

## **ASSESSMENT OF THE TRANSPORT INFRASTRUCTURE DEVELOPMENT ACCORDING TO THE BUSINESS COMMUNITY REQUIREMENTS**

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**Abstract.** *Transport infrastructure plays a key role in the development of the economy of any country. The transport infrastructure development directly affects the country (or region) economy competitiveness, as well as affects the GDP growth and country export potential. The aim of this study is to develop a methodology for assessing the transport infrastructure development (for example, the Russian Federation) on the basis of the business community estimates and Rosstat data using quantitative and statistical methods of evaluation and using statistical data for 10 years. In this study, the following methods were used: a) questionnaires of entrepreneurs, business leaders, b) modal estimation; C) median estimation; d) comparison method; d) expert assessments method. The study revealed the level of the transport infrastructure development of the Russian Federation on the statistical data basis, as well as the business community satisfaction degree with the transport infrastructure conditions. The study results can be used to develop plans and strategies for the targets selection for the transport infrastructure development.*

**Keywords:** *transport infrastructure; assessment; estimation; entrepreneurship; development.*

### **Introduction**

The condition of transport infrastructure significantly affects the development of the economy and society. The analysis carried out using statistical methods showed a significant correlation between the level of the transport infrastructure development and GDP per capita – the most representative indicator of socio-economic development.

This relationship is clear from the point of view of economic logic. The "motor" of economic growth is the entrepreneurial activity. The transport opens and helps to realize business opportunities by entering new markets or access to cheaper and quality resources. This finally contributes to economic growth and human well-being.

The issues of the transport infrastructure development are considered in various aspects in the works of both domestic and foreign scientists. Among the researchers who have made a substantial contribution to the theory and methodology development of economic evaluation and management of transport infrastructure, we can highlight the work of scientists such as Macheret, Ryshkov, Beloglazov and Zakharov (2010), Kirzner (2010), Lapidus (2008), Sokolov (2017), Lyovin (2016), Macheret (2016), Mogilevkin (2010), Sotnikov (2005), Walters (2004), Fogel (1964), Grant-Muller et al. (2001), Quinet (1998).

The aim of this study is to develop a methodology for assessing the transport infrastructure development (for example, in Russia) on the basis of the business community estimates and Rosstat data using quantitative and statistical methods of evaluation and statistical data for 10 years.

## **Methodology**

Taking into account the close relationship between transport and entrepreneurship, the survey assessed the of transport infrastructure development by the business community representatives. The Russian business climate survey conducted by the Russian Union of Industrialists and entrepreneurs covers transport infrastructure assessments by the members of all economic sectors, which makes their results quite representative (Russian Union of Industrialists and entrepreneurs, 2016, p.34). In order to confirm the objectivity of the transport infrastructure assessment, the business community members analyzed official data of Rosstat (Rosstat, 2016, p.18). They make it possible to compare the dynamics of the railway and highway road infrastructure development, as well as to confirm the objectivity of the entrepreneurial assessment of transport infrastructure.

The assessment of the transport infrastructure development was carried out using quantitative methods and was performed in several stages:

1. Assessment of the transport infrastructure situation by the business community representatives on a 7-bit scale as of 2007, 2011 and 2016 years.
2. Grouping of the received estimates within a 5-point scale, with the allocation of unsatisfactory (1-2 points) and satisfactory (3-5 points) estimates.
3. Modal assessment of transport infrastructure condition.
4. Median assessment of transport infrastructure condition.
5. Assessment of the dynamics of the railways and highways development according to the official data of Rosstat.
6. Comparison of the evaluation results of railways and highways development according to the official Rosstat data and to the business community data.

## **Results**

Taking into account the close relationship between transport and entrepreneurship, the business community members are interested in assessing the transport infrastructure

development. The Russian business climate survey conducted by the Russian Union of Industrialists and entrepreneurs covers the transport infrastructure assessments by the members of all sectors of the economy, which makes their results quite representative (Russian Union of Industrialists and entrepreneurs, 2016, p.34).

Representatives of the business community assessed the transport infrastructure condition on a 7-bit scale. Such a high level of detail makes less obvious the comparison of estimates in dynamics. Therefore, when carrying out the analysis, the extreme estimates of transport infrastructure condition (on the one hand "very bad" and "bad", on the other hand - "good" and "very good") were combined. The results of these estimates analysis are shown in table 1. This made it possible to reduce the scale of estimates to 5-bit, which made it possible to interpret it within the usual 5-point scale, with the allocation of unsatisfactory (1-2 points) and satisfactory (3-5 points) estimates.

