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THE DIGITAL FUTURE OF FINANCIAL INSTRUMENTS IN ADVANCING THE GREEN ECONOMY OF THE REPUBLIC OF KAZAKHSTAN

Digitalization provides innovative tools and solutions that contribute to the sustainable development of the green economy. The authors reviewed scientific articles on the digitalization of financial instruments focused on "environmental, social and corporate governance" criteria for assessing companies' sustainability and social responsibility (ESG). The article studies the capacity and needs of green finance in Central Asia and Kazakhstan.

The study concludes that the development of sustainable green finances in Kazakhstan corresponds to the goals of the Central Asian region. This study indicates the relevance and necessity of creating a Unified Green Finance Center, which would contribute to the coordination of efforts and resources of the area in environmentally sustainable development. Financial ecosystems using national banks' digital currencies, digital assets, and smart contracts can change the region's economic system and the architecture of green finance. This study also examines the digitalization of financial instruments, focusing on ESG criteria for assessing sustainability and social responsibility. Additionally, integrating digital currencies, digital assets, and smart contracts can reshape the region's financial system and architecture of green finance, further advancing sustainable development objectives.

The study establishes the relevance of sustainable green finances in Kazakhstan, proposing a Unified Green Finance Center to coordinate regional efforts, utilizing digital currencies, assets, and smart contracts to reshape financial systems and advance sustainable development goals.

Key words: green economy, taxonomy, greenwashing, greenhushing, tokenized bonds, sustainable development goals, digital financial assets.

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Қазақстан Республикасының "жасыл" экономикасын дамыту жағдайындағы қаржы құралдарының цифрлық болашағы

Цифрландыру жасыл экономиканың тұрақты дамуына ықпал ететін инновациялық құралдар мен шешімдерді ұсынады. Авторлар компаниялардың тұрақтылығы мен әлеуметтік жауапкершілігін (ESG) бағалау үшін «экологиялық, әлеуметтік және корпоративтік басқару» критерийлеріне бағытталған қаржы құралдарын цифрландыру туралы ғылыми мақалаларды қарастырды. Мақалада Орталық Азия мен Қазақстандағы жасыл қаржының мүмкіндіктері мен қажеттіліктері зерттеледі.

Бұл зерттеу Қазақстанда тұрақты жасыл қаржыны дамыту Орталық Азия өңірінің мақсаттарына сәйкес келеді деген қорытындыға келеді. Бұл зерттеу экологиялық тұрақты даму саласындағы аумақтың күш-жігері мен ресурстарын үйлестіруге ықпал ететін бірыңғай жасыл қаржы орталығын құрудың өзектілігі мен қажеттілігін көрсетеді. Ұлттық банктердің цифрлық валюталарын, цифрлық активтерді және ақылды келісімшарттарды пайдаланатын қаржылық экожүйелер аймақтың экономикалық жүйесін және жасыл қаржы архитектурасын өзгерте алады. Бұл зерттеу, солай-ақ, тұрақтылық пен әлеуметтік жауапкершілікті бағалау үшін ESG критерийлеріне назар аудара отырып, қаржы құралдарын цифрландыруды қарастырады. Сонымен қатар, цифрлық валюталарды, цифрлық активтерді және смарт-келісімшарттарды біріктіру аймақтың қаржы жүйесін және «жасыл» қаржы архитектурасын өзгерте алады, бұл тұрақты даму мақсаттарына одан әрі қол жеткізуге ықпал етеді.

Бұл зерттеу өңірлік күш-жігерді үйлестіру, Қаржы жүйелерін өзгерту және орнықты даму мақсаттарына қол жеткізу үшін цифрлық валюталарды, активтерді және смарт-келісімшарттарды пайдалану үшін бірыңғай жасыл қаржы орталығын құруды ұсынылып, Қазақстандағы орнықты жасыл қаржының өзектілігін растайды.

Түйін сөздер: жасыл экономика, таксономия, гринвошинг, гринхашинг, токенизацияланған облигациялар, тұрақты даму мақсаттары, цифрлық қаржы активтері.

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Цифровое будущее финансовых инструментов в условиях развития "зеленой" экономики Республики Казахстан

Цифровизация предоставляет инновационные инструменты и решения, которые способствуют устойчивому развитию зеленой экономики. Авторы рассмотрели научные статьи о цифровизации финансовых инструментов, ориентированные на критерии «экологического, социального и корпоративного управления» для оценки устойчивости и социальной ответственности компаний (ESG). В статье изучены возможности и потребности зеленых финансов в Центральной Азии и Казахстане.

В данном исследовании делается вывод, что развитие устойчивых зеленых финансов в Казахстане соответствует целям Центральноазиатского региона. Данное исследование указывает на актуальность и необходимость создания Единого центра зеленых финансов, который будет способствовать координации усилий и ресурсов территории в области экологически устойчивого развития. Финансовые экосистемы, использующие цифровые валюты национальных банков, цифровые активы и смарт-контракты, могут изменить экономическую систему региона и архитектуру зеленых финансов. В данном исследовании также рассматривается цифровизация финансовых инструментов с упором на критерии ESG для оценки устойчивости и социальной ответственности. Кроме того, интеграция цифровых валют, цифровых активов и смарт-контрактов может изменить финансовую систему региона и архитектуру «зеленых» финансов, способствуя дальнейшему достижению целей устойчивого развития.

Даное исследование подтверждает актуальность устойчивых зеленых финансов в Казахстане, для создания Единого центра зеленых финансов для координации региональных усилий, использования цифровых валют, активов и смарт-контрактов для изменения финансовых систем и достижения целей устойчивого развития.

Ключевые слова: зеленая экономика, таксономия, гринвошинг, гринхашинг, токенизированные облигации, цели устойчивого развития, цифровые финансовые активы.

Introduction

"Future generations will be able to evaluate whether the current generation has been able to take advantage of the opportunities presented by the era of digital interdependence. The time has come to act," said António Guterres, UN Secretary-General [1].

