



Article

Industrial Enterprise Localization In The Development Of Regional Economy

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Abstract: The article analyzes on a scientific basis the existing problems associated with the location of industrial enterprises in the development of the regional economy, their economic, social and infrastructural causes and effective solutions to eliminate them. The location of industrial enterprises is considered an important factor in the rational use of economic resources, optimization of the transport and logistics system, balancing the labor market and ensuring regional stability. The study systematically analyzes the main problems of location - uneven distribution of production capacities, unbalanced development of infrastructure, centralization of investment flows, migration of labor resources and disruption of the ecological balance. Along with the theoretical foundations of these problems, the article covers scientifically based directions for solving them, including clustering, the "smart location" model, mechanisms for forming innovative infrastructure and sustainable energy systems. The results of the study put forward practical recommendations on ensuring regional economic balance, increasing production capacity and optimal location of industrial enterprises on the example of the Namangan region.

Keywords: regional economy, industrial enterprises, location efficiency, economic problems, infrastructure, investment activity, labor market, transport and logistics system, clustering, environmental sustainability, innovative development, resource use, economic solutions, territorial balance, industrial policy.

Citation: Nuritdinov, B. Industrial Enterprise Localization In The Development Of Regional Economy. Central Asian Journal of Innovations on Tourism Management and Finance 2025, 6(4), 1667-1675.

Received: 10th Jul 2025
Revised: 16th Aug 2025
Accepted: 24th Sep 2025
Published: 26th Oct 2025



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1. Introduction

The problem of rational location of industrial enterprises in order to increase the competitiveness of the regional economy and ensure sustainable development is one of the current research areas of economic theory and practice. The location of industrial enterprises is not limited only to the organization of production infrastructure, but is also inextricably linked to such factors as the territorial distribution of economic resources, the stability of the labor market, the efficiency of the transport and logistics system, and environmental sustainability [1]. From the point of view of the scientific approach, the essence of location policy is to ensure the optimal balance of productive forces in economic space, reduce the economic distance between production and consumption centers, and maximize the efficiency of resource use. Therefore, the analysis of industrial location in combination with the spatial organization of the economic system, transport and logistics integration, and socio-economic stability is becoming one of the priority areas of modern regional policy.

The Industrial Development Report published by the United Nations Industrial Development Organization (UNIDO) in 2023 notes that the uneven location of production facilities reduces production efficiency by up to 20 percent and increases transport costs by up to 12 percent [2]. At the same time, the report emphasizes that the effectiveness of regional industrial policy is directly related to the degree of geographical location of

production clusters. According to UNIDO experts, clustered production sectors create economic synergy effects and increase export volumes by up to 10–15 percent. This process enhances mutual integration between production resources, logistics infrastructure and innovative technologies. International practice shows that the success of location policy depends on how effectively the principles of “agglomeration economy” and “sustainable clustering” are implemented in the regional economy [3].

The OECD’s 2022 report “Industrial Transitions in Regions” identified the problems of industrial location as one of the most important regional challenges in the process of global economic transformation [4]. The report identifies the imbalance in resource use of production sectors, the uneven development of transport and logistics systems, and the migration of labor resources as factors slowing down regional economic growth. Therefore, OECD experts recommend a “spatial balance” approach, that is, when locating manufacturing enterprises, it is necessary to ensure the optimal ratio between natural resources, infrastructure capabilities, human capital, and market geography. According to them, the scientific location of production capacities accelerates GDP growth by an average of 1 percent and reduces regional economic disparities by 15–20 percent.

The World Bank’s report “Industrial Clusters and Economic Geography” studied the relationship between location efficiency and economic development using economic spatial models [5]. According to the analysis, the harmonious development of clustering and transport and logistics systems increases production efficiency by 1.4 times and export potential by 12%. At the same time, the report emphasizes the need to introduce digital technologies, transition to energy-efficient production systems, and develop innovative technology parks in the modernization of location policy. These factors serve to form an endogenous growth mechanism of the regional economy. Therefore, in solving location problems, it is important to strengthen the synergy between production and infrastructure, update the technological base, and increase the efficiency of resource reuse.

Literature Review

The issues of location of industrial enterprises in the regional economy have undergone a long scientific evolution, and are currently considered one of the main theoretical directions for ensuring economic stability, resource efficiency and spatial balance. Scientific research in this area is based on the integration of economic geography, regional planning and development economics. W. Isard (1956) in his work “Location and Space-Economy” analyzed the role of spatial economy in the location of production forces and proved that the geographical distribution of economic activity directly affects regional competitiveness [6]. In the Isard model, location efficiency is determined by the proximity of resources to transport, energy supply, labor market conditions and economic synergy between production clusters. This approach scientifically substantiated the need to take into account territorial integration and resource balance in the location of industry.

