



Article

The Role of the Industry in the Sustainable Development of the Regional Economy

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Abstract: This article comprehensively analyzes the role and importance of the industrial sector in the sustainable development of the regional economy. In modern economic conditions, the industrial sector is the main driver of economic growth and has a significant impact on the socio-economic development of regions. The study extensively covers the share of industrial production in regional GDP, its role in increasing employment, its role in stimulating innovative activity, and its contribution to the development of infrastructure. The article pays special attention to the issues of environmental safety, rational use of resources, and the introduction of the principles of the "green economy" within the framework of the concept of sustainable industrial development. It also analyzes ways to minimize the negative impact on the environment by modernizing production processes, increasing energy efficiency, and reducing waste. The possibilities of ensuring economic diversification, creating new jobs, and improving the living standards of the population through industrial development in the regions are substantiated. The study used methods of economic and statistical analysis, comparative analysis, and a systematic approach. The results show that the effective development of the industrial sector not only ensures economic stability, but is also an important factor in increasing social well-being and maintaining ecological balance. At the same time, the need to improve regional industrial policy, attract investments, support small and medium-sized businesses, and widely introduce innovative technologies is emphasized.

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1. Introduction

An issue of critical importance in the development of a regional economy is achieving its sustainable level. In this context, the key criterion is gross regional product, which requires not only a positive level but also the assurance of high growth rates. In particular, this condition is directly related to sectoral development and the expansion of production capacity. Taken together, these factors constitute the material foundation for ensuring the sustainability of the regional economy. Nevertheless, depending on the material condition of the economy, development may be either intensive or extensive. In this regard, intensive development is the principal factor of sustainability. Therefore, at the initial stage, we examine the growth rate of the region's gross regional product and its role as a criterion of sustainability[1].

According to the results of the conducted study, the fluctuating trends of the above indicators were caused by various factors. In particular, during 2010–2016, the growth

rates of gross regional product were relatively high, ranging between 107 and 113 percent. We consider the main reasons for this to be the extensive involvement of available idle production factors in the regional economy during that period. In 2020, however, the growth rate slowed sharply to 101.1 percent, which was due to restrictions on economic activity under the impact of the global pandemic[2]. In 2021–2024, as noted above, the growth of gross regional product recovered to a certain extent, and a positive growth trend in the economy was maintained. It should be emphasized that the positive changes observed in recent years are associated with improvements in the quality and efficiency of the capital factor. That is, large-scale technology transfer processes are being implemented in the region[3].

2. Material and Methods

The sustainability criterion assessed on the basis of gross regional product growth in the region exhibits a fluctuating trend (Table 1). This criterion was calculated relative to the minimum threshold of sustainable growth established for the economy of Uzbekistan, namely a 5 percent level. During 2010–2016, coefficients in the range of 1.46–2.51 were identified. From 2017 onward, the sustainability coefficient showed a downward trend, declining to 0.21 in 2020. This situation indicates that economic growth assumed an unstable character and became highly dependent on external and internal factors. In subsequent years, the coefficient increased slightly, reaching 0.85 in 2024; however, the sustainability coefficient remained relatively low. Over the period 2010–2024, the average value of the sustainability coefficient in the region amounted to 1.45, which indicates the presence of fluctuations in the sustainability criterion of long-term growth in the economy of the Republic of Karakalpakstan[4].

The Republic of Karakalpakstan, the growth of gross regional product during the analyzed period was positive; however, its sustainability cannot be considered favorable across the years. In particular, after 2017, the sustainability criterion of economic growth declined, reaching its lowest level in 2020. Therefore, to strengthen economic sustainability in the region, it is necessary to diversify production, increase investment activity, and develop sectors and industries in line with identified growth points[5].

