

ISSN 2518-1467 (Online),  
ISSN 1991-3494 (Print)

«ҚАЗАҚСТАН РЕСПУБЛИКАСЫ  
ҰЛТТЫҚ ҒЫЛЫМ АКАДЕМИЯСЫ» РҚБ  
«ХАЛЫҚ» ЖҚ

# Х А Б А Р Ш Ы С Ы

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**ВЕСТНИК**

РОО «НАЦИОНАЛЬНОЙ  
АКАДЕМИИ НАУК  
РЕСПУБЛИКИ КАЗАХСТАН»  
ЧФ «Халық»

**THE BULLETIN**

OF THE ACADEMY OF SCIENCES  
OF THE REPUBLIC OF  
KAZAKHSTAN  
«Halyk» Private Foundation

PUBLISHED SINCE 1944

**4 (404)**

JULY-AUGUST 2023

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ALMATY, NAS RK

В 2016 году для развития и улучшения качества жизни казахстанцев был создан частный Благотворительный фонд «Халык». За годы своей деятельности на реализацию благотворительных проектов в областях образования и науки, социальной защиты, культуры, здравоохранения и спорта, Фонд выделил более 45 миллиардов тенге.

Особое внимание Благотворительный фонд «Халык» уделяет образовательным программам, считая это направление одним из ключевых в своей деятельности. Оказывая поддержку отечественному образованию, Фонд вносит свой посильный вклад в развитие качественного образования в Казахстане. Тем самым способствуя росту числа людей, способных менять жизнь в стране к лучшему – профессионалов в различных сферах, потенциальных лидеров и «великих умов». Одной из значимых инициатив фонда «Халык» в образовательной сфере стал проект *Ozgeris powered by Halyk Fund* – первый в стране бизнес-инкубатор для учащихся 9-11 классов, который помогает развивать необходимые в современном мире предпринимательские навыки. Так, на содействие малому бизнесу школьников было выделено более 200 грантов. Для поддержки талантливых и мотивированных детей Фонд неоднократно выделял гранты на обучение в Международной школе «Мирас» и в *Astana IT University*, а также помог казахстанским школьникам принять участие в престижном конкурсе «*USTEM Robotics*» в США. Авторские работы в рамках проекта «Тәлімгер», которому Фонд оказал поддержку, легли в основу учебной программы, учебников и учебно-методических книг по предмету «Основы предпринимательства и бизнеса», преподаваемого в 10-11 классах казахстанских школ и колледжей.

Помимо помощи школьникам, учащимся колледжей и студентам Фонд считает важным внести свой вклад в повышение квалификации педагогов, совершенствование их знаний и навыков, поскольку именно они являются проводниками знаний будущих поколений казахстанцев. При поддержке Фонда «Халык» в южной столице был организован ежегодный городской конкурс педагогов «*Almaty Digital Ustaz*».

Важной инициативой стал реализуемый проект по обучению основам финансовой грамотности преподавателей из восьми областей Казахстана, что должно оказать существенное влияние на воспитание финансовой грамотности и предпринимательского мышления у нового поколения граждан страны.

Необходимую помощь Фонд «Халык» оказывает и тем, кто особенно остро в ней нуждается. В рамках социальной защиты населения активно проводится работа по поддержке детей, оставшихся без родителей, детей и взрослых из социально уязвимых слоев населения, людей с ограниченными

возможностями, а также обеспечению нуждающихся социальным жильем, строительству социально важных объектов, таких как детские сады, детские площадки и физкультурно-оздоровительные комплексы.

В копилку добрых дел Фонда «Халык» можно добавить оказание помощи детскому спорту, куда относится поддержка в развитии детского футбола и карате в нашей стране. Жизненно важную помощь Благотворительный фонд «Халык» оказал нашим соотечественникам во время недавней пандемии COVID-19. Тогда, в разгар тяжелой борьбы с коронавирусной инфекцией Фонд выделил свыше 11 миллиардов тенге на приобретение необходимого медицинского оборудования и дорогостоящих медицинских препаратов, автомобилей скорой медицинской помощи и средств защиты, адресную материальную помощь социально уязвимым слоям населения и денежные выплаты медицинским работникам.

В 2023 году наряду с другими проектами, нацеленными на повышение благосостояния казахстанских граждан Фонд решил уделить особое внимание науке, поскольку она является частью общественной культуры, а уровень ее развития определяет уровень развития государства.

Поддержка Фондом выпуска журналов Национальной Академии наук Республики Казахстан, которые входят в международные фонды Scopus и Wos и в которых публикуются статьи отечественных ученых, докторантов и магистрантов, а также научных сотрудников высших учебных заведений и научно-исследовательских институтов нашей страны является не менее значимым вкладом Фонда в развитие казахстанского общества.

С уважением, Благотворительный Фонд «Халык»!

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**«Қазақстан Республикасы Ұлттық ғылым академиясы РҚБ-нің Хабаршысы».**

**ISSN 2518-1467 (Online),**

**ISSN 1991-3494 (Print).**

Меншіктенуші: «Қазақстан Республикасының Ұлттық ғылым академиясы» РҚБ (Алматы қ.). Қазақстан Республикасының Ақпарат және коммуникациялар министрлігінің Ақпарат комитетінде 12.02.2018 ж. берілген

**№ 16895-Ж** мерзімдік басылым тіркеуіне қойылу туралы куәлік.

Тақырыптық бағыты: *әлеуметтік ғылымдар саласындағы зерттеулерге арналған.*

Мерзімділігі: жылына 6 рет.