In addition, modal and median estimates of the transport infrastructure condition are revealed. Modal estimates are those that occur most frequently. For example, in 2016 the average estimate (25.6%) was the most common among highway condition estimates, while the average estimate for railways was "rather good" (28.5%). However, the modal estimate, being relatively more frequent, is not predominant. Moreover, the frequencies of different estimates can be very close. For example, in 2016 the evaluation of highways condition as "rather bad" was characterized by a frequency, which is slightly different from the frequency of the modal evaluation (25%). Therefore, the modal rating was complemented by the median estimates. The median estimate is located in the middle of the cumulative distribution of estimates, that is, it characterizes the "central trend" of estimates.

Proportion determination of satisfactory and unsatisfactory ratings, weighted average score, as well as modal and median estimates, makes it possible to characterize the transport infrastructure quality from the point of view of the business community in comparison by mode of transport and in dynamics.

Both on average, and on a ratio of satisfactory and unsatisfactory estimates leaders are railways and the airports, outsiders are the highways. (At the same time, the proportion of satisfactory estimates, as well as the modal estimate at the airports is slightly better than that of the railway infrastructure). Seaport infrastructure estimates (which began to be recorded only in 2013) are not high, but still better than on the highways. These are very significant results, demonstrating the advantages of privately owned transport infrastructure (even if the owner, as in the case of the railway infrastructure, is a company whose shares are wholly owned by the government). In turn, almost completely "state" highway infrastructure is in worse condition.

On the other hand, the condition of the highway (according to the business community estimates) has a clear tendency to improve. The increase in the proportion of satisfactory grades and the average score, the increase in modal and median grades from 2007 to 2016 indicate this.

There is no clear trend in the railway and seaport infrastructure. As for airports, we can talk about an unstable tendency to improve.

**Table 1. Dynamics of the transport infrastructure condition estimates by Russian entrepreneurs, % (Russian Union of Industrialists and Entrepreneurs, 2016, p.34)**

Transport infrastructure condition estimates	Highways			Railways			Seaports		Airports		
	2007	2011	2016	2007	2011	2016	2013	2016	2007	2011	2016
1. Bad or very bad	47,5	21,0	17,3	9,6	7,0	8,4	27,0	20,0	18,2	18,8	13,0
2. Rather bad	18,5	34,7	25,0	9,4	17,4	13,2	13,5	20,0	13,7	19,9	7,2
Total share of unsatisfactory estimates	66,0	55,7	42,3	19,0	24,4	21,6	40,5	40,0	31,9	38,7	20,2
3. Medium	14,4	21,6	25,6	22,3	40,7	26,4	27,9	24,8	22,6	29,6	25,4
4. Rather good	11,5	17,9	21,8	25,1	20,4	28,5	19,8	22,9	22,7	22,7	26,1
5. Good or very good	8,1	4,8	10,3	33,6	14,5	23,6	11,9	12,5	22,8	9,1	28,3
Total share of satisfactory estimates	34,0	44,3	57,7	81,0	75,6	78,5	59,6	60,2	68,1	61,4	79,8
The average score (on a 5-point scale)	2,1	2,5	2,8	3,6	3,2	3,5	2,8	2,9	3,2	2,8	3,5
Transport infrastructure condition modal estimation	Bad or very bad	Rather bad	medium	Good or very good	medium	Rather good	medium	medium	Good or very good	medium	Good or very good
Transport infrastructure condition median estimation	Rather bad	Rather bad	medium	Rather good	medium	Rather good	medium	medium	medium	medium	Rather good

Official Rosstat data make it possible to compare the dynamics of the development of railway and highway infrastructure (Table 2). The results of the analysis of Rosstat data are correlated with the dynamics of the Russian entrepreneurs' evaluations. While the main indicators for the railway infrastructure development have not changed much since 2007, the length of public highways has almost doubled. Thus, in the context of the insufficient level of private investment in transport infrastructure, although non-state infrastructure is in better condition, but is not developed. At the same time the governmental infrastructure is developing, but its quality is lagging behind the requirements of users. In particular, attention is drawn to the slow growth in the length of paved roads, as a result of which their share in the total length decreased by 12.9 percentage points. The share of roads with improved surface coverage has also been reduced.

**Table 2. The railways and highways development indicators change  
(Rosstat, 2015, p.127)**

<b>Indicators</b>	<b>2007</b>	<b>2011</b>	<b>2015</b>	<b>Change: 2015 to 2007</b>
<b>Railways</b>				
Operational length, thousand km (at year end)	85	86	86	+1,2%
Specific weight:				
Of electrified sections, %	50,4	50,5	50,6	+0,2 p.p.
Two-track and multi-track sections, %	43,5	43,8	44,0	+0,5 p.p.
<b>Public highways and roads</b>				
Operational length, thousand km (at year end)	747	927	1481	+98,3%
Including roads with a hard surface, thousand km	624	728	1045	+67,5%
Specific weight of hard surface roads, %	83,5	78,5	70,6	-12,9 p.p.
Specific weight of improved coverage roads, %	68,8	65,8	62,3	-6,5 p.p.

