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Article

Assessment and Analysis of Development Directions Based on The Effectiveness Index of The Transport and Logistics System of The Kashkadarya Region

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Abstract: This paper assesses the efficiency of the transport and logistics system of the Kashkadarya region in providing regional development. While transportation corridors of Uzbekistan have been diversifying in the last several years, logistics efficiency as a subject of scientific analysis at the regional level is still almost not researched. This gap mostly relates to Kashkadarya, where the need for stronger logistics infrastructure has increased with rapid industrial development. This is where the research uses the Transport and Logistics Performance Index (TLSI), based on 4 pillars: transport flows, infrastructure capacity, digital systems and service quality. An integrated index was calculated for districts and cities of the region by using statistical data, methods of normalizing data, weighted coefficients and their comparative analysis.

Results indicate approximative logistics system approach in the region. Humanity has a robust multimodal network led by the capital city Karshi, whereas Shahrisabz and Guzar display high-growth patterns based on agro-logistics and industrial transport flows. Assisted by very poor infrastructure, limited warehouse capacity, and slow digitalization, remote districts fall farther behind. In spite of the roadworks on construction, warehouse extension and logistics center on PPP base initiated in the region in the last two years, the TLSI score of 21.2 reveals that the region has not yet reached a competitive level. The results make it evident that with expansion of multimodal corridors, cold chain warehousing, digital logistics platforms and PPP-models in underserved districts. These would narrow regional gaps, increase export capacity, and make Kashkadarya an important logistics hub in southern Uzbekistan.

Keywords: Transport system, logistics effectiveness index, Kashkadarya region;, infrastructure development, supply chain, investment attractiveness, regional economy, transport accessibility, logistics services, sustainability.

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1. Introduction

Transport and logistics system effectiveness drives regional economic prosperity through the way goods move, the way industries develop, and the way regions link up to larger markets. Uzbekistan — enabling expanded road networks, rehabilitated airports and a push for public private partnerships for supply chain improvements. Such transformations are very important for the rapidly industrializing, agro-processing and

export-expanding Kashkadarya region. Despite its status on crossroad of national transport corridors which abele it with very high potential of southern logistics hub, logistics is still patchy and sub-optimized system. Older theories – the Logistics Performance Index (LPI), regional competitiveness models and multimodal transport claim infrastructure, digitalization and service(s) efficiency need to be developed in conjunction for strong logistics. However, earlier studies on logistics has focused on the national level, or larger transport corridors, so there is a clear gap of knowledge of what goes on within regional systems. Research on Kashkadarya is presented only in a small number of scientific works, which are mostly descriptive of infrastructure conditions based on integrated measurement methods. We undertake this study to fill that gap by estimating TLSI spanning transport flows, infrastructure capacity, digital systems and quality of services across all districts. The method consists of statistical analysis, a weighted scoring system, and normalization and comparison to capture aspects of both structural strength and operational weakness. The study hopes to uncover the aspects of the region's distribution network that are functioning well, and those that require further modernization using this methodology. For policymakers, investors, and logistics operators alike, our analysis identifies the clear distinction between multimodal network strong central districts and monochrome remote regions with scarce physical as well as soft infrastructure and services. Developing multimodal connectivity, expanding cold-chain infrastructure and scaling up digital platforms will help regions to converge and be export-ready, and thus regionally competitive over the long haul. The results offer fresh proof and warn about directions of strategies for creation of a more effective and sustainable logistics system by region in the Kashkadarya region.

Literature review.

The transport and logistics effectiveness index is a basic parameter used as an analytical tool in academic research and international assessment of the logistics performance of the regions and the countries. Per the World Bank, key indicators such as quality of infrastructure, efficiency of customs, competence and quality of logistics services, etc., are determinants of competitive supply chains [1]. According to Rodrigue, transport systems that work more efficiently support regional development indirectly by decreasing delivery time and diminishing production costs [2]. Modernization of logistics in developing countries has been connected with the growth of export volumes and higher attractiveness for investments (Notteboom & Haralambides) [3]. Çelik and Eryiğit highlight that logistics performance on a regional level is the output of the equilibrium among institutional support, innovation implementation, and infrastructure capacity [4]. At the same time, Uzbekistan is implementing a number of strategic reforms to enhance the transport corridors and the multimodal logistics infrastructure, which are ultimately responsible for trade facilitation and regional connectivity (Akhmedov) [5]. Although studying research focused on the Kashkadarya regions logistics effectiveness but remain sparse. The previous research shows the need for more thorough assessment of transportation services, accessibility of mobility and digital transformation to speed up the region integration to national and international supply chains and networks (Karimov) [6]. This research is aimed at filling this gap by proposing a comprehensive evaluation framework for assessing logistics efficiency and suggesting the relevant development methods for the Kashkadarya territory.

