

ҚАЗАҚСТАН РЕСПУБЛИКАСЫ ҒЫЛЫМ ЖӘНЕ ЖОҒАРЫ БІЛІМ МИНИСТРАЛІГІ  
МИНИСТЕРСТВО НАУКИ И ВЫСШЕГО ОБРАЗОВАНИЯ РЕСПУБЛИКИ КАЗАХСТАН  
MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE REPUBLIC OF KAZAKHSTAN

А.Н. ГУМИЛЕВ АТЫНДАҒЫ ЕУАЗИЯ ҰАТТЫҚ УНИВЕРСИТЕТІ  
ЕВРАЗИЙСКИЙ НАЦИОНАЛЬНЫЙ УНИВЕРСИТЕТ ИМЕНИ А.Н. ГУМИЛЕВА  
L.N. GUMILYOV EURASIAN NATIONAL UNIVERSITY



«ҰАТТЫҚ ВАЛЮТАНЫҢ ТҰРАҚТЫЛЫҒЫ МЕМЛЕКЕТТІҢ  
ҚАРЖЫЛЫҚ КАУІПСІЗДІГІН ҚАМТАМАСЫЗ ЕТУ ФАКТОРЫ РЕТІНДЕ»  
Қазақстан Республикасының ұлттық валютасының 30 жылдығына арналған  
халықаралық ғылыми-тәжірибелік конференциясының  
МАТЕРИАЛДАР ЖИНАҒЫ

### СБОРНИК МАТЕРИАЛОВ

Международной научно-практической конференции,  
посвященная 30-летию национальной валюты Республики Казахстан  
«СТАБИЛЬНОСТЬ НАЦИОНАЛЬНОЙ ВАЛЮТЫ КАК ФАКТОР  
ОБЕСПЕЧЕНИЯ ФИНАНСОВОЙ БЕЗОПАСНОСТИ ГОСУДАРСТВА»

### COLLECTION OF REPORTS

of the international scientific and practical conference dedicated to the 30<sup>th</sup> anniversary  
of the national currency of the Republic of Kazakhstan  
«STABILITY OF THE NATIONAL CURRENCY AS A FACTOR OF ENSURING  
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АСТАНА, ASTANA,  
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ҚАЗАҚСТАН РЕСПУБЛИКАСЫ ҒЫЛЫМ ЖӘНЕ ЖОҒАРЫ БІЛІМ МИНИСТРЛІГІ  
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қорына жинақтау және зейнетақы қорына, әлеуметтік сақтандыруға аударымдарды арттыру және т.б; валюталық түсімдердің жоғарлауы (экспорттың жоғарлауы), инфляцияның тежелуі, капиталдың келуі (инвестициялардың жоғарлауы). Ұлттық валютаның тұрақтылығына оң әсер ете алатын жағдайлардың бірі – жалпы экономиканың даму деңгейінің артуы. Валюта бағамының динамикасы мен ақша-несие саясаты халықтың әлеуметтік-экономикалық жағдайына және теңсіздік деңгейіне әсер етеді.

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## DIGITAL TRANSFORMATION OF HOUSING AND COMMUNITY SERVICES AND CONSTRUCTION IN KAZAKHSTAN

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**Abstract.** This article presents the findings of a study on the use of digital technologies in urban areas of Kazakhstan. Digitalization has emerged as a new technology for the country, and its adoption has significantly increased over the past 6-7 years. The government's digitalization program in Kazakhstan has a significant impact on all sectors of the national economy and the daily lives of the general population. Nowadays, it is impossible to imagine a country without the use of digital technologies. The author showcases the results of their research through an analytical review of the digitalization of urban facilities, focusing specifically on the housing and communal sector of the country. Programs that use digital technologies in construction have also been considered. This is because the construction industry is responsible for creating the majority of the country's housing stock. The effectiveness of digitalizing housing and communal services is evaluated through a predictive assessment. The impact of implementing digitalization in the energy supply sector is specifically evaluated for the major cities of Kazakhstan, while the effectiveness of digitalization in the water supply sector is assessed nationwide. The research findings on the implementation of the smart city concept are presented. Ratings are provided for urban economic areas both before and after the implementation of digital technologies.

