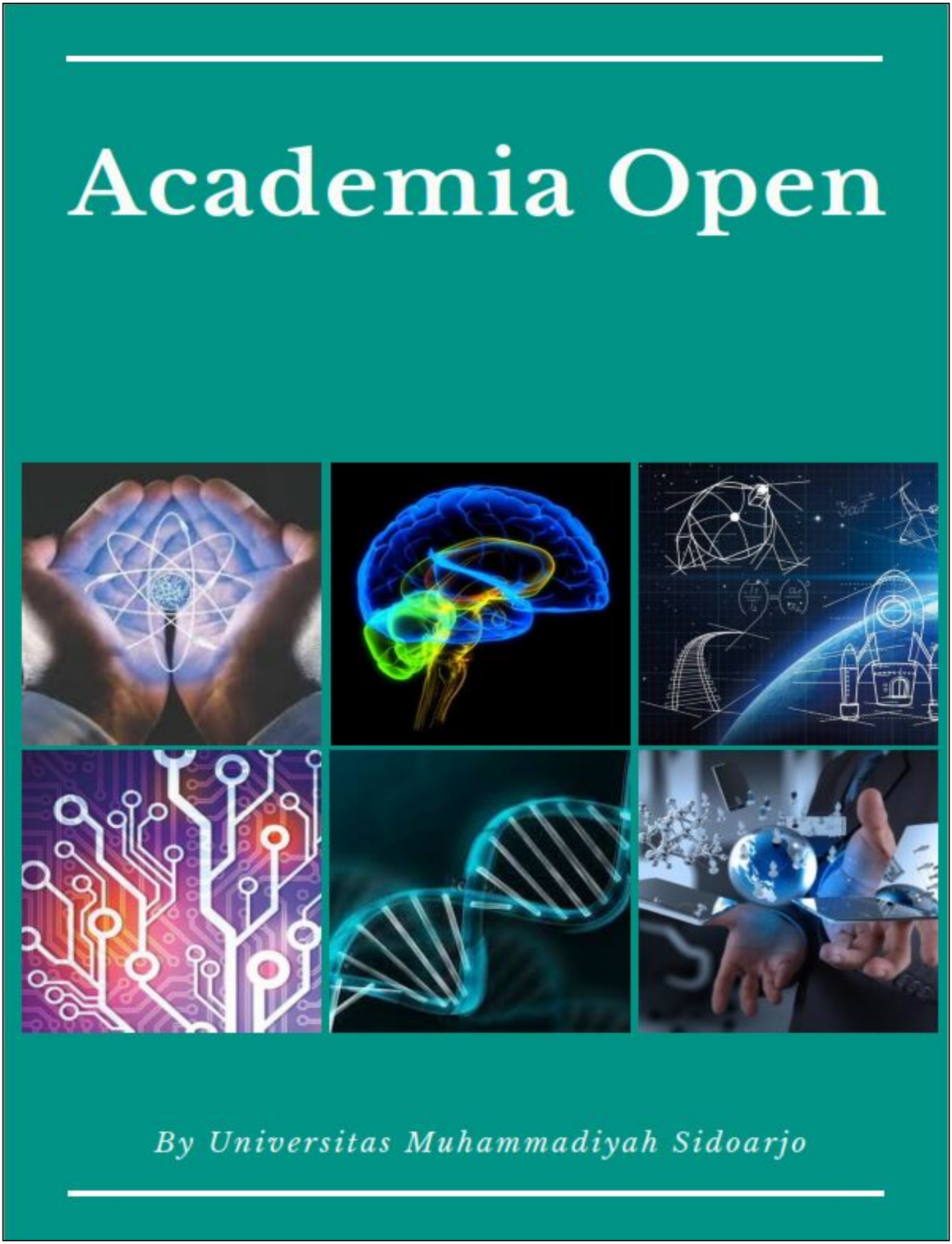
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Comparative Analysis of Investment Efficiency Factors in Regional Industrial Development

Analisis Perbandingan Faktor Efisiensi Investasi dalam Pengembangan Industri Daerah