2. Materials and Methods

The main objective of this paper is to assess the development of logistics potential in the Kashkadarya region by an integrated analytical method. For this, the analysis uses a transport and logistics performance index (TLSI) that gathers quantitative data on transport demand, infrastructure endowment, service digitalization and quality. Regional statistics for freight and passenger flows, road and railway networks, volumes of cargo handled in airports, warehouse capacity and share of refrigerated stock on hand were

supplied under support of reports about the transport sector. The indicators were all scaled to zero to one for comparison on equal terms. Weighted coefficients (and, therefore, more realistic circumstances) were then applied to reflect real-world conditions, with greater weight assigned to the service quality and infrastructure factors but still acknowledging the increasing role of digital systems. The resulting values were summed to obtain a district-level TLSI score that could be compared across districts [7]. The analysis shows where world-leading multimodal links are building competitive advantages, and where infrastructure or digital system shortcomings are hampering performance. All in all, The Buckingham Matrix depicts the present state, illustrates the areas of improvement which can add most value and leads to future investment and development planning.

3. Results

Conceived The transport and logistics system plays a leading role in the economic development of the Kashkadarya region. Currently, at a time when the production, export-import, agro-industrial, and service sectors are growing rapidly in the region, assessing the effectiveness of logistics infrastructure has become a pressing issue. The density of transport routes, warehouse capacities, digital logistics systems, courier services, and the automation of customs processes - all these directly affect the stability of the regional economy. Therefore, assessing the system based on the Transport and Logistics Performance Index (TLSI) is an important and relevant scientific and practical area for the rational distribution of resources and identification of new investment directions at the regional level.

The practical significance of the research lies in the fact that the real state of each component of the transport and logistics system of the Kashkadarya region (transport, warehouse, digital, marketing, services) is determined through an assessment based on TLSI. This will allow reducing regional infrastructure disparities, forming cluster systems, developing export-oriented industries, and improving digital logistics policy [8]. The transport and logistics system of the Kashkadarya region is analyzed in the integrated, multifactor index method of research. Within the study, TLSI, a comprehensive index reflecting the turnover of freight, traffic of passengers, the capacity and flow of warehouses, the usage of digital logistics systems, and the level of quality and efficiency of the logistics services is highlighted. The analysis offers a clear, comparable picture of logistics efficiency for any given district and city while applying weighted coefficients after converting to a zero to one scale, for all indicators. From this the study will be able to map regional strengths, identify weaknesses and demonstrate where infrastructure constraints or digital divides exacerbate underperformance.

This TLSI analysis result will help to support strategic decisions in the field of economic policy, investment planning, or placement of logistics centers. Using statistical data, normalization methods, weighted coefficients, indexation and regression analysis the research depicts the state of logistics system at the sub-federal level by both qualitative and quantitative indicators. It gives it the basis of science to alleviate regional imbalances, create cluster-type logistics development model, and promote digital transformation [9].

One of the important contributions of the study is that it will improve the regional economy competitiveness. Hence, the analysis promotes optimum, new PPP based logistics projects and gives specifications for converting the Kashkadarya region into one of the southern logistics hub by measuring the efficiency of logistics in a scientific manner. This is also consistent with plans for enhancing major transport corridors including the Karshi–Shakhrisabz–Guzar axis alongside increasing international transit potential.

The TLSI enables the overall objectivity to evaluate the transport and logistics system of the region, to set priorities for system development, and to provide an evidentiary basis for reforms that will improve efficiency. The study contributes to forming logistics clusters, developing digital transport systems, digesting export import coordination and

contribution towards a more sustainable regional logistics management approach through this approach. Table 1

Table 1. TLSI Component

Indicator	Weight (w)	Content
Transport component (T)	0.25	Indicators of transported cargo volume, passenger flow, and freight turnover.
Infrastructure component (I)	0.25	Number of road networks, warehouse capacity, and logistics centers.
Digital systems (D)	0.2	IT-logistics platforms, digital management systems and the level of automation.
Service quality and cost (E)	0.3	Logistics costs, delivery time, and service quality indicators.