As a developing country, Kazakhstan faces a unique set of environmental challenges and opportunities that demand a closer examination of the impact of ESG on sustainable development. For example, Kazakhstan has experienced significant economic growth in recent years, mainly driven by its vast natural resource reserves, particularly in the oil and gas sector. However, this rapid growth has also led to environmental degradation, including high greenhouse gas emissions, water pollution, and land degradation. In December 2022, Kazakhstan submitted a report on measures to combat climate change. According to the data, starting in 2000, the country's greenhouse gas emissions began to increase and by 2018 reached a level of 392.755 million tons of CO2eq without land use, land-use change, and forestry (LULUCF) and 401.662 million tons of CO2eq with LULUCF, making Kazakhstan the largest source of greenhouse gas emissions in the region (Nations, 2022).

The concept of Kazakhstan's transition to a green economy, together with the National Project "Green Kazakhstan", includes significant funding for implementing activities. Investments in critical areas of the concept are estimated at 3.3 billion USD annually, reaching about 119 billion USD by 2050. For 2021-2025, it is planned to allocate 1.4 trillion tenges from state, local, and extra-budgetary funds

for the National Project "Green Kazakhstan". The state seeks to attract financing from financial and credit institutions [6].

The Chairman of the Eurasian Development Bank Board emphasized that Central Asia's shift towards sustainability will strain national budgets without external funding. Adopting green initiatives, low-carbon technologies, and digital solutions for climate change and environmental protection demands significant capital investment. For instance, studies indicate that countries in the region may bear costs equivalent to 100 percent of their national GDP (as seen in the Kyrgyz Republic) up to 300 percent (as seen in Kazakhstan) to attain carbon neutrality [14].

Environmental degradation, global warming, and the fight against poverty and rising prosperity in developed countries provide reasonable opportunities for the emergence and development of new financial instruments and non-financial benchmarks. Addressing the conference, Inger Andersen, the United Nations Environment Program (UNEP) leader, asserted that while challenges persist, solutions are readily apparent. She emphasized the necessity of scientifically grounded approaches for honest and equitable transformations across economies, financial systems, lifestyles, and governance structures. Andersen underscored the pivotal role of science in translating intentions into tangible actions, guiding the moral compass toward meaningful change (Nations, 2022).

The International Science Council (ISC), established in 2018 in its annual report for 2020, paid particular attention to the process of digitalization, the so-called digital revolution. Within the relevant section of the report, a long-term goal is formulated – creating a "digital planet for sustainable development". ISC discussed this agenda with the German Environmental Protection Agency (UBA), UNDP, UNEP, and Future Earth. As a result, the Coalition for Digital Environmental Sustainability (CODES) was established in 2021. The Coalition proposes ways to embed sustainability in all aspects of digitalization. This includes global inclusive processes to define standards and frameworks for digital sustainability governance, resource allocation, and infrastructure. The World Health Organization (WHO) is exploring blockchain to improve medical records and combat counterfeit medicines. Project BRIGHT (Blockchain and the Rise of Humanity and Technology) has created a blockchain platform to enhance the transparency and accountability of local organizations involved in UN projects. In February 2023, the Hong Kong government successfully issued its first tokenized green bonds worth 800 million HK$ (101 million USD). The token offered as part of the government's green bonds marks an essential step in the development of global financial markets and sustainable investing.

Literature Review

There is a growing body of work in the field of research on the interaction between the digital economy and green financial investment. In their work, Tian et al. (2022) used panel data from Chinese provinces to examine how the digital economy may affect green financial investment. A feature of their approach was using a static panel least squares method and a threshold model method, where the threshold variables were the regional scale of the industry and green financial audit.

Initially, in their economic research, Tian et al. (2022) utilized provincial panel data and examined the effectiveness of the digital economy on green financial investment in China. They employed static panel OLS and a threshold model method, establishing a threshold model with regional industry scale and green financial audit as threshold variables. Through these procedures, Tian et al. (2022) scrutinized the nonlinear aspects of the digital economy and its impact on green finance. The findings of Tian's study indicated that integrating the digital economy into green finance may mitigate regional economic development imbalances. In a related study, Dubrova et al. (2021) proposed that green finance involves providing financial support while enhancing resource efficiency and mitigating environmental and global climate impacts. Furthermore, researchers like Song et al. (2023) are actively exploring integrating digital financial services to foster the growth of a green economy, emphasizing its substantial positive spillover effects. They highlight the positive contributions of regional competition in developing both a green economy and digital financial services to promote overall progress in the green economy.

Lin, B., & Ma, R. (2022), Liu, et al., (2022), and Feng et al., (2022) have researched how green technology innovation can be facilitated through digital finance (Lin & Ma, 2022; Liu, et al., 2022; Feng et al., 2022). It is concluded that the advantages of "cheap cost, fast speed, and wide coverage" offered by digital finance can lower the entry barrier for financial services. Through informed decisions, it can reduce information asymmetry and improve the efficiency of the financial market.

Feng et al., (2022) found that digital finance may alleviate financial constraints, promote production

expansion, and increase regional capacity for green innovation. Han et al. found that digital finance exhibits a 'network effect" and an "inclusive effect" in green innovation (Feng et al., 2022). Digitalization facilitates the collection, storage, transmission, and identification of information, enhances the ability of enterprises to analyze vast amounts of data, and increases risk due to increasing the availability of finance.

Digital finance positively impacts green technology innovation; Green technology innovation grows by 9.5% for every 1% growth in digital finance. This result is similar to that of Pangarso et al., (2022), who also proved that digital finance may promote green technology innovation (Pangarso et al., 2022).

Rao et al., (2022) concluded that it is necessary to promote the development of digital finance to facilitate green technology innovation (Rao et al., 2022). Digital finance promotes the rapid growth of digital technology, which can provide more opportunities for corporate green innovation. Yang et al., (2022) concluded that digitalization positively impacts the development of a green economy (Yang et al., 2022). In the context of the Asian region, Nguyen & Chuc (2018) explored the development of fintech and green finance in Vietnam, and Zhang & Yin, (2023) discussed the synchronized development of the digital and green economy in China (Nguyen & Chuc, 2018; Zhang & Yin, 2023).

The European context has also been addressed Manta O. (2022), studied how the European financial market is adapting to modern challenges, including using green bonds (Manta, 2022).

