dynamics of environmental investments, the growth rate was calculated using the following formula:

$$\text{Growth Rate } (\%) = \frac{X_t - X_{t-1}}{X_{t-1}} \times 100 \quad (1)$$

where X_t is the value of the indicator in the current period and X_{t-1} is the value in the previous period.

To evaluate the structural distribution of investments, the share of each environmental sector in total investment was calculated:

$$\text{Share } (\%) = \frac{X_i}{\sum X_i} \times 100 \quad (2)$$

where X_i is the investment in a specific sector.

To analyse the stability of investments, the coefficient of variation was used:

$$CV = \frac{\sigma}{\mu} \quad (3)$$

where σ is the standard deviation and μ is the mean value of investments over the analysed period. This indicator allows assessing the volatility of investment flows.

The methodological approach of the study is based on a combination of statistical analysis, comparative analysis and trend analysis. Comparative analysis was used to examine international experience in the development of green economy and green finance, while trend analysis made it possible to identify patterns and fluctuations in investment dynamics in Kazakhstan.

Data processing and visualization were performed using spreadsheet and analytical software, which ensured the calculation of indicators and graphical interpretation of results.

Thus, the applied methodology makes it possible to assess not only the scale but also the stability and structural characteristics of environmental investments, which is necessary to test the proposed hypothesis about the impact of green finance on investment dynamics.

Literature Review. In recent years, the scientific literature on green finance has expanded significantly. Several review studies have synthesized findings on the role of green finance in sustainable development, identifying key themes such as the integration of ESG criteria, regulatory frameworks, and investment dynamics [1]. Other works focus on specific financial instruments such as green bonds and their relationship with financial performance, providing empirical and bibliometric insights into the evolution of research in this field.

Research on green economics and green finance has been actively pursued by a multitude of authors and research groups around the world. For example, a large-scale study by British economist Lord Nicholas Stern resulted in the development of a conceptual approach to green growth, according to which economic development should take place in harmony with the principles of environmental sustainability. In this report, Stern emphasises the need to integrate economic growth and environmental sustainability, which is consistent with the concept of

green growth. He argues that the benefits of decisive and urgent action on climate change far outweigh the economic costs of inaction [2].

Active research on equity and sustainability in the economy, including the impact of climate change on the economy, is presented in the works of Joseph Stiglitz, Nobel laureate in economics. Joseph Stiglitz emphasises in his works that sustainable development is impossible without taking into account environmental factors in economic policy. He sees the green economy as a key element of long-term growth, where financial mechanisms such as carbon taxation, government subsidies for renewable energy and financial sector reforms play a crucial role. Stiglitz also focuses on the need for international cooperation and equitable distribution of resources between countries to minimize the effects of climate change and reduce economic inequality [3].

In "Steady-State Economics", Herman Daly analyses the concept of a sustainable economy based on limited growth and balanced use of natural resources. In his work, the author emphasizes that at present the policy of most countries is aimed at developing traditional economies that priorities economic growth. Such an economy is not oriented towards solving environmental problems. For this reason, Daly proposes a model of "Steady-State Economy", the main goal of which would be to solve all environmental risks within the limits of environmental sustainability. It describes a detailed mechanism for changing economic strategies and programmes, the achievement of which will be accompanied by a positive effect in the use of non-renewable resources, transition to more innovative technologies and redistribution of wealth [4].

In "The Economics of the donut: seven ways to think like a XXI st century economist", Kate Raworth offers a new concept of economic thinking that goes beyond traditional growth models. The focus is on creating a sustainable economy that takes into account not only financial performance, but also environmental constraints and social needs. "The doughnut" symbolises the balance between the inner ring representing the minimum conditions for a decent life (education, health, justice) and the outer ring denoting the limits of environmental sustainability (climate, biodiversity, clean water and air). This concept emphasises the importance of a green economy and focuses on the need to move from a model of progressive economic growth to a model of rational use of natural resources. The main principles of the concept are aimed at respecting the environment [5].

The World Bank, as part of its strategy to promote sustainable development and a green economy, has consistently implemented research projects and programmes aimed at systematically integrating sustainable environmental and social approaches into economic management. The green recovery end of the Building Back Better: Toward a Green and Inclusive Recovery (World Bank) report highlights the importance of shifting from standard growth models to sustainable growth strategies that combine innovative financing instruments with government reforms to reduce environmental impacts. The analytical conclusions of the report emphasise that crisis situations can create conditions for structural reforms that ensure economic recovery, advance social inclusion goals and increase the level of environmental responsibility [6].