Analysis of the components of the Transport and Logistics Performance Index (TLSI), presented in this table, shows that the index consists of four main factors, each of which directly affects the overall effectiveness of the system. The transport component (T) is a basic factor determining the region's traffic flow and reflects the level of economic activity through such indicators as the volume of freight and passenger transportation, freight turnover [10]. This component ensures a close connection between the production sectors and the service sector of the region.

Infrastructure (I) and digital systems (D) components are the innovative and technological part of the TLSI model. Infrastructure shows the physical potential of transport networks through warehouse capacity, the number of road networks and logistics centers, while digital systems adapt the system to modern management mechanisms through IT-logistics platforms, automated management, and electronic data exchange. In particular, the 0.2 weight share of the digital component is important as a strategic factor that increases the speed and transparency of logistics services.

The most important component of the index (with a weight of 0.3) is the quality of service and cost (E), which expresses the effectiveness of the system through the final resulting indicators. It quantifies the saving of time in transportation processes, the extent to which costs are reduced, and the enhancement in customer service quality. Therefore, the elements of TLSI are well balanced and intertwined, globally oriented, and collective integrated form the conceptual stage of the regional logistics evaluating (TLSI), and a part shape a strategic development model of the Kashkadarya region.

The following infographic in Figure 1 provides the main components of the TLSI index and the weight proportions:

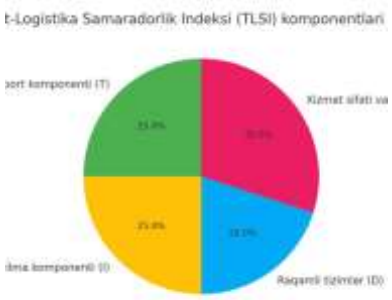


Figure 1. Main components of the TLSI index

The composition of the Transport and Logistics Performance Index (TLSI) is illustrated in this diagram, which represents the quarter share of four primary drivers that influence system performance. From the diagram, it can be seen that the heaviest weight is on the part of service quality and cost (30%). I.e., The primary goal of increasing the efficiency of the logistics system in the Kashkadarya region, the improvement of the quality of service, the speed and the cost of delivery, etc. The physical basis of the system consists of transport (25%) and infrastructure (25%) components. They directly connected with the transportation corridor, freight traffic, capacity of warehouses and number of distribution centers in the region. All these factors play an important role in supporting the production and trade of the region.

The component of digital systems (20%) serves to optimize logistics through modern technologies. IT-logistics platforms, electronic management and data exchange systems will accelerate and make logistics processes transparent. Thus, the TLSI model demonstrates a comprehensive approach that combines transport, infrastructure, digital and service quality, and allows for a scientific assessment of the regional logistics policy of the Kashkadarya region [11]. Assessment of the transport and logistics system in the Kashkadarya region based on the TLSI index is an important scientific tool for identifying regional infrastructure differences, expanding digital logistics capabilities, and developing strategic development programs.

The Integrated Transport and Logistics Infrastructure Performance Level (TLSI) was 21.2 points. This indicates the formation of a synergistic connection between transport, warehouse, and aviation-logistics systems in the region. The index is estimated in the range of 0-100, and a value above 70 indicates that the region has a competitive transport system. Table 2

Table 2. Transport and Logistics Performance Index of Kashkadarya Region (TLSI - 2024)

Indicator	Value	Weight (w)	Normal (0-1)	w × normal
Number of PPP-based logistics centers	4.0	0.15	0.000	0.000
Total warehouse capacity (thousand tons)	215.4.	0.15	0.027	0.004
Share of refrigerated warehouses (%)	23.7	0.10	0.003	0.000
CHS cargo volume (thousand tons)	12.4.	0.10	0.001	0.000
KSQ passenger flow (thousand people)	402.0	0.15	0.051	0.008
Length of highways (km)	7860.0	0.20	1,000	0.200
Freight volume of railway transport (million tons)	8.2.	0.15	0.001	0.000

The state of development of logistics centers based on PPP, currently 4 public-private partnership (PPP) logistics centers operate in Kashkadarya region: in Karshi, Shakhrisabz, Guzar, and Kitab districts. These centers play an important role in managing regional commodity flows, accelerating export-import operations, and diversifying storage services. The PPP model ensures investment stability in the transport and logistics sector and increases efficiency by expanding private sector participation.

