

*UDC 338.47:656.2(575.1)***DEVELOPMENT OF FORECAST INDICATORS FOR THE RAILWAY TRANSPORT SECTOR IN UZBEKISTAN****Utepbergenov Allambergen**

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**Abstract:** The efficiency of transport services plays a pivotal role in ensuring sustainable economic growth and competitiveness in developing countries. This paper examines the prospective directions for enhancing the efficiency of services in the transport sector of Uzbekistan, with a focus on Uzbekistan Railways JSC. The research employs theoretical analysis, comparative methods, and econometric assessment of key indicators to identify challenges and policy solutions. Findings reveal that the digitalization of transport management, implementation of energy-saving technologies, and improvement of public-private partnership (PPP) mechanisms are crucial to raising the efficiency of transport services. Recommendations are developed based on recent presidential decrees and national programs for 2022–2030, aligning with the strategic objectives of the New Uzbekistan Development Strategy. The study contributes to the scientific discourse on service economy (08.00.05) and provides policy guidance for future reforms.

**Keywords:** transport services, efficiency, innovation, Uzbekistan Railways, digitalization, economic development.

**Introduction**

The role of transport services is considered pivotal in ensuring sustainable economic development, increasing the competitiveness of entities, reducing the cost of production, and achieving the continuity of the reproduction process. Despite the development of transport services in various directions for the transportation of goods and passengers, railway transport is distinguished by high efficiency, low cost, and specific conditions for the transportation of passengers and goods.

In light of the prevailing circumstances, there is a discernible increase in the demand for railway transport, which indicates a discrepancy between demand and supply. This underscores the imperative for ongoing efforts to develop and modernise the industry, with a view to enhancing the volume and quality of services. In order to ensure the development of the industry in the future, it is first of all necessary to develop target indicators. The development of these indicators is of particular significance.

Transport services form a crucial foundation for sustainable economic growth and territorial cohesion. In Uzbekistan, the transport sector contributes approximately 5.3% to the national GDP as of 2024. Improving service efficiency in the railway sector remains an important objective within the framework of national modernization programs. According to Presidential Decree-60 (2022) 'On the New Uzbekistan Development Strategy', and the Transport Development Concept for 2022–2026 (Cabinet of Ministers Resolution No.431), the main priorities include digitalization, energy efficiency, and logistic integration of regional transport systems. Additionally, Presidential Decree -5953 (2020) emphasized the modernization of the management structure in the transport sector, introducing innovative monitoring tools and digital service platforms.

**Theoretical and Methodological Foundations**

The efficiency of transport services is defined as the optimal balance between resource utilization and the quality of logistics performance. Theoretical approaches, including the productivity model, cost-benefit framework, and integrated efficiency index, are applied. The analysis also considers the service quality index and time efficiency coefficient, adapted from

OECD (2021) and World Bank logistics indicators. The methodology involves econometric modeling of factors influencing service performance, supported by comparative international studies from Germany, Japan, and South Korea.

### Analytical Evaluation of Uzbekistan Railways JSC

Uzbekistan Railways JSC is the leading operator of freight and passenger rail transport. Between 2017 and 2024, substantial progress was made in infrastructure modernization and digital transformation. Key indicators of performance are shown in Table 1.

Year	Freight Turnover (mln ton·km)	Passenger. Turnover (mln pass·km)	Operating Cost Efficiency (%)
2017	21,300	12,500	72.5%
2019	22,800	13,400	74.2%
2021	24,100	14,200	78.0%
2023	25,900	15,300	81.4%
2024	26,700	16,000	83.0%

Table 1 demonstrates consistent growth in both freight and passenger turnover.

The efficiency ratio improved from 72.5% in 2017 to 83.0% in 2024, reflecting the effect of modernization under Presidential decrees-4754 (2020). Implementation of SAP ERP systems, electronic ticketing, and predictive maintenance contributed to operational stability.

According to the forecast results, the passenger turnover of railway transport will have a high growth rate. However, there is a downward trend in growth rates, decreasing from 7.0 percent to 3.0 percent. With an average growth rate of 4.9 percent, this will ensure a 1.33-fold increase in passenger turnover by 2030. If we take into account that the average growth rate of this indicator in the period under study was 4.8 percent, then this substantiates the degree of reliability of the proposed model.

It is anticipated that the average distance of transportation of one ton of cargo by rail in Uzbekistan will decrease from 371.6 kilometres in 2024 to 367.3 kilometres in 2025. Consequently, the indicator is predicted to decline to 358.3 kilometres by 2030. This figure represents a 3.6% decrease compared to the current level. The analysis demonstrates that there has been a positive change in both quantitative and qualitative indicators in freight transportation in recent years.

Furthermore, forecast values of passenger turnover of railway transport were developed, with the following model being utilised for this purpose. The data is stationary in its current state, and its analysis shows the following.

### Prospective Directions for Improving Service Efficiency

Enhancing service efficiency requires comprehensive organizational and economic reforms. Prospective directions include:

1. Strengthening digital infrastructure through SmartRail and blockchain freight-tracking technologies.
2. Expanding PPP mechanisms to attract foreign investment in logistics hubs.
3. Promoting energy-efficient and environmentally sustainable locomotives.
4. Developing multimodal corridors and integration into the China–Kyrgyzstan–Uzbekistan railway project.

Following the implementation of the Unit Root test for stationarity verification and the correlogram, the most optimal and reliable model for developing forecast values of the volume of cargo dispatched by rail transport of the Republic of Uzbekistan was selected. The following form was observed.

The following equation is to be solved:

$$(1-L)YH_t = 0,72*(1-L)YH_{t-1} - 0,99*(1-L)\varepsilon_{t-1} + 1,38*t$$

$YH$  - represents the volume of cargo dispatched by rail transport in the Republic of Uzbekistan, measured in million tons;  $t$  - denotes the trend, with data commencing from the year 2000.