Тиражы: 300 дана.

Редакцияның мекен-жайы: 050010, Алматы қ., Шевченко көш., 28, 219 бөл., тел.: 272-13-19

<http://www.bulletin-science.kz/index.php/en/>

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**«Вестник РОО «Национальной академии наук Республики Казахстан».**

**ISSN 2518-1467 (Online),**

**ISSN 1991-3494 (Print).**

Собственник: РОО «Национальная академия наук Республики Казахстан» (г. Алматы).  
Свидетельство о постановке на учет периодического печатного издания в Комитете информации Министерства информации и коммуникаций и Республики Казахстан № **16895-Ж**, выданное 12.02.2018 г.

Тематическая направленность: *посвящен исследованиям в области социальных наук.*

Периодичность: 6 раз в год.

Тираж: 300 экземпляров.

Адрес редакции: 050010, г. Алматы, ул. Шевченко, 28, ком. 219, тел. 272-13-19

<http://www.bulletin-science.kz/index.php/en/>

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## **Bulletin of the National Academy of Sciences of the Republic of Kazakhstan.**

**ISSN 2518-1467 (Online),**

**ISSN 1991-3494 (Print).**

Owner: RPA «National Academy of Sciences of the Republic of Kazakhstan» (Almaty). The certificate of registration of a periodical printed publication in the Committee of information of the Ministry of Information and Communications

of the Republic of Kazakhstan **No. 16895-Ж**, issued on 12.02.2018.

Thematic focus: *it is dedicated to research in the field of social sciences.*

Periodicity: 6 times a year.

Circulation: 300 copies.

Editorial address: 28, Shevchenko str., of. 220, Almaty, 050010, tel. 272-13-19

<http://www.bulletin-science.kz/index.php/en/>

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BULLETIN OF NATIONAL ACADEMY OF  
SCIENCES OF THE REPUBLIC OF KAZAKHSTAN  
ISSN 1991-3494

Volume 4. Number 404 (2023), 481-496  
<https://doi.org/10.32014/2023.2518-1467.564>

IRSTI: 06.71.63

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## THE TRANSITION TO GREEN ENERGY: A COMPREHENSIVE MARKET REVIEW OF FINANCING, INVESTMENT, AND POLICY FOR A SUSTAINABLE FUTURE

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**Abstract.** The transition to green energy has received significant attention around the world due to concerns about climate change, energy security and sustainable development. Global attention to renewable energy has intensified given their importance to achieving sustainability. Green energy projects covering various renewable energy sources and technologies play a critical role in achieving a sustainable energy future. This market review delves into the current body of knowledge on the current state of green energy financing and investment to identify key research areas, identify gaps, and provide insights for policy makers, researchers, and practitioners. Kazakhstan, as the largest landlocked country, is actively implementing green energy projects to reduce dependence on fossil fuels and promote sustainable development. The study uses content analysis of academic databases and statistical data from a variety of sources, highlighting the importance of policy frameworks, regulations, and technological advances in spurring clean energy initiatives. Statistics were taken for 2018-2022 from the Bureau of National Statistics on investment activities in the Republic and the green economy. The study highlights the need for green investment to achieve carbon neutrality by 2060. Kazakhstan is committed to international cooperation and investment in the green energy sector by establishing partnerships with China, the European Union and the United Arab Emirates. The development of the green lending market and technological advances in renewable energy further strengthen the country's commitment to reducing carbon emissions and using clean energy sources. Summarizing existing knowledge, this review aims to contribute to a better understanding of the challenges, opportunities and best practices associated with green energy projects.

**Keywords:** green energy, renewable energy sources, green energy projects, sustainable energy future, green energy financing, investment in green energy.

This research has been funded by the Science Committee of the Ministry of Science and Higher Education of the Republic of Kazakhstan (Grant "Development of a framework model to improve the efficiency of green energy projects in the Republic of Kazakhstan" No. AP19579384)

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ИНВЕСТИЦИЯЛАРҒА ЖӘНЕ ТҰРАҚТЫ БОЛАШАҚҚА АРНАЛҒАН  
САЯСАТҚА ЖАН-ЖАҚТЫ ШОЛУ**

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**Аннотация.** Климаттың өзгеруіне, энергетикалық қауіпсіздікке және тұрақты дамуға қатысты алаңдаушылыққа байланысты жасыл энергетикаға көшу бүкіл әлемде айтарлықтай назарға алынды. Жаңартылатын энергия көздеріне жаһандық назар олардың тұрақтылыққа қол жеткізудегі маңыздылығын ескере отырып күшейді. Әртүрлі жаңартылатын энергия көздері мен технологияларын қамтитын жасыл энергетикалық жобалар тұрақты энергетикалық болашаққа қол жеткізуде маңызды рөл атқарады. Бұл нарықтық шолу негізгі зерттеу бағыттарын анықтау, саясаткерлерге, зерттеушілерге және тәжірибе жүзінде қолданушыға түсінік беру үшін жасыл энергияны қаржыландыру және инвестициялаудың ағымдағы жағдайы туралы білімнің ағымдағы жиынтығын зерттейді. Қазақстан теңізге шыға алмайтын ең ірі мемлекет ретінде қазба отындарына тәуелділікті азайту және тұрақты дамуға жәрдемдесу үшін жасыл энергетика жобаларын белсенді түрде жүзеге асыруда. Зерттеуде әртүрлі көздерден алынған академиялық дерекқорлар мен статистикалық деректердің мазмұнды талдауы пайдаланылады, бұл таза энергия бастамаларын ынталандыру үшін саясат негіздерінің, ережелердің және технологиялық жетістіктердің маңыздылығын көрсетеді. Республикадағы инвестициялық қызмет және жасыл экономика бойынша 2018-2022 жылдарға арналған статистика Ұлттық статистика бюросынан алынды. Зерттеу 2060 жылға қарай көміртегі бейтараптығына қол жеткізу үшін жасыл инвестиция қажеттілігін көрсетеді. Қазақстан Қытаймен, Еуропалық Одақпен және Біріккен Араб Әмірліктерімен серіктестік орнату арқылы халықаралық ынтымақтастық пен жасыл энергетика секторына инвестиция