In other words, the highway infrastructure development is more extensive, and its quality leaves much to be desired. It is no accident that, given the positive dynamics of estimates, the condition of the highway is estimated to be much lower than that of railways.

The situation with railways is different. Their ownership of JSC "RZD", which is a nationwide freight rail carrier, earning its income on the transport market, on the one hand, stimulates care about the infrastructure maintenance in a condition that allows the efficient implementation of the transportation process, and on the other hand – gives financial resources generated by the market activity (And this is an important argument in favor of the unity of railway infrastructure and transportation activities).

However, these financial resources are not enough to expand the network and to construct new railways.

It is no accident that the railway transport development Strategy adopted by the Russian Government in 2008 provided for the need to unite the efforts of all parties interested in the railway infrastructure development - not only the Russian Railways holding and the government, but also private investors and regions (Lapidus & Macheret, 2008, p.13; see also Lapidus & Macheret, 2015). On this basis it was planned to build over the period 2008 - 2015 5193 km of new railway lines, 2407,9 km the second and 348,5 km. the third or fourth paths, to electrify 3918 km of railway lines. However, given the limited financial resources of the Russian Railways holding and the state budget and the low investment attractiveness of the railway infrastructure for private investors, the indicators for the railway infrastructure development provided by the Strategy are, as follows from the table. 2, have not yet been achieved.

The solution of this problem lies in establishing the legal and, from a broader perspective, the institutional conditions for the private capital attracting to the railway sector to expand the market opportunities of JSC "RZD».

Attracting private investment is necessary for the development of infrastructure of other modes of transport - including highways and roads, traditionally financed by the budget. Therefore, the Ministry of transport position seems quite reasonable. It is focused on attracting private investment to the implementation of projects in the public-private partnership format with the use of various options of "long-term contractual relations with investors".

It is important that one of the priorities of such projects is the upgrading of the seaport infrastructure associated with the development of railways. In the main export destinations, rail freight flows are sent to the seaports, so the harmonious development of railway and seaport infrastructure is key to the efficiency of such transportations and significantly affects the competitiveness of Russian goods on world markets. Meanwhile, as can be seen from the table. 1, the Russian entrepreneurs assess the seaport infrastructure condition significantly lower than that of the railways. Seaport failures often complicate the movement of goods on the railways, disrupting the transportation process at significant sites of the network. And taking into account the implementation of such projects as the BAM and Transsib modernization, which will increase the export potential of the Russian economy, the requirements of entrepreneurs to the development of the seaport infrastructure will certainly increase. And it is necessary to prepare in advance for their implementation.

Of course, the transport infrastructure development (as well as infrastructure in general), with all its importance for business and economic growth, is not the "magic lever" by clicking on which this growth can be significantly accelerated. To increase significantly the growth rate, the transport infrastructure improvement should be carried out in conjunction with the public institutions' improvement and the development of human capital, which is the main component of the modern societies wealth. The latter problem should be paid special attention to due to the fact that, in the opinion of Russian entrepreneurs, one of the three most acute problems hindering entrepreneurship is the lack of qualified personnel. According to the foreign business evaluations, the lack of qualified personnel is one of the two most acute problems hindering entrepreneurship in Russia (Fleishman Hillard Vanguard, 2016).

Detailing personnel problems of Russian business by the personnel categories, it should be noted that in the first three deficit categories of employees are specialists of the highest level of professional qualification - almost half of the Russian entrepreneurs pointed to the shortage of such specialists. In this regard, it should be noted the importance of developing the training of the highest level of professional qualification specialists for transport itself, without which it is impossible neither the modern transport infrastructure development nor the long-term improvement of the efficiency and competitiveness of the Russian transport system.

Russia has a very strong tradition of higher transport education, founded in the XIX century with the creation of the Institute of communication engineers (now the PGUPS in Saint-Petersburg) and the Imperial Moscow engineering school of the Ministry of Railways (now Russian University of Transport). These were integrated transport universities, from which in the 30s of the last century specialized universities "rebuffed" by type of transport. It was associated with the differentiation of the transport complex management system.

Currently, the dominant global trends are the integration of different transport modes within multimodal transport systems and the convergence of the transport modes in the creation of innovative transport systems. This requires the integration of transport education, the development of new areas of training in inter-transport and general transport directions. The basis for solving these problems should be the implementation of the decision adopted by the Government of the Russian Federation on the establishment of the Russian University of transport on the basis of the Moscow State University of railway engineering (MIIT) - the head transport University of the country. The Russian University of transport (created in 2017) should become a system integrator of scientific and educational potential and the main types of educational activities in transport, ensuring the education quality for the transport sector of the country (Lyovin, 2017, p.84).