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Abstract

The research focuses on evaluating investment performance within Surkhandarya's regional industry sector along with its factors which promote industrial enterprise development and sustainability. The study establishes an essential position for investment efforts because they drive economic stability alongside employment growth and technological development. Research shows a considerable lack of information about how efficient investments impact enterprise numbers in regional economic settings. The research implements correlation and regression analysis through econometric modeling with statistical data spanning from 2010 until 2023. The research shows clear positive relations between investment amounts and the growth of industrial enterprises because every 1% investment growth results in 0.63% industrial enterprise expansion. A 1% increase in the labor force leads to additional 0.42% participation in the workforce according to study findings. The research findings demonstrate how investments focused on underdeveloped areas especially agriculture sector development projects lead to improved regional economic diversification. The research demonstrates that investment optimization through strategic distribution improves industrial development and requires data-based decision-making. Data-driven policy-making together with improved infrastructure and innovation-based funding and balanced sectoral funding must be used to enhance regional development and economic policies and investment management. The field requires more research into specific industrial investment effects together with improved econometrics to better capture external economic influences for complete understanding about regional industrial development investments.

Highlights:

1. Investment drives economic stability, employment, and industrial growth.
2. Econometric analysis shows positive investment impact on enterprise expansion.
3. Strategic, data-driven policies enhance regional industrial development.

Key words: Regional industrial sector, GRP, investment efficiency, comparative models, investment factors

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Introduction

Any country requires important investments to reform its economy and develop production along with renewing its market and social infrastructure. National production competitivity relies heavily on these investments which also serve as a fundamental factor for global economic integration success of the nation. Complex manufacturing systems emerge exclusively through investments while higher investment levels boost production efficiency along with market adaptation speed to the maximum extent possible.

This scientific investment policy of the state plays an essential role in both crisis recovery and maintaining sustainable development through its determination of investment alignment and origin and its development of efficient measures to execute national and regional socioeconomic programs. Through its investment policy the state develops all economic sectors equally which leads to stable economic growth that persists over time.

Economic stability in Surkhandarya region depends on complex and effective changes to improve its regional development paradigm because the region faces financial limitations and external debt dependence in its national economic operations. Through this development process Surkhandarya can achieve both economic development and competitiveness and innovation.

The key responsibility in Surkhandarya region requires investment attraction so the population secures employment while modern production sectors can develop using innovative technologies to produce high-value-added items. The development requires expanding foreign economic settlements alongside increasing export of high-quality services and products together with building a competitive market system.

Literature review

Through his analysis of global countries Spanish economics expert Professor Xavier Sala-i-Martin identified essential factors for economic growth that combine labor forces with investment potential for developing nations. The models he developed enable measurement of how investment and labor factors contribute to GRP [1]. Nobel Prize winner Paul Michael Romer examined endogenous technological changes during his study of economic growth by integrating labor functions with investment analysis to measure changes in GRP [2]. Business efficiency in present-day economies gets substantial attention because effective investment practice is what drives contemporary economic analysis. Different models exist to examine investment projects for analysis purposes. Businesses must prioritize finding key aspects which straightly impact investment success in industrial operations. In their studies of fixed capital investment volume determinants economists Will Kenton [3], Rachel O'Brien [4], Josh Martin [5], Hamish Proctor [6], Julie King [7], Stephen Bragg [8], Kornyukhina N.B. [9], N.V. Spasskaya [10], A.V. Bezborodov [11] along with N.O. Khatamov [13] and T.D. Makhmudov [14] and Sh.Z. Soatmurodov [15] have analyzed the influential factors [12]. Science demonstrates the connection between factors affecting investments through the research of Uzbek economists N.O. Khatamov [13], T.D. Makhmudov [14], Sh.Z. Soatmurodov [15]. The said scientific studies failed to research influencing factors which shaped the industrial enterprise counts in Surkhandarya region.

Methods

The researchers employed economic methods together with statistical and systematic analysis in their study. The article conducted an analysis of multiple economist articles for its foundation. A multi-factor econometric model development took place after performing statistical analyses to determine industrial factors affecting Surkhandarya region enterprises.

