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# HOW PASSENGER TRANSPORT IS DEVELOPING IN BULGARIA IN THE CONDITIONS OF A DYNAMIC CHANGING ENVIRONMENT?

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# HOW PASSENGER TRANSPORT IS DEVELOPING IN BULGARIA IN THE CONDITIONS OF A DYNAMIC CHANGING ENVIRONMENT?

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*Abstract*: The current study seeks to establish the preferences of Bulgarians through exploring how passenger transport in Bulgaria developed from 2012 to 2022. On a theoretical level, the characteristics of this sector are described, such as types of passenger transport vehicles. The research interest is aimed at tracking the dynamics behind all the options for passenger carriage forming the supply of the transport market in Bulgaria: by rail, bus, air, water, and urban electric transport. To achieve this objective, the parameters of activity in the passenger transport segment are used as the main measures – number of passengers, passenger-kilometres and average distance travelled. During the studied period, passenger transport in Bulgaria developed at variable rates and was influenced by environmental factors. The mode of transport most affected by the pandemic in 2020–2021 was by air. A decrease in the total number of passengers and overall performance for 2022 compared to 2012 can be observed. This decline is due to a decrease in bus and rail transport indicators. The study has established that Bulgarians prefer traveling by bus to other public transport alternatives. Although the absolute number of vehicles has decreased in this segment, it has the largest relative share according to the indicators of transported passengers and performed work as part of the total transport activity in the country.

In a practical respect, attention is focused on modern solutions related to information and communication technologies, as well as some opportunities to attract more public transport passengers. The author also draws attention to some EU initiatives in the field of air and maritime transport concerning Union-wide energy policy.

*Key words*: carriage; passengers; transport

*JEL codes*: L91; O18

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## Introduction

Passenger transport is not only of economic importance; it is related to all spheres of life and, apart from adding value, it should also be accessible to everyone. The ideal organization of transport processes would ensure people's constitutional right to work, to visit cultural, natural, and historical sights, to organize their recreation, and to participate in events of a political, scientific, creative, educational, commercial, or other nature. Therefore, the free flow of movement is of particular importance both for individuals and organizations which also determines the important role of individual types of transport in the implementation of these movements.

The aim of the current study is to examine some theoretical propositions related to the characteristic features of passenger transport and, based on an analysis of the state of this market segment in Bulgaria, to present some opportunities for its development.

The research object is passenger transport in Bulgaria, which is carried out through various modes (by rail, bus, air, water, and urban electric transport), and the subject of research interest is its condition during the period 2012–2022. This study focuses on changes in the development of individual types of transport based on demand indicators for transport services (passengers carried, transport performance, and average transport distance) in Bulgaria.

The defined period is limited because a number of important economic, geopolitical, technological, social, and health-related events could be observed during those years. These greatly have affected the development of the entire transport market, including passenger carriage.

We mainly associate the limitations that have accompanied the sector's development with the impossibility to conduct research based on the most up-to-date empirical information, which we believe does not affect the quality of our findings, since the relevance of the topic does allow for studies of a theoretical and applied nature. Another limiting condition which should be mentioned is the lack of data on personal car trips. This does not allow for an accurate assessment of the total volume of passenger transport, only as an aspect of public transport.

## 1. Characteristics and types of passenger transport

The markets in which passenger transport is sought and offered have their own characteristics, associated in the first place with the participants in the transportation market: users of transportation services, who form the demand; companies that offer carriage; companies providing access to the transportation infrastructure for which they receive income in the form of fees; and the state, through the government, which

directly or indirectly regulates the functioning of the transport market and the transport infrastructure market.

Different transport alternatives create and offer people the conditions for carrying out their own movement from the starting point to the final destination, which are fundamentally different from those inherent in material flows. Transportation as one of the key functions in logistics is associated "with the physical movement of materials between individual units in the supply chain" (Waters, 2003, p. 439), as well as through the help of means of transport using a certain technology, and it should be added that transport services also include "moving people from one place to another" (Tsankov et al., 1995) in their role as passengers.

The definition of passenger transport implies that it can be differentiated depending on the transport alternatives and reduced to the specific provision of a basic service, defined as any movement of passengers: by train within a given railway network; in a road vehicle on a given road network; via vessels on navigable waterways through which a journey is made in whole or in part; on merchant ships where voyages are carried out wholly or partly by sea; or via aircraft.