салуды жақтайды. Жасыл несиелеу нарығының дамуы және жаңартылатын энергиядағы технологиялық жетістіктер елдің көміртегі шығарындыларын азайту және таза энергия көздерін пайдалану жөніндегі міндеттемесін одан әрі күшейтеді. Қолданыстағы білімді қорытындылай отырып, бұл шолу жасыл энергетикалық жобалармен байланысты қиындықтарды, мүмкіндіктерді және үздік тәжірибелерді жақсырақ түсінуге ықпал етуге бағытталған.

**Түйін сөздер:** жасыл энергия, жаңартылатын энергия көздері, жасыл энергетика жобалары, тұрақты энергия болашағы, жасыл энергияны қаржыландыру, жасыл энергияға инвестиция

Бұл зерттеуді Қазақстан Республикасы Ғылым және жоғары білім министрлігінің Ғылым комитеті қаржыландырды (№ АР19579384 «Қазақстан Республикасында жасыл энергетика жобаларының тиімділігін арттыру үшін негіздемелік модель әзірлеу»)

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## **ПЕРЕХОД К ЗЕЛЕННОЙ ЭНЕРГИИ: ВСЕСТОРОННИЙ ОБЗОР РЫНКА ФИНАНСИРОВАНИЯ, ИНВЕСТИЦИЙ И ПОЛИТИКИ ДЛЯ УСТОЙЧИВОГО БУДУЩЕГО**

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**Аннотация.** Переход на зеленую энергию привлек значительное внимание во всем мире из-за опасений по поводу изменения климата, энергетической безопасности и устойчивого развития. Глобальное внимание к возобновляемым источникам энергии усилилось, учитывая их важность для достижения устойчивости. Проекты «зеленой» энергетике, охватывающие различные возобновляемые источники энергии и технологии, играют решающую роль в достижении устойчивого энергетического будущего. Этот обзор рынка углубляется в существующую совокупность знаний о текущем состоянии финансирования и инвестиций в области зеленой энергетике, чтобы определить ключевые области исследований, выявить пробелы и предложить идеи для политиков, исследователей и практиков. Казахстан, как крупнейшая страна, не имеющая выхода к морю, активно реализует проекты в области зеленой энергетике, чтобы уменьшить зависимость от ископаемого топлива и способствовать устойчивому развитию. В исследовании используется контент-анализ академических баз данных и статистических данных из различных

источников, подчеркивая важность политических рамок, правовых актов и технологических достижений в стимулировании инициатив в области экологически чистой энергии. Статистические данные были взяты на 2018-2022 годы из Бюро национальной статистики по инвестиционной деятельности в Республике и зеленой экономике. В исследовании подчеркивается необходимость «зеленых» инвестиций для достижения углеродной нейтральности к 2060 году. Казахстан стремится к международному сотрудничеству и инвестициям в сектор «зеленой» энергетики, установив партнерские отношения с Китаем, Европейским Союзом и Объединенными Арабскими Эмиратами. Развитие рынка зеленого кредитования и технологические достижения в области возобновляемых источников энергии еще больше укрепляют приверженность страны сокращению выбросов углерода и использованию экологически чистых источников энергии. Обобщая существующие знания, этот обзор призван способствовать более глубокому пониманию проблем, возможностей и передового опыта, связанных с проектами в области «зеленой» энергетики.

**Ключевые слова:** зеленая энергия, возобновляемые источники энергии, проекты в области зеленой энергии, будущее устойчивой энергетики, финансирование зеленой энергии, инвестиции в зеленую энергию.

Данное исследование выполнено при финансовой поддержке Комитета науки Министерства науки и высшего образования Республики Казахстан (№ АР19579384 «Разработка рамочной модели для повышения эффективности проектов зеленой энергетики в РК»)

## **Introduction**

Renewable energy is attracting wide attention in the world due to its high importance and relevance. Green energy projects covering various renewable energy sources and technologies play a critical role in achieving a sustainable energy future. This market review delves into the current body of knowledge on the current state of green energy financing and investment to identify key research areas, identify gaps, and provide insights for policy makers, researchers, and practitioners.

Kazakhstan, the largest landlocked country in the world, has been actively pursuing green energy projects to reduce its reliance on fossil fuels and promote sustainable development.

The recent financial crisis triggered by volatile oil prices has now also been exacerbated by the global pandemic. Consequently, the need to reduce dependence on fossil fuels, as well as environmental impact, has prompted leaders around the world, including the government of Kazakhstan, to pay closer attention to the development of renewable energy sources. Thus, today the development of renewable energy sources is an important and significant topic that covers public policy, economics, innovation and science.