**Андатпа.** Бұл мақалада Қазақстанның қалалық аудандарында цифрлық технологияларды пайдалану бойынша зерттеу нәтижелері ұсынылған. Цифрландыру ел үшін жаңа технологияға айналды және соңғы 6-7 жылда оны енгізу айтарлықтай өсті. Қазақстандағы цифрландырудың мемлекеттік бағдарламасы ұлттық экономиканың барлық секторларына және жалпы халықтың күнделікті өміріне айтарлықтай әсер етеді. Қазіргі уақытта цифрлық технологияларды қолданбай елді елестету мүмкін емес. Автор өзінің зерттеу нәтижелерін елдің тұрғын үй-коммуналдық секторына ерекше назар аудара

отырып, қалалық нысандарды цифрландыруға аналитикалық шолуда көрсетеді. Құрылыста цифрлық технологияларды қолданатын бағдарламалар да қарастырылды. Себебі құрылыс саласы елдің тұрғын үй қорының көп бөлігін құруға жауапты. Тұрғын үй-коммуналдық қызметтерді цифрландырудың тиімділігі болжамды бағалау арқылы бағаланады. Энергиямен жабдықтау секторында цифрландыруды енгізудің әсері Қазақстанның ірі қалалары үшін нақты бағаланады, ал сумен жабдықтау секторында цифрландырудың тиімділігі бүкіл ел бойынша бағаланады. "Ақылды қала" тұжырымдамасын іске асыру бойынша зерттеу нәтижелері ұсынылған. Рейтингтер цифрлық технологияларды енгізгенге дейін де, енгізгеннен кейін де қалалық экономикалық аймақтар үшін жасалады.

**Аннотация.** В данной статье представлены результаты исследования по использованию цифровых технологий в городских районах Казахстана. Цифровизация стала новой технологией для страны, и за последние 6-7 лет ее внедрение значительно возросло. Государственная программа цифровизации в Казахстане оказывает значительное влияние на все секторы национальной экономики и повседневную жизнь населения в целом. В настоящее время невозможно представить себе страну без использования цифровых технологий. Автор демонстрирует результаты своего исследования в аналитическом обзоре цифровизации городских объектов, уделяя особое внимание жилищно-коммунальному сектору страны. Также были рассмотрены программы, использующие цифровые технологии в строительстве. Это связано с тем, что строительная отрасль несет ответственность за создание большей части жилищного фонда страны. Эффективность цифровизации жилищно-коммунальных услуг оценивается с помощью прогностической оценки. Влияние внедрения цифровизации в секторе энергоснабжения конкретно оценивается для крупных городов Казахстана, в то время как эффективность цифровизации в секторе водоснабжения оценивается по всей стране. Представлены результаты исследования по реализации концепции "умного города". Рейтинги составляются для городских экономических зон как до, так и после внедрения цифровых технологий.

**Key words:** Urban economy, smart city concept, housing and communal services, digitalization, construction, efficiency.

In recent years, cities have grown rapidly in the modern world, and the United Nations forecasts that by 2050, 70% of the population will be living in urban areas [1]. The ever-growing relocation of people to major cities is leading to a range of issues in relation to housing and the productive administration of the urban environment, particularly in terms of housing and public amenities. Smart city elements can make it possible to safeguard the quality of life in the city and guarantee the social necessities of the people. Digital technologies are enabling progressive development in the cities of Kazakhstan.

It is expected that within the next 10-15 years, Smart city components will be a common sight in the cities of Kazakhstan. Initially, it encompasses public transport, health, education, sports, culture, leisure, parking areas, housing and utilities, retail outlets, and other entities. Presently, citizens of the nation routinely employ different urban apps, which enable them to save time and boost the level of comfort in their lives.

Nonetheless, there remain many areas of urban governance and urban development where digital technologies could be applied innovatively. Kazakhstan cities are currently in the early stages of implementing smart external lighting. The disposal of municipal solid waste is a major issue, as no "smart points" for garbage collection exist yet. Private housing stock with few fire detectors installed leads to frequent fires, most notably during heating seasons. The utilization of wireless networks and data transmission through visible light are still novel digital technologies yet to be utilized in Kazakhstan. Nonetheless, digitalization is rapidly advancing in Kazakhstan, with almost every citizen of the country engaging with it. Digital technologies are progressively integrating into various aspects of the population's everyday routines. Moreover, Kazakhstan is striving to learn from the experiences of advanced metropolises like Seoul, Singapore, San

Francisco, Barcelona, Amsterdam, Tianjin, and others, seeking to implement similar technological advancements. In the Smart Centers Index (SCI) 6 rating for 2022, Astana, the capital of Kazakhstan, holds the 64th position and is recognized as an appealing destination for investment in digital technologies [2].