To this end, we analyze the development and sustainability levels of the industrial, service, and construction sectors across the region's territories. In particular, when examining the sustainability of the industrial sector in the territories of the Republic of Karakalpakstan for 2010–2024, significant imbalances between cities and districts, as well as differences in production volumes across regions, were identified. Moreover, according to average data, the level of sustainable development of the industrial sector gradually increased during 2010–2014, reaching 0.318 in 2014. This period corresponds to the phase of high and stable growth rates of gross regional product, indicating that regional industrial sectors were the main drivers of economic growth. At the same time, during 2015–2019, the decline in the average indicator (from 0.308 to 0.169) reflects a weakening of stability in industrial development. This situation aligns with the previously observed slowdown in gross regional product growth rates and the decline in sustainability coefficients[6].

In particular, after 2017, the uneven nature of economic growth across regions led to an increase in disparities in industrial sector stability. During 2020–2024, the average industrial sustainability indicator recovered within the range of 0.197–0.224, which corresponds to the phase of slow but relatively stable recovery in gross regional product growth rates. At the same time, the fact that sustainability did not fully return to the 2014 level indicates that the regional sources of economic growth do not yet possess sufficient stability[7].

3. Results and Discussion

Therefore, we examine the level of industrial stability in the territories of the Republic of Karakalpakstan. Based on the results of our study, it was determined that the city of Nukus, as well as the Takhiyatosh and Khojayli districts, are regions with high industrial stability. In particular, in the city of Nukus, the indicator remained at a level of 1.0 from 2015 to 2021, ensuring the stable development of industrial production [8].

In the Republic of Karakalpakstan, the growth rates of gross regional product over the period 2010–2024 reflected a positive trend. In particular, based on the values of this indicator, the study period is divided into two stages: 2010–2019 and 2020–2024. The first period was characterized by high growth rates, whereas the second period exhibited relatively lower but upward-trending growth. Overall, during the entire study period, the average growth rate of gross regional product amounted to 107.2 percent Table 1 [9].

Table 1. The Level of Economic Sustainability Based on Gross Regional Product in the Republic of Karakalpakstan

Indicator	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Average
Growth Rate of Gross Regional Product, %	112,5	107,3	111,8	108,0	109,2	110,5	112,5	106,1	106,3	106,4	101,1	106,4	104,2	102,1	104,2	107,24
Sustainability Criterion for Gross Regional Product Growth, coefficient	2,51	1,46	2,36	1,59	1,84	2,10	2,50	1,21	1,25	1,29	0,21	1,28	0,84	0,42	0,85	1,45

In addition, in the Takhiyatosh district, the rapid increase in industrial stability from 0.527 to 1.0 during 2019–2024 occurred in connection with the expansion of energy and large industrial enterprises. In the Khojayli district, stability indicators around the level of 1.0 were recorded during 2013–2015. At the same time, a relatively high average indicator (0.385) was observed, which reflects the significant industrial potential of the region.

In addition, in the districts of Kungrad, Muynaq, and Karaozak, industrial stability exhibits a fluctuating trend, reflecting average values among the region's territories. This indicates that industrial activity in these districts is highly dependent on individual projects. It should also be emphasized that these areas currently possess advanced technologies in industrial development. This underscores the necessity of effectively utilizing the industrial potential of these regional territories [10].

Additionally, in the districts of Amudaryo, Beruniy, Tortkol, Chimboy, Ellikkala, and Shumanay, industrial stability has remained at a low level. Indicators below 0.1 in these areas suggest that industrial production is limited and economic growth is primarily driven by the agricultural sector. As a result, the contribution of gross regional product across the region's territories is distributed unevenly.

Thus, the analysis carried out to determine the stability of the industrial sector indicates that the sustainability of gross regional product growth in the Republic of Karakalpakstan largely depends on the high development of the industrial sector in certain territories. However, the sharp disparities in industrial stability across regions remain a negative factor affecting gross regional product growth. Therefore, to strengthen economic sustainability in the Republic of Karakalpakstan, it is necessary to ensure proportional

development of the industrial sector across regions, to develop industrial infrastructure in districts with low stability, and to diversify investments[11].

In this regard, it is necessary to identify the experience of the regions that achieved the positive results mentioned above. To do this, the territories are classified into rating groups based on the level of industrial stability, which allows for the identification of structural imbalances in industrial development Table 2. In particular, in the “Excellent” rating group, the city of Nukus and the Takhiyatosh district demonstrate stable industrial development, which is associated with the concentration of infrastructure, production capacities, and technological base.