Transportation carried out by each type of passenger transport can be considered independently:

A. In general, the advantages of passenger road transport can be summarized into the following more important ones: greater convenience, better service, and improved culture, security, and comfort (Parvanov, 2004). With regard to passenger road transport, there is a certain specificity, as it is carried out in two main directions:

- Passenger carriage in cars. What is characteristic to private car transport is that they do not generate added value in a purely economic sense, but their ease of use generates the satisfaction of personal transport needs for individual people (Nikolova, 2018).
- Passenger carriage on buses. One characteristic of bus transport is its relative ease to develop, and no large capital investments are required, for example, complex road facilities, charging networks, or power supply devices (Gutovski, 2018). Its most important advantages are the great manoeuvrability and wide range of passenger capacity in the rolling stock (Gutovski, 2021).

Additionally, these modes of transport can be classified into urban and extra-urban, and it is possible to use a complex of different characteristics, including the average trip duration, frequency of trips, type of passengers as differentiated by gender, age, and social status, and the purpose of trips (for the purpose of recreation or for the purpose of work), etc. That is, passenger transport by road can be differentiated as:

- passenger transport according to the average duration of journeys in an urban environment (the length of journeys in an urban environment depends on city size) or in a non-urban environment (short journeys, medium-term journeys, and long journeys).
- passenger transport by frequency of trips (once a day, twice a day or more, once a week, twice a week or more, once a month, twice a month or more, other).
- passenger transport by age group (children, adults of working age, pensioners, mixed).
- passenger transport by gender (men, women, mixed, other).
- passenger transport according to the income of passengers (with minimum, average, or above average incomes).
- passenger transport according to the educational status of passengers (students and non-students).
- passenger transport for the purpose of work or for the purpose of recreation and rest.
- other.

The characteristics of public urban transport are associated with the need to ensure the mobility of citizens in populated areas on a regular schedule and route. The composition of urban electrical transport includes the carriage of passengers by trolleybuses, electric buses, trams, and metro. Most of these vehicles are characterized by a low degree of flexibility, caused by the need for a purpose-built infrastructure equipped with an electric current to power the vehicles (Zhelyazkova, 2018). This disadvantage has been overcome by the introduction of electric buses.

The passengers served by urban transport, including via electric vehicles, can be classified according to various criteria, one of the main ones being the ticket price of the transport service. Of course, criteria such as regularity of travel, age, or belonging to a certain group of the population (students, workers, pensioners, etc.) can be added.

- Depending on the transport document, passengers can be distinguished into passengers with paper tickets, e-tickets purchased from a website or mobile application, non-regular passenger tickets, electronic subscription cards, or electronic prepaid cards.
- According to the financial conditions when purchasing a travel document, passengers can be grouped into: free travellers, travellers who use discounts,

and travellers who pay the regular price for transport services.

B. Another possibility for passenger carriage over land is provided by railway transport, which covers not only medium and long distances but also mass passenger flows via short distances in suburban areas (Parvanov & Boeva, 2006).

Train journeys have different characteristics. According to tariff conditions and groups of passengers, trips can be reduced to the following classes: 1st class, 2nd class, and 3rd class. In turn, all passengers traveling in each class can be differentiated by: those using a regular fare; those traveling at relational prices; those traveling with a discount for the elderly, students, or pupils; and those traveling with a commercial offer. Passenger trips by rail can also be international, national, regional, or suburban, as well as carrying express, fast, or passenger trains.

C. Passenger air travel has the advantage of carrying out transport processes in the fastest possible way. In modern conditions, a feature of this market is the competition between low-cost and traditional carriers. According to M. Stojanov, "The service offered by low-cost airlines in its main essence does not differ significantly from that of traditional airlines (FSNC, full service network carriers). It was created by 'reengineering around the main benefits, which reveals easy price discrimination' in order to exploit the market potential missed due to the traditional airlines' 'business myopia' by stimulating the growth of the market via 'horizontal product differentiation'" (Stojanov, 2015).

In air transport, the classification of passenger transport follows the same logic applied to rail transport; the criteria by which it is carried out are the type of flight, class of travel, and type of airline.

- According to the type of flight: international flights, domestic flights, scheduled flights, and charter flights.
- According to the class of travel: business class and economy class.
- According to the type of airline: regular and low-cost airlines.