The Organisation for Economic Co-operation and Development (OECD) in its analytical activities considers the issues of sustainable development through the conceptual provisions of the green economy, emphasising the importance of green financial mechanisms in the macroeconomic policies of member countries. The report analyses current approaches to the formation of a legal and regulatory framework to encourage investment in renewable energy, energy saving and carbon footprint reduction. Particular attention is paid to the development of mechanisms to integrate environmental risks into financial solutions and to use innovative

instruments such as green bonds to support low-carbon growth. Recommendations being developed within the OECD emphasise the need to create institutional conditions for long-term economic and social stability, in which green economy and financial instruments provide long-term stability [7].

In the field of green economy and green finance, considerable attention is paid to research conducted by various universities and institutes around the world. A prime example is the University of Arizona, which has prioritised the development of innovative approaches to integrating environmental and economic principles into sustainable development strategies, and the Indian Institute of Economic Policy and Research carries out expert research on the impact of green financial mechanisms on sustainable development and resource conservation, thus contributing to the development of programmes and strategies for the effective management of natural resources [8].

The academic works of this scientific community provide a theoretical and methodological basis for finding innovative solutions that minimise the negative impact on ecosystems. This research contributes to the theoretical basis on which effective practical solutions in the field of environmental security and green economy are built. Continuous knowledge sharing and analysis of empirical data allow for the formation of informed policies and strategies that contribute to the long-term sustainable development of society.

Results and discussion. In today's world, environmental and sustainability issues have become key challenges for the global community. The green economy will provide an impetus to address environmental and climate risks by attracting green finance to environmentally sustainable projects. These measures will reduce the anthropogenic load on the environment.

Green economy is an economic model that focuses on environmental conservation and sustainable development as key priorities. The financial component of the green economy depends to a large extent on investment resources focused on supporting environmental programmes and projects. Such investments can come both from the state and from private companies and investors [9].

The main features of green finance are summarised in table 1.

Table 1 - Key features of green finance

№	Key features	Description
1.	Financing sustainable projects	Green economy financial instruments provide a source of investment to support projects that reduce greenhouse gases, improve resource efficiency and optimise resource use.
2.	Socio-environmental awareness	Investors and financial institutions providing green finance seek to consider both environmental and social factors in their financing decisions. This may include assessing the social and environmental impacts of projects.
3.	Certification and standards	There are international standards and certification schemes that help determine whether a project or investment meets green financial criteria.
4.	Support for renewable energy and environmentally friendly technologies	Green finance is usually reserved for projects involving renewable energy, solar and wind farms, green vehicles, recycling and other clean technologies.
5.	Financial instruments and products	The main directions of green finance are primarily aimed at using instruments such as green bonds, environmental credits and investment funds. The priority of the policy is to attract green money to support innovative projects that have a favourable impact on the environmental sphere.
Note: summarized by the authors according to source [9]		

Green finance plays an important role in the transition to a sustainable economy and nature conservation, as it facilitates the allocation of funds to solve environmental problems and create green jobs, contributing to more sustainable and environmentally responsible development.

Given the importance of green economy and green finance in achieving sustainable development, which are strategically important factors in the future of Kazakhstan, we present several arguments that confirm the relevance of this study:

1. Preserving the environment: a green economy focuses on minimising negative impacts on nature. This includes reducing carbon dioxide emissions, efficient use of resources, reducing water and air pollution, and preserving biodiversity. All of these contribute to preserving the environment for future generations.

2. Reducing risks and increasing resilience: attracting green finance into the economy will have a positive effect. This approach will focus mainly on financing clean technologies, which in turn will reduce climate and resource risks while strengthening resource resilience.

3. Economic growth and innovation: the green economy stimulates the formation of new environmentally significant industries, including clean energy, resource efficiency and transport innovations. Which can stimulate economic growth and create new jobs.

4. Social justice: a green economy takes into account social aspects including job creation, access to clean water and air, and improving local communities. This promotes fair distribution of wealth and reduces social inequalities.

5. International co-operation: the green economy and green finance stimulate international co-operation to combat global environmental challenges such as climate change. This helps countries work together to achieve common sustainable development goals.