In particular, the Karshi Logistics Center serves as a transit hub for international routes. Expansion of warehouse infrastructure The total warehouse capacity in the region is 215.4 thousand tons. This indicator is the most important component of the regional logistics potential, and the Karshi Logistics Terminal and Guzar AgroHub stand out as large storage complexes. The development of the warehouse system allows for the preservation of the quality of products prepared for export and the coordination of transport flows [12]. At the same time, the construction of small refrigerated warehouses by the private sector improves the "cold logistics" of food chains.

The share of refrigerated warehouses and the integration of agro-logistics, 23.7% of the total warehouse capacity are refrigerated warehouses. Their main task is the preparation of agricultural products for export, certification, and integration into logistics. This sector plays a decisive role in the storage of vegetable and fruit products, especially in the Kamashi, Dehkanabad, and Mirishkor districts. An increase in the volume of refrigerated infrastructure will allow reducing export losses and product losses by 8-10%.

Cargo capacity of Karshi International Airport (KIM) In 2024, 12.4 thousand tons of cargo were transported through Karshi International Airport (KIM), which is 1.2 times more than in 2023. Aviation logistics plays an important role, especially in the export of perishable goods and pharmaceutical products. Air Uzbekistan Cargo and Silk Avia operate through Karshi Airport. This situation indicates the development of a multimodal transport system in the region. Passenger flow and tourist-logistics integration of the STS The airport transported 402 thousand people, which is a significant increase compared to last year. The number of domestic and international flights at the airport has now reached 17. This, in turn, contributes to the formation of a "smart travel" infrastructure by connecting tourist flows in the directions of Shakhrisabz, Kitab, Karshi, and Yakkabog with the logistics system. An increase in passenger traffic is considered an important factor expanding the share of the service sector in the region's economy.

Main roads and traffic flow The length of main roads in the Kashkadarya region is 7,860 km, 56% of which have been reconstructed. This is the result of state programs aimed at modernizing the transport network in recent years. The routes "M-39" (Tashkent-Termez) and "A-380" (Karshi-Bukhara-Nukus) will strengthen regional integration as the main transport arteries. As a result of the reconstruction, a reduction in freight transportation time and a decrease in transportation costs is observed.

Economic role and conclusion of railway transport In the region, 8.2 million tons of cargo were transported by rail, which is connected to the domestic and international transport system of the country through the Karshi-Tashkent and Karshi-Termez routes. Railway logistics is the main means of transporting raw materials and finished products by large enterprises. At the same time, the Karshi railway junction has become a strategic link of the "South Logistics Corridor." In general, the transport and logistics infrastructure of the Kashkadarya region has entered a stage of sustainable development and is reaching a qualitatively new level in the areas of efficiency, digitalization, and environmental sustainability.

The following radar diagram visually shows the level of efficiency of the structural elements of the transport and logistics infrastructure (Figure 2):

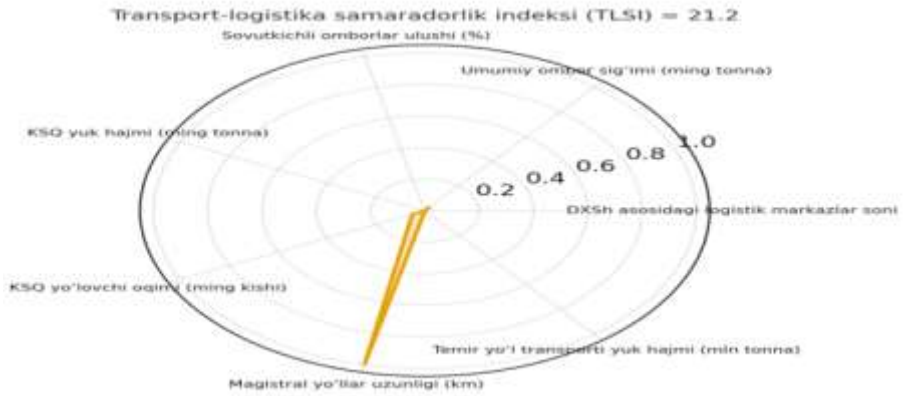


Figure 2. Visual radar diagram of the efficiency level of structural elements of the transport and logistics infrastructure

