Specifics of Railway Development in Russia

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Abstract. The state of rail transport in Russia today cannot be commended, considering that the leading countries in the industry are sometimes several times more efficient than Russia. A number of current problems, such as the lack of high-speed railways, the underdeveloped rail network, the monopoly of one company and, consequently, the unreasonably high prices for transportation, need to be resolved as soon as possible. Improvements in this area will help railways to be competitive among other transport: today, transportation by rail is slower than it could be and more expensive. Solutions need to be found that will soon solve the existing range of problems and also allow the railway industry to continue making a major contribution to the country's economy. Russia is a potentially game-changing country in this industry: it has a huge area, which means there should be no problems in accommodating the HSL. Besides, the country has good engineers trained in this field, and the investments made into changing the railroad sector would allow the country to develop at a pace similar to that of China, for instance.

1 Introduction

1.1 The relevance of the study

The relevance of the study of railway development is determined by the fact that transport and economy are interconnected, the multiplier effect of activities in the transport sector is reflected in the growth of the country's GDP. The product of transport is the transportation of passengers and freight, so of all types of transport, railways are one of the most essential. More than 50% of Russia's railways are involved in freight transport, so the railways as a whole are of great importance for areas such as the economy, social and defence. And the state of the railways is directly related to the state of the country's economy. Given Russia's lagging behind a number of countries in this area, there is a need to talk about further changes for the good of eliminating problems.

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1.2 Literature review

The contributions of Anna Fraszczyk a, Thomas Lamb b, Marin Marinov explain in detail the backwardness of railways today and the importance of developing railways even in places which are remote and seemingly unprofitable: developing railways is the way to develop backward territory, because railways connect a remote region with more developed ones.

The journal of Analytics, Finance and Economics, Southern Illinois University Carbondale, Illinois also supports the idea of the importance of railway development in matters of infrastructure and the economy as a whole; it also touches on the importance of development not just for a particular area, but for the whole country. These ideas are supported by the works of Mohammed Quddus, Craig Morton.

Zhongmei Liua,b, A-Xing Zhuc and Lei Wang discuss in their studies the impact of HSL on the territory. Of course, both authors point out that HSL is a way to economic development, but Lei Wang points out that there is a downside to this trend: HSL creates economic disparities between regions. Xuezhen Daia, Min Xub and Ningzhao Wang also point out the need for HSL in their work.

The works of authors who point out China's superiority in railways were also reviewed. Wei Zou*, Liangheng Chen, Junke Xiong noted in their works that China is ahead in this direction, and Lapidus B.M., Misharin A. S considered the benefits of building a new highway that would link Russia and China.

Fengqing Li a, Yao Cheng and Valery Grakhov, who are originally on different topics, also agree on an important point: of course it is necessary to develop the railway, but at the same time we should not forget that such an expensive exercise requires a lot of investment. It is worth noting that in Russia this is fully hindered by the monopoly, about which S. A. writes in his works. A. Bykadorov, admitting that Russian monopolism has put Russian railways in an economically precarious position.

1.3 Problem statement

The analysis of the cited and other academic papers in the area under study has identified a number of problems that need to be addressed first, among them problems such as lagging behind advanced countries in a number of indicators in railways, the monopolisation of Russian Railways, the lack of HSL in Russia, and the high competition with other modes of transport. It is important not only to discuss these problems, but also to consider them from different angles in subsequent studies in order to propose a clear solution for each problem.

1.4 Aim, objectives and hypothesis of the study

The main objective of the study is to examine the development of railways in Russia and to identify current problems in this field.

Objectives:

- To study the peculiarities of railway development in Russia by the example of such countries as the USA, Germany, Morocco and China;
- Examine such indicators as freight flow, passenger traffic and profits within Russian Railways, assessing the development over the last few years;
- Compare the current state of railways in Russia and other countries;
- On the basis of the problems identified, propose solutions implemented from the experience of other countries.

Hypothesis: the state of railways in Russia against the background of advanced countries is unsatisfactory and requires urgent reforms.

2 Methods

Using empirical-theoretical methods as well as the analogy method itself, a brief summary of the early development of railways in Russia and, for comparison, in countries such as Morocco, USA, Germany and China was examined.

Based on the induction method, the main problems of the railway sector in Russia were identified.

Statistical analysis has revealed the impact of the railway industry on the country's economy.

A comparative analysis was also presented for a number of countries based on indicators such as the length of roads in general, the length of Navy roads, the availability of express trains and high-speed trains.

3 Results and discussion

To investigate the state of the railways in Russia, it is important to analyse how their development affected the country in the early years of their establishment.