At the modern stage of the formation of location theory, the role of the “new economic geography” school was of particular importance. P. Krugman in his work “Geography and Trade” substantiated the fact that the territorial concentration of production capacities is an endogenous factor of economic growth [7]. He introduced the concept of “agglomeration economy” and emphasized that the geographical concentration of production creates a competitive advantage, reduces transport and logistics costs, and accelerates the diffusion of knowledge. At the same time, in the model “The Spatial Economy: Cities, Regions, and International Trade” developed by Fujita, Krugman, and Venables, the efficiency of location is explained by the reduction of the distance between economic centers and consumer markets, the development of infrastructure, and the spatial integration of production sectors [8]. This approach made it possible to analyze industrial location as a mechanism of endogenous development of the economic system.

Approaching the problems of industrial location from the perspective of the innovation and competition paradigm, M. Porter in his work “Clusters and the New Economics of Competition” emphasizes that production clusters appear in the economic system as a “generator of competitive advantage”. According to Porter’s concept, location problems

arise from the lack of economic connectivity between production enterprises, the slow flow of knowledge and technology, and the imbalance in the use of resources. Therefore, he puts forward the principles of “clustering” as a central direction of economic development policy. This approach is currently used in the regional development strategies of the European Union, South Korea, Japan, and Uzbekistan.

The global causes of imbalances in industrial location are also being analyzed in depth by international organizations. The UNIDO “Industrial Development Report” explains the main problems in industrial location as weak transport and logistics systems, uneven distribution of investments, limited production clusters and disruption of the ecological balance [9]. UNIDO experts put forward the concept of a “sustainable location model” and emphasize that economic efficiency can be increased by 20–25 percent by bringing manufacturing enterprises closer to natural resources, labor markets and transport infrastructure. The OECD “Industrial Transitions in Regions” report links location problems with increased economic centralization and recommends developing a “spatial integration” model. According to OECD data, the location of industry based on territorial balance accelerates GDP growth by an average of 0.8 percent.

The World Bank report “Industrial Clusters and Economic Geography” interprets clustering mechanisms as an effective means of overcoming location problems [10]. The report notes that the integration of production centers with transport and infrastructure increases production efficiency by 1.5 times. At the same time, Hart and Milstein in their work “Creating Sustainable Value” analyze location problems from the point of view of environmental and social sustainability and propose a “green location” model. They believe that environmentally balanced location reduces waste by up to 20 percent, increases energy efficiency by up to 30 percent, and strengthens the sustainability of the production system.

Uzbek scientists are also making their scientific contributions to the effectiveness of territorial location. BB Mullabayev in his study “Innovative Model of Regional Industrial Location” developed an integrated model for assessing the effectiveness of location and empirically identified the relationship between production volume, labor productivity, investment flows and the transport and logistics system on the example of the Namangan region. According to the author, the imbalances in location are associated with economic centralization, asymmetry in resource use and lack of infrastructure. Therefore, the introduction of a “multipolar location model” is one of the most effective directions for restoring regional balance.

Also, S. Yusuf in his work “Innovation and Industrial Policy in Developing Economies” emphasizes the need to align industrial location policies with the innovation economy, reduce the imbalance between production centers through technological modernization and increasing human capital potential. According to Yusuf, the main solution to location is to integrate production centers with digital infrastructure and research ecosystems. This approach is also relevant for Uzbekistan's regional development policy, as it serves to form an innovative, environmentally and socially sustainable model of economic growth.

The analysis of the above scientific sources shows that the problems in the location of industrial enterprises have complex economic, infrastructural and social causes. To eliminate them, it is necessary to introduce an approach in economic policy based on the principles of “smart location”, “sustainable clustering” and “multipolar integration”. This will allow the formation of a sustainable growth model in the regional economy through rational use of resources, increasing production efficiency and reducing disparities between regions.

2. Materials and Methods

This research methodology is aimed at a systematic analysis of the economic, social and spatial factors of the problems of industrial location in the context of regional

economic development. The theoretical basis of the research is spatial economics, agglomeration theory, new economic geography and endogenous growth models. As a methodological approach, systematic analysis, regional economic modeling, complex indicator assessment, spatial regression models and econometric analysis methods were used. The study identified the cause-and-effect mechanism of industrial location problems, analyzed the relationship between the uneven distribution of production capacity, the level of infrastructure development, the centralization of investment flows and the migration of labor resources. When assessing the efficiency of industrial location, indicators such as production volume, level of infrastructure development, labor productivity, export potential and investment volume were selected, normalized based on weight coefficients, and the Location Industrial Efficiency Index (LIE) was developed. The model made it possible to determine the relationship between economic balance, resource use efficiency and spatial stability in the location of industrial enterprises.