In the Muynaq district, which belongs to the “Good” rating group, industrial stability was high during certain periods. However, the sharp fluctuations in the indicators indicate that stable development has not yet taken a systemic form. This suggests that the institutional foundations of the industrial sector in the region are still insufficiently developed, although production capacities are high and enterprises creating high value-added chains are beginning to emerge.

In the Kungrad and Khojayli districts, which belong to the “Satisfactory” rating group, industrial potential exists; however, its stable development is not high. This situation is associated with insufficient diversification of the production structure and relatively weak industrial infrastructure. At the same time, the Table 2.proportion of territories included in the “Unsatisfactory” rating group is high, indicating the presence of systemic problems in the regional development of the industrial sector. In these districts, stable industrial production chains have not been formed, and the agricultural sector remains dominant[12].

Table 2. Rating of the Stable Development of the Industrial Sector in the Territories of the Republic of Karakalpakstan

Criteria of the Rating Groups	Range of Indicator Values for the Rating Criterion		Names of Territories by Rating Group Ranges	Share of Territories by Rating Group Ranges
	≥	<		
Excellent	0,782	0,593	City of Nukus, Takhiyatosh District	11,8
Good	0,593	0,404	Muynaq District	5,9
Satisfactory	0,404	0,215	Kungrad and Khojayli Districts	11,8
Unsatisfactory	0,215	0,026	Amudaryo, Beruniy, Bozatov, Karaozak, Kegeyli, Qonliko'l, Nukus, Takhtakupir, Tortkol, Chimboy, Shumanay, Ellikkala Districts	70,6

Thus, the sharp differences in industrial stability across regions are associated with the uneven distribution of production resources, limited investment flows, and variations in the level of institutional support. In regions with low industrial stability, the production system is highly susceptible to external influences. Furthermore, in regions with high industrial stability, there is a positive correlation between technological innovation and production efficiency. In the regions of the Republic of Karakalpakstan, the stable development of the industrial sector is currently highly regionally differentiated. To enhance industrial stability, it is necessary in the low-ranking regions to strengthen production infrastructure, consider regional specialization when locating industrial enterprises, and improve institutional support mechanisms.

We also specifically emphasize that the majority of the territory of the Republic of Karakalpakstan possesses priority potential in agriculture. For this reason, we examine the level of stability in the development of agriculture across the regions of the republic. In

particular, the sustainable development of the agricultural sector is considered one of the key areas that ensure food security, employment, and the rational use of natural resources within the regional economic system. The indicators of agricultural sustainability, calculated for the regions of the Republic of Karakalpakstan for the period 2010–2024, reveal the characteristics of the sector's development across these regions[13].

According to our research, the level of sustainable development in the agricultural sector remained relatively stable during 2010–2013, then declined to some extent in 2014–2016. From 2017 onward, a significant increase in the indicators was observed, reaching an average stability range of 0.65–0.68 during 2019–2021. This situation indicates an improvement in production efficiency in agriculture. Nevertheless, the decline of the average indicators to 0.49–0.51 in 2022–2024 suggests that sustainability in the agricultural sector has not been fully consolidated, and in some regions, conditions remain dependent on external natural and economic factors.

In particular, the level of sustainable development in the agricultural sector varies significantly among the regions. In the districts of Amudarya, Konlikul, Takhtakupir, Nukus, and Ellikkala, agricultural sustainability is at a high level. Notably, in Konlikul district, the indicator remained at 1.0 during 2021–2024, demonstrating a high degree of stability in agricultural production. At the same time, the maximum level of stability in Nukus district during 2010–2017 indicates efficient use of resources in agriculture and a well-established production system. In the districts of Beruniy, Karaozak, Chimboy, and Shumanay, agricultural sustainability is formed at an average level; while there is a growth trend, it is insufficient for long-term stability.

In addition, in the districts of Muynaq, Kungrad, Khojayli, and Tahiatosh, agricultural sustainability remains at a low level. This situation is associated with natural and climatic conditions, water supply problems, and limited production infrastructure in these regions. In Nukus city, the agricultural sustainability indicator is zero, indicating the low practical significance of agricultural activity within the urban area.

