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**KEY FACTORS IN OPERATING EFFECTIVENESS
OF ROAD INFRASTRUCTURE**

The conceptual framework for analyzing the economic efficiency factors of the road transport sector, including the economic, geographic and socioeconomic ones, has been considered. An emphasis is made on the state transport policy as the necessary condition for increasing the efficiency of road infrastructure of Kazakhstan.

Keywords: road infrastructure; economic efficiency; economic development; transport policy.

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**КЛЮЧОВІ ЧИННИКИ ЕФЕКТИВНОГО ФУНКЦІОНУВАННЯ
АВТОТРАНСПОРТНОЇ ІНФРАСТРУКТУРИ**

У статті розвинуто концептуальні засади аналізу чинників економічної ефективності автотранспортного сектора, в тому числі економіко-географічних і соціально-економічних. Показано, що необхідною умовою зростання ефективності автодорожньої інфраструктури Казахстану є системна реалізація державної політики у галузі транспорту.

Ключові слова: автотранспортна інфраструктура; економічна ефективність; економічний розвиток; транспортна політика.

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Мадина Рахимбердинова, Самажан Умирзаков
**КЛЮЧЕВЫЕ ФАКТОРЫ ЭФФЕКТИВНОГО
ФУНКЦИОНИРОВАНИЯ АВТОТРАНСПОРТНОЙ
ИНФРАСТРУКТУРЫ**

В статье развиты концептуальные основы анализа факторов экономической эффективности автотранспортного сектора, в том числе экономико-географических и социально-экономических. Показано, что необходимым условием роста эффективности автодорожной инфраструктуры Казахстана является системная реализация государственной политики в области транспорта.

Ключевые слова: автотранспортная инфраструктура; экономическая эффективность; экономическое развитие; транспортная политика.

Introduction. At the present stage of society development the issues of functioning of the transport infrastructure are becoming increasingly topical. Raising the competitiveness of national economy, regions and industries cannot be isolated from the full realization of transit potential, which, in its turn, is based on the extensive, available, high quality and efficient infrastructure. Since the 1990s road transport in Kazakhstan grew rapidly and currently is in second place (after the railway and pipeline), covering over 20% of freight and 90% of passenger traffic (Brief overview of the partnership program..., 2012).

Recent researches and publications analysis. The issues of efficiency in economics are among the most complex ones. The works of such scholars as V. Pareto (1927), H. Lebenstain (1995), J. Hicks (1939) and N. Kaldor (1939) are devoted to these issues; extensive studies in the field of transport infrastructure were carried out by

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international organizations, different approaches to improve the efficiency of vehicles are reflected in the publications of such economists as M. Bekmagambetov (2008), M.M. Weber and W.L. Weber (2004), V. Mozharova (2011), B.A. Zhumatayeva, Zh. Raimbekov and B.U. Syzdykbayeva (2012), L. Serebryakov and V.V. Yanovskiy (2010) and others. However, the criteria and factors of efficiency of the transport infrastructure functioning (hereinafter – TIF) are debated and need to be clarified in the context of transport strategy implementation in the Republic of Kazakhstan.

Problem statement. The study aims at extending the methodological approach based on the specification of the list of factors influencing the effectiveness of TIF in terms of peculiarities of economic and geographical situation and trends in the socio-economic development of Kazakhstan.

Key research findings. Economic and geographical conditions of the development, forming an "external" environment with respect to the transport network of Kazakhstan, are characterized by a combination of the following factors:

1. Sizable area, favorable transit location: from East to West – about 3000 km, and from North to South – about 2000 km in the heart of Eurasia. The area is 2724900 km² (9th place in the world), the length of the border is 12,000 km (with Russia, China, Kyrgyzstan, Uzbekistan and Turkmenistan) (Brief overview of the program..., 2012).