Over the past decade, numerous scientists, researchers, and authors have delved into the subject of Smart cities. Research findings across a wide array of scientific disciplines, including engineering, information technology, architecture, law, natural sciences, and various social sciences, have been published. These studies cover topics such as smart city management, improving the quality of life for urban residents, and enhancing city security. Authors often showcase the successful implementation of the global Smart city concept in specific countries or cities.

The concept of Smart cities emerged relatively recently in history, towards the end of the last century. Growing concerns about urban congestion, environmental crises, increasing poverty, and social disparities prompted the exploration of digital technologies as solutions. Cocchia A.'s research provides an analysis of various Smart city concepts, distinguishing between "Digital city" and "Smart city" [3]. Kummitha R. and Crutzen N. shed light on the processes involved in forming Smart cities within the Indian economy [4]. Reem A. and Shaligram P. address specific aspects of Smart cities that must be considered during planning and implementation, while also highlighting potential operational risks [5]. Leonidas Anthopoulos explores the future of cities and evaluates 10 cities vying for the Smart city title [6]. Shuping Wu's work examines the impact of Smart cities on urban ecology and their contribution to environmentally-friendly, resource-efficient practices, using China as an example [7]. Given China's technological leadership, a significant number of Chinese scientists are researching diverse aspects of Smart city development and implementation [8, 9]. Bitkom e.V. has compiled a comprehensive atlas of Smart cities in Germany, providing an assessment of the strengths and weaknesses of each city [10].

The main directions of digitalization in the sector of housing and communal services are presented in the article by G. Bannykh and N. Kozhevnikova, who define the range of applied technologies for automating various processes in this urban sector [11]. The problems of the functioning of the housing and communal services sector, digitalization at the level of individual areas of the city's public utilities are explored by Voevodkin N. [12]. Dmitrieva E., Ganchenko D. & Bodrov A. have also devoted their works to digitalization in housing and communal services [13, 14]. A review of the literature provides a considerable number of research results in this area. But the effects of the introduction of digital technologies in the development of the Smart city, the digitalization of urban sectors are practically not reflected in the scientific literature.

The purpose of this article is to present the effectiveness (efficiency) of using individual elements of the Smart city in the urban economy of Kazakhstan, namely, in housing and communal services; to show what digitalization programs are being implemented to transform the construction industry, in particular, in the construction of housing in Kazakhstan, since the study of digitalization of housing and communal services and the housing stock should be carried out in conjunction.

The article authored by G. Bannykh and N. Kozhevnikova outlines the primary digitalization strategies within the housing and communal services sector, defining the scope of applied technologies for automating various processes in this urban domain [11]. Voevodkin N. delves into the challenges facing the housing and communal services sector, specifically examining the digitalization of distinct aspects of city public utilities [12]. Additionally, Dmitrieva E., Ganchenko D., and Bodrov A. have contributed their research to the topic of digitalization in housing and communal services [13, 14]. A comprehensive review of the literature reveals numerous research findings in this domain. However, the literature largely lacks insight into the impacts of digital technology adoption on Smart city development and the digitalization of urban sectors.

The objective of this article is to demonstrate the effectiveness and efficiency of integrating individual components of the Smart city concept into the urban economy of Kazakhstan, with a

particular focus on housing and communal services. It aims to shed light on the ongoing digitalization initiatives aimed at transforming the construction industry, especially in housing development within Kazakhstan. This research underscores the importance of examining digitalization efforts in both housing and communal services and the housing sector as a whole in a unified manner.

The integration of digital technologies into urban economics offers several key advantages. Firstly, it promotes transparency and fosters a comfortable environment for urban residents. Furthermore, leveraging digital technologies in urban management can enhance the productivity of businesses that serve the city.