## **Materials and methods**

A systematic search of academic databases, including Scopus, Web of Science, and Google Scholar, was conducted to identify relevant peer-reviewed articles,

research papers, reports, and books. Search keywords included "green energy projects", "renewable energy projects", "sustainable energy projects" and related terms. In addition, methods of content analysis of scientific literature and regulations in the field of green energy were used; an analysis was made of indicators of the development of green financing in Kazakhstan. The study used statistical data from the AIFC Green Finance Center, information from KASE, Climate Bonds Initiative, the World Bank and the Development Bank of Kazakhstan, etc.

### **Literature Review**

In line with (Doyle et al., 2019) findings, the majority of developing nations are making efforts to obtain cleaner and more sustainable energy sources as part of their pursuit of sustainable development objectives. Consequently, the heavy reliance on and depletion of fossil fuels have had significant impacts on these countries, prompting them to shift towards sustainable energy initiatives. Nevertheless, the primary challenges that these developing countries face revolve around securing adequate funding and access to financial resources for their projects (Alieva et al., 2018). In recent years, various studies have been carried out to identify the problems and causes of insufficient funding for the green economy and green investment projects. In the research data, one of the main obstacles is the lack of investment attractiveness of green projects, which is associated with high risks, novelty of technologies, and long project implementation periods. In (Hadas-Dyduch et al. 2022) identify the most important incentives for expanding green bond issuance, such as capital mobilization, green financial market development, investor demand, reputational benefits.

Scientists have determined that the latest funding mechanisms to encourage investment in green energy projects in developing countries have helped several small energy projects save money while reducing emissions (Egli et al., 2018). In conjunction with other funding channels (Alieva et al., 2018), mentions that UNDP extends financial assistance to numerous countries, including Kazakhstan, through diverse and innovative economic mechanisms. Georgia was allocated working capital, while Kazakhstan receives support for green energy initiatives through interest rate subsidies, loan guarantees, and blended financing, which includes concessional and grant-based loans. Another authors (Yildirim et al. 2020) affirm that Kazakhstan is actively implementing NAMA projects in its urban sectors to enhance urban services.

The conceptual foundations of the "green" economy, the consideration of its relationship with the strategy of "green" growth and sustainable development, the need to change public consciousness in favor of rational use of natural resources and environmental protection is the subject of an article by Kazakh researchers (Nurgisaeva et al. 2020). The authors substantiate the indicators of a successful transition to a green economy, in particular the ecological footprint, the global green economy index, etc.

In (Doszhan et al. 2022) study, based on the study of current trends, she revealed the features of the Kazakhstani model of green financing, summarized the stages

of issuing green bonds in Kazakhstan. The authors come to the conclusion that the need for green financial instruments is quite large and continues to grow. The development of the green finance market requires legislative and financial support from the state. Authors (Elmustafa and Hoppe, 2020) pointed out several problems in the financial processes in the implementation of clean energy projects in Kazakhstan. Green energy projects are likely to have higher upfront costs and lower operating costs, resulting in long-term financing. Exclusion from long-term financing can lead to discriminatory treatment of investment decisions. In his study (Park, 2018) considered that this issue is particularly challenging for developing countries such as Kazakhstan, where securing long-term funding is difficult. In addition, limited investment opportunities in such countries further disadvantage them, as long-term assets cannot always be easily changed. Additionally, (Baxter, 2018) points out that clean energy projects in these developing nations face significant hurdles due to the absence of project financing, uncertainty, higher development costs, and a lack of equity financing.

Developed countries consider the transition to "green" energy sources as a key tool to reduce the risks of a recurrence of the energy crisis in the future. In the years leading up to the 2022 energy crisis, Lazard estimated that the cost of green energy had fallen below the cost of generating energy from coal, and in some cases even below the cost of generating energy from natural gas. With rising prices for traditional energy carriers, the cost advantage of green energy has become even more significant. For economic and political reasons, countries are planning to accelerate the pace of the green energy transition.

As of October 2022, countries that collectively account for almost 95% of global greenhouse gas emissions have committed to reducing emissions (nationally determined contribution) as part of the implementation of the 2015 Paris Agreement on climate change. To meet their commitments to decarbonization, countries are already implementing or planning to implement a large number of initiatives aimed at stimulating the transition to a green economy. Examples of such initiatives are: carbon trading systems, green finance standards and taxonomies of green projects, government support measures for green economy sectors, a ban on the sale of new cars with internal combustion engines, etc.

In his study (Farah, 2020) takes a short historical digression into the last century, when there was a sharp increase. On the one hand, this is energy consumption, and on the other hand, greenhouse gas emissions. Traditionally, energy security has been linked to the need to secure supplies. In turn, promote economic growth. Against this backdrop, countries have focused on diversifying their energy sources and trading partners. Also, while increasing investment in energy infrastructure and technology.

The unique features of green projects (for example, long time horizon, low liquidity and high risks) necessitate the use of innovative ways and tools for their financing. Our study complements existing developments in this area, taking into account the peculiarities of Kazakhstan

## **Results and discussion**

According to the ranking, The Green Future Index 2022 Kazakhstan took 49th place out of 76 countries. This ranking measures the degree of development of the green economy through investment in renewable energy, innovation and green finance. In the rating structure, Kazakhstan was highly rated in the Climate policy component - 32nd place and in the Carbon missions' component - 44th place. The decrease in the overall score is due to the low score of Kazakhstan in the components "Clean innovation", "Energy transition" and "Green society". When compared with the 2021 ranking, the position of Kazakhstan has significantly decreased from 33rd place to 49th place, while the number of points assigned to Kazakhstan has decreased from 4.9 to 4.5 points. It should be noted that the rest of the countries of the Central Asian region did not take part in The Green Future Index 2022.