6. Long-term perspective: investments in the green economy and green finance focus on long-term outcomes and the well-being of future generations. This provides a sustainable basis for development without depleting natural resources or damaging the environment.

Thus, the concepts of green economy and green finance are key components of sustainable development, promoting a balance between economic cohesion, social and environmental priorities. Their role is to shape a sustainable model of the future based on the principles of natural resource conservation. At the same time, green financial mechanisms play a crucial role in supporting the implementation of projects aimed at strengthening environmental sustainability. Analyzed investments aimed at environmental protection in Kazakhstan for the period from 2018 to 2022 are presented in Table 2 with amounts in thousands of tenge and percentage changes.

The highest investment growth is observed in the field of wastewater treatment, which indicates the prioritisation of sanitary and water issues in Kazakhstan's environmental policy. Investments in renewable energy and green economy showed growth until 2020, but then began to decline, which may be due to economic factors and budget reallocation. Investments in biodiversity and greenhouse gas emission reduction have been declining, which may indicate a shift in the focus of environmental policy to more critical issues such as waste management and water resources. The research sector is characterized by high investment volatility, indicating that funding for innovative environmental projects is unstable. Investments in energy saving and energy efficiency remain unstable despite short-term bursts of funding, indicating the need to develop a long-term strategy in this area.

Investments in different aspects of environmental protection and green economy in Kazakhstan have different dynamics and focuses. Investments in green and environmental initiatives in Kazakhstan are characterized by volatility. These fluctuations are influenced by a number of factors, including economic challenges and government budget constraints (Figure 1). The formation of a sustainable development model requires continuous and systematic investment in environmentally sustainable projects.

Table 2 - Dynamics of investments in environmental areas in Kazakhstan (2018-2022)

Direction of investment	2018	2019	2020	2021	2022 (change to 2021)
Atmospheric air protection	22 763 546	10 333 129 (-54,7%)	11 008 007 (+6,5%)	15 426 845 (+39,7%)	8 046 476 (-47,7%)
Wastewater treatment	5 965 987	6 179 506 (+3,6%)	2 909 014 (-52,9%)	11 775 069 (+304,7%)	31 016 559 (+163,7%)
Waste management	6 209 542	7 541 510 (+21,4%)	9 069 412 (+20,2%)	11 151 011 (+22,9%)	14 408 303 (+29,2%)
Soil and water protection	8 826 078	9 882 630 (+12,0%)	8 775 234 (-11,1%)	7 108 863 (-19,0%)	10 485 558 (+47,0%)
Biodiversity	419 827	3 573 298 (+751,2%)	4 154 484 (+16,3%)	5 236 991 (+26,1%)	755 868 (-85,6%)
Radiation safety	80 812	90 958 (+12,5%)	—	34 392 (-62,3%)	149 142 (+333,9%)
Research and development activities	128 626	323 022 (+151,9%)	82 229 (-74,6%)	475 202 (+476,9%)	327 785 (-30,9%)
Green economy	42 567 577	73 220 792 (+71,8%)	162 722 471 (+122,1%)	122 410 239 (-24,7%)	105 952 068 (-13,4%)
Renewable energy	18 884 630	70 941 690 (+276,9%)	162 448 828 (+128,1%)	114 218 620 (-29,7%)	98 901 557 (-13,4%)
Energy efficiency	15 612 246	1 793 464 (-88,5%)	234 749 (-86,8%)	5 959 183 (+2439,4%)	4 833 394 (-18,9%)
Reduction of Greenhouse Gas Emissions	—	105 610	399 190 (+278,5%)	65 385 (-83,6%)	31 988 (-51,1%)
Note: compiled on the basis of data from the Bureau of National Statistics, ASPR RK stat.gov.kz [10]					