Thus, the sustainable development of the agricultural sector in the Republic of Karakalpakstan is highly differentiated across regions. While some districts exhibit high sustainability, others remain highly sensitive to external factors. In areas with high agricultural sustainability, there is an expansion in production volumes, more rational use of resources, and improvements in technology.

Although the sustainable development of the Table 3. agricultural sector in the Republic of Karakalpakstan is generally positive, it is not balanced across regions. Therefore, in areas with low sustainability, improving water resource management, expanding agro-technologies, and developing agricultural infrastructure are of critical importance for ensuring the long-term sustainable development of the sector[14].

Table 3. Ranking of the Regions of the Republic of Karakalpakstan by Sustainable Development of the Agricultural Sector

Criteria for the rating groups	Thresholds of the rating criterion indicators		Names of the regions according to the rating group intervals	Share of regions according to the rating group intervals
	≥	<		
Excellent	0,827	0,620	Districts of Amudarya, Bozatov, Karaozak, Konlikul, Nukus, and Takhtakupir	35,3
Good	0,620	0,414	Districts of Beruni, Kegeyli, Tortkul, Chimboy, Shumanay, and Ellikkala	35,3
Satisfactory	0,414	0,207	Districts of Kungrad, Muynaq, Tahiatosh, and Khojayli	23,5

Unsatisfactory	0,207	0,000	Nukus city	5,9
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In addition, the regional territories were divided into four rating groups based on agricultural sustainability indicators. In particular, the highest rating group (0.827–0.620) includes the districts of Amudarya, Bozatov, Karaozak, Konlikul, Nukus, and Takhtakupir. In these areas, agricultural sustainability is high, and the production system is efficient and sustainably developed.

At the same time, the good rating group (0.620–0.414) includes the districts of Beruniy, Kegeyli, Tortkul, Chimboy, Shumanay, and Ellikkala. Their sustainability is at an average level, and agricultural efficiency is considered satisfactory.

In these areas, it is advisable to expand the use of agro-technologies to ensure positive changes. The satisfactory rating group (0.414–0.207) includes the districts of Kungrad, Muynaq, Tahiatosh, and Khojayli. In these regions, agricultural sustainability is low, and its growth depends on natural conditions, water supply, and infrastructure. It is necessary to increase sustainability in these areas through sector diversification and the introduction of modern technologies. The unsatisfactory rating group (0.207–0.000) includes only Nukus city, indicating that agricultural activity in the regional center exhibits the lowest performance indicators Table 3.

Thus, in conclusion, agricultural sustainability in the Republic of Karakalpakstan varies across regions. In areas with high sustainability, the production system is efficient and sustainably developed, resources are used rationally, and modern agro-technologies are widely applied. In regions with moderate sustainability, efficiency is satisfactory, but additional measures are required to strengthen long-term stability.

The sustainable development of the service sector in the regions of the Republic of Karakalpakstan was analyzed for the period 2010–2024. In 2010, the average sustainability indicator was 0.115, indicating a low level of development in the service sector. In the following years, a gradual increase in the indicator was observed, with the average index ranging between 0.154 and 0.158 during 2011–2013. In 2014–2016, the average sustainability rose to a level of 0.151–0.165. However, interregional differences persisted. During 2017–2020, the sustainability indicator experienced a significant increase, fluctuating between 0.193 and 0.196. In 2021–2024, the average sustainability indicator slightly decreased, ranging from 0.152 to 0.170.

The Table 4. level of sustainable development of the service sector in the regions of the Republic of Karakalpakstan was also analyzed based on a rating system. The rating groups were defined as “Excellent,” “Good,” “Satisfactory,” and “Unsatisfactory[15].”

