

EFFICIENCY INDICATORS OF INDUSTRIAL ENTERPRISE LOCATION

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Abstract: This article examines the efficiency indicators of industrial enterprise location from both theoretical and empirical perspectives. It first reviews the main theoretical principles, optimization approaches and indicators related to industrial location, followed by global trends and a regional analysis using Uzbekistan as a case study. Based on the research outcomes, the paper proposes policy and practical recommendations aimed at enhancing the efficiency of industrial enterprise placement.

Keywords: Industrial enterprises, location, efficiency indicators, regional analysis, industrial clusters, Uzbekistan.

Industrial enterprise location — a core concept of economic geography and regional economics — influences a wide range of economic and social aspects such as resource utilization efficiency, transport and logistics costs, environmental impact, and employment. Traditional theories (e.g., Alfred Weber's model) explain industrial location mainly through transport and raw material costs. However, modern studies also include agglomeration effects, technological progress, and sustainability factors. Identifying and analyzing the main indicators used to measure industrial location efficiency — such as employment density, output per square kilometer, share of transport costs, energy consumption per output unit, and waste/emission ratios — is crucial for regional policy implementation in Uzbekistan.

Classical and modern industrial location theories (Weber and later developments) link location decisions to transport costs, labor, and agglomeration factors. Contemporary approaches propose multi-criteria and dynamic models, as well as the use of GIS technologies and optimization algorithms. Recent research highlights energy intensity, the share of manufacturing value added (MVA), employment density, location quotient (LQ), level of clustering, and innovation metrics (R&D expenditures, patents) as key indicators in assessing industrial efficiency. Mathematical programming tools (MIP, ILP), metaheuristic algorithms (GA, PSO), and AI-based methods have proven effective in solving industrial location problems. Additionally, GIS integration and real-time monitoring strengthen decision-making in industrial placement. Special economic zones (SEZs), small industrial zones (SIZs), and technoparks are widely used as regional industrial policy instruments. In recent years, the activities of SEZs and SIZs have significantly expanded in Uzbekistan.

According to national statistics, more than 65,000 manufacturing enterprises operate in Uzbekistan, and industrial output continues to grow. Production dynamics in 2024–2025 show varying levels of growth across regions. Tashkent city, Fergana, Tashkent region, Samarkand, and Andijan have the highest concentration of industrial enterprises, while some regions such as Bukhara and Navoi specialize in extractive or processing industries. During this period, numerous SEZs, SIZs, and technoparks have been established, and their contribution to national industrial output has increased.

Incorrect or inefficient placement of industrial enterprises may lead to several negative outcomes: higher transport costs, inefficient use of land and energy resources, increased environmental pressures, widening socio-economic disparities, and unequal investment opportunities. Selecting

and monitoring efficiency indicators is essential for guiding regional policies and investors' decisions.

Due to the unequal distribution of industrial enterprises across regions:

- certain regions face a shortage of jobs,
- a low share of industry limits economic growth,
- transport and logistics costs rise,
- environmental burden becomes excessively high in certain urban areas,
- regional competitiveness gaps intensify.

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Indicators	2020	2021	2022	2023	2024
Industrial output	100.9	108.8	105.3	106.3	106.5
Mining and quarrying	78	110.8	101.9	99.5	103.9
Manufacturing	107.9	108.3	105.4	107.4	107
Electricity, gas, steam and air conditioning supply	106.8	111.8	113.5	109.5	105.7
Water supply; sewerage, waste management	99.1	85.8	94.7	103.2	112.1
Food production	108.6	104.2	106	107	105.6
Beverage production	105.7	118	115.7	106.4	96
Tobacco production	99.5	91.4	124	100.5	121.8
Textile production	117.4	119.5	109.9	106.4	111.2
Clothing production	107.2	118.7	105.8	112.7	107.1

Thus, identifying and analyzing indicators that reflect the efficiency of industrial enterprise location is a highly relevant issue.

Efficiency indicators may be systematized as follows:

- Standardization of efficiency indicators — introducing a minimum official indicator package (MVA per km², employment density, energy intensity, CO₂/output ratio, share of transport costs);
- Expansion of GIS and AI integration — using GIS and optimization algorithms for planning;
- Targeted development of SEZs and SIZs — forming clusters aligned with regional resource potential;
- Promotion of green and sustainable industrial practices;
- Human capital development and innovation infrastructure.

Improving the efficiency of industrial enterprise location contributes to regional development, sustainability, and national economic goals. Global experience and Uzbekistan's current indicators show the necessity of using multidimensional metrics and modern technologies. Properly guided SEZ and clustering policies can reduce regional disparities and increase national export potential.

References:

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