2. Rich resource potential: deposits of chromium, vanadium, bismuth, copper, zinc, uranium of the world importance, large reserves of oil, gas and coal (Brief overview of the program..., 2012).

3. Rapid GDP growth (by 7.5% per year on average), more than 90% of Kazakh production is exported due to the rapid development of export-oriented industries (major trade partners are China, the EU and the Russian Federation) (Brief overview of the program..., 2012).

4. Relatively underdeveloped, unbalanced transportation system: the length of roads is 97.2 ths km (road density – 0,036 km/km²), (86.2 ths km (88.7%) of them have hard surface and 14.2 ths km are railways, 3.9 ths km of water lines and about 60 ths km of airways). The main freight traffic belongs to road and railway networks (Figures 1 and 2) (On the status and development of automotive..., 2012; Program for the development of transport..., 2010).

5. Uneven distribution of TIF: 48.9% of the total road network of the country is for 4 out of 13 regions (East-Kazakhstan, Almaty, Karaganda and Kostanay) (Mozharova, 2011).

The method of analysis of socioeconomic factors, influencing the processes in the road network in Kazakhstan, is connected with the choice of methodological precondition justifying the performance criteria. Modern economic theory distinguishes many similar criteria, such as Pareto efficiency – the state of the system where the value of any parameter cannot be improved without improving the others; Kaldor-Hicks efficiency is associated with compensation by "won" the costs to those who are incurring them; or X-efficiency based on the optimization of production factors (Barr, 2012; Weber, 2004).

However, the specifics of the transport sector economy points to the reasonability of the use of *operating effectiveness* as the main criterion and the *development effectiveness* of TIF as an additional one. The former takes into account the direct effects

of the use of resources, and the latter – the effects of the carried out measures (qualitative aspect).

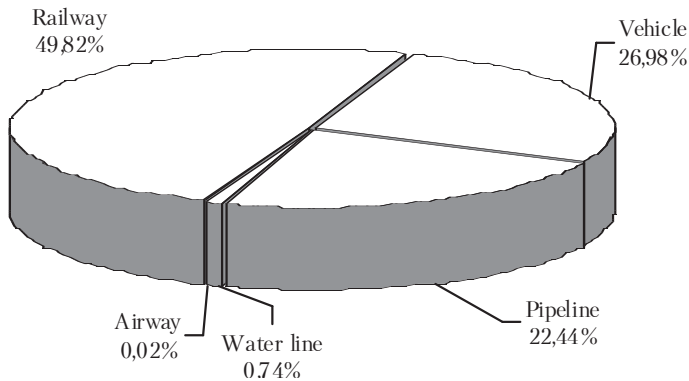


Figure 1. Trade Turnover in Kazakhstan in 2012
(Agency of the Republic of Kazakhstan, 2012)

Assessment of operating effectiveness is conditioned by the very nature of transportation services, namely: 1) cargo (passengers) traffic and, therefore, reflects the most important components for customers of the services in relation to costs; 2) investments and costs for construction, maintenance, modernizing of TIF itself for its owners; 3) costs and losses of the transport process in relation to turnover for the industry and the economy as a whole (on the basis of quantities and capitalized value units).

Assessing the development effectiveness is attributed to the costs and results of the measures (in value terms) aimed at improving the competitiveness of TIF at the market of transportation services: 1) the quality of infrastructure development (relative indices – per unit area, weight, cost etc.); 2) quality of service (performing of standards, norms etc.); 3) profitability of TIF (the ratio of profit and resources used to obtain it: investments, capital, expenditures).

The total economic efficiency can be calculated by the following formula:

$$E_{TIF} = (1 + E_C)^{p-t} \frac{K_{t-1}}{K_t} \times \frac{\sum_{t=1}^n P_t}{\sum_{t=1}^n Z_t}, \quad (1)$$

where E_{TIF} – economic efficiency in the calculation period; E_C – capital efficiency standard; K_t , K_{t-1} – factors of measures' efficiency for the current and prior periods; P_t and Z_t – cost estimation of total results costs for TIF, $1 < t < n$ – the years of calculation period for investment in TIF.