Analysis and discussion of results:

One of the essential directions includes the development of regional innovation ecosystems together with modern transport systems and sustainable natural resource management and network maintenance stability. The economic and social expansion of the region needs investments to be allocated logically while monitoring their success and implementing innovative sustainable implementation techniques.

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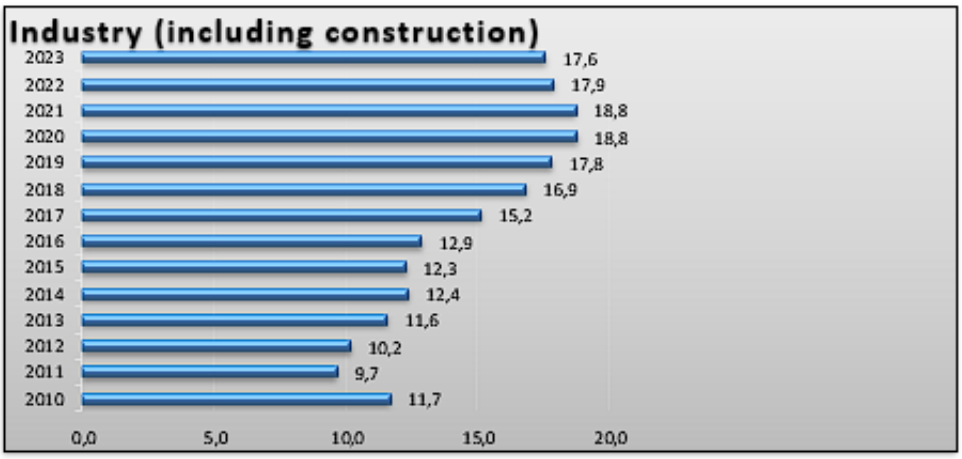


Figure 1. *Share of the industrial sector of Surkhandarya region in gross regional product in percent (%)*

Statistical data shows how the industry sector including construction raised its GRP share from 11.7% in 2010 to 12.4% in 2014. This increased percentage served as a sign for economic development and stable production growth. The industrial sector of Uzbekistan keeps expanding to position itself as an essential economic pillar. During 2015-2016 industry contributed 12.3% to GRP in 2015 that later increased to 12.9% in 2016 while industrial growth rates experienced a slight decrease. The industrial sector and construction sector growth in 2016 resulted from modern sector development and technological innovation. The shares of industrial production rose substantially as a percentage of GRP over the years 2017-2019. During the period between 2017 and 2019 industry consistently grew to reach 15.2% in 2017 then 16.9% in 2018 before achieving 17.8% in 2019. Industrial development along with construction expansion and increasing export and production activity drives this growth. The economy showed a policy favoring industrial development as industry maintained its maximum market share in 2017-2019. The pandemic influenced the economy in 2020-2021 through a 18.8% decline of industrial GRP during 2020 which stayed at the same level in 2021. Even though the pandemic caused specific economic sectors to decrease their operations the industrial sector displayed growth during this period. During this period the high level of industry preservation stems primarily from construction activity and the execution of infrastructure projects. The share of industry in the Gross Regional Product reduced to 17.9% in 2022 and 17.6% in 2023 due to global economic situations and external resources fluctuations. The industrial sector maintains a strong position in GRP due to robust fundamentals of both its stability and economic potential within India. The percentage of industrial contribution to GRP displayed a modest rising pattern from 2010 up to 2023. The earliest years showed steady growth rates until 2017-2019 interval produced the highest measurement. The pandemic caused industry to maintain its high share in 2020 and 2021 but brought about a gradual reduction in 2022-2023. Despite the strong foundation of industry in the economy industry maintains its position as one of the dominant sectors.

The process to increase gross regional product volume requires selecting key factors that influence industrial product development at competitive levels. The correct determination of influencing elements for this process must be followed by an analysis of their impact intensity. The following assessment of industrial enterprises in Surkhandarya region throughout 2010-2023 relies on statistical information from the Department of Statistics of Surkhandarya region.