Su et al., (2022) explored the relationship between the digital yuan and the digital economy in China (Su et al., 2022). The study highlights the transformation of currency in the digitalization era, the role of the digital yuan in the financial and economic sphere, and its potential impact on global finance and trade. The challenges and opportunities associated with digital currencies are also highlighted. Similarly, Bertayeva et al. (2023) contend that "green" financing is directed toward efficiently utilizing natural resources and maintaining a satisfactory environmental state (Bertayeva et al., 2023). They emphasize that the purview of the green economy extends to managing liquid resources for societal development with an ecological focus.

Some researchers, such as Kurbanova K. et al. (2021) and Nurgaliyeva A. et al. (2022), argue that in the current phase, the government must ensure the collection of taxes resulting from changes in business practices and financial transactions (Kurbanova et al., 2021; Nurgaliyeva et al., 2022). They assert that adopting environmental, social, and governance principles is aimed at supporting countries in meeting their obligations under the Paris Climate Agreement and achieving the United Nations' Sustainable Development Goals. The goal is to identify opportunities for leveraging green bonds in Kazakhstan to enhance territorial management efficiency and promote environmental projects. The empirical analysis employs tools such as the Theil index, natural discontinuities, Moran's index, and other methods. The research findings reveal apparent disparities in the digital economy, with dynamic fluctuations in the levels of development in both the green and digital economies. Notably, there are evident variations in the digital economy's development levels among cities within an urban agglomeration.

Methodology

The research applies an integrated scientific methodology to study investments in the context of digital financial assets, considering non-financial factors. The use of systems analysis allowed the integration of different conceptual frameworks in the field of digital finance, thus providing a holistic view of investment decision-making processes and analyzing their essence from several perspectives. Additionally, historical analysis methods were applied to trace the evolution of key concepts and trends in digital investment in the green economy. In contrast, comparative analysis was used to identify and analyze semantic correspondences and differences between approaches and models in the field. The capacity and needs of green finance in Central Asia and Kazakhstan were studied.

In 2022, the Kazakhstan government reported a record-breaking inflow of foreign direct investment (FDI) – $28 billion, 17.7% more than the results in 2021. Regarding sectors, the maximum investments went to the mining industry (43%). The manufacturing sector attracted 20%, slightly ahead of wholesale and retail trade (18%). Professional, scientific, and technical activities were unpopular with foreign investors – they accounted for 4% of FDI. The external debt of the Republic of Kazakhstan as of July 1, 2023, was $161.8 billion. Since the beginning of 2023, the debt has increased by 1.2 billion U.S. dollars [6]. This figure indicates significant pressure on the country's national budget and on solving environmental problems.

During his press briefing, Yakup Berish [31], the UNDP Resident Representative in Kazakhstan, highlighted areas of environmental concern outlined in UNICEF's Millennium Development Goals re-

port. These include various ecological crises such as the shrinking of the Aral Sea, soil pollution near the Baikonur Cosmodrome from heptyl, the aftermath of explosions at the Semipalatinsk nuclear test site, emissions from major metallurgical plants and power stations fueled by Ekibastuz coal, the mortality of seals in the Caspian Sea, and extensive waste dumps. Berish emphasized the urgent need for initiatives such as access to clean water, sustainable financing, waste management, and environmental education, underscoring their significance in Kazakhstan's pursuit of Sustainable Development Goals [31].

Meanwhile, on the road to a low-carbon economy, the entire Central Asian region faces a huge investment gap. Decarbonizing the area is estimated to require up to 1 trillion US dollars of total investments (proportional to current carbon dioxide emissions).

It is crucial to promote the creation and maintenance of personal investor interest to achieve the goals of building a regional ESG-financing market in Central Asia to attract private investment in green projects and develop green finance instruments. This is achieved by developing and promoting transparent and reliable mechanisms within the regional ESG financing market. At the same time, the development of domestic policies supported by external international assistance and the introduction of a green taxonomy should continue, considering the experience of Kazakhstan and Uzbekistan.

For 2023, the total capacity of the sustainable finance market in the Republic of Kazakhstan is estimated at 228.9 billion tenge. The sustainable finance market is represented by 11 releases of green bonds (114.9 billion tenge), six releases of social bonds (76.7 billion tenge), and four green loans (37.3 billion tenge). Green bonds account for 50% of the total market, social bonds – 34%, and green loans – 16%. The main actors of the sustainable finance market in Kazakhstan are development banks (Asian Development Bank, Eurasian Development Bank, Development Bank of Kazakhstan) [2].

As a response to these modern demands, ESG criteria may help evaluate the activities of companies related to investing in sustainable development. Moreover, applying these criteria allows companies to reduce risks, build a reputation, and help investment funds make quality investment decisions (fig. 1).

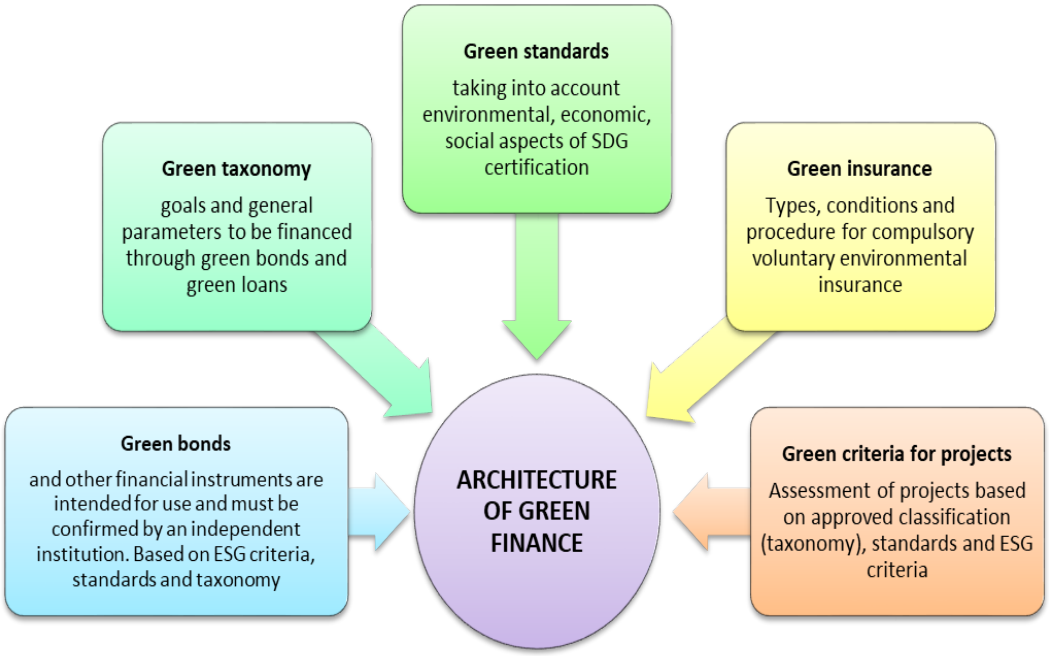

Figure 1 – Transformation of the economy's financial instruments
Note: Compiled by authors