A more detailed classification of passenger transport can be made by introducing a number of other criteria related to the average duration of trips in an international environment, the type of aircraft, the frequency of trips, etc.

D. Passenger transport via waterways is carried out by passenger ships intended for the transport of passengers and their luggage, as well as for leisure and tourist trips. Both sea and river transport have lost their importance for passenger transport over the years due to the development, above all, of passenger aviation (Kudryavtseva, 2008).

Sea and river passenger transport can be classified according to criteria similar those used for air transport.

Depending upon the scope, travel by water can be considered as:

- international sea and river passenger transport;
- inland sea and river passenger transport.

With regard to regularity, it can be considered as:

- passenger transport on regular lines;
- passenger transport on routes outside the usual regular lines.

The following types of transport offers are arranged:

- Carriage of passengers with a standard offer, which usually includes accommodation in the selected type of cabin for the entire period, port charges at all points along the route, full-board meals, daily cleaning of cabins, daytime and evening entertainment on board the ship, and the use of outdoor pools, deck chairs, outdoor hot tubs, beach towels, a fitness centre, sports courts, and group sports activities.
- Passenger transport with an offer including luxury cabins and additional services.

Passenger transport implies the performance of a wide range of additional services that directly or indirectly correspond to passenger service. They are related to the boarding and disembarking of passengers (welcoming and sending off), managing the movement of luggage, and providing services during the trip such as tourist information, catering, sanitary and hygiene services, etc.

When carrying out passenger transport, there are a number of features that relate to ensuring a safe, accident-free, and comfortable journey which will satisfy client expectations while observing a balance between the price and quality of the transport service offered. In response to these requirements, vehicles operated for the purpose of passenger transport shall be constructed in accordance with the norms for the protection of human life and health.

Strict compliance with all requirements for organizing passenger carriage is of particular relevance for people's security and safety, which is important given the interest in these modes of travel registered on the transport market.

A special type of transport offered in the segment of road passenger transport is bus transport. By definition, buses are vehicles which, due to their construction and equipment, are suitable for the transport of more than nine people, including the driver, and are intended for this purpose. Safety requirements apply to both vehicles and their drivers – including the technical condition of the vehicle and compliance with regulations for safe driving.

In railway transport, there are also systematized requirements regarding passenger cars, which concern both their technical condition and satisfaction of passengers' needs. Such requirements are observed in terms of seating and interior furnishings, sanitary facilities, plumbing, etc. Additionally, the materials from which the interior furnishings of the wagons are made (surfaces, flooring, upholstery, etc.) must meet modern standards for non-flammability, which is proven by a certificate.

For the convenience of passengers, special types of wagons are integrated into the train such as dining cars and sleeping cars.

According to the Law on Civil Aviation, "An aircraft is any means of support in the atmosphere due to the reaction of the air, other than the reaction of the air from the earth's surface" (Law on Civil Aviation, 2023).

Regulations on passenger aircraft equipment place special emphasis on safety, due to the psychological barriers that many passengers face, even though air transport is in fact one of the safest modes of travel.

Before take-off, passengers must be made aware of the location of seat belts, emergency exits, emergency instruction cards, life jackets, oxygen supply equipment, life rafts, and other emergency equipment provided for individual use.

Airplanes are also equipped with a seat or recliner for each person on board over the age of 2, a seat belt for each passenger seat, safety belts for each reclining bed, and child restraints for those under 2 – a safety belt with a diagonal shoulder strap – all as a means of restraining an occupant's body in the event of sudden deceleration, etc. (European Aviation Safety Agency, 2012).

The safety requirements in water transport are similar. There should be suitable personal life-saving equipment on board the ship to accommodate all the adult and child passengers. Necessary rescue accessories such as lifebuoys, life jackets, lifeboats, etc. are provided.

Therefore, each mode of passenger carriage offers transport conditions in harmony with the criteria of security, safety, and comfort of passengers.

In order to complete the present study, the parameters of activity in the passenger transport segment were used as the main measures – number of passengers, passenger-kilometres, and average distance travelled. The number of transported passengers expresses the static volume of passenger transport, i.e., regardless of distance. The main quantitative indicator of passenger carriage is the transport activity carried out, expressed in passenger-kilometres (Bakalova, Nikolova, 2010), obtained as a product of the number of passengers transported by the distance travelled (Nikolova, 2018).