### **1. Policy and Regulations**

Many research studies have explored the impact of policy frameworks and regulations on the advancement of green energy initiatives. These studies underscore the significance of favorable policies, feed-in tariffs, renewable portfolio standards, and carbon pricing mechanisms in encouraging investment and expediting the uptake of renewable energy technologies. Legal acts in green energy refer to laws, regulations, and policies implemented by governments to promote and regulate the development and use of renewable energy sources and foster the transition to a sustainable energy system. These legal acts are essential in creating a supportive legal framework, providing incentives, and ensuring a level playing field for green energy projects. Back in 2009, Kazakhstan implemented the "Law on Supporting the Utilization of Renewable Energy Sources," which outlines the primary domains of state regulation aimed at promoting the use of alternative energy sources. These domains encompass facilitating the establishment and functioning of generating facilities and incentivizing the production of electrical and thermal energy through the utilization of renewable energy sources.

Another landmark moment that reflected a qualitatively new approach of the government in regulating the economic and energy sector was the adoption of the "Concept of Transition to a Green Economy" in 2013. The document reflects the key goals for building an effective model of the national economy based on RES, as well as achieving a 10% share of RES in the country's energy complex by 2030. The Concept also sets goals for increasing the productivity of the agricultural sector through the use of "green" technologies and solving the problem of energy shortage in remote areas of the country. It is stated that the project will be implemented in several stages: in the periods from 2013 to 2020, from 2020 to 2030. and from 2030 to 2050 Thus, the project for the transition to a "green economy" in Kazakhstan is at the second stage of development, which provides for the rational use of natural resources based on high technologies. The Environmental Code, adopted in 2021, introduces a taxonomy of green projects, provides a legislative definition of green financing, specific tools for economic stimulation of activities aimed at protecting the environment. In December 2021, a taxonomy of green projects to be financed through green bonds and loans was adopted. The taxonomy provides clear definitions

of the types and technologies of green projects, so that all market participants (banks, funds, investors, supervisors, users) have the same basis for defining their objectives, programs and financial products, for example, the conditions for issuing green loans. Green Finance Initiatives: The Kazakh government has been exploring ways to attract green finance and investments to fund renewable energy projects. This includes the issuance of green bonds and establishing green investment funds. The environmental legislation of the Republic of Kazakhstan defines Taxonomy as a classification of "green" projects to be financed through "green" bonds and "green" loans. For the regulatory support of the procedure for issuing green bonds, the AIX exchange adopted the Rules for the Issuance and Circulation of Green Bonds, developed on the basis of the Principles of Green Bonds of the International Capital Market Association and the standards of the international organization Climate Bonds Initiative.

## **2. Financing and Investment**

Due to the significant attention on the financial aspects of green energy projects, researchers are actively studying various financing mechanisms, such as green bonds, public-private partnerships and venture financing, and evaluate their effectiveness in attracting investments.

In order for Kazakhstan to achieve carbon neutrality by 2060, a necessary condition is to attract "green" investments. During 2019, Kazakhstan unveiled its green energy development strategy extending until 2030. This strategy entails a deliberate effort to elevate the proportion of renewable energy sources within the nation's energy system. As part of this strategy, Kazakhstan plans to attract investments in the amount of about 3 billion US dollars. Kazakhstan is also actively working to attract foreign investment in green energy. For example, in September 2021, China Power announced plans to invest US\$1.2 billion to build a wind farm in Kazakhstan. According to PWC, investment in renewables is particularly relevant for the oil and gas and energy sectors, both to ensure compliance with legal requirements for greenhouse gas emissions and to avoid paying fines, and to ensure the sustainability of the company's market value. So, in the UK, over the same period, investments in "green energy" brought 75% per annum, against 8.8% for fossil fuels. The profitability of RES in the US is 200% versus 97.2% for fossil fuels analyzed over a 5-year period. Based on the foregoing, the Information Package will allow attracting all the necessary participants to the implementation of "green projects", namely small-scale RES projects.

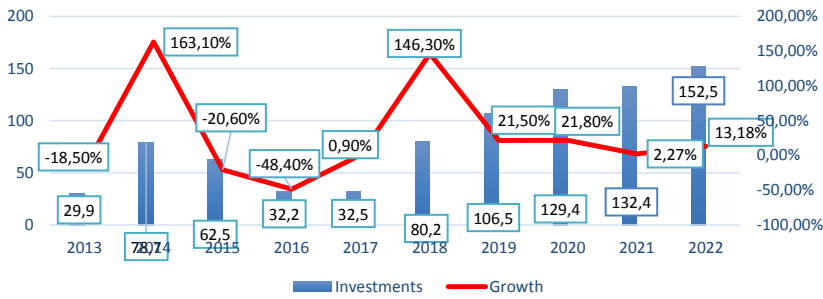


Fig. 1 The amount of investments directed towards the green economy in the Republic of Kazakhstan, measured in billion tg

We will also provide data characterizing the volume of funding for scientific and scientific and technical projects approved by the National Scientific Councils in the framework of grant and program-targeted funding. The amount of allocated funds for financing scientific and scientific-technical projects on the "green economy" is shown in Table 1.