Considering the large-scale tasks provided by the Transport strategy of the Russian Federation till 2030 on the transport infrastructure construction, including high-speed railway and automobile communication, development of the specialists' education (in the field of transport construction including the design of the transport infrastructure objects, and also the transport construction economy) in the Russian University of transport is fundamentally important.

We should focus particularly on the problems of training economists for the transport industry. Transport is a dynamic system whose key components are in the process of spatial movement. Because of this, as well as the economic characteristics of transport production (transportation), transport economy differs significantly from the industry and other economic activities, and in many aspects, it is not just specific, but much more difficult than the other activities economy. Transport economists should know the subject area perfectly, including the problems of transport equipment, technologies, design and transport facilities construction. It is no accident that training of economists for transport and transport construction is traditionally carried out in the transport universities. MIIT has almost 90 years of experience in such training, carried out within the framework of the specialized Institute of Economics and Finance. It seems that at the Russian University of transport such training should be expanded in relation to the

integrated development of the transport complex, covering all modes of transport in their multimodal interaction.

At the same time, the close relationship between the technical, technological and economic aspects of the transport complex functioning and development, which is mentioned above, requires the restoration of the economic engineers' education in the field of transport and transport construction. Past experience shows that such training is appropriate in the form of a specialist.

Improving the quality of transport education in the Russian Federation will contribute to the successful implementation of the country's Transport strategy, bringing the transport infrastructure in a condition that meets the requirements of both the business community and the population of Russia, improving the Russian economy efficiency.

Thus, the transport infrastructure development in accordance with the requirements of effective business needs not only to stimulate private initiative based on the market institutions improvement but also in the development of human potential – including through the conclusion of a new level of higher education in the field of transport.

The systemic solution of these tasks will stimulate the growth of entrepreneurial activity, increase the pace and ensure the sustainability of the country socio-economic development.

## **Conclusion**

The results of the business assessments analysis showed that, for example, in 2016, among the estimates of the highways condition the "average" rating (25.6%) was the most common, and of the railways – the "rather good" rating (28.5%). However, the modal estimate, being relatively more frequent, is not predominant. Moreover, the frequencies of different estimates can be very close. For example, in 2016, the evaluation of the condition of the highway as "rather poor" was characterized by a frequency slightly different from the frequency of the modal evaluation (25%). Therefore, the modal rating was complemented by the median. The median estimate is located in the middle of the cumulative distribution of estimates, that is, it characterizes the "central tendency" of estimates.

The results of the Rosstat analysis data showed that they correlate with the dynamics of estimates given by Russian entrepreneurs. While the main indicators of railway infrastructure development have not changed since 2007, the length of public highways and roads has almost doubled. Thus, in conditions of an insufficient level of private investments in transport infrastructure, non-state infrastructure, although being in better best condition, requires more acceleration. And the state infrastructure is developing, but its quality still lags behind the requirements of users.

Determination of the satisfactory and unsatisfactory rating proportion, weighted average score, as well as modal and median estimates makes it possible to characterize the transport infrastructure quality from the point of view of the business community in comparison by mode of transport and in dynamics.



Both on average and on a ratio of satisfactory and unsatisfactory estimates leaders are the railways and the airports, and outsiders are the highways. (At the same time, the proportion of satisfactory estimates, as well as the modal estimate at the airports, is slightly better than that of the railway infrastructure). Seaport infrastructure estimates (which began to be recorded only in 2013) are not high, but still better than on highways. These results are very significant indicating the benefits of the transport infrastructure in private ownership.

On the other hand, the condition of the highways (according to the business community) has a clear tendency to improve. The increase in the proportion of satisfactory grades and the average score, the increase in modal and median grades from 2007 to 2016 indicate this.

On railway and port infrastructure there is no clear trend in the condition change; with regard to airports – we can talk about an unstable trend towards improvement. In other words, the highways infrastructure development is more extensive and its quality should be improved.

The situation is different with railways. Their ownership of JSC "RZD", which is a nationwide freight rail carrier earning its income on the transport market, on the one hand, stimulates the care of the infrastructure maintenance in a condition that allows the efficient implementation of the transportation process, and on the other – gives for this financial resources generated by market activities.

However, we need to expand the railway network and build new railways. It is no coincidence that the railway transport development Strategy adopted by the Government in 2008 provided the need to unite the efforts of all parties interested in the railway infrastructure development – not only the "RZD" holding and the government, but also private investors and regions.

In the framework of the implementation of the Strategy, it is required to create legal and (from a broader perspective) the institutional conditions for attracting the private capital to railways - in the expansion of market opportunities for JSC "RZD" which is a core company of the Russian transport industry.

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