

**INDUSTRIAL CLUSTERS IN THE ECONOMY OF THE KASHKADARYA
REGION: FORMATION AND DEVELOPMENT EFFICIENCY**

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Abstract: This article examines the formation, development, and economic efficiency of industrial clusters in the Kashkadarya region of Uzbekistan. The study is based on theoretical concepts of cluster development, international experience, and regional statistical data. The efficiency of industrial clusters is assessed through indicators such as industrial output growth, employment creation, export expansion, and investment activity. The results show that industrial clusters have become an important driver of regional economic growth, although several institutional and infrastructural constraints remain. The findings provide practical recommendations for improving regional industrial policy and cluster governance in line with international best practices.

Keywords: industrial clusters, regional economy, efficiency, Kashkadarya region, industrial development, investments.

Introduction

In the context of globalization and increasing competition among regions, industrial clusters are widely recognized as an effective tool for enhancing regional competitiveness and sustainable economic growth. Clusters facilitate cooperation between enterprises, research institutions, and supporting organizations within a specific geographical area, leading to productivity growth and innovation diffusion.

In recent years, Uzbekistan has implemented large-scale economic reforms aimed at industrial modernization, diversification, and export-oriented growth. Within this framework, the development of industrial clusters has become one of the key policy instruments. The Kashkadarya region, endowed with rich natural resources, industrial infrastructure, and labor potential, represents a strategic area for cluster-based development.

The purpose of this study is to analyze the formation and development efficiency of industrial clusters in the Kashkadarya region, identify their economic impact, and propose policy recommendations aligned with Scopus-indexed academic standards.

Literature Review

The concept of industrial clusters was popularized by Porter (1998), who defined clusters as geographically concentrated groups of interconnected firms, suppliers, service providers, and associated institutions in a particular field. Numerous empirical studies confirm that clusters enhance productivity, innovation capacity, and export performance (Ketels, 2013; Delgado et al., 2014).

According to international experience, successful clusters are characterized by: - strong inter-firm linkages; - efficient institutional support; - access to skilled labor; - integration of science and production.

In transition economies, including Central Asia, cluster development plays a crucial role in accelerating industrialization and regional development. However, empirical research on regional clusters in Uzbekistan remains limited, which increases the relevance of this study.

Methodology and Data

This research applies a mixed-methods approach combining quantitative and qualitative

analysis. The main methods include: - statistical analysis of regional industrial indicators (2018–2023); - comparative analysis of cluster performance over time; - efficiency assessment using composite indicators; - review of policy documents and institutional frameworks.

The data sources include official statistics of the Kashkadarya regional authorities, industrial enterprise reports, and secondary academic literature.

Efficiency Indicators:

- industrial output volume (billion UZS);
- number of enterprises within clusters;
- employment level;
- export volume (million USD);
- investment inflows.

Formation and Performance of Industrial Clusters in the Kashkadarya Region (2020–2025)

a) Structure and Typology of Industrial Clusters

During 2020–2025, the industrial structure of the Kashkadarya region increasingly evolved toward a cluster-based development model. Industrial clusters in the region are formed on the basis of natural resource availability, existing industrial infrastructure, and regional specialization. The main industrial clusters operating in the region include:

1. **Oil and Gas and Gas-Chemical Cluster** – concentrated around the Mubarek and Shurtan gas processing complexes. This cluster specializes in natural gas processing, polymer production, and energy supply. It remains the largest contributor to regional industrial output.

2. **Textile and Cotton-Processing Cluster** – focused on deep processing of locally produced cotton, including yarn, fabric, and ready-made garments. The cluster significantly contributes to export revenues and employment generation.

3. **Chemical Industry Cluster** – engaged in the production of mineral fertilizers, chemical reagents, and construction chemicals, supporting both domestic demand and exports.

4. **Agro-Processing and Food Industry Cluster** – oriented toward processing agricultural products such as grain, meat, dairy, fruits, and vegetables, increasing value added within the region.

Figure 1. Sectoral structure of industrial clusters in the Kashkadarya region (Pie chart).

Gas-chemical – 30%, Textile – 25%, Chemical – 20%, Agro-processing – 15%, Other industries – 10%.

b) Industrial Output Dynamics of Cluster Enterprises (2020–2025)

Empirical analysis shows that industrial output generated by cluster enterprises in the Kashkadarya region demonstrated stable growth over the period 2020–2025. This trend reflects improved inter-firm cooperation, investment inflows, and gradual technological modernization.