The passenger-kilometre (pkm) is a unit of measure indicating:

- in rail transport, the transportation of one passenger by rail over a distance of one kilometre,
- in road transport, the road transport of one passenger over a distance of one kilometre,
- in water transport, the movement of one passenger for inland journeys per kilometre or the movement of one passenger on a commercial vessel per kilometre,
- in air transport, the carriage of one passenger over a distance of one kilometre.

The distance taken into account for all transport options is the distance actually travelled by the passenger.

These indicators can be supplemented with available passenger-kilometres, completed passenger-kilometres, use of passenger capacity, density and seasonality of passenger transport, mobility of the population, etc., as well as systematized by types of transport, with a view to account for the characteristics of the activity carried out. For example, in air transport and inland waterway transport, the available seats per passenger-kilometre are used; in air transport, the total number of sellable passenger seats available on the aircraft serving a flight leg between a pair of airports is also measured.

It is also possible to study indicators of the quality of the transport services provided to passengers, such as: safety, speed of transport, regularity, comfort, continuity, accurate execution of the traffic schedule, high frequency of transport, service culture, etc. (Persianova, 2014).

## 2. Study of the state of passenger transport in the Republic of Bulgaria during the 2012 – 2022 period

The state of passenger transport is an adequate indicator measuring the mobility of the population, which largely depends on many economic, social, natural, geopolitical, technological, and other factors. During the pandemic, we witnessed a number of atypical situations that blocked the standard dimensions of economic and social activity as much as they activated the search for creative solutions. It is precisely such anomalies in public life that provoke interest in the study of passenger transport with a view to tracking its development in dynamics and ascertaining the impact of the main factors on the registered results.

From a structural point of view, we can note that no significant changes were observed

in this market during the studied period, with the exception of a serious drop in the relative share of transported passengers and the air transport carried out during the pandemic years of 2020 (10.292%) and 2021 (16.240%) (see Table 1).

The changes in values reported by the sector vary within quite narrow limits, and this is a sign of stability in terms of the supply–demand sides of transport services in the passenger carriage segment.

Table 1. Relative share by transport type in total passengers and activities carried out in the transport sector of the Republic of Bulgaria in 2012 – 2022 (%)

| Metrics | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Passengers carried by rail transport | 3.490 | 3.598 | 3.482 | 3.150 | 2.992 | 2.833 | 2.957 | 2.887 | 3.280 | 3.428 | 3.890 |
| Performance by rail transport | 10.727 | 10.580 | 9.333 | 8.384 | 7.812 | 8.434 | 8.706 | 8.461 | 14.118 | 14.114 | 11.728 |
| Passengers carried by bus transport | 58.576 | 58.889 | 60.174 | 61.834 | 62.481 | 59.497 | 58.556 | 60.367 | 58.923 | 58.072 | 54.843 |
| Performance by bus transport | 59.935 | 59.782 | 62.760 | 66.207 | 65.424 | 61.914 | 58.179 | 60.171 | 63.545 | 57.999 | 49.297 |
| Passengers carried by air transport | 0.291 | 0.313 | 0.336 | 0.313 | 0.326 | 0.294 | 0.342 | 0.364 | 0.115 | 0.121 | 0.408 |
| Performance by air transport | 20.173 | 21.660 | 22.057 | 19.683 | 20.731 | 21.338 | 24.717 | 23.511 | 10.292 | 16.240 | 29.714 |
| Passengers carried by water transport | 0.026 | 0.020 | 0.013 | 0.016 | 0.017 | 0.015 | 0.016 | 0.014 | 0.018 | 0.030 | 0.036 |
| Performance by water transport | 0.017 | 0.012 | 0.011 | 0.011 | 0.027 | 0.029 | 0.024 | 0.056 | 0.076 | 0.070 | 0.066 |
| Passengers carried by urban electric transport | 37.617 | 37.181 | 35.995 | 34.687 | 34.184 | 37.362 | 38.129 | 36.368 | 37.663 | 38.349 | 40.824 |
| Performance by urban electric transport | 9.149 | 7.967 | 5.839 | 5.715 | 6.007 | 8.284 | 8.374 | 7.802 | 11.970 | 11.576 | 9.195 |

*Source:* Author's calculations based on a database from the National Statistical Institute of the Republic of Bulgaria.

