
Contemporary State of the Transport System in Bulgaria

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Abstract

The movement of people, goods and information has always been one of the main components of human societies. Modern economic processes are associated with a significant increase in mobility and higher levels of accessibility. Although this trend can be traced back to the Industrial Revolution, it accelerated significantly in the second half of the twentieth century, when trade was liberalized, economic clusters emerged, and the comparative advantages of global labor and resources began to be used more effectively. This article makes a modern analysis of the transport system in Bulgaria, considering the main modes of transport in quantitative and qualitative indicators and the factors and features that form it.

Keywords: Transport system, Transport-geographical location, Trans-European road network, Transport accessibility

1. Introduction

Transport is extremely important for the normal functioning of the economy of each country, as it transports raw materials and products to other sectors of the economy, and provides the necessary human resources to participate in production. Transport serves all activities in society – economic, social, cultural, political, tourist, etc. Its main function is to make the connections in the system "production – consumption", as well as between other economic activities, which makes it an essential factor for market formation. For this reason, its development is determined by the development of other sectors, and conversely. Transport is also important for export and import. Through it, in the presence of an "open" economy to the world economy, foreign trade is carried out, the transport of tourists to and from Bulgaria. The social significance of transport is particularly important and is the subject of research by geographical science.

Conditionally the most important characteristics of transport can be determined as follows:

- The unique purpose of transport is to overcome the space, which is shaped by various human and physical limitations – distance, time, state borders, administrative division, etc.;
- Transport is a key sector that encompasses a complex network of private and public companies that deliver goods and services to citizens and businesses inside and outside the country;
- Transport is an integral part of the production process, as it is crucial for the supply of raw

materials and distribution of finished goods. This makes it possible to transport goods from the place of production to the place where they are to be consumed or used. The development of transport is the engine of globalization and the unification of countries into a common world market;

- Labor mobility increases with the development of transport. An efficient network of transport services encourages the movement of people from one place to another;
- Transport helps each region or country to make optimal and efficient use of its national resources. In this way, the movement of goods and people from one place to another leads to specialization and division of labor, resulting in minimal waste of resources and reduction of production costs.
- Transport contributes to the development of industries that do not have their own raw materials;
- Transport helps increase a country's national wealth by facilitating agriculture, industry, trade and more.

In the context of Bulgaria's membership in the European Union, improved transport services create conditions for economic and social cohesion [1]. They are also important for trade competitiveness, as they have a significant impact on production processes and on the choice of trading partners. The main challenges facing the transport sector in Bulgaria as part of the Community include its implementation in the single European transport area, its connection through modern and safe transport infrastructure networks and the transition to mobility with low negative impact on the environment. In general, transport is a measure of the standard of living of the population, the socio-economic development, which makes the development, improvement and optimization of the transport system in the country a national priority [2].

The transport sector is characterized by some main features:

- functions as a single system, which includes: roads, vehicles, specific infrastructure; labour resources (staff), passengers and cargo;
- energy intensity – due to the use of large quantities of liquid fuels and electricity;
- labour intensity - is served by a large number of skilled workers;
- linearity – linear location and organization of activities;
- knowledge intensity - there is a need for continuous improvement of the transport network and means, which makes it high-tech;
- cyclicity – the transport has a pronounced cyclical nature due to the nature of the transported goods and the activities performed;
- does not create new products;
- transport services are interchangeable – the services of different types of transport can be used depending on the customer's preferences, the nature of the goods, delivery time and a number of other factors;
- it must be reliable above all - the transport must be carried out without affecting the transported goods;

- there is a specific form of territorial manifestation - the parts of the transport infrastructure (such as transport centre, node, complex, region) allow the zoning of different types of transport;
- strong dependence on natural conditions (relief, climate, waterways, etc.);
- main polluter of the environment in Bulgaria.

The main groups of factors that have the strongest influence on the development of transport are: the transport-geographical position of the country; groups of natural geographical and socio-economic factors. Political, demographic, scientific, technical and environmental factors can be considered with them or on their own. Important international roads from Western and Central Europe to the Middle East and from Northern and Eastern Europe to the Mediterranean and North Africa pass through Bulgaria. This potentially makes our territory an important European transport hub. Five trans-European corridors pass through the country:

- №4 – Dresden – Prague – Vienna – Bratislava – Budapest – Vidin – Sofia – border checkpoint "Kulata" – Thessaloniki – Athens / Plovdiv – Haskovo – Istanbul;
- №7 – Danube waterway, which is part of the Rhine – Main – Danube;
- №8 – Durres – Tirana – Skopje – Bitola – Gueshevo border checkpoint – Sofia – Plovdiv – Burgas (ferry connection to Batumi (Georgia) / Varna (ferry connection to Chernomorsk (Ukraine) and Poti (Georgia));
- №9 – Helsinki – St. Petersburg – Moscow – Kiev – Chisinau – Bucharest – Ruse – Kardzhali – Makaza border checkpoint – Alexandroupolis (Alexandroupoli);
- №10 – Salzburg – Ljubljana – Belgrade – Kalotina border checkpoint – Sofia – Kapitan Andreevo border checkpoint – Edirne – Istanbul.