Analysis of the system of interfactor correlation requires further comparison of their dynamics. For example, the rapid growth of vehicle fleet (by 60%, to 3.64 mln units) in combination with a quite slow pace of its modernization (wear rate decreased by 7.4%) led to an increase in the load on TIF, increases in cost value, accident rate and overall reduction of industry efficiency (Figure 2). Thus, transport charges are 8–10% of the final cost of Kazakh products, unlike 3.5–4.5% for developed countries (Bekmagambetov, 2008; Mozharova, 2011).

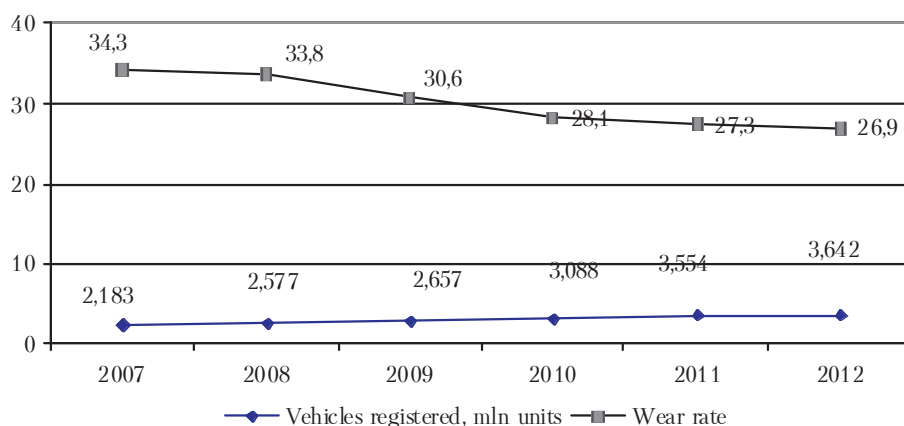


Figure 2. **Number and Wear Rate of Vehicles in Kazakhstan for 2007–2012**
(Agency of the Republic of Kazakhstan, 2012)

Program for the development of transport infrastructure in the Republic of Kazakhstan for 2010–2014 provides investments amounts to 1,822.1 bln KZT (12.1 bln USD), equivalent to 125 ths USD in the length of the road network at the average cost of the reconstruction of 1 km of roads 2.7 mln USD (that is, only about 4.6% of the existing needs will be financed at best) (On the status and development of automotive..., 2012; Program for the development of transport..., 2010).

Generalization of the factors affecting TIF performance allows forming a general idea on the possibilities and prospects of road transport industry development. In general, socioeconomic factors can be united into 5 groups: 1) international; 2) financial; 3) technical and economic; 4) organizational and economic; 5) social and ecological factors (Table 1).

Table 1. **Factors of Increasing the TIF Performance**

Factors	Measures	Costs	Effects
International	Formation of transit corridors	Optimization of transport network Construction of modern checkpoints Introduction of international standards	Increasing the competitiveness Economic growth
Financial	Financing of capital investment	Budget capital investment State guarantees Syndicated loans Private investment	Creating new jobs Attraction of investments Growth in tax revenues
Technical and economic	Construction and reconstruction of TIF	Construction and reconstruction of roads Developing of a service stations' network Construction of cargo and passenger auto terminals Introduction of smart transport systems	Reduce in budget expenditures Increasing freight and passenger traffic Increased carrying capacity (passenger capacity)
Organizational and economic	Improving the management system	Optimizing the regulatory policy New standards of planning, accounting and control Optimizing the route of freight and passenger traffic Improving the quality of personnel training	Growth of transportation speed (mileage) Cost reduction Less downtime

Continuation of Table 1

Factors	Measures	Costs	Effects
Social and economic	Improving the quality of services and the environment	Increasing the availability of services Introduction of modern ecology standards Integrated introduction of innovation (technologies, equipment, organization)	Reducing the number of accidents Improving the quality and safety of services Reduction of environmental load

Developed by the author considering (Defining common criteria..., 2009).