We cannot ignore the dominant position of bus transport, the most preferred by Bulgarian citizens for some time now. This is a reasonable result given its greater flexibility and adaptability to people's needs. In the future, some restructuring can be expected, for which there are indications in 2022, given the achievement of the lowest relative share of bus transport in terms of passengers transported (54.843%) and work performed (49.297%) within the period studied. One of the reasons can be linked to the fact that traveling in relatively small spaces and with a significant number of passengers is a favourable environment for the spread of a number of diseases, which has become a factor when choosing transport options, given higher levels of awareness considering the recent health crisis. In modern vehicles, if a social distance of 1.5 m is required, this means that no more than 50% of the vehicles' capacity will be in use. These operational features reduce the efficiency of bus transport and will inevitably be reflected in ticket prices, which will reduce consumer interest in this type of transport.

From a public health standpoint, the safest option for the movement of passengers is the use of personal motor vehicles, as it allows for the maximum degree of isolation from the environment, but we should note that not everyone has real opportunities to benefit from this option from a financial point of view.

We should also emphasize the role played by air operators in the passenger transport market. Air carriers have a very high relative share (24.717% in 2018), which is a consequence of passengers' interest in more distant tourist and business destinations. To a significant extent, the concept of low-budget transport services and the intensive entry of new companies into this market have contributed to the sector's development. These events have significantly contributed to widening supply limits, reducing ticket prices, and increasing passenger demand as a result.

During the pandemic period, air transport reported the biggest declines, registering record low levels of 10.292% of the total volume of work carried out by Bulgaria's transportation network: the decline in 2020 compared to the peak in 2018 amounted to 14.425%. A favourable turn was not long delayed, however, and already by 2021 air transport had reached 16.240% for this indicator, and the highest relative shares according to this indicator for 2022 represented 29.714%.

At the same time, under the changed reality of the pandemic, rail transport turns out to have profited quite well from the crisis: the relative share of work performed in the total transport activity of the sector in just one year increased from 8.461% (2019) to 14.118% (2020). The reasons for these results are clear, as railway travel more readily allows for social distancing and is more cost effective than transport by private

motor vehicles over relatively long distances. Unfortunately, passengers' interest in rail transport was not preserved, and the relative shares of this indicator have been gradually approaching the values recorded at the beginning of the period.

The Bulgarian market for passenger transport covers all possible transport alternatives: rail, road, air, waterways, and urban electric transport, with the most important domestic options being bus transport; on the international market – by air.

The dynamics of the demand for passenger carriage for all modes of transport are represented by the indicators of transported passengers and work performed, which are the main indicators in the transport sector and are the basis on which we calculated the average transport distance.

Rail transport has grown to become a popular choice among Bulgarian citizens over the years (see Table 2, Figures 1 and 2).

Table 2. Development of railway passenger transport in Bulgaria, 2012 – 2022

| Years | Passengers carried | Absolute change of passengers carried | Growth rate (increase or decrease) (%) | Index (%) | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | thousands | 2012=100 | chained | 2012=100 | chained | 2012=100 | chained |
| 2012 | 26,523.2 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2013 | 26,071.5 | -451.7 | -451.7 | -1.703 | -1.703 | 98.297 | 98.297 |
| 2014 | 24,627.3 | -1,895.9 | -1,444.2 | -7.148 | -5.539 | 92.852 | 94.461 |
| 2015 | 22,526.3 | -3,996.9 | -2,101.0 | -15.069 | -8.531 | 84.931 | 91.469 |
| 2016 | 21,433.6 | -5,089.6 | -1,092.7 | -19.189 | -4.851 | 80.811 | 95.149 |
| 2017 | 21,203.2 | -5,320.0 | -230.4 | -20.058 | -1.075 | 79.942 | 98.925 |
| 2018 | 21,337.7 | -5,185.5 | 134.5 | -19.551 | 0.634 | 80.449 | 100.634 |
| 2019 | 21,339.5 | -5,183.7 | 1.8 | -19.544 | 0.008 | 80.456 | 100.008 |
| 2020 | 16,810.4 | -9,712.8 | -4,529.1 | -36.620 | -21.224 | 63.380 | 78.776 |
| 2021 | 17,147.2 | -9,376.0 | 336.8 | -35.350 | 2.004 | 64.650 | 102.004 |
| 2022 | 23,074.4 | -3,448.8 | 5,927.2 | -13.003 | 34.567 | 86.997 | 134.567 |

*Source:* Author's calculations based on a database from the National Statistical Institute of the Republic of Bulgaria.