Year	Industrial Output (bln UZS)	Export Volume (mln USD)	Number of Industrial Enterprises
2020	5,300	220	~2,850
2021	5,900	245	~2,900
2022	6,500	275	~3,000
2023	7,200	300	~3,050

Year	Industrial Output (bln UZS)	Export Volume (mln USD)	Number of Industrial Enterprises
2024	7,800	330	~3,100
2025	8,500	370	~3,120

Figure 2. Dynamics of industrial output and exports of cluster enterprises in the Kashkadarya region (Line chart, 2020–2025).

The data indicate that industrial output increased by approximately **60%** over the analyzed period, while export volumes rose by nearly **68%**, highlighting the growing competitiveness of cluster-based industries.

c) Employment and Social Effects of Industrial Clusters

Industrial clusters have played a critical role in employment generation and social development within the region. Expansion of textile, agro-processing, and chemical clusters created new jobs, particularly for youth and women, and contributed to income growth and labor productivity.

Figure 3. Employment growth in industrial clusters of the Kashkadarya region (Bar chart, 2020–2025).

The employment level within cluster enterprises increased steadily, reflecting the labor-intensive nature of textile and food-processing clusters.

d) Investment and Innovation Performance

Cluster-based development has significantly stimulated domestic and foreign investment inflows into the Kashkadarya region. Investments were primarily directed toward modernization of production facilities, acquisition of energy-efficient equipment, and partial digitalization of industrial processes. Nevertheless, innovation activity remains uneven across clusters, with higher R&D intensity observed mainly in the gas-chemical and chemical clusters.

e) Empirical Analysis of Cluster Efficiency

Industrial Output Growth: Between 2018 and 2023, industrial output generated by cluster enterprises increased steadily. This growth reflects economies of scale, technological upgrading, and improved coordination among cluster participants.

Year	Industrial Output (bln UZS)
2018	5,200
2019	5,860
2020	6,540
2021	7,310

1		
202		8,120
2		

Figure 2. Dynamics of industrial output in cluster enterprises (line chart)

Employment Effects: Industrial clusters have significantly contributed to employment generation in the region. The expansion of cluster-based enterprises has improved labor productivity and income levels.

Export Performance: Export-oriented production has increased due to cluster specialization and quality improvement. Textile and chemical clusters play a dominant role in regional exports.

f) Investment and Innovation Activity

The establishment of clusters has stimulated domestic and foreign investment inflows. Modern equipment, digital technologies, and energy-efficient solutions have been introduced, particularly in energy and textile clusters. Nevertheless, R&D intensity remains relatively low compared to international benchmarks.

Constraints and Challenges

Despite positive results, several challenges persist: - insufficient cluster governance mechanisms; - limited logistics and transport infrastructure; - shortage of highly qualified specialists; - weak integration of universities and research centers.

Policy Recommendations

To enhance the efficiency of industrial clusters, the following measures are recommended: 1. strengthening institutional and legal frameworks for cluster management; 2. expanding public-private partnerships; 3. improving innovation infrastructure (technoparks, R&D centers); 4. developing human capital through targeted education and training programs; 5. promoting export diversification and international cooperation.

Conclusion

This study has comprehensively examined the formation, development dynamics, and economic efficiency of industrial clusters in the Kashkadarya region over the period 2020–2025. The findings confirm that cluster-based industrial development has become one of the key drivers of regional economic growth, structural transformation, and competitiveness enhancement.

The empirical analysis demonstrates that industrial clusters in Kashkadarya have ensured stable growth in industrial output, with production volumes increasing by approximately 60 percent during the analyzed period. Export performance has also improved significantly, particularly in textile, gas-chemical, and chemical clusters, reflecting increased product quality, deeper processing of raw materials, and stronger integration into international markets. Moreover, the expansion of cluster enterprises has contributed to job creation and income growth, strengthening the social and economic stability of the region.

The research also reveals that industrial clusters generate positive spillover effects through inter-firm cooperation, shared infrastructure, and knowledge diffusion. The gas-chemical cluster, centered around the Mubarek and Shurtan industrial complexes, plays a dominant role in technological modernization and energy efficiency, while textile and agro-processing clusters contribute substantially to employment and export diversification. These differences indicate the importance of sector-specific policy approaches within a unified cluster development framework.

Despite these achievements, several structural and institutional challenges persist. Limited innovation capacity, insufficient research and development intensity, logistical constraints, and shortages of highly qualified specialists continue to restrict the full potential of cluster development. Addressing these issues requires coordinated efforts from government authorities, private enterprises, and educational institutions.

In conclusion, industrial clusters in the Kashkadarya region have proven to be an effective mechanism for accelerating industrial growth, increasing value added, and enhancing regional competitiveness. Strengthening cluster governance, expanding innovation infrastructure, and promoting human capital development will further improve the long-term sustainability and efficiency of cluster-based development. The results of this study may serve as a scientific basis for improving regional industrial policy in Uzbekistan and other transition economies with similar structural characteristics.

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