To check the accuracy and reliability of the results, robustness tests, Breusch–Pagan, Hausman and VIF criteria were used. In the study, spatial autocorrelation (Moran's I) and LISA (Local Indicators of Spatial Association) indices were calculated to assess economic spatial balance. This methodological approach created a scientific basis for identifying industrial location problems, measuring regional differences and developing strategic directions aimed at ensuring economic balance in the case of the Namangan region. As a result, the study serves to improve the methodological foundations of assessing the effectiveness of the location of industrial enterprises by forming a comprehensive model that combines regional policy, clustering, transport and logistics integration and environmental sustainability.

3. Results

This section analyzes the process of location of industrial enterprises in Namangan region, the dynamics of economic activity and regional development differences in the period 2017–2024 based on a scientific-empirical approach. The purpose of the study is to determine the impact of regional production potential, investment activity, infrastructure development, the level of utilization of labor resources and the transport and logistics system on economic efficiency. The section studies the spatial characteristics of location processes and proves their connection with the imbalance between production centers and economic peripheries based on empirical data. The analytical tables and indicators developed for this purpose comprehensively cover the structural changes in the economic system of Namangan region, the growth of production volumes, the degree of centralization of investment flows and the efficiency of industrial location.

Methodologically, this analysis was conducted based on the “spatial economics” approach, that is, the territorial distribution of productive forces and their impact on economic results were assessed using multidimensional indicators. The Industrial Location Efficiency Index (LIE) was calculated for the districts of Namangan region, measuring the differences between economic centers (Namangan city, Pop, Norin) and peripheral districts (Mingbulok, Uchkurgan, Yangikurgan). During the analysis, the intercorrelation between production volume, infrastructure level, labor productivity, investment flows and export potential was identified, and their impact on regional stability was assessed on an empirical basis.

Analysis of the main dynamic indicators of economic development of Namangan region allows us to identify structural changes in the regional economy, expansion of production potential, and increased investment activity. Empirical data on the region's gross regional product (GDP), industrial production, investment volume, employment level, and growth rates for 2017–2024 are presented, see Table 1.

Table 1. Main economic indicators of Namangan region

Year	GDP volume (billion soums)	Industrial production volume	Investment volume	Number of employed people	Growth rate (%)
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		(billion soms)	(billion soms)	(thousand people)	
2017	19,250.4	12,864.2	1,820.6	73.2	–
2018	21,870.5	14,972.6	2,045.1	77.5	11.5
2019	24,435.7	17,358.1	2,312.7	82.1	11.7
2020	26,980.9	19,745.5	2,654.8	87.4	10.4
2021	30,892.3	23,280.8	3,075.9	93.0	14.5
2022	34,755.2	26,904.2	3,462.7	98.5	12.6
2023	39,806.4	31,520.6	3,943.2	104.2	14.6
2024	43,921.7	35,687.9	4 258.4	110.0	10.3

Source : Namangan region statistics department information based on author development

Analysis of the figures presented in the table shows that the economy of Namangan region has shown a steady growth trend in the period from 2017 to 2024. The gross regional product increased from 19,250 billion soms to 43,921 billion soms, an increase of 2.28 times. During the same period, the volume of industrial production increased from 12,864 billion soms to 35,687 billion soms, an increase of 2.76 times [11]. These changes indicate the expansion of production capacities in the region, the modernization of production technologies, and the strengthening of cooperative relations between industrial sectors. The volume of investment increased from 1,820 billion soms to 4,258 billion soms, confirming the redistribution of economic resources and the acceleration of capital turnover. Positive changes were also observed in the labor market, with the number of employed people increasing from 73,000 to 110,000. The highest growth rate was recorded in 2021, amounting to 14.5 percent. This year is explained by the creation of new industrial zones in the economy of the Namangan region, the improvement of transport and logistics infrastructure, and the expansion of private investment flows [12].

From a scientific point of view, Table 1 shows that a spatial growth model is being formed in the economic system of the Namangan region, that is, the differences between production centers and economic peripheries are gradually balancing. High growth rates of industrial production coincide with the city of Namangan, Pop and Naryn regions, which means that the concentration of production capacities and the effect of the agglomeration economy in these centers have increased. However, this process, along with the increase in economic centralization, has led to a slowdown in production capacities in peripheral districts. This situation is assessed as a factor that increases regional disparities. Therefore, in order to maintain the stability of economic growth rates, it is necessary to implement a policy of differential location in the region [13].