The relief of Bulgaria has a very strong influence on the development of land transport. Over 70% of the territory of our country falls at an altitude of 0 to 600 m, which predetermines the possibility of easier and less capital-intensive roads. On the other hand, the connection between Northern and Southern Bulgaria is very difficult due to the chain-located Balkan Mountains, the passage through which is carried out predominantly through the passes "Vitinya", "Pass of the Republic" and Shipka Pass. The construction of a tunnel (tunnels), connecting the two parts of Bulgaria, is a geographical idea with more than a century ago and at the moment is extremely important for our economic development investment intention. The predominant flat-hilly terrain is favorable for the creation and operation of a dense road network. The valleys of the rivers and the saddles along the mountain ridges support the creation of roads through the mountains, as there is still no road and railway in the valley of the Arda River. In terms of climate, Bulgaria has favorable conditions for the development of its transport system. The low temperatures in the winter in the high mountain passes, which are often accompanied by snowfalls, have an adverse effect. Complicating the functioning of road, water and especially air transport are the days with fog during the cold half of the year in the Danube areas, in the valley fields and on the Black Sea coast. Local thunderstorms and hurricane winds also have a negative impact, especially on air and water (sea) transport. Of the socio-economic factors, the territorial location of the production facilities has a strong influence on the development of the

road network, as their concentration in certain parts of the country requires good transport security for the timely transport of raw materials and finished products [3]. The density of the settlement network and its spatial location has a direct impact on the development of the transport system. In recent decades, the emphasis has been on road transport links between major urban and tourist centers, while rail links have been abandoned.

The condition of the transport infrastructure directly affects the volume, quality and timing of freight and passenger transport. It consists of all fixed transport facilities - the network of roads, railways and canals; terminals, including docks, airports and related territory; buildings and equipment. It requires large investments, which return slowly but reduce some of the other costs. The elements of the transport infrastructure are classified into three levels – national, regional and local. In some cases, an element of national importance such as a motorway is irrelevant to certain regions due to its transit nature. The state of the transport infrastructure and the economic development of the country and its regions are interrelated. In our country the condition of the ports (Black Sea and Danube) and the railway network lags significantly behind the average European levels.

Political factors are decisive in building the strategic vision for the future development of the national transport network. Transport links with our neighbors Greece and Romania, which are EU member states, are particularly important, as are transport links with Turkey and northern Macedonia.

Demographic factors strongly influence the transport system, especially with the availability of labor resources to carry out various economic activities. The population influences as a consumer of transport services, as the improvement of the quality of life is an incentive for the development of transport in general. The entry of innovative and modern means of transport, new fuel products, basic and additional road infrastructure is an incentive for higher social efficiency, reliability and environmental friendliness of our transport.

Environmental factors have expanded their impact on transport by introducing stricter requirements to reduce high levels of pollution. This has led to the import of vehicles with higher levels of protection against pollution in urban bus and taxi transport.

2. Contemporary analysis of the national transport system

The European Union's transport strategy is to improve and rationalize the use of infrastructure and means of transport, to achieve greater security, combined with reducing the damage that transport does to the environment. Priority is given to building a trans-European transport network that will ensure the sustainable development of individual modes of transport, but also their energy efficiency and environmental friendliness, Bulgaria's transport system has good conditions for the functioning of all modes of transport. One of the advantages for this is the density of the built transport infrastructure. The country has over 19 thousand km of national roads, over 4 thousand km of railways, sea and river ports, airports. Connections of public transport of national importance with the Bulgarian road and railway network have been established; there are a number of projects for the development of the transport system that are in the process of implementation. The main indicators characterizing the transport activity of transport are related to the density of the road network and the transport of goods and

passengers by land, water, air and urban electric transport.

2.1. Railway transport and infrastructure

Rail transport is important for the country's economy. It is a leader in the mobility of the population and the provision of accessible transport services. It has lower fuel costs, is reliable because it depends poorly on weather conditions, and is convenient for transporting bulk and bulk cargo over medium and long distances [4]. It is characterized by a high degree of construction of the railway infrastructure, as well as a high degree of electrification of the railway network. As of the end of 2020, the total length of railway lines in Bulgaria is 4,029 km, of which 2,871 km are electrified (71%). The railway network is developed according to the relief features of the territory. The main obstacle is the Balkan Mountains, which cross only three places by railway. There are mountainous areas that remain far from the network, and the only area without a railway network is Smolyan.