The digitalization of housing and communal services serves multiple objectives, including cost reduction, efficient financial management, ensuring transparency for public oversight, reducing rates through the establishment of competitive dynamics, and enhancing the quality of public services. Moreover, it opens up avenues for attracting investment resources to further expand the digitalization of urban housing and communal services. The authors have conducted diverse studies related to modernizing and implementing innovative technologies within Kazakhstan's housing and communal services sector. Table 1 provides an overview of selected digitalization programs in urban planning and construction in Kazakhstan.

Table 1. Distinct aspects of digital transformation in both the housing and communal services and the construction sectors within Kazakhstan

<b>Program</b>	<b>Contractor</b>	<b>Efficiency</b>
Creation of a single platform for digitalization of housing and communal services	JSC Kazakhtelecom, JSC "Kazakhstan Center for Modernization and Development of Housing and Communal Services"	<ol style="list-style-type: none"> <li>1. Increase the installation of base stations - up to 400 units.</li> <li>2. In Kazakhstan, the level of installation of IT devices - information transmission sensors is 45% (8000 devices in the country), the country needs to install at least 60 thousand devices.</li> <li>3. The presence of common house meters reduces the cost of utilities by 36%.</li> <li>4. Long Range technologies have been introduced in the cities of Astana, Almaty and Ak-tobe (102 base stations have been installed).</li> </ol>
"E-Shanyraq" intelligent information system	Ministry for Investments and Development of the Republic of Kazakhstan, JSC "Kazakhstan Center for Modernization and Development of Housing and Communal Services"	<ol style="list-style-type: none"> <li>1. Implementation of a unified system of intelligent management of apartment buildings.</li> <li>2. Self-monitoring by residents: general income and expenses at home, the activities of the management company, the correctness of calculations and charges for utility bills, participation in solving house management issues, and others.</li> </ol>
"Open source" program-project	JSC "Kazakhstan Center for Modernization and Development of Housing and Communal Services"	<ol style="list-style-type: none"> <li>1. Management of an apartment building.</li> <li>2. Information system for centralized collection and storage of electronic resources in the housing sector.</li> </ol>
Republican situational center using Big Data.	JSC "Kazakhstan Center for Modernization and Development of Housing and Communal Services"	The state will be able to control the problems of housing and communal services, respond in a timely manner to the accident rate of utility networks, depreciation of the housing stock, the condition of infrastructure facilities

The electronic program on the “I-Qala” portal - an element of the “Smart Astana” program (the capital of Kazakhstan)	Astana city government body (capital of Kazakhstan)	The program is up and running. Through a single window, individuals and legal entities can conclude contracts for the receipt of 134 different services (mainly housing and communal services) around the clock on the website www.iqala.kz
“BI-Ecosystem” program	“BI Group” construction company	<ol style="list-style-type: none"> <li>1. BI Click is the first online real estate store in Kazakhstan.</li> <li>2. BI Rent is a convenient virtual assistant for letting and renting housing.</li> <li>3. BIG App provides all the necessary services for a comfortable life from paying household bills to calling an electrician or plumber.</li> <li>4. A platform for partners of the BI-Partners company for the purchase of raw materials and materials in digital format.</li> </ol>
“E-Qurylys” system - “State Bank of Information Models” system	Ministry for Investment and Development of the Republic of Kazakhstan	<ol style="list-style-type: none"> <li>1. Modeling of building objects in online format.</li> <li>2. Application of information modeling technologies - BIM technologies.</li> <li>3. Monitoring of all stages of the construction of the facility online.</li> <li>4. Transparency of payments for construction works - information will be carried out through the Blockchain platform.</li> </ol>
Note. Compiled by the author according to sources [15-18]		

Programs for the introduction of digital technologies, given in table 2, are practically working today in most of Kazakhstan. In addition to the functioning of these programs, residents of Kazakhstan use only digital format to make all types of payments for housing and communal services, Internet communications and public transportation. Many types of public services, including queuing for concessional financing (obtaining a mortgage) for the purchase of an apartment under state housing programs for providing the population with affordable housing, for obtaining a rental apartment from the state housing stock, for receiving subsidies for paying rental housing to individual categories of the population, to obtain a land plot for private housing construction are currently carried out in digital format on-line through the official websites of organizations or through the platform of the “E-gov” program - the Electronic Government of the Republic of Kazakhstan.