In pre-revolutionary times, railways were just beginning to develop. Their emergence turned the economy of the Empire upside down. Agriculture, mining and processing industries, metallurgy, coal, oil, cotton and salt production began to develop more actively. Thanks to the railways which had been built, the economy had shifted from extensive forms of subsistence farming to intensive ones.

The railway economy continued uninterrupted, neither during the revolution nor during the war. The building of railways continued during the Great Patriotic War, at that time railways were of great importance: they transported ammunition, raw materials, people and food between areas despite the fact that railways were raided in order to destroy communications between strategically important cities. After the war, the railways were entirely state-owned, although even in pre-revolutionary times some of the roads were sponsored by private companies.

It has been established that, today, almost 80% of the Russian railway network is pre-1917 stock, as during the Soviet era, most roads were built in the Soviet republics. In this respect, there is a need for further development of railways at the present stage, as is the case in a number of countries today.

In the USA, the development of railways began in 1815 and initially railways were used for industry. After 15 years, passenger trains were launched. Before the outbreak of the Civil War, in 1860, the length of the tracks was already 30,000 miles. Just as in Russia, during the Civil War the railways in the United States were of great importance: troops, weapons, ammunition, and groceries were delivered.

In 1865 begins "Golden Age", the length of railways grows up to 254 thousand miles, building of railway corporations. During World War I, the railroads were taken over from the corporations by the government, and that is where the Golden Age ends. After the 20th century, the railways do return to private hands, but in a dilapidated state.

In Germany, railway development began with the opening of the first railway in 1835. By 1855, it had grown to 8,000 kilometres. However, it is worth noting that until the creation of a unified state, German railways were not a unified network. During the World

Wars, Germany also actively used railroad transportation to transfer ammunition, food, and military mobilization.

The development of railways in China is highlighted in stages. Initially, all the necessary materials and resources were transported from abroad, as the country had no desire or motivation to develop this field (the first road was built in 1876). Because of the world wars, the government had to reconsider its attitude to this sphere and railways started to develop more actively, but still not enough because of internal feuds. After the war, the development of the railway started apace, and the Chinese government created the conditions so that all the necessary resources could be created within the country. China started to develop mechanisation. The more the economy developed, the more other forms of transport in China developed. And in order to restore the competitiveness of rail transport, China launched the active development of high-speed rail, and Chinese scientists began to develop high-speed trains. Today, the country is the leader in terms of HSL length and the number of high-speed trains. HSL is an indicator of economic development, which is confirmed by Zhongmei Liua,b, A-Xing Zhuc: "HSR has not only become the focus of world railway modernization but also has been an important symbol of modern society". [9, p.271] However, it is also worth noting that HSL does not have only positive aspects, which is well reflected by Lei Wang: "It has reduced the disparity of regional accessibility but has widened the gap between HSR and CR cities and increased the disparity of CR cities". [10, p.34] And this is indeed an issue worth thinking about: HSL development is important, but on a scale where it will not nurture inequality.

Africa, on the other hand, differs from previous countries in its particular history of railway development. Its roads are a product of its colonial past. As soon as most African countries achieved sovereignty, most of the railways started to collapse.

Today, rail transport in Russia has a number of problems. First, it is unevenly distributed. Only the western part of the country has a dense railway network (accounting for 2/3 of the length of all railways, also with a density of 13.7, while the Asian part has a density of 2.1) and the eastern part of the country has a less extensive network. This problem requires the start of railway development in all the necessary and disconnected areas. A number of regions with useful locations are either not provided with rail transport or are difficult to access (predominantly in the eastern part of the country). Also to date, 7 constituent entities of the Russian Federation have no access to rail transport at all. Saleh Alotaibi, Mohammed Quddus, Craig Morton also note that "that regions that are well-connected to the railway network, experiences an increase to their economic growth". [3, p 11] Needless to say, 7 subjects of the Russian Federation are now far behind in the economic aspect.

It is not difficult to conclude that this level of development is having a negative impact on the country's economy from that point of view. Journal of Analytics, Finance and Economics, Southern Illinois University Carbondale, Illinois: "Infrastructure network from roads and bridges to freight rail and ports to electrical grids and internet provision plays a critical role in every nation's growth and prosperity. It also improves households' social and economic welfare. Investigations have shown that available and quality infrastructure enhances economic growth in both developed and developing countries". [2, p.12]

In addition, the railway industry in Russia is characterised by a noticeable lagging behind advanced countries. This applies both to technology and technology itself. In order to solve this problem, it is necessary to delve into foreign experience and adopt effective methods. A comparison of some indicators of a number of countries with those of Russia is provided below.

