METHODS FOR EVALUATING THE ECONOMIC EFFICIENCY OF THE RAILWAY TRANSPORT NETWORK

Nasrullayev Nurbek Baxtiyorovich

Globally, researchers have been actively engaged in examining the economic efficiency of transport systems as a fundamental component of sustainable development and economic progress. In the modern era of globalization, transport systems are not only responsible for connecting regions and facilitating trade but also for driving national productivity, competitiveness, and innovation. As international trade networks expand, the importance of efficient transport infrastructure and logistics systems becomes even more critical in determining a country's ability to participate successfully in the global economy. Studies have shown that the transport sector acts as the central "circulatory system" of an economy, ensuring the smooth and continuous movement of goods, services, and people. A well-organized transport system enables rapid access to markets, reduces operational and logistical costs, and fosters balanced regional development. In contrast, an inefficient or underdeveloped transport network often leads to economic stagnation, logistical delays, and higher production costs. Therefore, improving the efficiency of transport systems is one of the key priorities for governments, researchers, and international organizations. Many scholars have developed general frameworks to measure the efficiency of transport systems, focusing on economic, technical, and environmental aspects. However, despite the numerous efforts, there is still no universally accepted set of indicators that can comprehensively capture transport system efficiency. This lack of standardization makes it difficult to compare systems across countries or regions. As a result, there remains a strong need for continued research to establish more precise theoretical and practical approaches to assessing transport performance. Transport efficiency studies typically emphasize the balance between achieved results and the resources used. Economists such as G. Samatov, A.A. Zohidov, and A.A. Gulamov argue that the efficiency of a transport system can be understood as the relationship between the expected or planned outcomes and the actual results of its operation. They propose that performance indicators should reflect this relationship using three main formulas:

Result/Costs – representing the level of outcome achieved per unit of cost;

Costs/Result – showing how much expenditure corresponds to a unit of achieved result;

(Result – Costs)/Result – indicating the relative share of costs in the achieved result.

These formulas provide a basis for constructing transport performance indicators. However, real-world applications are not always straightforward. For instance, the results of cargo delivery are not always measurable in the same units as costs. Outcomes might be expressed in time savings, service reliability, or customer satisfaction, while costs are typically monetary. Moreover, many improvements in transport systems, such as better organization, digitalization, or increased reliability, may not immediately produce high quantitative results but instead have long-term positive effects, often multiplying across other sectors of the economy. Another important distinction is made between static and dynamic efficiency. Static efficiency refers to a transport system's ability to function effectively within its existing conditions,

ensuring short-term operational stability and competitiveness. It does not, however, account for growth, innovation, or long-term adaptability. Dynamic efficiency, on the other hand, reflects how the system evolves over time — including its capacity for modernization, reliability, safety, and environmental sustainability. A dynamically efficient transport system can adapt to technological advances, shifting economic demands, and environmental challenges, thereby ensuring sustainable development in the long run. Improving transport efficiency depends on both extensive and intensive factors. Extensive factors are quantitative and include expanding the physical infrastructure, increasing cargo capacity, or raising the volume of transported goods. Intensive factors, by contrast, focus on optimizing the use of existing resources, such as improving route planning, enhancing workforce productivity, and adopting digital management systems to reduce costs and increase reliability. The effective combination of these two types of factors is essential for balanced and sustainable transport development. Additionally, the efficiency of transport systems has a profound impact beyond the economic domain. It influences environmental outcomes through energy consumption and emissions, affects social aspects like accessibility and mobility, and plays a strategic role in national security and regional integration. For countries without direct access to seaports or favorable geographic conditions, enhancing transport and logistics potential becomes even more crucial. Such nations prioritize developing international transport corridors, multimodal logistics hubs, and digital management systems to ensure smooth integration into global trade flows. In conclusion, evaluating and improving the economic efficiency of transport systems is a multifaceted task that requires an integrated approach. It involves understanding not only cost-effectiveness and resource utilization but also broader impacts such as innovation capacity, sustainability, and resilience. The future of global transport lies in the transition toward digital, sustainable, and smart infrastructure systems that balance economic growth with environmental and social responsibility.

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