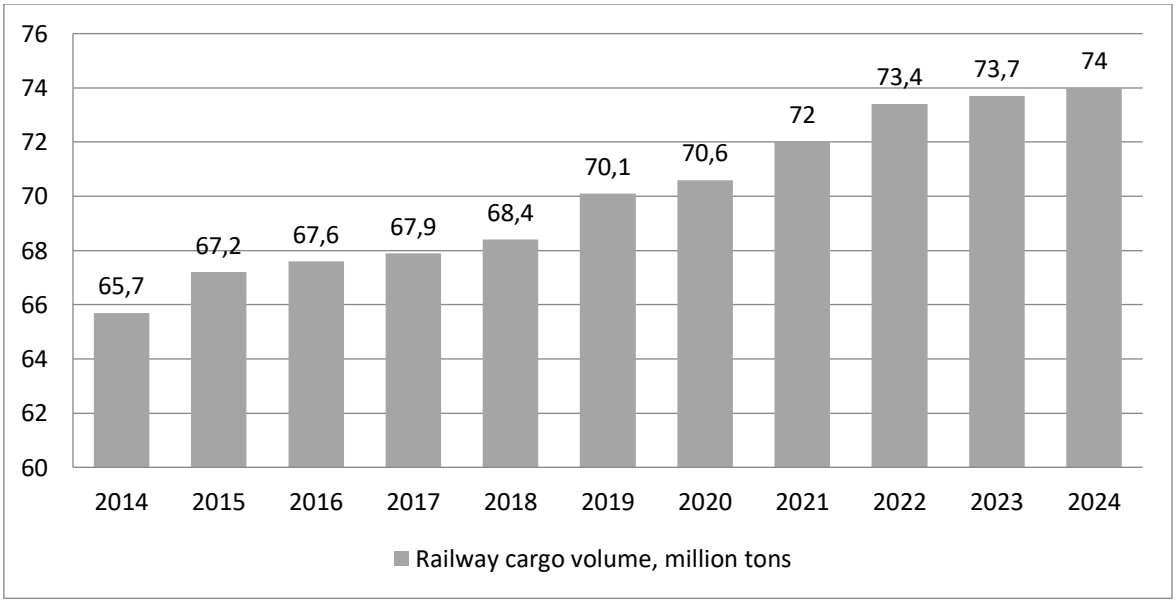
ECONOMIC ASSESSMENT OF RAILWAY FREIGHT GROWTH AND WAGON FLEET OPTIMIZATION

Khurshidakhon Egamberdieva
Transport economics, Tashkent State Transport University, PhD
Araylim Abdinabieva
Kimyo International University, master's degree student

In today's rapidly changing market economy, there is no opportunity for proper planning of transportation volumes, which results in a shortage of cars and, in some railroads, an oversupply of cars. This has a negative effect on the competitiveness of rail transport as a whole. As a result, there is a decrease in confidence in rail transport. The quality of the transportation process, as well as the reliability of transportation services, can be assessed by several parameters: cost of transportation, terms of cargo delivery, level of its safety.



Pic.1. Dynamics of railway freight transportation volume, 2014–2024

The data presented in the chart indicate a steady upward trend in railway cargo volumes from 2014 to 2024. Over this period, freight transportation by rail increased from 65.7 million tons to 74 million tons, demonstrating the growing importance of railway transport in supporting economic activity and logistics.

During 2014–2018, growth was gradual and stable, reflecting consistent development of the sector without significant fluctuations. From 2019 onward, the rate of increase became more pronounced, with particularly notable growth in 2021–2022, when cargo volumes reached 72–73.4 million tons. This acceleration may be associated with the expansion of transit corridors, improvements in logistics infrastructure, and changes in regional trade flows.

In 2023–2024, railway cargo volumes continued to rise, although at a slightly slower pace, which may indicate capacity constraints or the influence of external economic factors. Nevertheless, the achievement of the highest value in 2024 confirms a positive long-term trend.

Overall, the observed dynamics highlight the role of railway transport as a reliable and strategically important component of the transport system, ensuring stability of supply chains and contributing to sustainable economic development.

The steady growth in railway cargo volumes observed between 2014 and 2024, culminating in 74 million tons in 2024, is closely connected with qualitative changes in the structure of the railway rolling stock. The data for 2023–2024 demonstrate a strategic reallocation and expansion of freight wagons in response to evolving cargo demand. (Tab. 1).

Table 1. Production of freight cars, wagon.

Name	2023	2024
Covered wagons	1	10

Gondola cars	435	350
Tank wagons for the transport of petroleum products	17	150
Tanks for transportation of cement products	268	150
Hoppers for transportation of mineral fertilizers	62	80
Hoppers for grain products transportation	50	100
Dumper trucks	50	50
Hoppers - dispensers		40
Tank wagons for industrial enterprises		
Platforms with a long base for the transport of containers	100	70
Total	983	1000

The increase in specialized wagons in 2024 reflects the diversification of freight flows. A particularly significant rise is observed in tank wagons for petroleum products, which increased from 17 units in 2023 to 150 units in 2024. This indicates growing volumes of liquid bulk cargo and a strengthening of energy-related transportation, which traditionally generates high and stable freight turnover. Similarly, the growth in grain hoppers (from 50 to 100 units) and fertilizer hoppers (from 62 to 80 units) aligns with increased agricultural production and export-oriented logistics.