The length of the operational part of the railways in Russia is 87 thousand kilometres. Among the areas compared, Russia, despite being the largest country in terms of area, is only ahead of Africa (Morocco) and Germany, as shown in Figure 1.

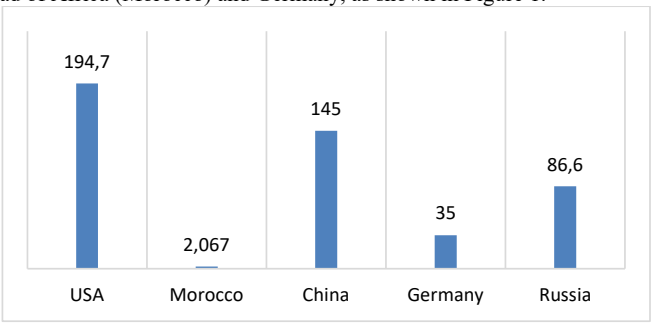

Fig. 1. The length of the railway in the USA, Morocco, China, Germany and the Russian Federation, thousand kilometers.

It can be seen that Russia, the world' number one in terms of area (17130,000 km²), lags far behind the leader in terms of railway length, the US (9834,000 km²).

Considering high-speed traffic, it is worth noting that China is the leader in this matter. It has more than 38,000 km of high-speed railways. Wei Zou*, Liangheng Chen, Junke Xiong confirm this: "The opening of HSR has been driving force in China's national economic growth." [4] Although Russia has a large percentage of express and high-speed trains, the trains are operated on mixed and suburban tracks. Since high-speed trains have to travel slower, their productivity decreases accordingly.

The importance of HSL is confirmed by a number of authors, including Lapidus B.M., Misharin A. S.: "the highway will open up fundamentally new opportunities for high-speed transcontinental transportation by landfor passengers and transportation of high-value goods - for manufacturers and consumers". [5]

Also, when assessing high-speed trains, it is worth noting that there is only one such train in Russia. "Sapsan" is the fastest train with its maximum speed of about 260 km/hour. Its main route: the route between Moscow and St. Petersburg, along Oktyabrskaya, rather than on a separate road, along with other trains, which prevents it from travelling fast. And high-speed roads would relieve the country's highways and airports very well.

Figure 2 below shows the length of HSL in a number of countries. It is worth noting that the length of Russia's HSL is arbitrary: these are the roads used by the Sapsans, but in fact there is no full-fledged HSL in Russia.

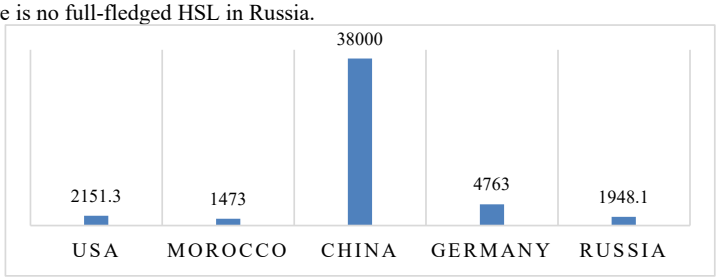

Fig. 2. The length of the HSR in the USA, Morocco, China, Germany and the Russian Federation, kilometers.

While China is still second in terms of total railway length, it has a clear lead in terms of HSL length. Russia, on the other hand, is behind literally all the countries represented, not far behind Morocco, which cannot even come close to matching Russia in terms of total area.

It's worth noting that of the existing trains, the leaders in terms of high-speed traffic are Chinese trains: Shanghai Maglev (431 km/h) and Fuxing Hao (400 km/h). And they are not the most powerful trains in the world, there are a number of trains which are not put into service, but during tests the trains reached speeds of over 600 km/hour. It is not difficult to conclude that Russia is far behind on this issue. Table 1 clearly shows this underperformance.

Table 1. High-speed trains of the Russian Federation, Germany, China, Africa and the USA.

Country	Russia	Germany	China	Africa	USA
Title	Sapsan	ICE-Zug	Fuxing Hao	Euroduplex	Acela Express
Speed, km/h	260	330	400	220	241

The first HSL in Russia was intended to be the HSL Moscow-Kazan (with the prospect of an extension to Yekaterinburg). The first HSL in Russia was to be the HSL Moscow-Kazan (with the prospect of extension to Yekaterinburg). Plans for this construction began as early as 2013, but in 2021 the nearly completed project failed to pass the approval of the President of the Russian Federation (but a clear "no" to the project was nevertheless not said). The reason was simple: the 1.7 trillion rouble project would simply never have paid for itself. There are no major cities between Moscow and Kazan apart from Nizhny Novgorod, but even in the case of links between these cities it is more often easier to choose air transport. Passenger and freight traffic did not justify this investment.