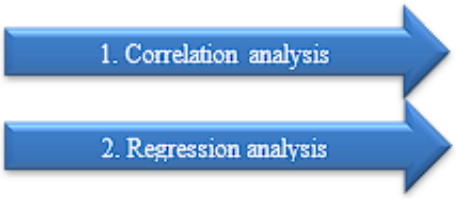


Figure 2.

The selection of industrial enterprise figures SKS, and employment statistics SKIBS, and investment volume SKKIH was made to serve as the outcome factor in Surkhandarya region. We start by computing the correlation coefficient to establish how these necessary factors affect the resulting variable (or resulting factor) (Table 1).

Years	SKS	SKIBS	SKKIH(billion soums)
2010	36	245	178,0
2011	72	578	206,2
2012	65	260	272,8

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2013	97	791	379,3
2014	87	378	438,8
2015	109	325	527,2
2016	150	1762	675,5
2017	212	2711	886,9
2018	374	1422	1 516,0
2019	716	2190	2 213,0
2020	1225	7565	2 768,0
2021	834	1819	3 715,8
2022	548	1632	4 987,0
2023	400	445	5 943,8

Table 1. ***Indicators of industrial enterprises, employed people and the volume of investment in industrial enterprises in Surkhandarya region***

We decided to develop the regression equation in logarithmic form. For this, it was necessary to find the logarithmic values of the above indicators of industrial enterprises (SKS), employed persons (SKIBS) and the volume of investment in industrial enterprises (SKKIH). These values are presented in detail in Table 2.

Years	SKS	SKIBS	SKKIH(billion soums)
2010	3,583519	5,501258	5,181784
2011	4,276666	6,359574	5,328847
2012	4,174387	5,560682	5,608739
2013	4,574711	6,673298	5,938327
2014	4,465908	5,934894	6,084044
2015	4,691348	5,783825	6,26758
2016	5,010635	7,474205	6,515453
2017	5,356586	7,905073	6,787732
2018	5,924256	7,25982	7,323831
2019	6,57368	7,691657	7,702104
2020	7,110696	8,931288	7,92588
2021	6,726233	7,506042	8,220349
2022	6,306275	7,397562	8,51459
2023	5,991465	6,098074	8,690104

Table 2. ***Logarithmic values of the indicators of industrial enterprises, employed persons and the volume of investment in industrial enterprises in Surkhandarya region***

Based on Table 2, the data in Table 1 were brought to the same gender because they were of different genders, namely the number of industrial enterprises, the number of people employed in the industry, and the volume of investment in the industry.

Nomi	SKS	SKIBS	SKKIH(billion soums)
y	X 1	X 2	
SKS	1		
SKIBS	0,799002983	1	
SKKIH(billion soums)	0,921722068	0,586124014	1

Table 3. ***Correlation coefficient of factors affecting the number of industrial enterprises in Surkhandarya region***

Considering the values of Table 3, it was found that the number of industrial enterprises in Surkhandarya region - the number of people employed in industrial enterprises - SKIBS ($r_{(SKS,SKIBS)}\approx0.799$), the volume of investment in industrial enterprises - SKKIH ($r_{(SKS,SKKIH)}\approx0.921$) are strongly correlated with the factors, and the correlation coefficient ($r_{(SKS,SKIBS,SKKIH)}$)>0.7 indicates that the condition is satisfied. In particular, based on the requirements for multi-factor econometric models, the independent factors should not be multicollinear (i.e. strongly correlated). Our analysis revealed that the selected SKIBS and SKKIH factors were not mutually col-linear.

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$$Y = a + b_1 x_1 + b_2 x_2 \quad (1)$$

$$SKS = a + b_1 SKIBS + b_2 SKKIH \quad (2)$$

$$lnSKS = -1{,}909 + 0{,}42 \cdot lnSIBS + 0{,}63 \cdot lnnSKKIH \quad (3)$$

a=e^-1,909

0,148249004

$$lnSKS = lna + lnSKIBS^{0{,}42} + lnSKKIH^{0{,}63} \quad (4)$$

$$lnSKS = \ln (a * lnSKIBS^{0{,}42} * lnSKKIH^{0{,}63}) \quad (5)$$

Figure 3.