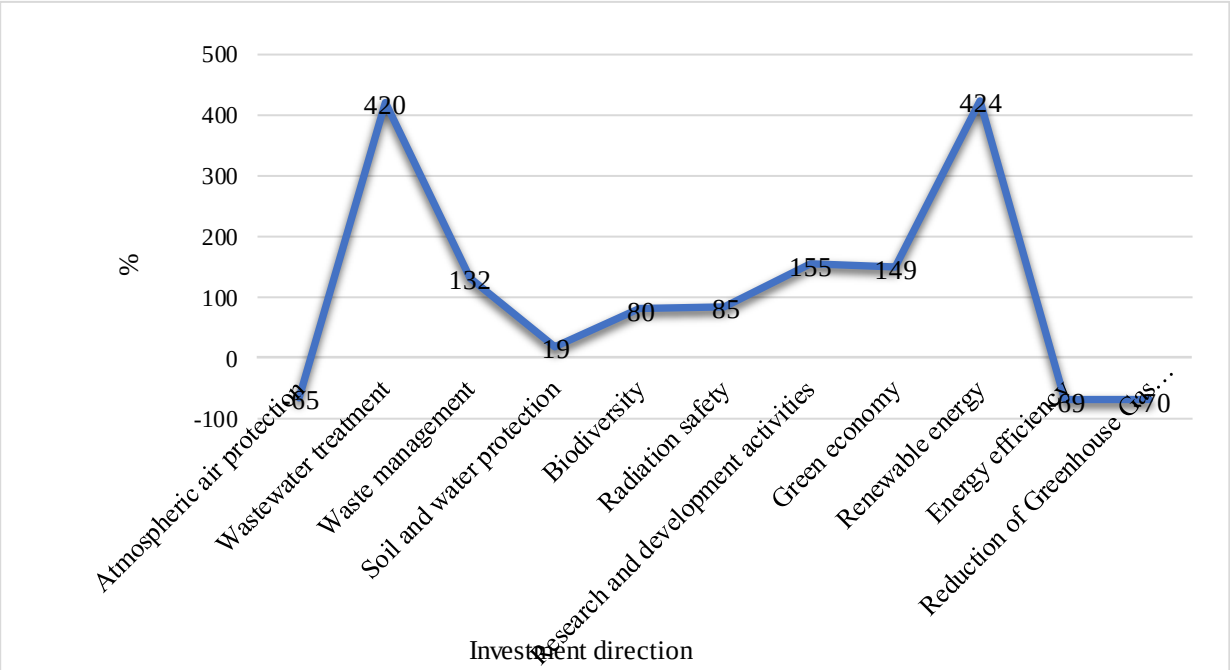

Figure 1 - Change in the volume of investments in economic projects in Kazakhstan (%)
Note: compiled on the basis of data from the Bureau of National Statistics [10]

Green loans and bonds are financial instruments that allow access to finance for environmental projects through loans or bonds. For example, Kazakhstan has established an Advisory Council on green finance with the participation of local and international experts. With EBRD support, fundamental documents have been developed, such as the Concept of Kazakhstan's green finance System and the AIFC Strategy for Leadership in green finance until 2025. Also, definitions of green finance have been introduced in the new Environmental Code of Kazakhstan, and amendments to the Entrepreneurial Code are being developed to economically incentivise green loans and bonds. In order to attract investors and borrowers, regulations for issuing green bonds on the AIFC Exchange were introduced. Eurasian Development Bank JSC became a co-investor of the Centre for green finance, while strengthening institutional capacity at the regional level.

Environmental standards and certification help identify and evaluate environmentally friendly projects and investments.

The strategic course of Kazakhstan's transition to a green economy provides for a series of activities according to a three-phase time structure:

1. (up to 2020) - the main direction of development was the efficient use of natural resources within the framework of traditional economy;

2. (up to 2030) - the main course is taken on ecological modernization of the economy. This will be primarily achieved through efficient water use and promotion of renewable energy;

3. (up to 2050) - green economy containing the basic principles of integration of the "third industrial revolution" aimed at development. The transition to a green economy and green finance can bring many benefits, which are summarized in Table 3.

Table 3 - Benefits of implementing green economy and green finance

№	Benefits	Description
1.	Risk mitigation	Reducing environmental and climate risks, such as damage from natural disasters and energy price fluctuations.
2.	Job creation	Development of new industries and infrastructure, which contributes to job creation and economic growth.
3.	Social inclusion	Reducing the gap between the poor and the rich, providing access to clean water, energy and sustainable technologies.
4.	Conservation of natural ecosystems	Reducing the rate of exploitation of natural resources and ensuring the sustainability of species.
Note: summarized by the authors according to source data [11]		

Here are some key aspects of economic growth and innovation in Kazakhstan:

Development of non-resource sectors: Kazakhstan is actively seeking to diversify its economy and reduce its dependence on the extraction and export of hydrocarbon resources. This strategy focuses on the development of key sectors - IT sphere, tourism, agro-industrial production and processing industry, together with other areas of the economy.