Table 4. Ranking of the Regions of the Republic of Karakalpakstan by Sustainable Development of the Service Sector

Criteria for the rating groups	Thresholds of the rating criterion indicators		Names of the regions according to the rating group intervals	Share of regions according to the rating group intervals
	≥	<		
Excellent	1,000	0,754	Nukus city.	5,9
Good	0,754	0,509	Kungrad district	5,9
Satisfactory	0,509	0,263	-	0,0
Unsatisfactory	0,263	0,017	Districts of Amudarya, Beruni, Bozatov, Karaozak, Kegeyli, Konlikul, Muynaq, Nukus, Tahiatosh, Takhtakupir, Tortkul,	88,2

Khojayli, Chimboy, Shumanay, and
Ellikkala

In particular, only Nukus city is included in the “Excellent” group, achieving the highest results in sustainable development. This indicates that the service infrastructure and quality of services in Nukus city are significantly higher than in other regions. The “Good” group (0.754–0.509) includes Kungrad district. The level of sustainable development in the relevant sector of this district is high, but lower compared to Nukus. This reflects the availability of infrastructure and service provision in the area, while also indicating the need to expand the sector within the region.

At the same time, the “Unsatisfactory” group (0.509–0.263) includes Amudarya, Beruniy, Bozatov, Karaozak, Kegeyli, Konlikul, Muynaq, Nukus district, Tahiatosh, Takhtakupir, Tortkul, Khojayli, Chimboy, Shumanay, and Ellikkala, covering 88.2% of the regions (Table 4). Thus, the rating data indicate that the service sector in Karakalpakstan exhibits low sustainability in the majority of regions.

Only Nukus city and Kungrad district are highly developed. Overall, 88.2% of the regions fall into the low sustainability (unsatisfactory) group. This situation indicates the need for comprehensive strategic development of the sector.

The level of sustainable development of the economy of the Republic of Karakalpakstan increased from 0.246 in 2010 to 0.298 in 2024. Among the regions, the highest sustainability was recorded in Nukus city (average 0.594), which is explained by its high level of economic activity as the central city. In regions such as Kungrad and Khojayli, sustainability was also relatively high, with an average of 0.403–0.434.

At the same time, in Chimboy, Tortkul, and Shumanay, sustainability is low (average 0.2–0.21), indicating the presence of interregional imbalance (Table 5).

In particular, the overall sustainability level of the region exhibited the following trends over the years: during 2010–2014, an increase from low to medium levels was observed (average from 0.246 to 0.297). In 2015–2017, a slight decline in sustainability was recorded in some areas (average 0.285–0.243). The period of renewed growth began in 2018–2020 (average 0.344–0.353), indicating that new strategic measures, particularly the modernization of service infrastructure, had a positive impact on improving sustainability. During 2021–2024, sustainability remained stable (average 0.296–0.298), reflecting balanced development within the sector.

The interregional sustainability analysis indicates the following. Regions with high sustainability include Nukus city (average 0.594), as well as Kungrad and Khojayli districts. Regions with moderate sustainability are Amudarya, Beruniy, Karaozak, and Takhtakupir districts. Low sustainability corresponds to Chimboy, Tortkul, Shumanay, and Ellikkala districts Table 5.

Table 5. Level of Sustainable Development of the Regions of the Republic of Karakalpakstan

Name of the regions	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Average
Nukus city.	0,44 7	0,46 1	0,48 4	0,54 6	0,56 2	0,65 4	0,66 7	0,66 7	0,66 7	0,66 7	0,66 7	0,66 7	0,66 4	0,58 7	0,50 7	0,594
<i>districts:</i>																
Amudarya	0,20 8	0,21 6	0,21 4	0,26 0	0,22 5	0,24 0	0,21 8	0,35 3	0,36 1	0,36 7	0,35 8	0,34 1	0,28 6	0,28 4	0,29 6	0,282
Beruniy	0,21 3	0,23 4	0,22 9	0,26 0	0,21 6	0,21 7	0,18 2	0,28 9	0,27 0	0,28 0	0,30 0	0,27 9	0,19 7	0,20 7	0,21 1	0,239
Bozatov										0,29 9	0,36 9	0,27 1	0,22 5	0,27 6	0,27 0	0,285