Result and Discussion

Using the capabilities of gretl, we present the results in the following table:

Model 1: OLS, using observations 2010-2023 (T = 14)
Dependent variable: SKS

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	−1.90886	0.518941	−3.678	0.0036	***
SKIBS	0.421913	0.0876596	4.813	0.0005	***
SKKIHmlrdsoam	0.634349	0.0752165	8.434	<0.0001	***

Mean dependent var	5.340455	S.D. dependent var	1.100076
Sum squared resid	0.761940	S.E. of regression	0.263187
R-squared	0.951568	Adjusted R-squared	0.942762
F(2, 11)	108.0615	P-value(F)	5.86e-08
Log-likelihood	0.511475	Akaike criterion	4.977049
Schwarz criterion	6.894221	Hannan-Quinn	4.799580
rho	0.237050	Durbin-Watson	1.484676

Figure 4. ***Results of the assessment of factors affecting the number of industrial enterprises in Surkhandarya region***

Based on our research, we formulated the following regression equation:

SKS = 0,15 * SKIBS 0,42 * SKKIH 0,63 (6)

From this result, a 1% increase in employment in industry leads to an increase in industrial enterprises by 0.42%, and a 1% increase in the volume of investment in industrial enterprises leads to an increase in the number of industrial enterprises by 0.63%, and the total number of industrial enterprises by 0.15%. Also, if we check this situation without a constant, we can get the result in the table below.

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Model 2: OLS, using observations 2010-2023 (T = 14)
Dependent variable: SKS

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
SKIBS	0.236133	0.102439	2.305	0.0398	**
SKKIHmlrdsoam	0.547098	0.102054	5.361	0.0002	***

Mean dependent var	5.340455	S.D. dependent var	1.100076
Sum squared resid	1.699161	S.E. of regression	0.376293
Uncentered R-squared	0.995906	Centered R-squared	0.891995
F(2, 12)	1459.495	P-value(F)	4.71e-15
Log-likelihood	−5.102679	Akaike criterion	14.20536
Schwarz criterion	15.48347	Hannan-Quinn	14.08704
rho	0.640065	Durbin-Watson	0.548329

Figure 5. ***Evaluation results of factors affecting the number of industrial enterprises in Surkhandarya region***

Analyzing the obtained constant-free regression coefficients, the final equation was expressed as follows:

SKS = SKIB 0,24 * SKKIH 0,55 (7)

Conclusion

Research shows that when businesses in the region gain one percent more employees working at industrial enterprises they will create 0.24 additional industrial facilities. The study revealed investments into regional industrial production can grow up to 0.55% at the current time. For investments to generate effective economic results sectoral and regional coordination must guide their distribution and attraction process. Econometric research reveals the labor force intensity through a total regression coefficient impact of 0.79. The labor force plays an important role in driving economic growth even though the transformation of capital intensity occurs at a steady pace.

Our research shows that the economic influence of industrial workers turns out to be substantial. Industry along with construction demonstrates higher operational efficiency than other sectors but less so than these two industries. The economy shows low overall efficiency since the industry sector contributes more than 17.6 percent to its total. The level of efficiency in the region works as a negative factor that decreases investment quantities.

Also, when we analyze the distribution of investments by sectors and industries, it is revealed that the share of the industry and services sector is high. This, in turn, indicates that insufficient investments are directed to agriculture, which is one of the main sectors of the economy. Similar problems exist in the regions. Therefore, it is necessary to optimally regulate the attraction of investments in the region by sectors and regions. In this regard, taking into account the specific characteristics of the region, we propose the following measures:

Increase investments in agriculture, especially stimulating innovative and technological development;

Effectively distribute investments directed to the industry and services sectors, developing new sectors in accordance with market demand;

Attracting investments to regions outside major economic centers, including developing programs aimed at developing industry in rural areas;

In general, the region will increase its investment efficiency, attractiveness and potential, and the volume of investment attraction will expand. At the same time, optimal market mechanisms will be created for the effective distribution of investments across sectors and industries, as well as cities and districts of the region.

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