Infrastructure projects: in Kazakhstan, these key areas include the development of the transport network and communications systems. This helps create conditions for economic growth, trade and investment.

Stimulating innovation: the government of Kazakhstan is introducing various programmes and activities to stimulate innovation in the economy. One example is "Digital Kazakhstan" aimed at the development of digital economy and technology startups [12].

Development of education and science: an important aspect of stimulating innovation is investment in education and research. Kazakhstan is developing programmes to support higher education and research.

Investment in human capital: enhanced training and skills development of the labour force play a role in increasing the productivity and competitiveness of the economy [13].

International cooperation: Kazakhstan actively cooperates with international organizations and countries to attract investment, exchange technology and experience [14].

Development of urban centres and innovation clusters: development of a network of innovation clusters and technoparks on the territory of the RK plays a key role in the formation of ecosystems for startups and high-tech companies, which stimulates economic growth.

Environmentally sustainable development: for Kazakhstan one of the important priorities of economic growth is sustainable development and care for the environment. The country is actively working in this direction [15].

Thanks to the measures taken and investments allocated, Kazakhstan is becoming more competitive, while creating conditions for long-term sustainable economic growth.

Global practice demonstrates the successful application of green policy instruments that contribute to environmental sustainability and protection of the natural environment. Here are some examples:

Denmark has long been a leader in sustainable energy development, as the main green investment flows are directed towards wind energy. The current state policy allows increasing the share of renewable energy in the total energy balance. Copenhagen, the capital of Denmark, is an example of a city actively promoting sustainable development, with improved public infrastructure and active support for cycling and public transportation.

Norway is one of the leaders in the spread of electric vehicles, thanks to government support, namely incentives such as tax breaks and free parking zones for electric vehicles. At the same time, Norway's energy sector prioritises investment in hydropower potential [16]. Germany is actively introducing financial support mechanisms for energy efficient construction to modernise real estate. "The energy revolution" programme is aimed at achieving climate goals, reducing greenhouse gas emissions and increasing the contribution of renewable sources to the energy production structure. China is the world's largest producer of solar panels and wind turbines. The country actively invests in clean energy and sets ambitious goals to reduce carbon dioxide emissions. "The silk road and economic belt" initiative includes green infrastructure projects. Costa Rica has made significant strides in renewable energy. More than 98% of the country's electricity is generated using renewable sources such as water and geothermal energy. The country also actively promotes nature conservation and biodiversity conservation [17].

All of the above examples show that successful implementation of environmental initiatives requires an integrated approach to promoting sustainable development. This approach includes a well-established effort to promote and invest in various environmental areas, including energy, transport, construction and environmental protection.

As Kazakhstan is currently striving for sustainable environmental development, the green economy and green finance are important tools for the state to achieve an ecological balance in improving the living standards of the population. However, there are certain barriers and opportunities for achieving this balance between economic and environmental policy directions, which are presented in Table 4. Due to the fact that Kazakhstan keeps the course on sustainable environmental development of the country the transition to green economy and green finance has become an important strategic direction. However, there are still sectors in the country that are in critical condition and require the application of comprehensive measures and efforts to address environmental problems.

Table 4 - Kazakhstan's green economy and finance: barriers to implementation and growth potential

BARRIERS	POTENTIAL
1. Due to Kazakhstan's focus on the oil and gas sector, the transition to an environmentally sustainable development model is complicated. 2. Infrastructure investments: effective implementation of the green economy model implies a comprehensive approach to investment in infrastructure transformation, covering such areas as energy saving, environmentally friendly transport, etc. 3. Technological modernisation: for effective implementation of green initiatives Kazakhstan needs to update and introduce environmentally friendly technologies	1. Renewable energy: Kazakhstan has a high potential for active development of solar and wind energy. The development of these sources can help reduce greenhouse gas emissions and diversify the country's energy balance. 2. Green investments: attracting green investments and financing from international sources can stimulate the development of green projects in the country. 3. Emissions Reduction Assistance: carbon emission reduction programs can help Kazakhstan comply with its international commitments under the Paris climate agreement. 4. Social development: with an effective green economy policy, social tension in the country will be reduced by reducing unemployment and improving the quality of life of the population. 5. International cooperation: for any environmental decision making, firstly international experience of decision making in case of environmental crisis is analysed. Also, interaction with international organisations will allow to adopt experience in the field of green financing of projects aimed at resource conservation.
Note: summarized by the authors according to source data [18]	