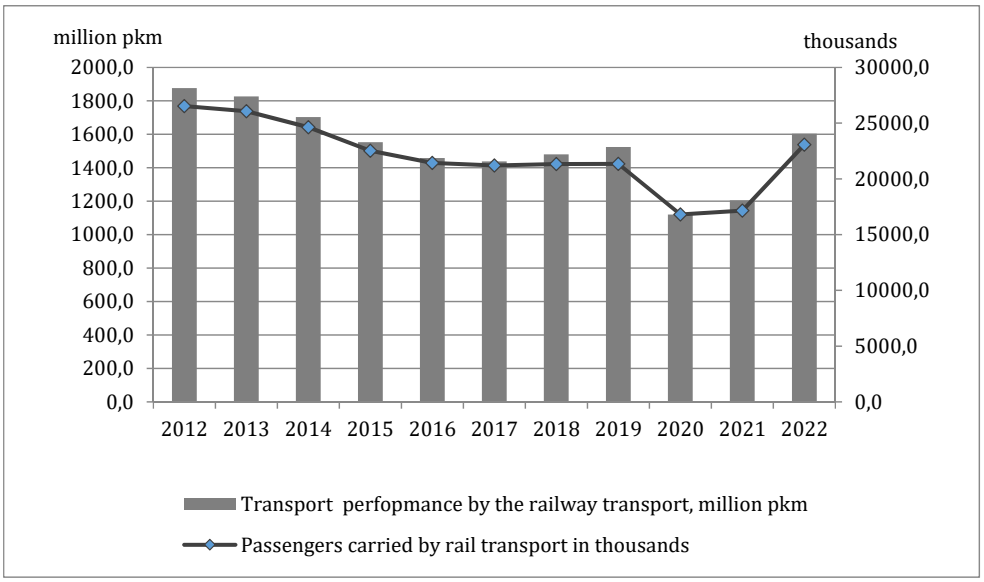



Figure 1. Development of railway passenger transport in Bulgaria, 2012 – 2022

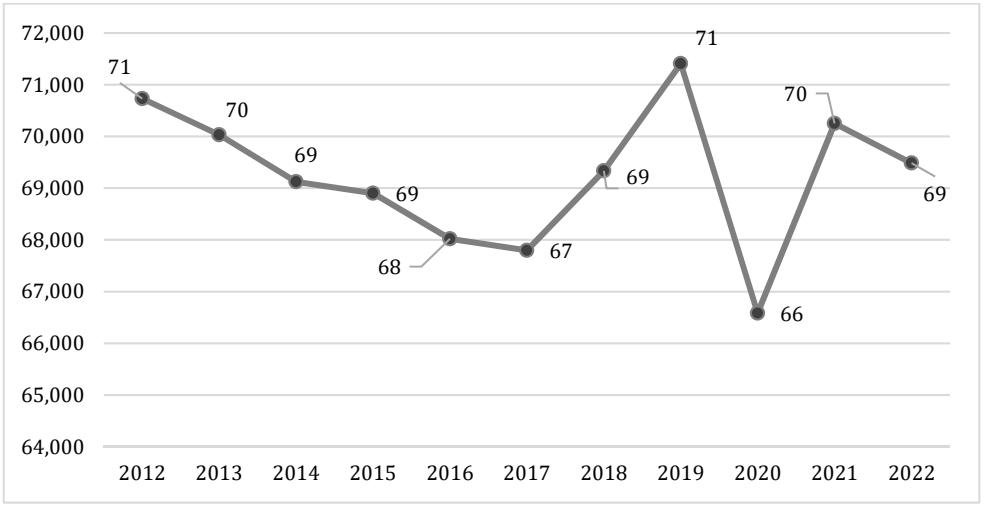



Figure 2. Changes in average transport distance (passenger-kilometres) by railway in Bulgaria, 2012 – 2022

The curve reflecting the movement of the indicators of transported passengers and work performed shows a downward trend over the entire studied period until 2021, with a particularly sharp decline in the registered results for both indicators in 2020 when they

reached their lowest levels. There was growth in 2022 on a chain basis, though not yet reaching base year (2012) levels. The reasons for this may be the lack of connection between the quality of service and the subsidy that rail receives on a per train/ per kilometre basis or competition from bus services, which attract passengers with greater route flexibility and comfort, although the data do not confirm this. Transportation by private cars may also be an important factor, but the lack of information does not allow for such a hypothesis to be confirmed or rejected.