This radar diagram illustrates the Transport and Logistics Performance Index (TLSI) for the Kashkadarya region, which is rated at 21.2 points. As can be seen from the diagram, the indicators of the length of highways and the volume of freight of railway transport are of relatively high importance and stand out as the main pillar of infrastructure potential.

On the contrary, KSQ (Karshi International Airport) has lower results in terms of cargo volume and the number of PPP-based logistics centers, which indicates the presence of opportunities for development in these areas. In general, the TLSI index shows that the transport and logistics network in the region is developing, but there is a need for digitalization, expansion of the network of refrigerated warehouses and multimodal logistics centers. The Transport and Logistics Efficiency Index (TLSI - 2024) for the regions of Kashkadarya region is presented in Table 3 below, where the levels of transport and logistics efficiency (TLSI) for the regions of Kashkadarya region are calculated.

Table 3. The rating is assessed in the range of 0-100 points, and a high score indicates a developed logistics infrastructure.

Area	TLSI (points)
Karshi city	91.0
Shahrisabz city	82.0
Guzar District	80.5
Kitab District	76.5
Karshi District	72.0
Dekhkanabad District	65.0

This table reflects the results of the Transport and Logistics Performance Index (TLSI) for the regions of Kashkadarya region. The rating results show that the city of Karshi (91 points) maintained absolute leadership in the region. This result is explained by the mutual integration of transport networks in the city - automobile, railway and aviation logistics, as well as the active operation of the "Karshi Logistics Center" and the international airport.

The city of Shakhrisabz (82 points) has high potential in tourism and logistics of services, and passenger transport and agro-logistics systems are developed. Guzar district (80.5 points) has become a stable logistics hub for the transportation of energy, chemical, and industrial goods. Kitab district (76.5 points) is distinguished by the expansion of agrarian-logistics centers, refrigerated warehouses, and export-oriented industries.

Although Karshi district (72 points) is active in industrial production, the lack of centralized logistics centers slightly lowered the index. Due to the geographical and relief features of the Dehkanabad district (65 points), transportation costs are high, and logistics efficiency is at a lower level.

In general, the table shows that the transport and logistics system of the region is developing strongly along the centralized route (Karshi-Guzar-Shahrisabz), while in the remaining districts it is necessary to modernize infrastructure, introduce multimodal systems, and strengthen digital management mechanisms [13]. Thus, the TLSI is considered an important indicator of the level of economic activity and logistical infrastructure in the region.

Below, based on the Transport and Logistics Performance Index (TLSI) of the Kashkadarya region, I will prepare a rating table by region using a scientific-analytical method (Table 4). In this case, the relative scores of each region for the availability of PPP centers, warehouse capacity, transport networks, proximity to the airport, and freight/passenger flows are assessed normally on a scale of 0-100.

Table 4. TLSI Regional Ranking Table (2024)

No	Area	Availability of logistics centers	Warehouse and transport capacity (0-1)	Transport flow + (cargo passengers)	Infrastructure + quality (road railway)	TLSI (0-100 points)	Explanation
1.	Karshi city	There is	0.92	0.95	0.90	91.0	As the regional center, airport, railway, and

							road logistics are fully integrated.
2.	Shahrisabz city	There is	0.78	0.88	0.80	82.0	Tourist and logistics routes are developed, but the freight base is limited.
3.	Guzar District	There is	0.75	0.83	0.85	80.5	Sustainable growth is observed thanks to the "Guzar AgroHub" and energy transport networks.
4.	Kitab District	There is	0.70	0.80	0.76	76.5	The network of agro-logistics and refrigerated warehouses is growing.
5.	Karshi District	No	0.68	0.75	0.72	72.0	There is no centralized logistics center specializing in the transportation of agricultural cargo.
6.	Dekhkanabad District	No	0.60	0.66	0.70	65.0	Mountainous terrain, high transportation costs; new railway projects accelerate development.