Among all utilities, one of the most expensive ones is the provision of electricity. One of the ways to solve problems in the housing and communal and urban sectors is the installation of smart sensors, which can save up to 40% of electricity. Table 2 presents a forecast for a decrease in energy consumption with the maximum digitalization of this sector of the economy for the main cities of Kazakhstan.

Table - 2. The effectiveness of the introduction of digital technologies for energy supply in the cities of Kazakhstan (forecast)

№	City	Year 2021 Before the introduction of digital technologies [kW Ч hr /m <sup>2</sup> Ч year]	Year 2022 (forecast) After the introduction of digital technologies [kWЧ hr /m <sup>2</sup> Ч year]	Economy growth rate [%]
1	Almaty	253,38	207,28	77,75



2	Astana	285,95	229,40	75,34
3	Karaganda	251,05	175,10	56,62
4	Atyrau	284,03	194,25	53,78
5	Oskemen	321,82	234,38	62,69
6	Aktobe	325,77	265,63	77,35
7	Oral	340,39	234,86	55,06
8	Kyzylorda	191,24	119,62	40,12
9	Taldykorgan	201,21	108,02	13,72
10	Kokshetau	300,98	220,80	63,68
11	Kostanay	308,65	196,50	42,92
12	Shymkent	205,73	114,74	20,69
13	Turkestan	204,90	116,87	24,67
14	Petropavl	298,84	210,83	58,25
15	Taraz	220,60	173,95	73,18
16	Aktau	254,62	169,80	50,04
17	Pavlodar	333,53	265,17	74,22
	<i>Total</i>	<i>269,57</i>	<i>190,42</i>	<i>58,43</i>
Note. Compiled by the author according to the source [19]				

The widespread installation of electronic sensors for water consumption by the population also gives a reduction in payment, since information is transferred automatically from the consumer to the water supply organization through the cloud system. Forecast performance indicators as a result of digitalization of water supply are given in Table 3.

In Kazakhstan, all "Smart Homes" and high-end luxury residences are equipped with automatic water transfer sensors. These sensors play a crucial role in protecting apartments from water leakage, preventing potential flooding, and safeguarding furniture, carpets, and other household belongings in the event of sudden pipe damage. Consequently, these sensors serve as a cost-saving measure since post-flood repairs often entail significant expenses.

Table - 3. Efficiency from the introduction of digital technologies in water supply in Kazakhstan (forecast)

1 m <sup>3</sup> water usage	The cost of water per 1 m <sup>3</sup> [in KZT]			
	Year 2021	Year 2022	Year 2023	Year 2024
Individuals	44,81	44,14	43,48	42,82
Legal entities	195,60	192,66	189,78	186,93
Noted. Compiled by the author according to the source [19]				

Another prominent issue in urban areas of Kazakhstan relates to outdoor lighting. To illustrate, in the capital city of Kazakhstan, there are over 200,000 outdoor lighting fixtures, but only approximately 50,000 of them are energy-efficient. This situation contrasts with many developed nations worldwide where 100% of urban areas have energy-efficient street lighting. Table 4 provides a projection of the anticipated benefits of implementing digital technologies in street lighting for the capital city of Kazakhstan, Astana.

Table - 4. Efficiency from the introduction of digital technologies for street lighting in the city of Astana

Funding amount [bln.KZT]			
Year 2021	Year 2022	Year 2023	Year 2024
1,7	1,66	1,632	1,60
Note. Compiled by the authors			

The analysis of survey data from the “Smart city” internet portal, which was carried out a part of research, allowed the authors to identify the main directions for the development of the “Smart City” (Table 5).

Table - 5. The main directions of development of the "Smart City" in Kazakhstan

Direction of digitalization	Number of the implemented projects	Share of the implemented projects [%]	Implementation plan for the most effective projects, number	“Smart City” projects implementation index [%]	“Smart City” projects implementation rating, quality and rating number
Energy saving	41	11,3	140	3,41	High(1)
Digital city and information systems	180	49,5	87	0,48	Low (9)
Transport	40	11,0	20	0,5	Low (8)
Municipal solid waste	5	1,4	10	2,0	High (2)
Heat supply	11	3,0	7	0,64	Low (7)
Construction	6	1,6	2	0,33	Low (10)
Water supply	14	3,9	25	1,79	High (3)
Ecology	10	2,7	12	1,2	Average (5)
Safety	47	12,9	43	0,91	Average (6)
Power supply	10	2,7	15	1,5	High (4)
<i>Total</i>	<i>364</i>	<i>10</i>	<i>361</i>	-	-

Note. Compiled by the author

In the process of selecting innovative projects or forming a portfolio of projects for the implementation of the Smart City program in various regions of Kazakhstan, it is recommended to use indicators of the level of the project's rating indicator.