A similar trend is outlined by the average transport distance, which reports movement within the limits of 71 km (2019) and 66 km (2020). The results of this indicator are relatively favourable compared to the reported kilometres travelled by the railways' main competitor in the passenger carriage segment, which is bus transport.

The development of passenger carriage via bus transport in Bulgaria from 2012 to 2022 shows that the average number of passengers who chose this option for travel was over 4 million people (see Table 3), which is about twenty times more compared than those who chose to travel by rail.

Table 3. Development of passenger transport by bus in Bulgaria, 2012–2022

| Years | Passengers carried | Absolute change of passengers carried | | Growth rate (increase or decrease) (%) | | Index (%) | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | thousands | 2012=100 | chained | 2012=100 | chained | 2012=100 | chained |
| 2012 | 445,131 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2013 | 426,763 | -18,368 | -18,368 | -4.126 | -4.126 | 95.874 | 95.874 |
| 2014 | 425,603 | -19,528 | -1,160 | -4.387 | -0.272 | 95.613 | 99.728 |
| 2015 | 442,244 | -2,887 | 16,641 | -0.649 | 3.910 | 99.351 | 103.910 |
| 2016 | 447,621 | 2,490 | 5,377 | 0.559 | 1.216 | 100.559 | 101.216 |
| 2017 | 445,332 | 201 | -2,289 | 0.045 | -0.511 | 100.045 | 99.489 |
| 2018 | 422,532 | -22,599 | -22,800 | -5.077 | -5.120 | 94.923 | 94.880 |
| 2019 | 446,185 | 1,054 | 23,653 | 0.237 | 5.598 | 100.237 | 105.598 |
| 2020 | 301,958 | -143,173 | -144,227 | -32.164 | -32.324 | 67.836 | 67.676 |
| 2021 | 290,467 | -154,664 | -11,491 | -34.746 | -3.805 | 65.254 | 96.195 |
| 2022 | 325,327 | -119,804 | 34,860 | -26.914 | 12.001 | 73.086 | 112.001 |

*Source:* Author's calculations based on a database from the National Statistical Institute of the Republic of Bulgaria.

The increased interest in buses is a result of the discounts offered due to serious competition in this market, as well as the entry of many operators who both perform full transport services and attract the attention of customers with combined travel packages. Over the years, we can observe that the most serious volumes of carriage were in 2015 and 2016, when the most passengers were transported (see Figure 3).