In 2007, the European Investment Bank introduced the first green bonds, Climate Awareness Bonds. Subsequently, the International Bank for Reconstruction and Development issued bonds officially named "Green Bonds" the following year. A turning point occurred in 2013 when significant

corporations entered the market with bonds labeled "green bonds." Since then, the issuance of such bonds has been steadily increasing.

Kazakhstan has already gone a long way in this direction, becoming the first country in Central Asia to issue green bonds. Establishing the IFCA Center for Green Finance in 2018 and subsequent initiatives such as the voluntary ESG reporting system underscore the country's commitment to developing a green economy. The Center is actively involved in developing green finance standards and taxonomies, including the AIX Green Bond Rules for Kazakhstan, and supports other Central Asian countries. Based on the principles of transparency and public participation, the Center actively engages with regulators and shapes green growth policy in the region. Partnership with Astana International Exchange (AIX) and international organizations such as ICMA and Climate Bonds Initiative allows the Center to implement standards and practices, confirming compliance with global requirements.

The Financial Market Development Strategy also reflects the global decarbonization and sustainable development agenda. To achieve this goal, ESG principles are planned to be integrated into the financial market and stimulate the development of "green finance." It's designed to introduce disclosure standards for ESG risks.

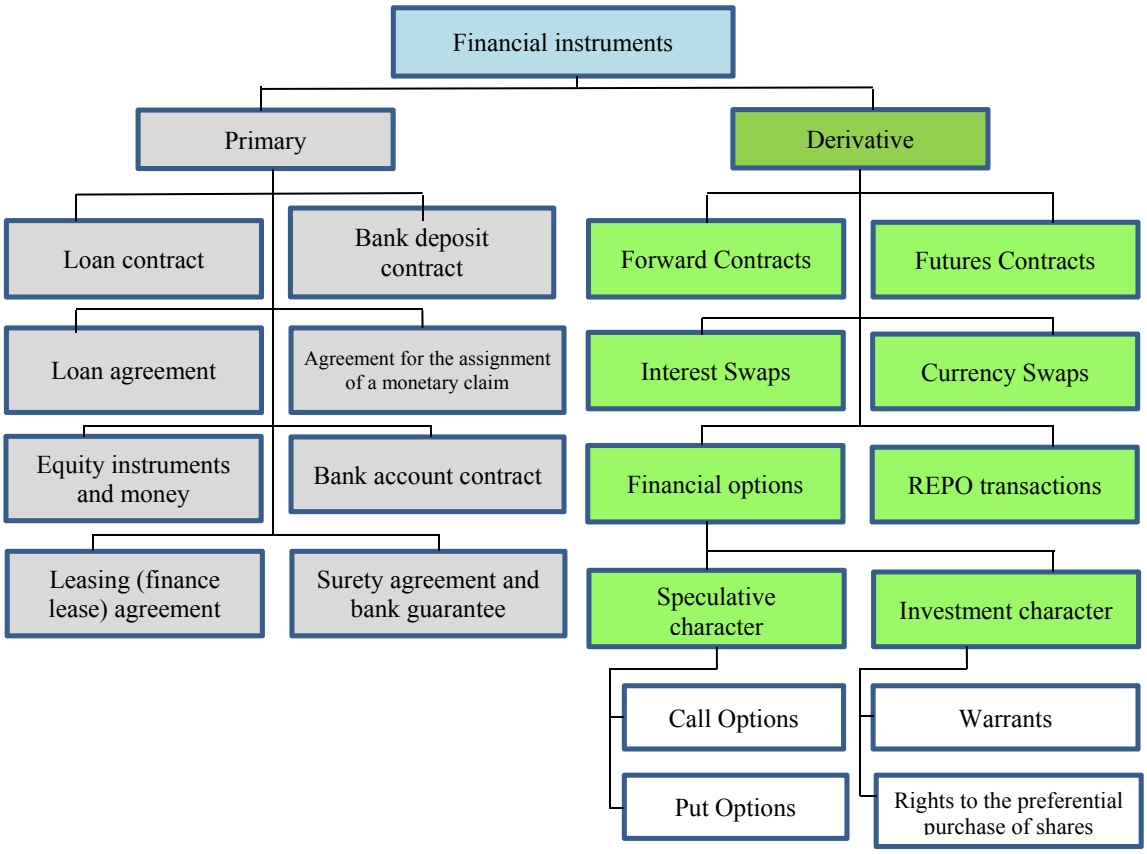

Figure 2 – Extended classification of financial instruments
Note: Compiled by authors

In 2024, the ESG Bond Program intends to issue the first sustainable development bonds for AIX on the territory of Central Asia. The first issue will be up to 236.8 billion tenge [13]. The corresponding agreement between Almaty Power Plants JSC (AlES) and Eurasian Development Bank (EDB) was signed on November 30, 2023, on the AIFC (Astana International Financial Centre) platform. In addition to EDB, the leading investor, other development institutions, and second-tier banks may act as potential project investors.