It is logical to assume that the only payback HSL in Russia would be the new HSL between St. Petersburg and Moscow, as the main passenger traffic is between these cities.

The HSL between Moscow and St. Petersburg would also be a good solution, as it would relieve the existing network and allow for faster train movements. The HSL Moscow-Kazan project is also worth revisiting, strategically considering stretching this road to China, which would make freight cheaper, faster and pay for HSL as a whole, as well as linking the Russian east to the central part of the country with a new road, increasing track length in general. The stalling of this project is justified by the fact that such a road would not pay for itself, when a number of localities do not even have simple railways. It is important to develop a solution to this problem in the direction of laying the network even in remote settlements. Anna Fraszczyk a, Thomas Lamb b, Marin Marinov write about it: "This is an important issue as not only would it increase the quality of life for people living in secluded villages and towns, it could also potentially generate extra income for infrastruc- ture managers as well as at journeys' destinations (employment, education, entertainment, etc.). [1]

Of course, the development of HSL is also a problem within an already existing problem. It is worth looking back at China's experience: the country has developed a flexible approach that has incorporated already existing technologies along with the development of its own engineering and scientific base. However, HSL is a necessity for economic development of the country, which is confirmed by Xuezhen Daia, Min Xub, Ningzhao Wang: "Reasoning on the importance of HSM, the author also notes that further,

the development of traffic services can even make some agglomeration disappear". [6] However, based on the experience of China, we should not forget about the peculiarities of the internal state of the country, as Yongzhi Chang writes: "HSR development must be coordinated internally. The internal elements include infrastructure, transport equipment, scheduling, service provision, and software-hardware integration". [11]

Of course, it should also be noted that profitable construction is impossible without investment, as Fengqing Li a, Yao Cheng point out in their paper using the example of China: "Construction of an additional 4000 km of HSR was planned to extend the original railway network to central and western China, which are economically less developed". [7] And the possibility of investment by foreign entrepreneurs is confirmed. In the context of the urgent need to reshape the railway sphere, the issue of monopoly prevents the acceptance of much needed support from outside, Valery Grakhov: "The construction of a high-speed railway is a large-scale and expensive venture therefore it is important to note that its implementation requires significant financial support from investment funds, which includes the support not only from the state and private investors, but also from foreign entrepreneurs". [12]

Another acute problem of rail transport in Russia is the high level of competition with other modes of transport. Despite a number of advantages, rail transport remains quite expensive due to the fact that it is operated by a monopoly company. In addition, it is not the fastest due to a lack of HSL. Monopoly is also a very acute problem. It is hindering the development of the rail industry today, as the work of S. A. Bykadorov: "the Trans-Siberian Railway, is a natural monopolist, which is surrounded by a capillary net-work of local, social, often low-active, and therefore economically unprofitable railways, which is still in the making. Under any circumstances, but especially under sanctions, the state is obliged to support this railway network for the purpose of strategic security using either direct funding from the budget, or indirectly, on a concession basis. [8]

The contribution of Russian Railways to GDP and the economy as a whole is worth mentioning. Over the past 3 years, it has not fallen below 5.3%. As for the net profit, each year this is a rather unstable indicator, depending on various factors. Figure 3 below shows how the net profit of Russian Railways has changed over the last 5 years.

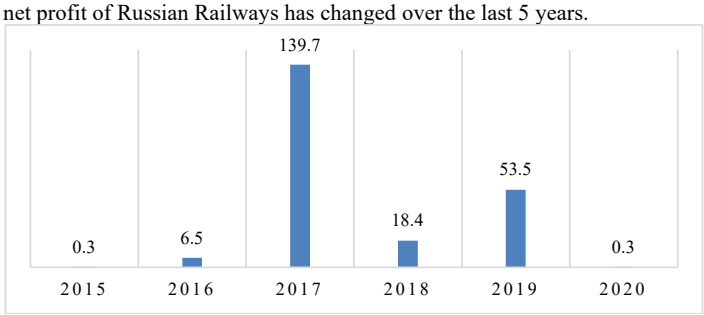

Fig. 3. Russian Railways net profit for 2015-2020, billion rubles.

When it comes to indicators such as freight and passenger traffic, things are more stable, as shown in Figure 4.