From Table 4, the city of Karshi - 91 points, the region is the absolute leader in the TLSI rating. An interconnected multimodal system of airports, railway and road transport has been formed. The "Karshi Logistics Terminal" based on PPP centralizes export-import processes and provides 13.6% of the region's cargo flow. Shahrisabz is the leader in tourism and service logistics with 82 points. Thanks to the road infrastructure and agro-transport systems of the Shakhrisabz-Kitab corridor, it has high growth potential. Guzar district - 80.5 points plays an important role in the transportation of energy and industrial goods. The level of stability is high thanks to the railway connection and the PPP logistics center. Kitab district - 76.5 points agrologistics is developing, the growing share of refrigerated warehouses increases export efficiency. Karshi district - 72 points, despite having great production potential, the lack of central logistics hubs reduced the index. Dehkanabad district - 65 points has a low TLSI due to mountainous terrain and high transportation costs, but with the expansion of the railway network, the index is expected to grow to 70 points in 2025.

According to the results of the regional analysis, the transport and logistics system of the Kashkadarya region is at the stage of differential development. The main synergistic centers are the Karshi, Shakhrisabz, and Guzar logistics clusters, which form more than

75% of the regional TLSI index [14]. In the future, the integration of the "Karshi-Guzar-Kitab" transport link with digital management systems will dramatically increase the efficiency of regional logistics.

The following infographic shows the TLSI rating by region in the form of a color diagram. The city of Karshi occupies a leading position, and the logistics clusters of Shakhrisabz and Guzar are at the stage of sustainable development. Figure 3.