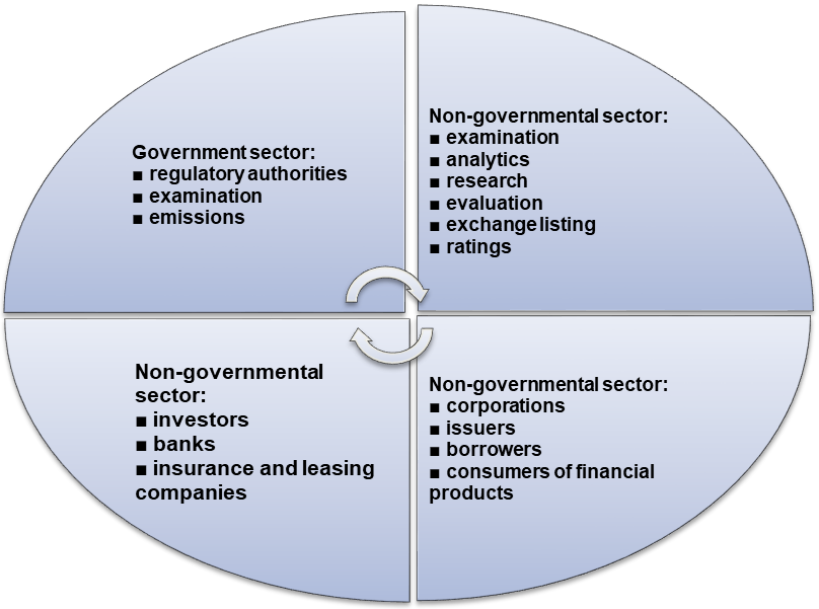

Figure 3 – Participants in the green finance and responsible investment market
Note: Compiled by authors

The issuance of sustainable development bonds by AlES is supported by AIFC's Center for Green Finance (CGF), which provided advisory support and an independent opinion on the compliance of the bonds with the principles of sustainable development. AIFC will continue to promote innovative financial instruments to attract investment in environmentally sustainable projects.

Results and Discussion

Given the scale of the problems, the transition to a green economy should be carried out at the international and regional levels. All conditions have been created for this purpose at the legislative level, and infrastructure development is underway. In this regard, the AIFC One-Stop Green Finance Center will be the foundation of sustainable development for Central Asian countries.

The creation of common reporting standards in sustainable development is particularly relevant in the context of global efforts to combat environmental and social problems. Standards play a crucial role in improving the transparency and consistency of reporting on organizations' environmental and social impacts. Non-financial reporting has evolved in stages, reflecting society's growing awareness of integrating environmental and social aspects into corporate reporting. The evolution of these standards demonstrates a shift from voluntary initiatives to more structured and mandatory reporting forms.

On June 26, 2023, the International Sustainability Standards Board (ISSB) published the first two sustainability standards: IFRS S1, "General Requirements for Disclosure of Sustainability-related Financial Information, "and IFRS S2, "Climate-related Disclosures." They are effective for annual reporting periods starting from January 1, 2024. The European Commission adopted sustainability reporting standards (ESRS) on July 31, 2023.

The idea behind Kazakhstan's shift toward a green economy involves considerations of infrastructure, budget allocations, statistical analyses, and financial instruments. The focus is on determining the type of financing intended for this transition, including the percentage of benefits for Sustainable and Green Finance Institutions (STBs) and the rationale for directing profits toward these institutions.

Figure 4 illustrates the projected distribution of funding sources, detailing the percentage allocation for Sustainable and Green Finance Institutions (STBs), and offering insights into the rationale for distributing profits to these institutions.

Having analyzed foreign and domestic literature, as well as studied the Taxonomy of green proj-

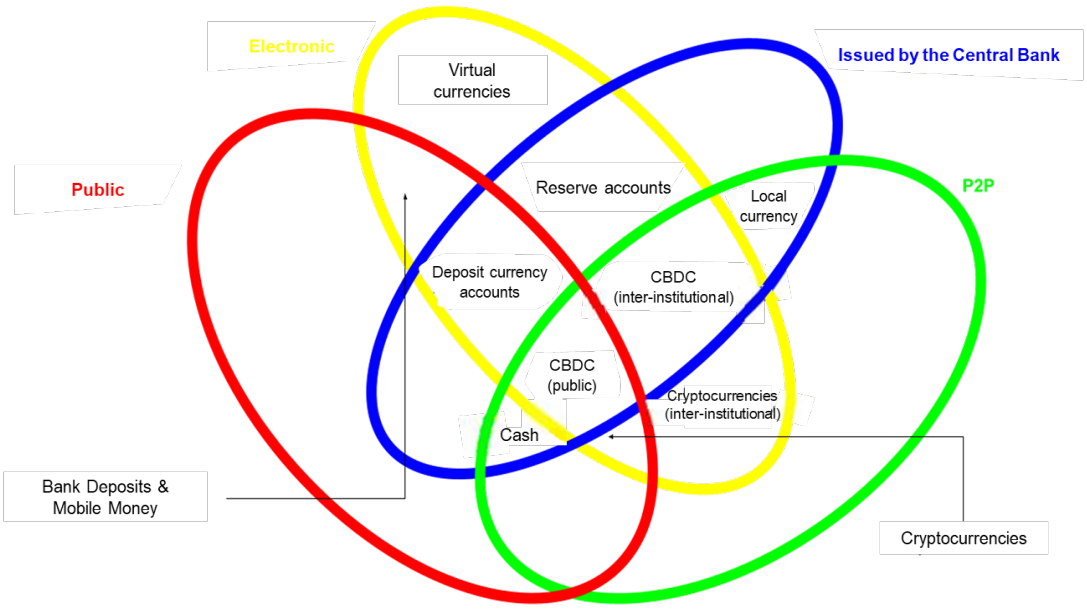

Figure 4 – Projection of funding origins breakdown (% gains for STBs, rationale behind STBs' profit allocation)
Note: Compiled by authors

ects in Kazakhstan, developed by IFCA Green Finance (Adilet, 2021), we summarize the following basic concepts:

- A green economy is focused on the development of environmentally friendly production based on energy-saving advanced technologies and alternative, renewable energy sources;
- Green finance is financial resources used for sustainable environmental development, increasing social responsibility, promoting economic growth, minimizing ecological risks, and eliminating critical environmental problems;
- ESG risks are threats resulting from non-compliance with ESG principles that affect the sustainable growth of an organization;
- ESG tools contain environmental, social, governance, and performance assessment criteria, based on which socially responsible investors can analyze potential investments. Environmental Criteria (E) assesses the extent to which a company complies with environmental standards. Social Criteria (C) can be used to determine the company's strategy to attract qualified employees and increase motivation for labor productivity. Governance Criteria (G) allows you to assess the effectiveness of the company's management.