Karaozak	0,20	0,21	0,21	0,25	0,22	0,25	0,18	0,31	0,36	0,39	0,35	0,36	0,30	0,33	0,32	0,287
	5	0	5	6	3	1	8	7	4	2	6	6	5	4	8	
Kegeyli	0,19	0,22	0,22	0,26	0,22	0,22	0,17	0,25	0,25	0,26	0,26	0,21	0,17	0,16	0,14	0,218
	2	2	6	6	1	2	1	7	4	6	5	8	8	2	5	
Kungrad	0,18	0,30	0,34	0,34	0,58	0,66	0,37	0,39	0,27	0,39	0,42	0,46	0,44	0,43	0,40	0,403
	1	9	6	2	3	8	9	6	6	4	7	1	5	4	0	
Konlikul	0,25	0,22	0,26	0,25	0,19	0,18	0,24	0,32	0,34	0,37	0,39	0,41	0,40	0,42	0,39	0,312
	5	3	2	4	0	7	5	1	1	6	5	1	4	1	4	
Muynaq	0,38	0,39	0,39	0,26	0,32	0,07	0,17	0,23	0,25	0,38	0,24	0,22	0,22	0,26	0,28	0,277
	5	8	7	0	7	2	2	6	7	3	9	5	9	9	9	
Nukus	0,36	0,39	0,39	0,40	0,39	0,40	0,36	0,37	0,29	0,38	0,37	0,30	0,28	0,26	0,27	0,351
district	7	0	1	4	4	0	3	2	3	8	1	7	3	6	8	
Tahiatosh								0,23	0,23	0,31	0,41	0,46	0,43	0,43	0,42	0,371
								5	1	8	8	3	8	6	7	
Takhtakupi	0,26	0,24	0,24	0,25	0,20	0,19	0,20	0,35	0,31	0,40	0,42	0,41	0,36	0,33	0,33	0,305
r	7	4	6	9	5	9	5	7	5	2	4	3	7	3	9	
Tortkul	0,16	0,19	0,19	0,21	0,17	0,19	0,15	0,23	0,23	0,25	0,27	0,27	0,20	0,18	0,17	0,208
	6	5	1	5	8	4	9	4	3	4	0	0	1	3	4	
Khojayli	0,29	0,31	0,37	0,48	0,44	0,41	0,20	0,19	0,23	0,24	0,24	0,21	0,18	0,18	0,17	0,281
	2	9	3	3	0	5	8	5	3	4	1	9	9	4	9	
Chimboy	0,15	0,15	0,17	0,19	0,15	0,19	0,16	0,26	0,23	0,24	0,26	0,24	0,18	0,18	0,18	0,200
	5	0	2	1	7	7	5	7	6	9	6	8	0	9	7	
Shumanay	0,12	0,14	0,15	0,17	0,13	0,13	0,13	0,24	0,26	0,28	0,31	0,30	0,23	0,25	0,24	0,210
	5	6	4	8	3	7	6	9	1	4	7	0	3	4	2	
Ellikkala	0,23	0,26	0,23	0,28	0,23	0,22	0,18	0,27	0,26	0,29	0,30	0,28	0,20	0,19	0,19	0,245
	2	0	6	7	2	3	7	8	5	0	2	8	5	8	8	
<i>Average</i>	<i>0,24</i>	<i>0,26</i>	<i>0,27</i>	<i>0,29</i>	<i>0,28</i>	<i>0,28</i>	<i>0,24</i>	<i>0,31</i>	<i>0,30</i>	<i>0,34</i>	<i>0,35</i>	<i>0,33</i>	<i>0,29</i>	<i>0,29</i>	<i>0,28</i>	<i>0,298</i>
	6	5	6	7	6	5	3	4	4	4	3	8	6	5	6	

The regions of the Republic of Karakalpakstan were grouped using a rating method to assess the sustainable development of the economy. They were classified into four groups: excellent, good, satisfactory, and unsatisfactory. Excellent sustainability was recorded in Nukus city, indicating its high potential in economic capacity and infrastructure development as the central city. The good level includes Kungrad district, where economic activity is stable but slightly lower compared to the central city. The satisfactory level was observed in Konlikul, Nukus district, Tahiatosh, and Takhtakupir districts (accounting for 23.5%). In these areas, the economy is stable, but additional investment and resources are required for strategic development. The unsatisfactory level includes Amudarya, Beruniy, Bozатов, Karaozak, Kegeyli, Muynaq, Tortkul, Khojayli, Chimboy, Shumanay, and Ellikkala districts. These regions have the weakest potential in the republic's economy and require comprehensive measures to ensure sustainable development Table 6.