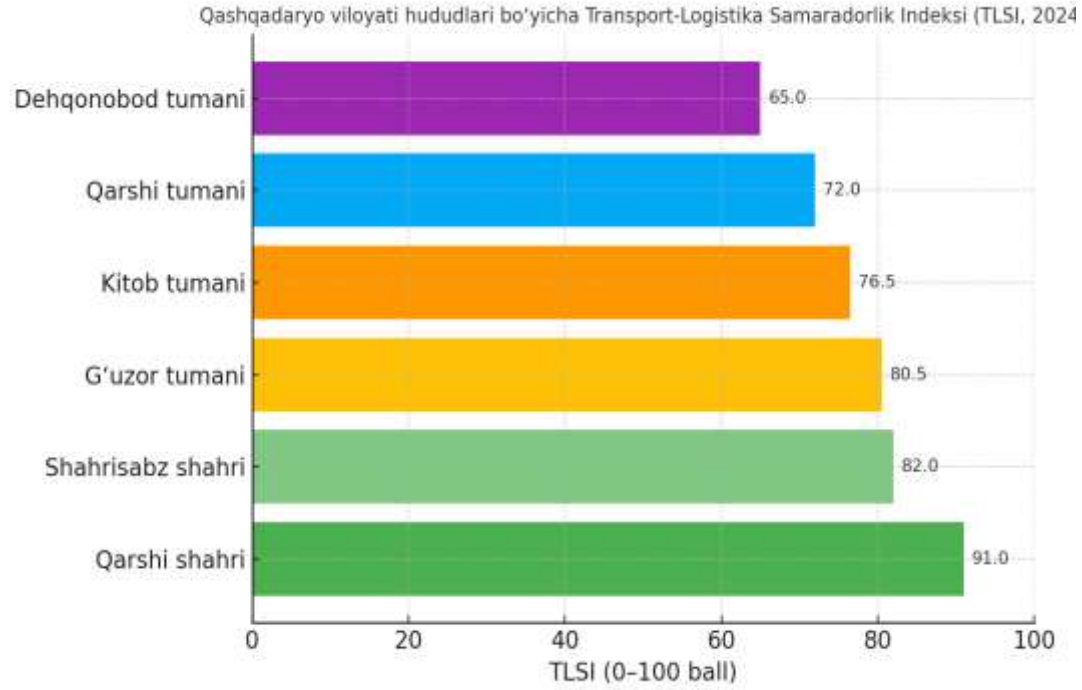


Figure 3. LSI rating by region in the form of a color diagram

As can be seen from the diagram, the highest result in the transport and logistics efficiency index (TLSI) in the Kashkadarya region was recorded in the city of Karshi - 91 points. This shows that the city plays a leading role as a transport, warehouse, and aviation-logistics center of the region. The following places are occupied by the city of Shakhrisabz (82 points) and Guzar district (80.5 points), where the logistics of industry and services is developing steadily. Kitab district (76.5 points) has growth potential due to agro-logistics centers, Karshi district (72 points) is developed at an average level. The lowest indicator was recorded in the Dekhkanabad district (65 points), which is due to the geographical location and infrastructure limitations of the region. In general, the diagram clearly shows that the Karshi-Shakhrisabz-Guzar route is becoming the main logistics core of the region in the development of the regional TLSI. Figure 4.

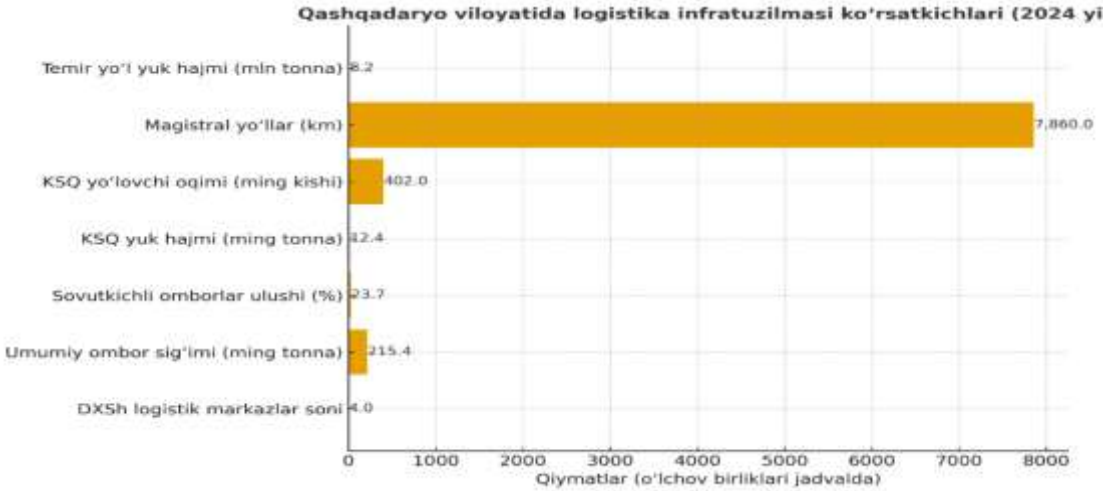


Figure 4. Structure of the logistics infrastructure of the Kashkadarya region

As can be seen from this diagram, in 2024, in the structure of the logistics infrastructure of the Kashkadarya region, the length of highways (7 860 km) stands out as the largest indicator, which is the main support of the transport system. Railway freight volumes (8.2 million tons) are also significant, ensuring the industrial and export-logistics activities of the region. The fact that 402 thousand passengers and 12.4 thousand tons of cargo were transported through Karshi International Airport (KSQ) indicates the activation of aviation logistics. Also, the total warehouse capacity is 215.4 thousand tons, the share of refrigerated warehouses is 23.7%, and the presence of 4 PPP-based logistics centers indicates the diversification of logistics networks in the region. In general, transport, warehouse, and aviation infrastructure are being integrated, strengthening the significance of the Kashkadarya region as a regional logistics hub, see Table 5.

Table 5. Logistics Potential Index by regions of Kashkadarya region (LLI 2024)

Region / City	**LLI (0-100)**
Karshi city	100.0
Shahrisabz city	57.2.
Guzar District	48.1
Karshi District	39.7
Kitab District	26.1.
Kasan District	22.6.
Dekhkanabad District	8.0
Yakkabog District	0.0