Table 1

	Issuer	Unit	2017	2018	2019	2020	2021
1.	Number of scientific and scientific-technical projects on the "green economy"	units	15	41	41	42	3
2.	Expenses on scientific and scientific-technical projects related to the "green economy"	thousand tenge	...	1 191 095,7	1 446 137,8	1 594 321,2	203 940,0

International Cooperation: Kazakhstan has been actively seeking international cooperation and investments in the green energy sector. The country has attracted investments from international companies and financial institutions to support the development of renewable energy projects. Partnerships with countries like China, the European Union, and the United Arab Emirates have been established to promote renewable energy investments. Volume of investments in green energy received from other countries (Sustainable Development Goals 15.a.1) is presented in Table 2.

Table 2

Year	Kazakhstan-recipient, million US dollars	Growth	Year	Kazakhstan-recipient, million US dollars	Growth
2010	2,1849		2016	2,4875	
2011	0,2651		2017	3,1811	127,88%
2012	0,5611		2018	2,023	-63,59%
2013	11,5444		2019	1,0853	-53,65%

2014	0,2214	-191%	2020	0,3462	-31,95%
2015	0,0145	-6%	2021	0,4769	37,70%

Kazakhstan has been actively pursuing investments in green energy to diversify its energy mix, reduce greenhouse gas emissions, and promote sustainable development. Here are some key areas and initiatives related to green energy investments in Kazakhstan:

1. **Renewable Energy Development:** Kazakhstan has abundant renewable energy resources, including wind, solar, hydro, and biomass. The government has established ambitious goals to raise the proportion of renewable energy in the nation's energy mix. Investments are actively being channeled into the development of renewable energy projects, including wind farms, solar power plants, and small hydropower facilities.

2. **Wind Energy:** Kazakhstan has significant wind potential, particularly in the southern regions. The country aims to develop wind power capacity of up to 3,000 megawatts (MW) by 2030. Investments have been made in wind farms, including the Yereymentau Wind Power Plant, which has a capacity of 50 MW, and the Shelek Corridor Wind Power Plant, with a capacity of 60 MW.

3. **Solar Energy:** Kazakhstan enjoys abundant sunlight, especially in its southern regions. The government has set a target to increase solar power capacity to 1,000 MW by 2030. Investments have been made in solar energy projects, such as the Burnoye Solar Power Plant with a capacity of 100 MW and the Baikonur Solar Power Plant with a capacity of 50 MW.

4. **Energy Efficiency:** Kazakhstan is also focusing on improving energy efficiency in various sectors, including buildings, industry, and transportation. Investments are being made in energy-efficient technologies, infrastructure upgrades, and energy management systems to reduce energy consumption and emissions.

Investments aimed at environmental protection by types of environmental protection activities to 2013-2021 years is presented in Table 3.

Table 3

	Investments aimed at green energy	Investment in renewable energy	Investing in energy-saving technologies and enhancing energy efficiency.	Investments aimed at reducing greenhouse gas emissions	Total investment in fixed assets	The proportion of investments dedicated to environmental protection out of the total investments.
2013	12213408	9042494	906487		6072687	1,30%
2014	3096380	490287	872208	413199	6591482	1,60%
2015	16968902	7487656	655538	1115434	7024709	1,25
2016	1761336	956349	154966	218070	7762303	0,60%
2017	42567577	18884630	15612246		8770572	1%



2018	73220792	70941690	1793464	105610	11179036	1%
2019	162722471	1,62E+08	234749	399190	12576793	1,60%
2020	122410239	1,14E+08	5959183	65385	12270233	1,40%
2021	105952068	98901557	4833394	31988	13242233	1,30%

Kazakhstan is working on creating a favorable environment for green finance and attracting investments through various mechanisms. This includes the development of green bonds and other financial instruments, as well as the establishment of funds to support renewable energy projects. The active use of green bonds can contribute to knowledge sharing, capacity building and government support (especially in the analysis of the economy of Kazakhstan) for the development of the green bond market, as well as government encouragement of private investors to green investment (Nurgaliyeva et al. 2022). Kazakhstan is making significant efforts to expand the practice of green finance. This is evidenced by the growth in the cumulative volume of issuance of "green" bonds to 95.9 billion tenge and the volume of green loans issued to 28.5 billion tenge by the beginning of February 2023. With the growth of the market and the expansion of the issuance of "green" financial instruments, the regulatory framework of the "green" financial system of Kazakhstan is being updated, the methodology of "green" financing is being specified.

Analyzing the trends in the global green bond market, it should be noted that, according to the Climate Bonds Initiative, the total volume of green bond issuance at the end of September 2022 amounted to more than 2 trillion USD, 57.2% of the total volume of GSS+ bonds (Kalkabayeva 2023). At the same time, these funds still account for 5% of the global debt market. In Kazakhstan, the share of green bonds does not exceed 0.3% in the total volume of the Kazakhstan debt market.

In 2023, globally, there was a 20% decline in the issuance of new ESG (Environmental, Social, and Governance) bonds compared to the previous year. Conversely, in Kazakhstan, there was a 14% increase in the volume of new sustainable bond placements. Over a three-year period, the Kazakhstan Stock Exchange (KASE) recorded ESG bonds worth 139.7 billion tenge, with only 85.8 billion tenge successfully placed, accounting for less than 1% of the total corporate debt traded on the exchange. The current state of the Kazakhstan green bond market for 2022 is presented in the table 4.