Some of the problems facing the Bulgarian railway transport are: unsatisfactory technical condition of the railway infrastructure and rolling stock; uneven passenger and freight traffic and insufficient use of the capacity of the existing railway network; low efficiency caused by excess capacity, high freight car turnover, high idle rate, etc.; insufficient funding and underfunding of railway transport by the state; low level of used new communication and information technologies; lack or poor integration between rail and other modes of transport in many settlements (remoteness of stations from the settlement, lack of public transport to the station, etc.). Significant shortcomings can also be noted the weak integration of the national railway network into the European one and the insufficient connections of the national railway network with the seaports.

Although a significant part of the rolling stock does not meet European standards in terms of comfort, hygiene and quality, and the maintenance and repair of the obsolete fleet is not sufficiently timely and adequate, rail transport remains preferred by a large part of the population as it is still the cheapest way to get around [5].

In order to encourage the use of rail transport and improve the quality of the service provided, some strategic steps have been taken, such as expanding the electrification of railways through full electrification of railways along the trans-European transport network; stimulating the use of combined transport through reconstruction and construction of new terminals; increase of the admissible speeds for the passenger and freight trains in the railway sections, in which projects for rehabilitation or modernization have been realized; improving and developing the physical railway infrastructure connections and achieving interoperability in order to attract international traffic through the country and increase the competitiveness of the Bulgarian railways; rehabilitation of some key railway lines such as Dragoman – Sofia; Vidin – Sofia; Ruse – Dimitrovgrad; Radomir – Gueshevo; Radomir – Kulata.

2.2. Road transport and infrastructure

Road transport is the most widespread and most accessible to the population. It is very maneuverable, fast, easily adaptable, less dependent on weather conditions, but due to the high fuel consumption it is also a big polluter [6], inconvenient and unprofitable over long distances.

One of the main problems of road transport is the poor condition of the road infrastructure [7]. According to the current "Methodology for measuring and assessing damage to road surfaces" over 50% of pavements on national roads are rated as "medium" (10% to 30% of damage) and "bad" (over 30%), which, along with the unfinished highway network, leading to the failure to provide high-speed and quality connections between the main settlements of the country and neighboring countries, is one of the reasons and important condition for our not very successful integration into the European transport area. The national road network includes motorways and first, second and third class roads, which provide transport connections of national importance. Local roads include municipal and private roads open to the public, providing transport links of local importance. The development of the road infrastructure of Bulgaria can be considered as a priority in several directions:

- development of the national road network in the directions of the five trans-European transport corridors passing through the country;
- development of the road network connecting the Black Sea and Danube ports with the main road routes of the country;
- development of the road infrastructure in the border territories of the country;
- development of road infrastructure in places where there is no other mode of transport.

According to NSI data, the total length of highways in operation by 2020 is 806 km. Although about 33% of the newly built highways (265 km) have been built in the last 10 years, the pace of their construction is slow. Of the nearly 1,500 km of highways planned, just over half have been built so far. By 2020, Bulgaria ranks among the lagging countries in the degree of completion of the main road network (TEN-T) by EU member states - a share of less than 55%.

The Struma Motorway, connecting Sofia and the Kulata border checkpoint, is 80% complete. It is expected to be ready by the end of 2023-2025. Currently, the construction of two sections is underway – the railway tunnel and Blagoevgrad – Krupnik. The construction of the section through the Kresna Gorge is problematic, as it is a protected area under Natura 2000.

The Black Sea Motorway, connecting the two largest Black Sea centers – Burgas and Varna, is rather in the planning stage, as only 8 of the planned 103 km have been completed. Its construction is expected to begin after 2025.

Priority for Bulgaria is the completion of the Europe Motorway (A6), which is the connection between Sofia through the Kalotina border checkpoint to Nis via Pirot. The Europe Motorway is part of the E20 international road and is crucial for our economic and trade relations not only with our western neighbor, but also with other European countries. On the territory of Serbia, the motorway (A4) is completed, and on the territory of Bulgaria a little more than half of the 63 km planned for construction are in operation. The section from Dragoman to the Kalotina border checkpoint is to be completed and the construction of the section from the village of Mramor to Bozhurishte will begin.

It would be important for the country to build a highway in the section Ruse - Veliko Tarnovo, which is currently under construction.