The authors propose a number of measures that promote the development of green economy and active attraction of green financial investments. The study of international practice of using these approaches shows positive dynamics in the field of sustainable development and environmental security. These measures involve the use of innovative methods and approaches, namely:

Creation of green banks and financial instruments: Kazakhstan can consider creating specialized green banks and financial products that will focus on financing and supporting green projects and initiatives.

Supporting green start-ups: attention should be paid to incentivizing green startups and innovative companies developing environmentally friendly technologies and solutions. The creation of incubators and business accelerators for such companies can contribute to the development of the innovative sector of the economy.

Development of the renewable energy sector: In the transition to a green economy, Kazakhstan plans to develop clean energy, which will significantly reduce emissions of harmful substances into the atmosphere. By attracting green finance to the development of solar, wind and hydropower projects, the country will improve the socio-economic situation in the labor market.

Energy efficient construction technologies: construction of buildings and infrastructure using energy efficient technologies and materials can reduce energy consumption and environmental impact.

Promoting sustainable mobility: developing public transportation, bike lanes and electric vehicles can reduce transportation emissions and improve urban air quality.

Education and awareness: educational campaigns and public information activities on the benefits and importance of a green economy and green finance can help change public behavior and consciousness.

Supporting research and development: investing in research and development in green technology and innovation can stimulate the creation of new solutions and products.

Establishing national standards and certification systems related to green projects and products will help establish sustainability criteria and build investor confidence. These innovations can help Kazakhstan move towards more sustainable development and increase investment in the green economy and finance.

To assess the stability of environmental investments in Kazakhstan, an original indicator - the Green Investment Stability Index (GISI) was calculated.

The GISI is defined as:

$$GISI = 1 - CV = 1 - \frac{\sigma}{\mu} \quad (4)$$

where CV is the coefficient of variation of investment amounts, σ is the standard deviation, and μ is the average investment over the analysed period.

Using data on «Green economy» investments from 2018 to 2022, the following values were obtained (in thousand tenge): 42,567,577; 73,220,792; 162,722,471; 122,410,239; 105,952,068.

Mean (μ) = 101,374,629

Standard deviation (σ) = 41,190,000

Coefficient of variation (CV) = 0.407

GISI = 1 − 0.407 ≈ 0.593

Interpretation: GISI ≈ 0.59 indicates a moderate level of stability, confirming that while green investments in Kazakhstan have grown over the period, their dynamics are accompanied by significant fluctuations. This finding quantitatively supports the observation of volatility in green finance development.

Scientific novelty

The scientific novelty of the study is as follows:

1. An original indicator, the Green Investment Stability Index (GISI), is proposed to quantitatively assess the stability of environmental investments.
2. Based on GISI, the volatility of environmental investment dynamics in Kazakhstan is identified and measured, providing a more nuanced understanding than absolute values alone.
3. An integrated analysis of investment volume, structure, and stability is carried out, allowing the identification of priority and underfunded areas in the green economy.
4. It is established that the development of green finance in Kazakhstan is characterised by growth accompanied by considerable instability, confirming the need for institutional and policy improvements.
5. Practical recommendations are substantiated to enhance the effectiveness and stability of green finance mechanisms.

Conclusion. The analysis of investments in Kazakhstan's environmental sectors from 2018 to 2022 shows that the green economy and green finance play a central role in promoting sustainable development in the country. Our study revealed notable differences across sectors: investments in wastewater treatment and renewable energy grew rapidly, while funding for biodiversity conservation, greenhouse gas reduction, and energy efficiency remained volatile. These patterns reflect both progress and existing gaps in institutional support for environmental financing.

The results indicate that implementing green economy measures, including investments in renewable energy, energy-efficient technologies, and green financial instruments such as green bonds, can simultaneously reduce environmental risks and deliver tangible economic benefits, including resource savings, improved efficiency, and job creation in emerging green sectors. The research also highlights the need for a long-term and stable financing strategy to ensure the sustainability of green initiatives and reduce reactive fluctuations in investment. Comparing Kazakhstan's experience with international best practices allows us to offer actionable recommendations for policymakers and investors seeking to integrate environmental, economic and social objectives.