Green financial instruments like green loans, bonds, leases, and trusts yield optimal results solely when allocated towards environmentally sustainable initiatives. Hence, establishing digital investment platforms akin to InvestEU is crucial, enabling investment accessibility into green ventures. InvestEU prioritizes endeavors aligned with EU strategic objectives, including the European Green Deal, digital economy advancement, and enhancing social and economic cohesion.

So, according to a study by scholars Chang Sua, Wenbo Liu, and Yueting Liu, the Central Bank of the People's Republic of China uses digital yuan in macro regulation and micro tracking. The ability to pay without intermediaries in digital RMB greatly facilitates real-time cross-border transactions. Controlled anonymity also allows for accurate monitoring of illegal money laundering methods while maintaining the privacy of both parties to the transaction.

In February 2023, the Hong Kong Government issued a tokenized green bond using distributed ledger technology (DLT). Tokenizing a bond means registering the beneficial interest of the bond in the DLT registry, which distinguishes it from traditional computerized accounting records. Combining bonds and other relevant financial instruments, parties, and activities on a single digital platform can enhance interoperability. This approach can achieve considerable cost reductions, facilitating comprehensive

automation. Such measures may potentially revolutionize current operational methodologies and empower individual investors over the long run. Money tokens are similar to wholesale CBDCs. Their issuance and redemption in this transaction are built on a similar mechanism adopted by the Hong Kong Monetary Authority (HKMA) in a cross-border CBDC payment platform called mBridge. Collaboration on the platform is underway with the Bank for International Settlements (BIS) Innovation Center and central banks in mainland China, Thailand, and the United Arab Emirates [5].

In Kazakhstan, the market of digital financial asset platforms is just beginning to develop. Therefore, it is essential to consider the prospects of creating new platforms that can attract investments to strategically important sectors. Today, the legislative regulation of digital assets in Kazakhstan is based on the Constitution of the Republic of Kazakhstan, the Constitutional Law of the Republic of Kazakhstan dated December 7, 2015, № 438-V "On the International Financial Center Astana," the Law of the Republic of Kazakhstan dated February 6, 2023, № 193-VII "On Digital Assets in the Republic of Kazakhstan" and other normative and legal acts.

Digital assets are "property created in electronic-digital form with the assignment of a digital code, including the use of cryptography and computer calculations, registered and ensured the immutability of information based on distributed data platform technology."

In September 2023, the National Bank of Kazakhstan (NBK) established the National Payment Corporation (NPC) to implement the digital tenge. The legal status of the digital tenge, which combines the features of cash and non-cash money, allowing for online and offline transactions, is to be enshrined in the legislation.

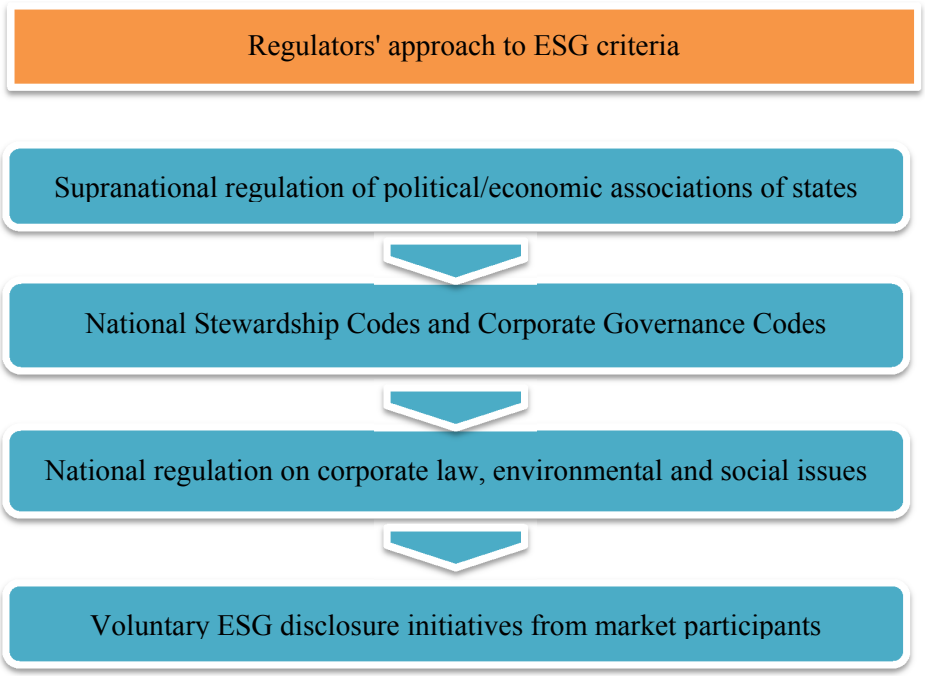

Figure 5 – Regulators' approach to ESG criteria
Note: Compiled by authors

It will be imperative to establish and distribute the responsibility for the sustainability and continuity of the information system within the framework of which the digital currency of NBK will circulate. It will simplify public spending by labeling budgets for earmarked use and ensuring control and transparency of the process.

In 2023, two digital tender (DT) platform circuits are planned: industrial and experimental or research and development (R&D). All the work results will be published in the 2023 final report in December. The optimal architectural parameters for developing the target DT architecture will be determined based on this document.