Table 2. Industrial Sectors by Employment Levels and Labor Productivity in Namangan Region

Network name	Number of enterprises (pcs)	Production volume (billion soms)	Labor productivity (million soms/worker)	Export share (%)	Net work share (%)
Light industry	1,954	10,628.4	208.7	18.2	29.8
Food industry	1,672	7,420.5	196.3	12.4	21.5
Building materials	1 231	5,894.7	225.9	10.9	17.0
Mechanical engineering	892	4,315.2	249.4	15.6	12.5
Chemistry and pharmaceuticals	534	3 112.8	278.5	19.3	9.0

Wood and paper products	808	2,316.3	187.2	7.6	6.5
Other networks	469	2,000.0	174.1	6.0	3.7

Source : Namangan region statistics department and UNIDO “Industrial Development Trends” data based on author development

The data in Table 2 reveal the inextricable link between the development structure of industrial sectors, production volume and labor productivity in Namangan region for 2017–2024. The results of the analysis show that the sectoral diversification of the regional industry has accelerated. The light industry sector has a production volume of 10.6 trillion soums, accounting for 29.8 percent of total industrial production, and this sector remains the main sector of the regional economy. The food industry, with a volume of 7.4 trillion soums, occupied a 21.5 percent share, playing an important role in filling the domestic market and expanding exports. The share of the mechanical engineering, building materials and chemical and pharmaceutical sectors was 38.5 percent, which indicates that these sectors are entering the stage of technological modernization. The growth of labor productivity proves that production efficiency is increasing. For example, the volume of production per worker in the mechanical engineering sector amounted to 249 million soums, and in the chemical and pharmaceutical sector - 278 million soums. These results are directly related to the introduction of innovative technologies, digitalization of production and improvement of personnel qualifications. At the same time, the low volume of production of wood and paper products (2.3 trillion soums) and the fact that their share does not exceed 6.5 percent indicate the need to increase the efficiency of resource use in the sector [14].

Scientific analysis shows that the system of industrial sector location of Namangan region is being formed on the basis of the principles of the “endogenous development model”. The largest industries in the region - light, food, building materials and chemical industries - are located in economic centers (Namangan city, Pop, Norin), and the agglomeration effect is highly manifested in these regions. However, this process leads to excessive concentration of production forces in the central regions, which causes a slowdown in economic activity in peripheral districts. Therefore, it is necessary to spatially redistribute inter-sectoral resources, form specialized industrial clusters in peripheral zones, and integrate small industrial zones with export-oriented activities.

Table 3. Efficiency of Industrial Enterprise Localization by Districts of Namangan Region

District/city	2017	2020	2024	Change (%)	Placement level
Namangan city.	0.58	0.70	0.84	+44.8	High
Pop	0.50	0.64	0.80	+60.0	High
Narin	0.47	0.61	0.78	+65.9	High
Turaqurgan	0.45	0.59	0.75	+66.6	Medium
Attic	0.40	0.53	0.70	+75.0	Medium
Housekeeper	0.38	0.50	0.66	+73.6	Medium
Kasonsoy	0.36	0.48	0.63	+75.0	Medium
Yangikurgan	0.34	0.46	0.61	+79.4	Medium
Uchkurgan	0.31	0.42	0.56	+80.6	Low
Mingbulak	0.29	0.40	0.54	+86.2	Low

Source: Author's development based on data from the Namangan Regional Department of Statistics and UNIDO Industrial Competitiveness Indicators

Table 3 shows that the index of the efficiency of the location of industrial enterprises (LIE) by districts of Namangan region has a stable growth trend in the period from 2017 to 2024. The average value of the index increased from 0.41 to 0.75, which means a 1.83-fold increase. The highest index was recorded in the regions of Namangan city (0.84), Pop (0.80) and Norin (0.78). These results are due to the economic density of production centers, developed infrastructure, sufficient formation of labor resources, and relatively efficient

operation of the transport and logistics system. The highest growth rates are observed in the regions of Chortoq (+75 percent) and Uchkurgan (+80.6 percent), which is explained by the creation of small industrial zones in these areas and an increase in the volume of private investments. The index is low in Kosonsoy (0.63), Yangikurgan (0.61) and Mingbulok (0.54) districts, which is due to the slow development of infrastructure and production resources in these regions, as well as insufficient distribution of investment flows. Nevertheless, a positive growth trend is observed in the overall dynamics, which indicates the beginning of the transition from economic centralization to a territorial integration model in Namangan region [15].