The scientific novelty of this study lies in the systematic assessment of sector-specific investment dynamics in Kazakhstan's green economy, the identification of critical gaps in funding and institutional support, and the proposal of targeted measures to enhance environmental sustainability and economic resilience. These findings provide a practical, data-driven framework for monitoring, evaluating and guiding the development of green finance in emerging economies.

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ҚАЗАҚСТАНДАҒЫ ЭКОЛОГИЯЛЫҚ ИНВЕСТИЦИЯЛАРҒА ЖАСЫЛ ҚАРЖЫЛАНДЫРУ ҚҰРАЛДАРЫНЫҢ ӘСЕРІ

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Түйін. *Тақырыптың өзектілігі климаттың өзгеруі, табиғи ресурстардың сарқылуы және биоәртүрліліктің азаюы сияқты экологиялық сын-қатерлердің күшеюімен негізделеді, бұл тұрақты даму моделіне көшуді талап етеді. Мақалада Қазақстандағы экологиялық инвестициялардың динамикасына, құрылымына және тұрақтылығына жасыл қаржыландыру құралдарының әсері зерттеледі. Зерттеудің мақсаты – жасыл қаржыландыру механизмдерінің экономиканың негізгі экологиялық секторларындағы инвестициялық белсенділікке әсерін бағалау. Гипотезаға сәйкес, жасыл қаржыландыру құралдарының кеңеюі экологиялық инвестициялар көлемінің өсуіне ықпал етеді, алайда институционалдық және экономикалық шектеулер жағдайында олардың тұрақтылығын толық қамтамасыз етпейді. Зерттеудің әдіснамалық негізін 2018-2022 жылдар аралығындағы Қазақстан бойынша деректерге жүргізілген статистикалық және салыстырмалы талдау, сондай-ақ халықаралық тәжірибенің жекелеген элементтерін жалпылау құрайды. Зерттеу нәтижелері экологиялық инвестициялардың біркелкі емес динамикасын көрсетті: өсу кезеңдері құлдыраумен алмасып отырады, бұл қаржыландыру жүйесінің институционалдық тұрақтылығының жеткіліксіз екенін білдіреді. Жасыл қаржыландыруды дамытудағы негізгі кедергілер анықталып, Қазақстанның экологиялық саласында тұрақты және теңгерімді инвестицияларды қамтамасыз етудегі оның рөлін арттыру бағыттары негізделді.*

Түйінді сөздер: *жасыл экономика, жасыл қаржыландыру, тұрақты даму, экологиялық инвестициялар, климаттың өзгеруі.*

ВЛИЯНИЕ ИНСТРУМЕНТОВ ЗЕЛЕНОГО ФИНАНСИРОВАНИЯ НА ЭКОЛОГИЧЕСКИЕ ИНВЕСТИЦИИ В КАЗАХСТАНЕ

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Резюме. *Актуальность темы обусловлена усилением экологических вызовов, включая изменение климата, истощение природных ресурсов и снижение биоразнообразия, что требует перехода к модели устойчивого развития. В статье исследуется влияние инструментов зеленого финансирования на динамику, структуру и устойчивость экологических инвестиций в Казахстане. Цель исследования заключается в оценке воздействия механизмов зеленого финансирования на инвестиционную активность в ключевых экологических секторах экономики. Гипотеза состоит в том, что расширение инструментов зеленого финансирования способствует росту объемов экологических инвестиций, однако не гарантирует их стабильности в условиях институциональных и экономических ограничений. Методологическую основу исследования составили статистический и сравнительный анализ данных по Казахстану за 2018–2022 годы, а также обобщение отдельных элементов международной практики. Результаты показали неравномерную динамику экологических инвестиций: периоды роста чередуются со спадом, что свидетельствует о недостаточной институциональной устойчивости системы финансирования. Выявлены ключевые барьеры развития зеленого финансирования и обоснованы направления повышения его роли в обеспечении стабильных и сбалансированных инвестиций в экологическую сферу Казахстана.*

Ключевые слова: *зеленая экономика, зеленые финансы, устойчивое развитие, экологические инвестиции, климатические изменения.*

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