Table 4

№	Issuer	2020	2021	2022	2023
	JSC Entrepreneurship Development Fund Damu	200 million	1 billion		
	Development Bank of Kazakhstan JSC		20 billion		32 billion
	Asian Development Bank	1,5 billion			
	"KEGOC" JSC			16,1 billion	18,9 million

Analyzing current trends in green finance in Kazakhstan, it should be noted that financial institutions and private businesses are showing significant interest in green

financial instruments. In the green bond market, there is an excess of demand over supply. Figure 1 shows the dynamics of green finance indicators in Kazakhstan.

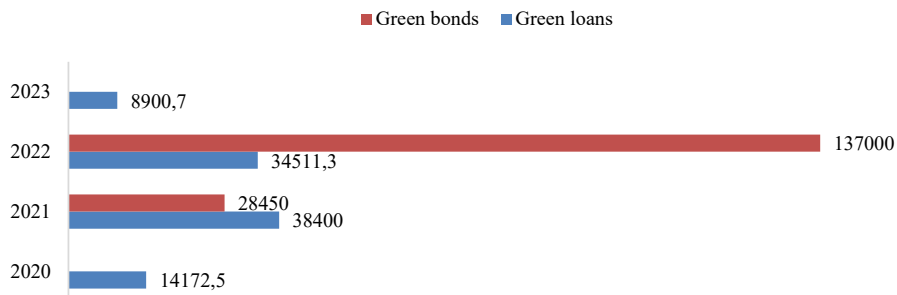


Fig. 2 Volumes of green finance in Kazakhstan, 2020-2023

In accordance with Figure 1, the following can be noted: in the volume of green financing, the largest share is "green" bonds - 70.7%. At the same time, green bonds issued by the Eurasian Development Bank, Samruk-Energy JSC and KEGOC JSC made a big contribution. The necessary infrastructure was created for the issuance of green bonds on the Kazakhstan stock exchanges KASE and AIX, including the requirements for such debt instruments and the provision of incentives for listing fees.

In parallel with green bonds, the green lending market, that is, the provision of loans for environmentally significant projects, has been rapidly developing in recent years. Given the dominant role of the banking sector in the financial system of Kazakhstan, the development of a green lending market, accessible to a wider range of potential borrowers, including small and medium-sized businesses, will contribute to the development of green projects.

Green loans are integral to the principles of sustainable development, encompassing the ESG framework (Environmental, Social, and Governance) that evaluates companies' impact on the environment, their social responsibility, and the quality of corporate governance. On a global scale, funding sources related to ESG initiatives are experiencing notable expansion.

The loan portfolio of second-tier banks at the end of July 2022 amounted to 20.4 trillion. tenge (\$42.8 billion): including 4.0 trillion tenge (\$8.4 billion) loans to small and medium-sized enterprises (SMEs). At the end of August, the liquidity surplus in the financial market of Kazakhstan amounted to 2.7 trillion tenge (\$5.7 billion). Loans for "green" technologies comes with 19 interest rate). According to forbes.kz, many loans are not repaid, which is why second-tier banks are reluctant to lend to "green" projects, considering them risky.

That is, the barriers that hinder the use of "green" technologies include difficult access to financing, its high cost, gaps in legislative regulation. Also, the system of tariff formation for traditional energy carriers.

There are positive results on lending. In July 2021, the EBRD and Bank CenterCredit (BCC) signed a green economy credit line in the amount of \$20 million. The purpose of the joint action is to finance energy-efficient modernization of business and residential facilities using environmentally friendly materials and resource-saving technologies. In 2020, the Asian Development Bank placed green bonds on KASE in the amount of \$32 million, and the Damu Fund raised 200 million tenge on the AIFC exchange. As you can see, both cases relate to the practice of funding on the stock exchange. The volume of green loans provided by DBK amounted to 16.9 billion tenge or 13.6% of the total amount of green financing. In addition, the Development Bank of Kazakhstan provides most of the loans issued to non-energy sectors of the economy.

Considering the "green" projects financed by DBK, it can be noted that many of them are related to the use of renewable energy sources. In particular, this is the construction of the Kaskelen 50 MW solar power plant, the AstanaExpo-2017 wind power plant with a capacity of 100 MW, the Turgusun-1 hydroelectric power plant with a capacity of 24.9 MW and others. The execution of these projects facilitates comprehensive changes, aiming to shift towards a green economy by curbing carbon dioxide emissions, enhancing the population's quality of life, and simultaneously lessening the strain on the environment and preserving natural resources.

By the conclusion of 2021, HalykBank JSC extended a green loan of 7.9 billion tenge to KazGreenEnergy for the establishment of a 5MW bioelectric power plant. The loan was assessed and approved by the AIFC Green Finance Center.

To stimulate private investment in "green" business, several financial instruments were tested jointly with Damu Entrepreneurship Development Fund JSC. They aim to increase the availability of green finance for SMEs in the energy efficiency and renewable energy sources (RES) sectors. All this is within the framework of UNDP and the Government of the Republic of Kazakhstan projects financed by the Global Environment Facility.

In 2022, a tool was introduced to subsidize the amount of the principal debt, providing for the repayment of up to 40% of the loan after the launch and acceptance of the project (technical verification). Since 2018, the instrument of subsidizing the loan rate has been used. 36 projects were supported by paying an interest rate subsidy to the bank, reducing debt-financing payments. Key performance indicators of RES, including the number of people employed at RES facilities, as of January 30, 2023 is shown in Table 5.