At the same time, a reduction in gondola cars (from 435 to 350 units) and cement tank wagons (from 268 to 150 units) suggests a shift away from certain traditional bulk cargoes or improved efficiency in their transportation. This restructuring may indicate optimization of wagon utilization rather than a decline in demand, especially given the continued overall growth in total freight volumes.

The expansion of covered wagons and the introduction of hopper-dispenser wagons in 2024 further support the trend toward handling higher-value, packaged, and specialized cargo. Meanwhile, the stable number of dump trucks reflects consistent demand for construction-related transport without significant structural change.

Overall, the increase in the total number of wagons from 983 in 2023 to 1,000 in 2024 demonstrates targeted capacity expansion rather than extensive quantitative growth. This confirms that the rise in railway cargo volumes over the past decade has been supported not only by infrastructure development but also by structural modernization of the rolling stock, improving adaptability to changing cargo patterns and strengthening the sustainability of railway transport growth.

Determining the number of cars sufficient for the operational activities of rail transport is one of the pressing problems. The presence of an excessive number of cars also leads to costs associated with maintaining an excessive number of cars.

One of the main indicators in the study of the efficiency of the organization of the car fleet of a railway company is the accounting of various parameters of car turnover, as well as payment for the transportation of empty cars.

Wagon turnover includes the time of cargo delivery from the departure station to the designated station, the period of empty wagons delivery (load on own axles). Reducing this indicator allows to reduce the number of cars needed to transport the planned amount of cargo, reduce the cost of transportation and increase profits of the railway company - owner of the rolling stock.

Taking into account the risks associated with obtaining an excessive or insufficient fleet of cars in the future, the criterion of choice is the minimum overall economic risk in the organization of the transportation process.

When developing the methodology, we take into account the possibility of performing freight runs in several directions, the statistical nature of rail transport parameters, and the economic risks of using the wagon fleet.

The optimization problem and the target function, based on an estimate of the required number of parking spaces N, are of the form:

$$E(N) = E_b(N) + E_{req}(N) + E_{eksp}(N) + E_{man}(N) + E^{(P)}(N) \rightarrow \min (E_{const}) \quad (5)$$

Where: $E_{buy}(N)$ - the cost of buying wagons; $E_{req}(N)$ - repair costs; $E_{ekspl}(N)$ - operating costs; $E_{man}(N)$ – costs of managing the fleet of cars; $E^{(P)}(N)$ - additional financial risks resulting from disruptions in cargo transportation

Calculation of the wagon fleet required for the work in question should be performed in the following sequence is: drawing up a schedule of loading in cars (or a report on loading for the period under consideration); calculation of the average daily loading of cars; calculation of the average loading for the period under consideration without taking into account the day when loading into cars was significantly increased; determination of the wagon fleet - determination of the wagon fleet required to cover changes in wagon loading.

Analysis of the world experience and the author's research showed that the problem of the rolling stock maintenance and improvement of its technical condition can be solved, first of all, by improving the quality of capital and depot repairs of cars, purchasing new cars and their overhaul with the extension of their service life.

REFERENCES

1. Afanasev, V. V., Gribkova, O. V., & Ukolova, L. I. (2019). *Methodology and methods of scientific research : textbook for undergraduate and graduate programs*. Yurait.

2. Badalyan, P. (2017). About the dynamics and calculation of required fleet of freight cars. *Transport business in Russia*, (4), 74-76. https://elibrary.ru/item.asp?id=30458372

3. Chernyak, T. B. (2014). *Methodology of scientific research* (2nd ed.). Marshrut.

4. Leinova, U. (2013). Determination of the Required Fleet of Freight Cars in the Transport Market of the Republic of Belarus. *Bulletin of the Volga State Academy of Water Transport*, (37), 78-84. https://elibrary.ru/item.asp?id=22846088

5. Petrov, Y. D., Kuporov, A. I., & Shkurina, L. V. (2008). *Planning in the structural divisions of railway transport* (3rd ed.). Transport.

6. Romanova, A. A., Jarova, E. A., Reshetov, V. A., & Xoxlov, S. V. (2011). Innovative freight rolling stock: technical and economic parameters. *Transport of the Russian Federation*, *3*(34), 185-191. https://elibrary.ru/item.asp?id=17045746

7. Senko, V., & Gurskiy, Y. (2009). Modeling the Process of Forming the Required Wagon Fleet. *Herald of the GGTU*, (4), 9-15. https://doi.org/http://elib.bsut.by/bitstream/handle/123456789/5458/14%20-%2018.pdf?sequence=1&isAllowed=y

8. Tereshina, N. P., Galaburda, V. G., Lapidus, B. M., & Trikhunkova, M. F. (2013). *Economy of railway transport* (7th ed.). Marshrut.

9. Uzbekistan Railways. (2020). *The concept of development of railway transport of the Republic of Uzbekistan until 2033*.