The implementation index of the Smart City project can be determined by the following method:

$$I = S_i / \sum N_i \quad (1)$$

where:

I - “Smart City” project implementation index,

$S_i$  - number of implemented projects in Kazakhstan,

$\sum N_i$  - total number of implemented projects for each direction of digitalization of the urban economy (urban environment).

Certainly, when choosing an investment project, priority is given to those with the most extensive digitalization coverage based on rating indicators. Located just 100 kilometers away from Kazakhstan's capital, in 2005, the first "Smart City," known as Smart Aqkol, was established, boasting a population of 14,000 residents. This Smart City operates via a unified digital platform for city management. Information related to hospitals, schools, businesses, roadways, and public utilities is accessible in real-time through an online format. Key contributors to this project include the Tengri Lab IT company, in collaboration with Kazakhtelecom, ERG, BTS Digital, the Akmola Electricity Distribution Company, and the leadership of the Akmola region. Within Smart Aqkol, there has been a significant deployment of smart water meters (4,500 units) and smart electricity meters (6,000 units) in residential and commercial buildings. The city is equipped with 250 automated streetlights, as well as digital recognition cameras, fire alarm sensors, transport tracking

systems, and systems for monitoring healthcare and school performance, all integrated across the city. Furthermore, the entire city benefits from comprehensive 4G network coverage on LoRaWAN technology.

The study's findings indicate that the implementation of digitalization measures in Kazakhstan's energy supply sector can result in energy consumption reductions of over 50%. Likewise, the utilization of smart meters for monitoring water supply can lead to cost savings in water services. The high rating scores for energy supply and water supply underscore the effectiveness of digitalization in these areas.

The annual increase in investments in digitalization projects is making Astana, the capital of Kazakhstan, even more appealing to external investors. Notably, digitalization efforts in other major cities such as Almaty, Shymkent, Aktobe, and Karaganda are also noteworthy.

In Kazakhstan, Smart Aqkol stands out as the first experimental zone where smart city systems are maximally utilized. The primary author has been engaged in long-term research on this subject, and two co-authors, who are pursuing doctoral degrees, are focusing on dissertations related to the digitalization of urban agriculture and the construction industry. Research endeavors in this domain are expected to continue in the future.

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## **ВЛИЯНИЕ КРИПТОВАЛЮТЫ НА ЭКОНОМИЧЕСКУЮ СИСТЕМУ КАЗАХСТАНА**

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**Аннотация.** Криптовалюты, такие как Биткойн и Эфириум, представляют новые возможности для инвестиций, платежей и развития финансовой технологии. Влияние криптовалюты на экономическую сферу Казахстана может быть значительным и иметь как положительные, так и отрицательные последствия. Анализируя влияние криптовалюты на экономическую систему Казахстана, мы обратим внимание на несколько ключевых аспектов. Во-первых, криптовалюты могут стимулировать инновации и развитие финансовой технологии в стране. Внедрение блокчейн-технологии может улучшить эффективность и безопасность финансовых операций. Во-вторых, криптовалюты могут предоставить возможности для привлечения инвестиций и развития финансового рынка Казахстана. Криптовалютные стартапы и ICO могут привлечь капитал из разных частей мира и способствовать развитию местной экономики. Однако, существуют и некоторые риски и вызовы, связанные с использованием криптовалюты. Во-первых, отсутствие регулирования и недостаточная защита прав инвесторов могут привести к возникновению финансовых мошенничеств и потере доверия в систему. Во-вторых, использование криптовалюты может создавать проблемы в области борьбы с отмыванием денег и финансированием терроризма. Для успешной интеграции криптовалюты в экономическую систему Казахстана необходимо разработать соответствующую регуляцию и политику, которая бы обеспечивала защиту интересов всех участников рынка и минимизировала риски. Дальнейшие исследования и анализ необходимы для полного понимания влияния криптовалюты на экономическую систему Казахстана и разработки эффективных стратегий для ее использования.