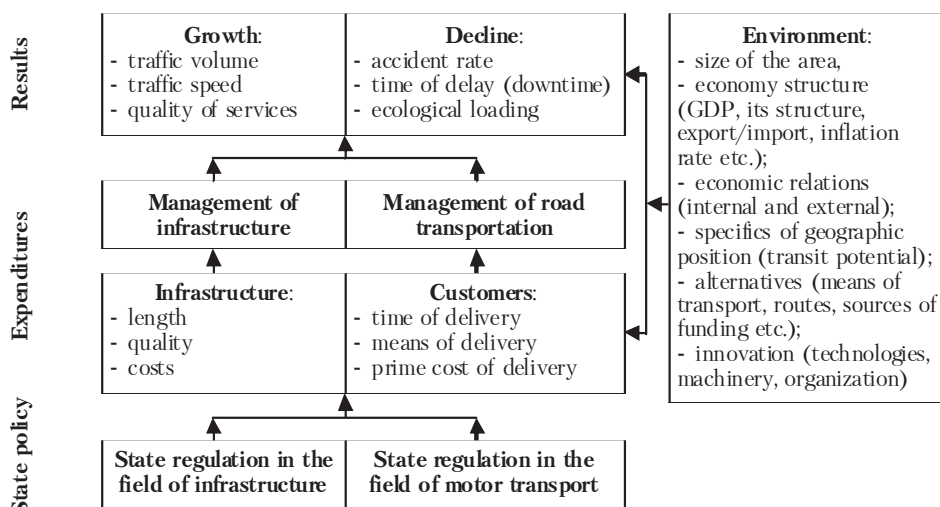


Figure 3. Interaction of Public Policy and TIF Development Factors, developed by the author considering (Defining common criteria..., 2009)

Coordinated exposure to different groups of factors has a cumulative effect on the processes not only in the motor transport industry, but on the economy as a whole. That is why the role of coordinator in TIF modernizing in Kazakhstan is given to the state because it provides the interaction between all the participants in the process through the use of instruments of state policy: fiscal rates, tariff regulation, budget financing (investment, subsidies) and government lending, as well as government business, standards, regulations and monitoring and control (Figure 3).

Goals and objectives of public policy, built taking into account external, economic and geographic factors, determine the overall development strategy of motor transport, in particular TIF modernization directions.

Efficient infrastructure is a necessary condition for the development of Kazakhstan, where geography of placement of export-oriented production is combined with low density of the transport network. Assessing the impact of two types of factors, namely: economic and geographical and socioeconomic allowed drawing the following **conclusions**:

1. Efficiency of the existing infrastructure is insufficient to achieve the objectives of sustainable development since the priority development of TIF itself is not a factor of economic growth. Only comprehensive efforts to modernize all types of transport infrastructure, analysis of their comparative effectiveness will optimize the structure, reduce costs and increase revenues of the industry.

2. TIF in Kazakhstan belongs to public sector, having the cost-effectiveness at sidelines in comparison with the objectives of public policy, resulting at nonoptimal solutions, particularly in the long term.

3. Qualitative assessment of the TIF effectiveness depends on the correctness of estimates of basic socioeconomic indicators of the industry, taking into account cost discounting and external effects.

4. Notable territorial differences in the structure of networks, provision and quality of TIF in Kazakhstan create preconditions for partial delegation of TIF management functions to the regional level.

In addition to solving the problem of TIF material component shortage, there is a need in qualitative changes in the field of optimization of existing networks, the level of management, the revision of taxes, tariff and regional policies to strengthen the competitive position of road transport sector of Kazakhstan within the contemporary global economy.

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