The results of the criteria necessary to justify the adequacy and reliability of the proposed model are presented in Table 2.

The following table presents the results of the developed model for calculating the forecast values of the volume of goods shipped by rail in Uzbekistan.

Model 2: ARMAX, using observations 2001-2024 (T = 24)

Dependent variable: (1-L) YH

Standard errors based on Hessian

	Coefficient	Std. Error	z	p-value	
phi_1	0.722888	0.163933	4.410	<0.0001	***
theta_1	-0.999998	0.118146	-8.464	<0.0001	***
Time	1.37653	0.195084	7.056	<0.0001	***
Mean dependent var	1.316667		S.D. dependent var	2.832830	
Mean of innovations	0.165113		S.D. of innovations	2.559275	
R-squared	0.941303		Adjusted R-squared	0.935713	
Log-likelihood	-57.39842		Akaike criterion	122.7968	
Schwarz criterion	127.5091		Hannan-Quinn	124.0470	
		Real	Imaginary	Modulus	Frequency
AR					
	Root 1	1.3833	0.0000	1.3833	0.0000
MA					
	Root 1	1.0000	0.0000	1.0000	0.0000

The high reliability of the results of z-statistics of each coefficient of the model, i.e. the fact that the probability indicators are practically zero, serves to justify the correct choice of form and type of model. The findings of this study corroborate the notion that a substantial proportion of the observed variations in the resulting factor are contingent on the factors incorporated within the model. Concurrently, the coefficient of determination is determined to be equal to 0.94. Concurrently, the MAPE indicator is minimal, with a value of 2.96. These results indicate a high level of reliability of the proposed model and the possibility of forming scientifically substantiated forecast values with its help.

These objectives are supported by Presidential decrees -4896 (2021) and Presidential decrees -295 (2022), which define measures for service quality and ecological safety.

## Discussion

The comparative analysis reveals that Uzbekistan's transport sector is aligning with global efficiency trends. The share of digitalized logistics processes increased by 35% between 2020 and 2024. However, challenges remain in workforce training, capital financing, and cross-sector coordination. To address these issues, lessons from European and East Asian countries emphasize innovation-driven management and stable institutional support.

The forecast indicators developed using the model until 2030 have the following form (see Table 3).

The following table presents the projected values of the volume of freight dispatched by rail in Uzbekistan.

For 95% confidence intervals,  $z(0.025) = 1.96$

Yillar	Prognoz qiymatlari	O'sish sur'ati	Standart xatolik	95 foizlik interva
2025	76,1	102,9	2,6	(71,1114, 81,1436)
2026	78,0	102,5	3,2	(71,8575, 84,2364)

<b>2027</b>	79,8	102,3	3,4	(73,0943, 86,5376)
<b>2028</b>	81,5	102,1	3,6	(74,4925, 88,4598)
<b>2029</b>	83,1	101,9	3,6	(75,9411, 90,1745)
<b>2030</b>	84,6	101,8	3,7	(77,3973, 91,7678)

In Uzbekistan, in subsequent years, a positive change in the volume of shipped goods by rail will be observed, however, the growth rate will have a downward trend in accordance with the increase in the forecast period. Specifically, the growth rate compared to the previous year was 2.9% at the beginning of the forecast period and is expected to reach 1.8% by 2030. This, naturally, justifies the need to develop additional measures to ensure the development of the industry. Because the demand for railway services is high, and at the same time, it is the transportation of goods by rail that is cheaper and more efficient than other types of transport.

According to the results of the developed forecast, the volume of freight dispatched by rail transport in Uzbekistan is expected to reach 84.6 million by 2030. This is 1.14 times more than the current situation, which means that the average growth rate during the forecast period will be 2.2 percent. Considering that the growth rate was 2.5% in the period taken as the basis for the forecast, the presented forecasts correspond to the existing trend. Because an increase in volume causes a certain decrease in the growth rate of the scale effect.

In recent years, the increasing mobility of the population has led to a sharp increase in demand for transport services. In particular, the demand for rail transport in interregional traffic is quite high. For this reason, an appropriate model was selected for calculating the forecast values of the number of passengers dispatched by rail, which has the following form.

### Conclusion and Recommendations

By 2030, Uzbekistan Railways aims to increase freight transport by 1.5 times and passenger transport by 2 times compared to 2020 levels. To achieve this, the following recommendations are proposed:

- Strengthen digital transformation in transport management systems.
- Expand multimodal and international transport corridors.
- Increase investments in green transport technologies.
- Develop advanced research partnerships with international logistics institutions.

The average distance of one passenger transported by rail in the Republic of Uzbekistan in 2024 was 418.4 kilometers, and in 2025 it is expected to reach 438.5 kilometers. A high growth rate of this indicator will be ensured until 2028, and in 2029 it will have a positive growth rate, but a decrease in the rate will be observed. Only by 2030 will there be a decrease in the growth rate, that is, from 471.2 kilometers in 2029 to 467.7 kilometers. Overall, it is expected to increase by 1.12 times compared to 2024.

According to the forecast results, by 2030, the volume of shipped goods by rail will increase by 1.14 times, and the number of shipped passengers - by 1.19 times. At the same time, the freight turnover of railway transport will increase by 1.10 times, and passenger turnover - by 1.33 times.

These strategies will contribute to improved efficiency, cost optimization, and sustainable service development in accordance with Presidential decrees-285 (2024) – the National Strategy for Transport Development until 2030. As a result, it is expected that the average distance of transportation of one ton of cargo by rail will decrease by 3.6%, and the average distance of transportation of one passenger will increase by 1.12 times.

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