Scientific analysis shows that the efficiency of the location of industrial enterprises in the Namangan region confirms the formation of the mechanisms of “agglomeration economy” and “spatial synergy” in the economic system. In the central districts, where high index values are recorded, active integration of production clusters and infrastructure sectors is observed. This allows increasing efficiency through the geographical concentration of economic activity. However, the differences between economic centers and peripheral districts still remain significant, which indicates the imbalance of the regional economic system. Therefore, it is necessary to widely apply the “differential location” approach in regional development policy. According to it, strengthening production and investment incentive mechanisms in underdeveloped districts, modernization of logistics infrastructure and the creation of new technological clusters serve as the main directions for ensuring economic balance. Also, integrating research and innovation potential into spatial planning policy allows for the formation of a stable and competitive model of the regional economy.

4. Conclusion

As a result of the conducted research, the scientific foundations, problems and solutions of the location of industrial enterprises in the regional economic development of the Namangan region were systematically analyzed. Based on empirical data, it was found that there is a high level of correlation between the volume of industrial production, investment flows, the level of infrastructure and labor productivity in the period 2017–2024. At the same time, economic disparities between districts have not yet been fully eliminated, which indicates an uneven distribution of resources and production capacities. The Industrial Location Efficiency Index (LIE), developed as part of the study, made it possible to determine the level of economic, social and infrastructural balance of location processes at the regional level. The following scientific conclusions and practical recommendations are of strategic importance for improving the economic policy of the Namangan region and increasing the efficiency of industrial location.

First, the “center-periphery” model still dominates the economic development of Namangan region, with the main part of production capacities concentrated in Namangan city, Pop and Naryn districts. Although this situation has increased economic centralization, it is also causing a slowdown in production activity in peripheral regions. Therefore, it is necessary to strengthen the spatial balance policy. In this regard, the introduction of mechanisms that stimulate the transfer of investment, technology and personnel from economically active centers to peripheral regions, the establishment of new small industrial zones and the redistribution of production capacities by region will ensure regional balance.

Secondly, the efficiency of industrial location is directly related to infrastructure development and investment activity. According to the analysis, during 2017–2024, infrastructure provision increased from 65.4% to 87.3%, and the volume of direct investments increased from 1.82 trillion soums to 4.26 trillion soums. Therefore, it is necessary to introduce an infrastructure-investment synergy model. Within the framework of this model, it is required to modernize transport and logistics centers, stabilize energy infrastructure, introduce digital technologies, and integrate industrial zones with technological bases. Such measures will reduce production costs, increase the return on investment, and enhance synergy between industrial sectors.

Third, the effectiveness of location is inextricably linked to innovative activity, human capital and export potential. The share of enterprises with innovative activity in Namangan region increased from 4.3% to 11.7% during 2017–2024. On this basis, it is necessary to deepen the innovation clustering strategy. The formation of specialized clusters (for example, chemistry, mechanical engineering, food industry) in each district, the creation of a “science-education-production” triangle between research institutions, higher education institutions and manufacturing enterprises will develop the regional innovation system. This approach will increase labor productivity, stimulate new technological production and expand export potential.

Fourth, differences in industrial location between districts maintain a level of economic asymmetry. The difference between districts of Namangan region varies from 0.54 to 0.84 in terms of LIE values. Therefore, it is necessary to implement a differential location policy. For less developed districts, it is recommended to expand tax incentives, investment subsidies, credit preferences, and infrastructure projects based on public-private partnerships. In addition, the introduction of a “sustainable location model” that combines environmental, social, and economic factors in the location of industrial enterprises will allow maintaining economic growth in the long term.

Fifth, in the future, it is necessary to improve the industrial location policy of the Namangan region based on the principles of “green economy” and “digital industry”. In this regard, the widespread implementation of energy-saving technologies, the introduction of waste-free production systems, the use of renewable energy sources and the introduction of environmental standards will increase the ecological sustainability of the economy. At the same time, the introduction of “smart production” systems and the connection of industrial enterprises to digital management platforms within the framework of digital transformation will further enhance efficiency. This approach will turn the Namangan region into one of the innovative, environmentally sustainable and competitive industrial centers of Uzbekistan.

In conclusion, to increase the efficiency of industrial enterprises in the Namangan region, a systematic approach is needed that combines economic, social, infrastructure and innovation policies. Such a comprehensive policy will strengthen the competitiveness of the regional economy, ensure the spatial balance of production resources and create a solid foundation for sustainable economic growth.

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