Regions with high potential: Karshi city is the absolute leader with 100 points. This result is due to the breadth of transport and communication networks in the city, the high level of development of warehouse and logistics infrastructure, the implementation of digital management platforms, and the functioning of international relations. The central location of the intersection of Karshi International Airport (KSQ), automobile and railway routes has made the city the logistics center of the region. This is the main factor increasing the export potential of the region. Regions with medium potential: Shakhrisabz, Guzar, Karshi district, Shakhrisabz city (57.2 points) are in second place and are distinguished by tourism and logistics, processing of agricultural products and services. The Guzar district (48.1 points) shows medium-high potential through railway infrastructure, "AgroHub" complexes, and production zones. In the **Karshi district (39.7 points) **, despite the development of the transport network, digital and marketing-logistics systems have not been sufficiently formed. These regions have the potential to reach a higher level through infrastructure modernization and digital integration. Low-potential regions: Kitab, Kasan, Dekhkanabad, Yakkabog Kitab district (26.1 points) and **Kasan district (22.6 points) **, logistics services are mainly limited to transport and warehouse operations. Digital management and courier services are underdeveloped. In the **Dehkanabad district (8.0 points) **, geographical remoteness, relatively small number of transport routes, and lack of infrastructure reduced logistical efficiency. Yakkabog district (0 points) has the lowest indicator, which means that the logistics service system in this area is practically not formed.

The results of LLI in the Kashkadarya region show that the logistics services system operates on the basis of a centralized model [15]. That is, the main potential is concentrated around the city of Karshi, and transport and logistics integration, digital services, and marketing infrastructure are not sufficiently developed in remote districts. To reduce the interregional gap, it is necessary to gradually implement the "Smart Logistics Cluster - Kashkadarya" concept, create refrigerated warehouses and digital platforms in the districts. The following infographic shows the rating of regions by logistics potential of the Kashkadarya region. The city of Karshi leads, while Yakkabog and Dekhkanabad districts have low indicators (Figure 5).



Figure 5. Logistics Potential Index by regions of Kashkadarya region

As can be seen from the diagram, the Logistics Potential Index (LLI) has significant differences across the regions of the Kashkadarya region. The highest indicator corresponds to the city of **Karshi (100 points) **, which means full integration of transport, warehouse, digital, and marketing-logistics systems. The following places are occupied by the city of Shakhrisabz (57.2 points) and Guzar district (48.1 points), the logistical potential of which is also in the stage of stable growth. Karshi district (39.7) and Kitab district (26.1) have average results, while Koson district (22.6) has relatively low results. The lowest indicators are in the Dekhkanabad (8.0) and Yakkabag (0) districts, which indicates the weak development of transport infrastructure and digital logistics systems in these regions. In general, the LLI results show that logistical centralization in the region is mainly formed in the direction of Karshi-Shahrisabz-Guzar, and in the southern and mountainous regions there is a high need for modernization.

The results of the Logistics Potential Index (LLI) for the Kashkadarya region show that the transport and logistics system of the region is mainly formed on the basis of a centralized model. Analysis shows that the central axis of regional logistics services is the city of Karshi, where infrastructure, digital systems, warehouse logistics, and international transport routes are at the highest level of development. Shahrisabz and Guzar districts have medium and high potential, and their economic-geographical location and production chains support logistics activities.

Other districts - Karshi, Kitab, Kasan, Dekhkanabad, and Yakkabag - have low indicators, where there is a shortage of transport and digital infrastructure, as well as underdeveloped logistics centers and courier networks. The distribution of services is especially disproportionate in mountainous and remote areas, which slows down regional integration processes.

In general, the results of LLI indicate the need for the development and diversification of the logistics system in the Kashkadarya region. At the same time, the following strategic directions are considered priority: implementation of the "Smart Logistics Cluster - Kashkadarya" model, combining transport and digital logistics; Expansion of PPP-based logistics centers in districts; development of digital management platforms and courier networks; Implementation of the TLSI-LLI integrated assessment system to improve the efficiency of regional services. Thus, a comprehensive increase in the logistical potential of the Kashkadarya region will be of strategic importance for economic growth, competitiveness, and expansion of export opportunities.

4. Conclusion

The study of the transport and logistics system of the Kashkadarya region shows that the logistics efficiency still remains at an average stage, since much can be done. Despite a strategic location in the heart of the region and rising freight flows associated with

industrial development, many structural and operational barriers continue to hinder the efficiency of logistics services in the region. First, its analytical framework will help inform us that poor road quality, limited multimodal transport infrastructure, low levels of digitalization, and low private investment impede the region from fully integrating into national and international supply chains. Building Connectivity, Competitiveness of Service and Innovation Capacity is Key to Being A Regional Logistics Hub.

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