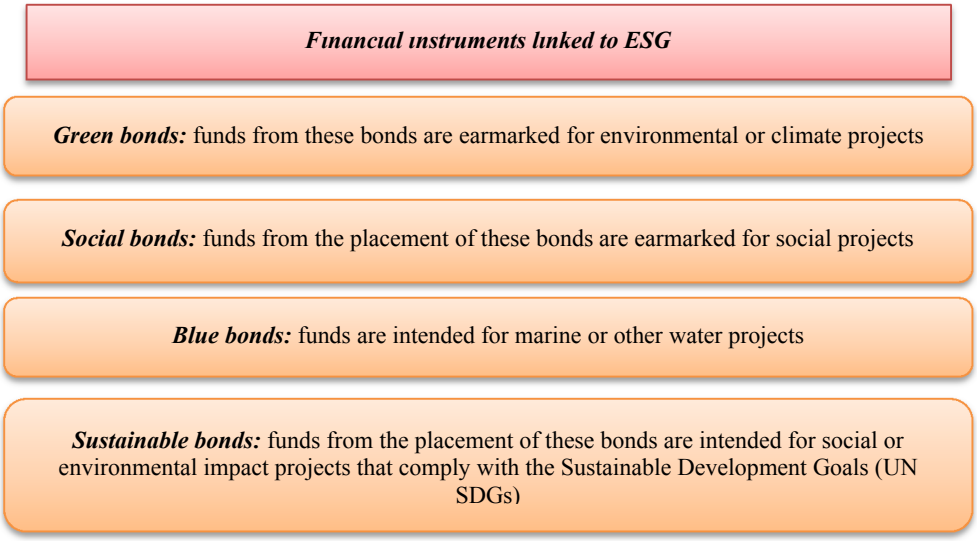

Figure 6 – Financial instruments linked to ESG
Note: Compiled by authors

Sustainable development is only possible with the implementation of innovative technologies. Combining scientific principles and business objectives, cooperating with specialized companies in conducting practical works in financial engineering and their step-by-step evaluation by independent specialists promotes the engagement of a comprehensive professional community in green finance.

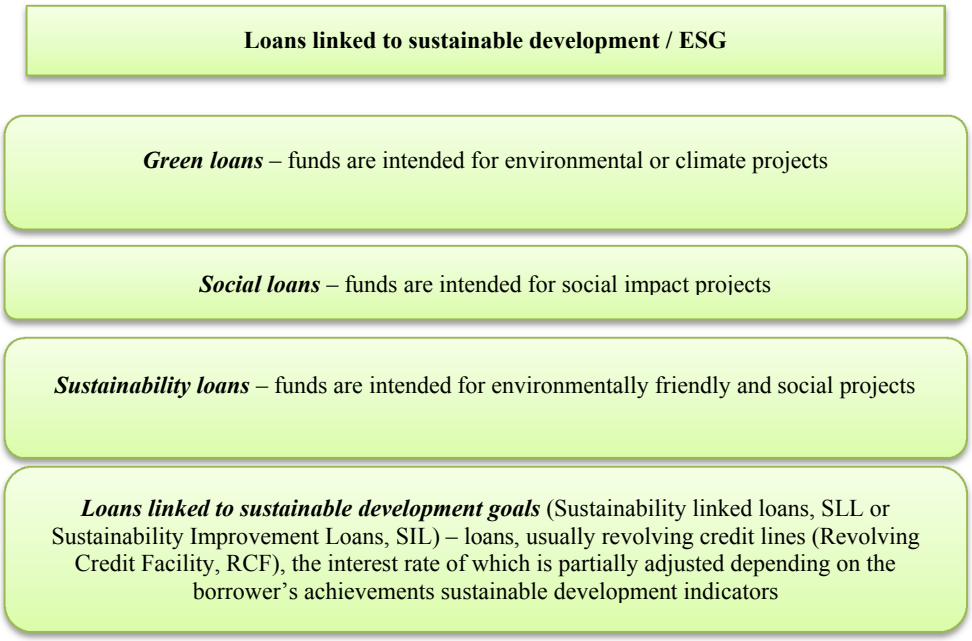

Figure 7 – Loans linked to sustainable development / ESG
Note: Compiled by authors

Funding through Initial Coin Offerings (ICO) and Security Token Offerings (STO): Some green finance companies raise funds through ICOs and STOs, providing investors with tokens to support green finance projects.

Trading and investing in green digital assets: Investors can trade and invest in digital assets associated with environmentally sustainable projects, contributing to financing green infrastructure and technologies.

The digital asset ecosystem holds considerable economic potential through blockchain cooperative banks, featuring a scheme devoid of intermediaries. International and local cooperation yields numerous benefits.

The evolution of the global financial system commenced with the active integration of digital assets. Digital asset networks are pivotal in the future financial landscape, facilitating the seamless exchange of digital assets and currencies across various networks. The digital asset ecosystem harbors substantial economic potential. For cross-border payments and settlements, shared settlement networks employing distributed ledger technologies can drastically decrease settlement times from two to three days to less than 10 minutes and reduce transaction costs from 6 percent to less than 1 percent of the transferred value. With financial backing for trade, distributed ledgers enabling transaction tracking have reduced letter of credit processing times from 5-10 days to less than 24 hours. In capital markets, distributed ledgers can diminish clearing times for securities transactions from two days to less than 30 minutes. The digital financial assets market is emerging as a competitor to the traditional securities market, offering broader investment and capital-raising opportunities. It expands the range of underlying assets, lowers market entry barriers, simplifies asset issuance procedures, and reduces issuance and circulation costs.

Decentralized finance, governed by cryptocurrency, is able to supplant the Bretton Woods system. Blockchain stands out as a technology that ensures the utmost integrity in data transmission. Society must prioritize ethical, social, moral, and environmental considerations during the initial dissemination of information, which should subsequently undergo transformation incorporating ESG criteria. The digital asset ecosystem necessitates a tokenized medium for transactional purposes. Cryptocurrencies, stablecoins, and national bank digital currencies emerge as three prominent contenders for fulfilling this role.

Tokenization makes it easier to fragment an asset (dividing ownership of an investment, much like company ownership is divided among shareholders). Tokenization facilitates secure and seamless trading and exchange of assets, eliminating the need for intermediaries. Digital transformation can reduce financial investment and increase real investment, leading to a reduction in negative financialization.

A digital asset is any object of value whose ownership is represented in digital or computerized form. The digital asset ecosystem has three characteristic features:

- tokenization, in which ownership of an asset is converted via software into a digital token that can be stored, traded, or used as collateral;
- distributed registry, or blockchain, is an immutable computer record of ownership and transfer of ownership of tokens;
- encryption – the use of advanced cryptographic technologies that ensure the security of transactions with tokens.

Blockchain technology has the capacity to generate digital ownership certificates for green assets like forests, solar farms, or organic lands, aiding in the fight against illegal logging and other environmental infractions.