According to NSI data, the total length of roads in Bulgaria as of 31.12.2020 is 19,917 km.

Of these, only 4.1% are motorways and 14.5% are first-class roads. The third-class roads have the largest relative share of 61.3%. The development of the road network is in the direction of increasing its total length. For the period 2010-2019 it has increased by 461 km.

The distribution of highways and first-class roads is uneven throughout the country. The East-West roads are better developed than those in the North-South direction, which is determined by the relief of the country. The density of the road network is the lowest in the South-West and the South-East region, but both regions have a well-developed high-class road network. In the opposite position is the North Central region, which has the highest overall road network density due to a well-developed regional network, but still lacks fully completed motorways. In the North-West region the low construction is mainly due to an underdeveloped high-class road network, and in the South-East region the regional road network is underdeveloped. The south-central region has the lowest construction of the first-class road network of all regions. This is to some extent compensated by the construction of the highway in its northern part, but the predominant territory is served only by the regional road network. The districts of Blagoevgrad, Burgas, Sliven, Montana and Pazardzhik have the lowest density of the road network.

The number of cars in the country is growing by about 100,000 on an annual basis. Thus, in 2011 there were just over 3,4 million cars, and in 2019 – 3,8 million. As the number of motor vehicles increases, the intensity of road traffic increases, as does the risk of road accidents. Bulgaria is among the leaders in the negative ranking for the most victims on the road – 89 people per 1 million populations. For 2019, only Romania has a higher value – 96 people. The only two highways that are fully completed and in operation are the Trakia Motorway (Sofia – Plovdiv – Stara Zagora – Yambol – Burgas) and the Maritsa Motorway (Chirpan / Trakia Motorway – Haskovo / Dimitrovgrad – Kapitan Andreevo Border Checkpoint), respectively with a length of 360 km and 117 km. Hemus Motorway, connecting Sofia, Veliko Tarnovo, Shumen and Varna, is under construction and has been completed at just over 40% so far. It is expected to be completed in 2025-2030.

2.3. Port infrastructure and inland waterways

Water transport is the cheapest mode of transport and most fully meets environmental requirements, which is why it accounts for the largest share of transported goods both globally and in European and national terms. For Bulgaria, the efficiency of water transport and ports can be defined as one of the primary factors for the competitiveness of the Bulgarian economy, as 2/3 of international trade in physical volumes is served by water transport.

Water transport provides significant opportunities to increase efficiency and improve environmental performance. The importance of maritime spaces for the socio-economic development of Europe requires that the objectives of our transport policy be aligned with those of the Community's integrated maritime policy. In recent years, new systems have been set up to improve shipping conditions on the Black Sea and the Danube. The country's goal is to increase traffic for freight and passengers. Today the main river ports are 8 and belong to two port complexes - Ruse, Lom, Svishtov, Silistra, Vidin, Somovit, Oryahovo, Tutrakan. There

are other smaller ports.

2.4. Air Transport

In recent years, and especially after Bulgaria's accession to the EU, the air market for passenger transport has been experiencing a special growth rate, which is mainly due to tourism and business development. The high demand is borne mainly by the country's international airports in Sofia, Varna and Burgas. This trend continued until 2020, when the COVID-19 pandemic limited global travel.

As a result of the purposeful investment policy in recent years, the country's fleet is rapidly being renewed and Bulgarian air carriers are constantly increasing their competitiveness. Its advantages are: very high speeds, high maneuverability, air routes are shorter, not so much investment is needed (because there are no costs for road construction) and more.

Air transport does not encounter physical barriers caused by the peculiarities of the terrain, which makes it the only option for reaching remote and inaccessible locations. Air transport remains the safest transport (according to a study by the United States Department of Transportation). Negative features include the higher cost of transport, the need to use additional vehicles to the starting and ending point, a very serious investment in the construction and maintenance of airports and the existing fleet, strong dependence on climatic and meteorological conditions. In 2019, the winner was chosen for the concession of the largest Bulgarian airport – Sofia Airport, which in mid-July 2020 received permission to change the contract, due to the significantly changed situation and the need to take actions to mitigate the effects of the COVID-19 pandemic.

2.5. Pipeline transport

It serves for the transport of liquid, gaseous and powdered cargo - oil, petroleum products and natural gas, in the country's network, as well as for transit exports to Turkey, Macedonia and Greece. Its advantages are: it is organized on much shorter roads, transport is automated, relatively lower fuel costs and therefore cheaper, and the disadvantages include: low speed of movement of goods, can not be organized in small cargo flows.