Table 5

Types of RES	Qty	Installed capacity, MW	Generation, million kWh for 6 months of 2022	Number of people employed at RES facilities, people	including	
Wind farms	50	684	1 053,8	446	69	377
Hydroelectric power plants	40	281	485	758	109	649

Solar power plants	49	1 037,6	853,3	385	48	337
Biogas power plants	5	7,8	0,4	23	-	23
<b>Total for all RES facilities</b>	<b>134</b>	<b>2 010,7</b>	<b>2 392,5</b>	<b>1 612</b>	<b>226</b>	<b>1 386</b>

Based on the data presented by the Ministry of Energy of the Republic of Kazakhstan, several statistical findings can be observed. Renewable Energy Sources (RES) emerge as the leading type of generation. In the year 2020, a total of 11 facilities were commissioned, with a cumulative installed capacity of 218.5 MW. However, in 2021, there was a decrease in the number of new facilities, with only 10 being added, and their combined capacity amounted to 132.7 MW, representing a decline of 39.3% compared to the previous year. For comparison: in 2020, the renewable energy sector was replenished with 10 new solar stations, and their installed capacity was 368.8 MW, in 2021 there were six of them with a total capacity of 126 MW (-65.8%).

The installed capacity of new small HPPs has increased. In 2021, only one project was launched (capacity 4.5 MW), and in 2022 two objects at once (total capacity 50.7 MW) were launched.

In the regional context, the leader in the commissioning of new capacities in 2021 was the energy-deficient Turkestan region. New capacities of 115 MW were commissioned there (+93.9% compared to 2020). The second place belongs to the East Kazakhstan region, where green capacities of 54.6 MW were put into operation. An additional 50 MW of green capacity provided the third place for the Kostanay region. Akmola region distinguished itself, where 4.5 MW capacities were put into operation. Although a year earlier the indicator was at the level of 137 MW.

From the information provided by the Ministry of Energy of the Republic of Kazakhstan, it follows that of the new projects in 2022, four objects can be called significant. They entered the top 20 largest facilities in terms of installed capacity.

PwC estimates indicate that the construction costs of different types of power plants in the Republic of Kazakhstan from 2011 to 2022 amounted to at least 628.5 billion tenges. Analyzing the changes in investment volumes for renewable energy sources (RES) by types, it is evident that the share of electricity generated from hydroelectric power plants has decreased by 12% over the span of 6 years. In contrast, the share of electricity from wind power plants has increased by 6 times, and solar power plants have seen a remarkable 22-fold increase. These trends suggest that the Republic of Kazakhstan is placing a greater emphasis on the development of solar and wind power plants.

### **Conclusions**

In conclusion, Kazakhstan has taken significant strides in promoting green energy and fostering a sustainable future. The country's policies and regulations aimed at developing the green economy demonstrate a strong commitment to reducing carbon emissions, increasing the share of renewable energy in the energy mix, and embracing a more environmentally conscious approach to economic development.

Through the implementation of renewable energy support mechanisms such

as feed-in tariffs, power purchase agreements, and tax incentives, Kazakhstan has encouraged both domestic and foreign investments in wind, solar, and other renewable energy projects. These initiatives have contributed to the diversification of the energy sector and reduced the country's reliance on fossil fuels.

Furthermore, Kazakhstan's focus on energy efficiency measures has played a crucial role in optimizing energy consumption and reducing overall environmental impact. By setting energy efficiency standards and providing incentives for energy-saving practices, the country has made substantial progress in achieving its sustainable development objectives.

The government's commitment to international climate agreements, notably its participation in the Paris Agreement, underlines Kazakhstan's dedication to addressing global climate challenges. As a responsible global citizen, Kazakhstan has pledged to work towards mitigating climate change and transitioning to a low-carbon economy.

Green finance initiatives, such as the issuance of green bonds and the establishment of green investment funds, have facilitated the funding of green energy projects and attracted investments from various sources. This financial support has been crucial in driving innovation and expanding the country's renewable energy infrastructure.

Furthermore, Kazakhstan's alignment with the United Nations Sustainable Development Goals reflects a holistic approach to green energy development. By integrating sustainability goals into its national development strategies, the country aims to achieve not only environmental objectives but also broader social and economic benefits.

Research and innovation have played a pivotal role in Kazakhstan's green energy journey. The country's collaboration with international organizations and companies, as well as its emphasis on public-private partnerships, has paved the way for cutting-edge technologies and solutions that contribute to a greener and more sustainable future.

While Kazakhstan has made commendable progress in its pursuit of a green economy, continuous efforts and strong commitment from all stakeholders are necessary to further accelerate the transition towards renewable energy and sustainable development. Embracing emerging technologies, fostering research and development, and enhancing international cooperation will be key to overcoming challenges and achieving long-term sustainability goals.

Overall, Kazakhstan's dedication to green energy and sustainable practices sets a positive example for other nations. By continuing to build on its achievements and addressing evolving environmental challenges, Kazakhstan can play a pivotal role in shaping a more environmentally conscious and prosperous future for generations to come.

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**ISSN 2518–1467 (Online),**

**ISSN 1991–3494 (Print)**

**<http://www.bulletin-science.kz/index.php/en>**

Подписано в печать 30.08.2023.

Формат 60x881/8. Бумага офсетная. Печать - ризограф.

38,5 п.л. Тираж 300. Заказ 4.

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*РОО «Национальная академия наук РК»  
050010, Алматы, ул. Шевченко, 28, т. 272-13-19*