Thus, in central cities, investment activity is high due to well-developed infrastructure and services. In peripheral regions, additional measures in investment, infrastructure, transport, and service sectors are required to ensure sustainable development. Furthermore, to increase the level of sustainability, it is necessary to develop an interregional investment strategy, enhance entrepreneurial capacity, and expand infrastructure projects.

Table 6. Ranking of the Regions of the Republic of Karakalpakstan by Sustainable Economic Development

Criteria for the rating groups	Thresholds of the rating criterion indicators		Names of the regions according to the rating group intervals	Share of regions according to the rating group intervals
	$\geq$	$<$		
Excellent	0,594	0,496	Nukus city.	5,9
Good	0,496	0,397	Kungrad district	5,9
Satisfactory	0,397	0,299	Konlikul, Nukus, Tahiatosh, Takhtakupir districts	23,5
Unsatisfactory	0,299	0,200	Amudarya, Beruniy, Bozatov, Karaozak, Kegeyli, Muynaq, Tortkul, Khojayli, Chimboy, Shumanay, and Ellikkala districts	64,7

In this context, it is important to determine which criterion has the strongest influence on the sustainable development of the regions of the Republic of Karakalpakstan. Specifically, we examine whether the industrial, agricultural, or service sectors have the greatest impact on overall sustainability. For this purpose, econometric analyses are employed.

Specifically, by assessing the sustainability of the economy of the Republic of Karakalpakstan and its explanation through various sectors, we are able to draw a number of scientific conclusions. For this purpose, the model was formulated as follows:

$$UB_t = \beta_0 + \beta_1 SB_t + \beta_2 XB_t + \beta_3 QB_t + \varepsilon_t \quad (1)$$

Where: UB_t – overall sustainability indicator; SB_t – sustainability of the industrial sector; XB_t – sustainability of the service sector; QB_t – sustainability of the agricultural sector; ε_t – random error.

Based on the above model, we developed the following model through our regression analyses:

$$UB_t = -0,190 + 0,142 * SB_t + 0,130 * XB_t + 0,307 * QB_t \quad (2)$$

The test results of our developed model are also positive and meet the required standards. Specifically, $R^2 = 0.825$ and $F_{test} = 20.36$ ($p < 0.001$), confirming the overall statistical significance of the regression model. This indicates that all three sectors together statistically explain overall sustainability.

4. Conclusion

In this case, the sustainability of the agricultural sector has the greatest impact, with a coefficient of 0.307. When the sector's sustainability increases by one unit, overall sustainability rises by 0.307 units. This indicates that in Karakalpakstan, agriculture not only provides employment but also directly influences stable economic activity and the living standards of the local population.

The industrial sector coefficient has a statistically significant impact on regional sustainability, with a value of 0.142 ($p < 0.01$). This means that a one percent change in industrial sustainability leads to a 0.142 percent increase in overall sustainability. A one percent increase in the service sector raises overall sustainability by 0.130 percent. The service sector is important for the population's living standards, service quality, and local economic activity. The sustainability of this sector is also linked to social and infrastructural factors within the economy.

Thus, at present, agriculture is the most influential factor affecting the sustainability of the regional economy. This highlights the need to develop high-efficiency sectors such

as industry and services. An effective and rational way to implement this process is through the promotion of entrepreneurial activity in the Republic of Karakalpakstan. In particular, expanding industrial entrepreneurship specialized in agricultural processing is considered an efficient approach.

Thus, to further enhance the sustainable development of the regional economy, ensure its continuity, and strengthen the impact of sectoral efficiency, it is necessary to increase entrepreneurial capacity.

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