The development of this type of transport is predominantly associated with the expansion and diversification of the gas transmission network. The total length of the existing gas transmission network as of 31.12.2020 is 3 276 km, with 11 compressor stations, 8 cross-border entry-exit points and 1 connection point with a storage facility (Chiren gas storage). In previous years, there were ideas for two large but unrealized natural gas transmission projects – the Nabucco project – to transport Azerbaijani natural gas from Turkey's Eastern border to Austria via Bulgaria, Romania and Hungary, which would reduce our dependence on Russia, and the South Stream (offshore gas pipeline) project to transport gas from Russia through Turkey to Bulgaria, Serbia, Hungary and Slovenia. Finally, the new Balkan Stream gas pipeline, which is a continuation of the Turkish Stream and starts from the border with Turkey (Strandzha / Makoclar) to the one with Serbia (Kirevo / Zajcar), is currently in operation. Criticism of the Balkan Stream is related to the country's lack of energy independence, on the contrary – Russia's trade in natural gas in Europe is intensifying, and the pipeline itself has no deviation

to Bulgarian municipalities along its route (not as an impossibility, but as a long-term reserved volume by foreign companies).

Real diversification of natural gas supplies would take place upon the final completion of the Greece-Bulgaria gas interconnection, which began in 2009. The pipeline should connect the Greek national gas transmission system in the area of Komotini with the Bulgarian one in the area of Stara Zagora. The planned length of the gas pipeline is 182 km and with a design supply capacity of up to 3 billion m³ per year. The project is extremely important in terms of increasing security of supply and ensuring diversification of gas supplies to Bulgaria and the region of Southeast Europe. It is financially secured with national and European funds, but remains unfinished to this day. This project is the only one that would ensure partial energy independence from Russia in the medium term and has the potential to reduce the prices of natural gas supplied directly by Azerbaijan.

3. Perspectives and challenges for the transport sector – analysis and results

3.1. Strengths:

The integration of the Bulgarian transport system into the European one has several positive dimensions:

- improvement and development of the infrastructure connections and achievement of interoperability, attraction of international traffic through the country and increase of the competitiveness of the Bulgarian transport companies;
- favorable geographical position, enabling transit traffic along the five trans-European transport corridors passing through Bulgaria.

3.2. Weaknesses:

- for all modes of transport the problems are related to the outdated material base, which leads to inefficiency, lack of competitiveness, inability to integrate into the common European transport system, excessive pollution, etc .;
- the highways in Bulgaria have low quality, the highway network is not completed, the railways do not allow traffic at higher speeds, waterways are not fully used. Therefore, in combination with the development of transport in our neighboring countries, international traffic is directed, if possible, so as to avoid our territory;
- despite the favorable geographical position and the lack of significant natural obstacles, our country still cannot extract assets from the development of transport;
- unequal distribution of the length of the road and the railway network on the territory of the country, which makes the access to transport services limited for a part of the population of the country. There is a lack of continuous, consistent and permanent transport networks to ensure fast and safe movement over longer distances;
- weak intermodality of transport. Lack of specialized port and railway terminals, providing

adequate capacity, highly efficient and competitive operation.

3.3. Opportunities:

- the integration of Bulgaria in the European structures provides the opportunity for construction, modernization and development of part of our transport infrastructure with much lower costs for the country;
- five of the ten trans-European corridors cross Bulgaria, which is an opportunity for it to benefit from its favorable geostrategic position. This makes them extremely important for the development of transport infrastructure and for its overall socio-economic growth;
- efficient intermodal transport, supported by new and improved terminals, has the opportunity to provide significant economic benefits and increase Bulgaria's trade participation in the EU;
- reducing the growth rate of road freight traffic by providing additional incentives for the use of rail and water transport through improved intermodal facilities.

3.4. Threats:

- despite the widespread accelerated construction of roads, especially motorways, it must be borne in mind that the main funding comes from European Union schemes. It is necessary to speed up the work so that Bulgaria can take full advantage of the opportunities provided to it for funding from EU funds;
- focusing on the development of international transport and neglecting the needs at national and intra-regional level;
- increase of the negative impact on the environment and climate change from the transport activity;
- lack of motorway connections between the main cities and the border checkpoints.

4. Conclusion

The analysis of the transport infrastructure of Bulgaria and its use shows that the main problems are related to the change in the geopolitical situation, the redistribution of freight flows, the reorganization of routes. The many possibilities for modelling transport subsystems provide the state with a powerful tool for influencing economic and social life, as well as regional development - a key element of European Union policy. The transport system is expected to breathe life into lagging regions and make them suitable for business development and attracting investment. That is why the main priorities for the development of transport, set in the National Strategy for the period after 2020, are: achieving economic efficiency; development of a sustainable transport sector; improving regional and social development and cohesion.

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