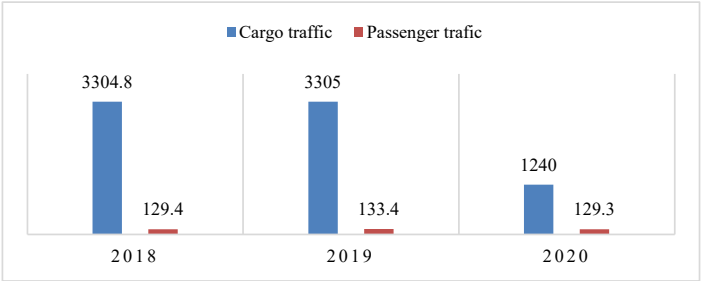

Fig. 4. Cargo and passenger traffic in Russian Railways for 2018-2020, billion kilometers.

It is evident that passenger traffic has been increasing, even though most of 2020 was full of restrictions, the figures have hardly dropped compared to 2018 in terms of passenger traffic. Cargo traffic, on the other hand, has fallen by almost a factor of three.

But a clearer picture can be shown by EBITDA in Figure 5.

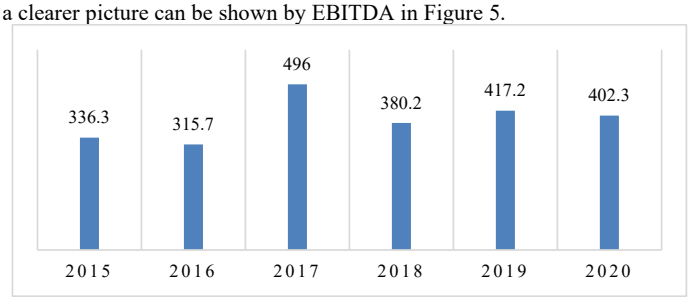

Fig. 5. Russian Railways EBITDA for 2015-2020, billion rubles.

Overall, the indicator is fairly stable and its decline in 2020 is explained by the current epidemiological situation in the world.

The significant jump in both net profit and EBITDA in 2017 can be explained by the fact that 2017 saw a rise in oil prices and the Russian economy started to grow for the first time in three years, investment and consumer domestic demand increased, Russian exports increased, industrial indicators (in particular oil and coal production) started to grow and foreign trade increased.

However, this figure cannot be called high by reference to global indicators. According to Forbes, investment in transport as a share of GDP in Russia lags behind the world average by a factor of 1.5, and from countries such as China and the USA by a factor of 2 to 3. Obviously, the railway could bring the country 2 to 3 times as much income as it does today. But this has not happened yet.

The solution to this problem could lie in investors, the attraction of which is suspended by the monopoly of Russian Railways. Today this company is not so much developing the railways as maintaining them. It is important to work out a clear strategy for development, to change the terms of monopoly, which would give Russian Railways a chance to develop further, gaining an advantage over competitors.

The Anti-Monopoly Service has repeatedly stated that freight and passenger services are quite expensive even at the global level, that there is no transparency in price formation, and that because of the monopoly and lack of competition Russian Railways does not

provide quality services at the level required at the present time. Today 100% of all RZD shares are owned by the state.

A solution to this problem could be the rather efficient Swedish model. Sweden divided the monopoly into two sectors, with one dealing with the development and maintenance of the railways, and the other operating directly as a commercial enterprise. On the basis of the same sector, separate companies began to be established over time, which were engaged in different activities. That is, the companies remained state-owned, but the companies were able to attract commercial enterprises. This model has improved the railways in general, as well as the quality of the services provided, and in the first years of this model, costs were reduced by 3% per year.

4 Conclusion

Consequently, the study of the state of the railways in Russia identified the main problems and confirmed the hypothesis that Russia lags far behind the world in terms of railways, and therefore provided solutions to increase the efficiency of the railways.

A number of objectives were set at the beginning of the study. To solve such a task as studying the peculiarities of railroad development in Russia by the example of such countries as the USA, Germany, Morocco and China, the features of railroad development in the listed countries were analyzed, and it was found out that formation of railways in each country has led the territory to active economic development.

The task of studying such indices as freight flow, passenger flow, and profit within the Russian Railways has also been carried out, evaluating the development for the last several years. We can see development in this area, but it is not significant: the railways are lagging far behind the leading countries in this area in Russia, given that it is the longest country. This task echoed a subsequent one - a comparison of the state of Russian Railways today. It was found that Russia lacks the HSL so necessary to maintain both Russian railways' competitiveness on the world stage and their own domestic competitiveness against other modes of transport. Russian rail transport is slow, outdated, expensive and in need of a number of reforms, investment and a loosening of the RZD monopoly, as it is the lack of competitors that keeps the industry lagging behind.

The examples of such countries as the USA, Sweden and China have provided options for solving a number of problems.

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