Tokenization of Green Assets: Green assets such as energy projects or water resources can be tokenized using digital assets such as tokens or cryptocurrencies. This makes it easier for investors to invest in environmentally sustainable projects.

Smart contracts implemented on the blockchain have the capability to validate adherence to environmental regulations autonomously. For instance, they are able to automatically disburse funds to investors upon fulfilling predefined environmental benchmarks within the project.

In previous stages of the project, the NB RK (National Bank of the Republic of Kazakhstan) focused on researching only retail central bank digital currency (CBDC). This has led to new initiatives for wholesale CBDC, including securities settlement, stablecoin scenarios, and cross-border and social payments, in addition to the retail CBDC planned in the early stages of the project.

In this context, as a component of the 2023 agenda, establishing two digital tenge (DT) platform frameworks is scheduled: one for industrial purposes and the other for experimental or research (R&D) initiatives. All findings from these endeavors are slated for inclusion in the year-end final report of 2023, anticipated to be published in December. This document outlines the optimal architectural specifications for crafting the desired DT architecture.

Digital tenge combines the features of cash and non-cash money, allowing transactions both online and offline. The state also supports digital currency and differs from cryptocurrencies, as it has a single issuer – the National Bank. The digital tenge also simplifies government spending by marking budget funds for intended use and providing control and transparency.

The presence of a dynamic financial sector is one of the main conditions for attracting the private capital necessary to implement the transition to a green economy. Achieving net-zero emissions by 2060 will require a very significant average annual investment. Still, the government has other spending commitments beyond those associated with the transition to a green economy, including spending on human capital and social protection. A well-developed and sound national financial system is essential in ensuring climate change mitigation efforts are as effective as possible. Creating a more dynamic financial sector in Kazakhstan will require improved prudential regulation, greater transparency of government support for the financial industry, and a shift away from interest rate subsidies and targeted lending to indirect impact strategies. The government has made progress in developing green finance. In 2018, the Astana International Financial Center (AIFC) established the Green Finance Center to promote fundraising through green finance instruments. The Center sets mandatory rules for issuers wishing to issue green bonds listed on the AIFC Exchange (AIX), providing independent compulsory verification.

Similarly, the issue of "green" bonds is actively promoted by the Kazakhstan Stock Exchange (KASE). However, in Kazakhstan, green bonds are mainly issued by public sector representatives, including SOEs and international financial institutions. Capacity could be further enhanced by measures to facilitate the issuance of these instruments by local banks to strengthen their loss absorption capacity. Improving prudential regulation will help Kazakhstan secure the flow of private capital needed for green finance. Numerous green initiatives necessitate scalability, are anticipated to yield profits in the long run and entail substantial risks or considerable uncertainty.

After reviewing foreign and domestic literature, as well as studying the Taxonomy of green projects in Kazakhstan, developed by the AIFC "green" finance (Adilet, 2021), we have given updated interpretations on the following main concepts:

The green economy is focused on developing environmentally friendly (clean) production based on energy-saving advanced technologies and alternative, renewable energy sources.

Green finance is financial resources used for sustainable development of the environment, increasing social responsibility, promoting economic growth, minimizing environmental risk, and eliminating critical ecological problems.

ESG risks are threats arising from non-compliance with ESG principles that affect the stable growth of the organization.

ESG tools have environmental, social, and company management criteria and performance assessments against which socially responsible investors can analyze potential investments. Environmental criteria (E) make it possible to assess how well a company complies with environmental standards. Based on Social criteria (S), it is possible to evaluate the company's strategy for attracting qualified employees and increasing motivation for labor productivity. The company governance criteria (G) make it possible to assess the effectiveness of its management.

Conclusion

Each region has its own country background, mentality of the population, geography of natural resources and challenges related to sustainable development goals. In international practice, the inefficiency of application of existing environmental, social legislation and the lack of results of state "green" programs has arisen due to uncontrolled and corrupt government, parliament, regulators, law enforcement agencies and inaction of the judicial system. A experience has shown frequency of emergencies related to accidents in the extractive sector, protests and riots, the number of sick people and mortality during the COVID 19 epidemic is directly related to state policy and, business community and international institutions regarding the implementation of the SDGs.

The authorities, being able to impose their will and influence the activities and behavior of the population, pursue a policy of fixing the consequences of environmental and social problems and deliberately silencing the causes. The most important goal of the global community is to eliminate poverty while ensuring sustainable economic growth and solving social and environmental problems. Green economy is meant to define and to integrate them. International institutions have the capacity to offer statistical data and exemplify best practices. Meanwhile, the successful development of local and national programs depends on elected government, businesses and in-

dividuals. Successful implementation of the green economy of the Republic of Kazakhstan requires high-level coordination between all stakeholders – bodies implementing state environmental and social policy, financial regulators and technical supervisors; corporate and investment community, development institutions and civil society institutions.

One of the challenges in implementing sustainable development projects is the need for additional financial resources. A financial architecture involving second-tier banks (STBs), central depositories (CDs) and stock exchanges was developed to regulate the capital market because there was no available alternative before. Meanwhile, the world's digital financial architecture can conduct targeted financing, control the use of existing budgets, detect corruption schemes and green laundering.

Digital transformation is unstoppable. The government must innovate to improve public services, facilitate citizen engagements and provide more transparency in decision-making. Digital transformation of the financial system is no longer an option but an imperative. Thus, ESG risks in digitalization processes must be adequately addressed to achieve environmental sustainability, social responsibility and good governance to facilitate our country's engagement in an increasingly globalized environment.

Transition to sustainable development in Central Asia and Kazakhstan requires unified efforts and coordination. The establishment of a single green finance center becomes an indispensable step to ensure the sustainability and effectiveness of efforts in this direction. Current moment provides a unique opportunity for the countries of the region, together with the private sector and international partners, to create digital financial instruments that will support green projects and contribute to a sustainable future for Central Asia.

We also developed taxonomy of "green economy," "green finance," "ESG tools," and "ESG risks" in Kazakhstan under the requirements of ESG standards and principles among business communities, "green" enterprises, and financial institutions based on a review analysis literature and regulations, collaboration with the AIFC green finance (AIFC-GFC, 2023). This is necessary for consumers of financial services to understand green finance and recognize the basic concepts of the topic under study.

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