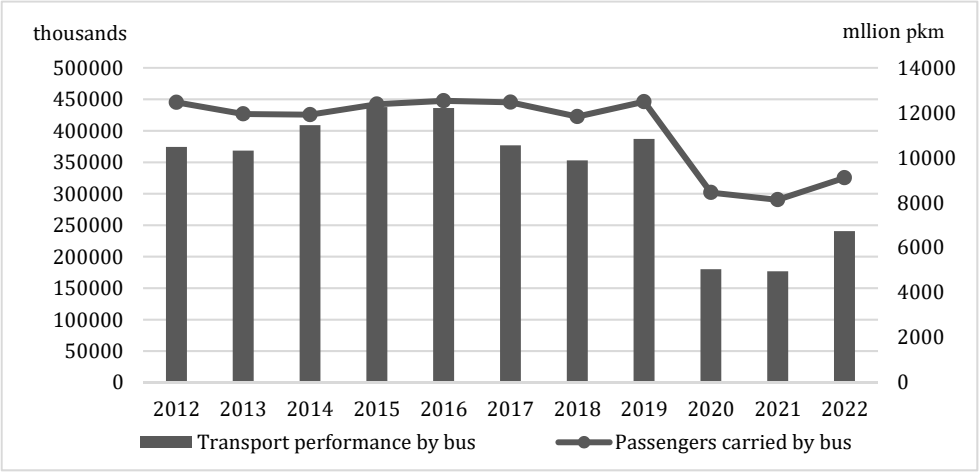



Figure 3. Development of passenger transport by bus in Bulgaria, 2012–2022

Throughout the researched period, especially in later years, certain fluctuations in the demand for bus passenger transport took place which transformed into a marked decline in 2020 and 2021, given the need to observe social distance – practically impossible in this mode of travel – and a noticeable general decrease in the dynamics of people's lives. The slowing down of daily life and the transition of a part of the able-bodied population to remote working has reduced labour migrations; fluctuations in organizing trips during employees' annual leave and around holidays also have a significant impact. The total change in lifestyle and the economic downturn as a result of not only the health crisis but also increased fuel costs, which have driven up the final prices of services and consumer goods, contribute to a reduced interest in travel among the population in recent years. Despite the significant decline of 26.914% in 2022 compared to 2012, as reported above, there was also a slow increase in passenger numbers compared to 2020.

In terms of the average transport distance, relatively short routes can be observed that cover the destination network of this transport option. Compared to the competitive opportunity offered by rail, buses travel shorter distances ranging from 17 km (2020) to 28 km (2015) (see Figure 4).

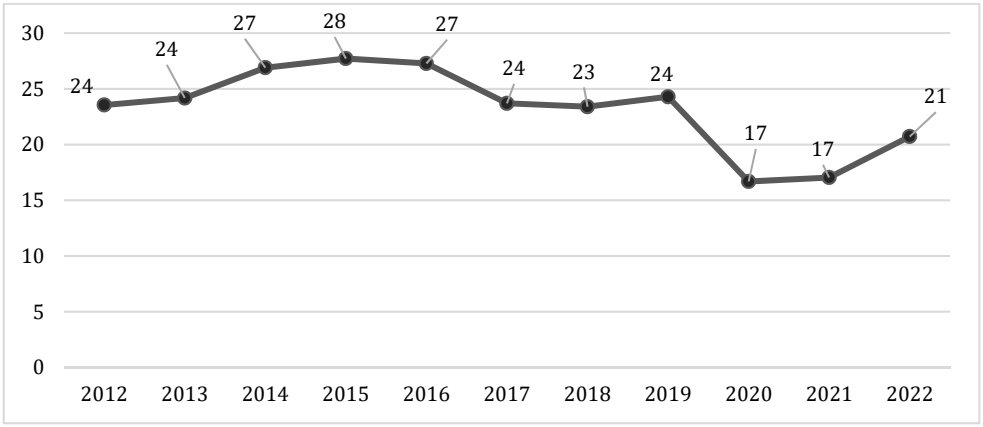
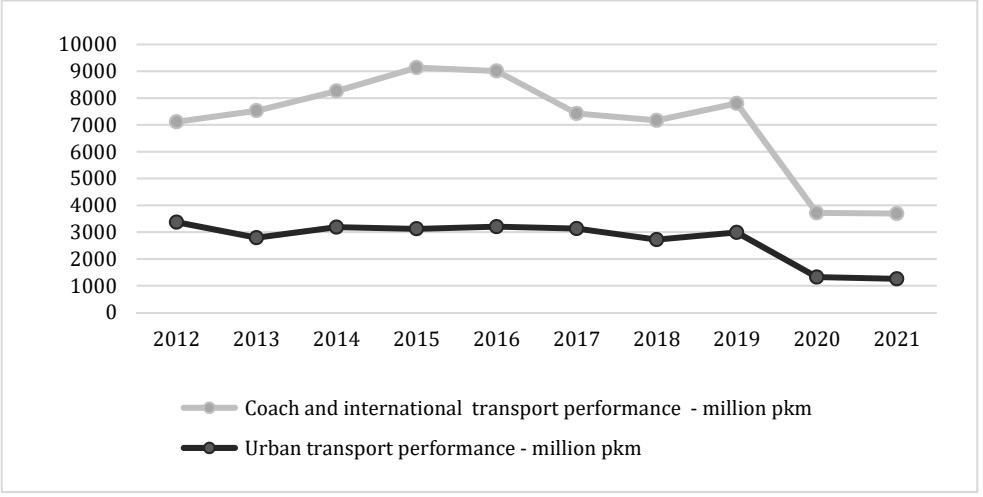



Figure 4. Changes in average transport distance (passenger-kilometres) by bus in Bulgaria, 2012–2022

The probable reasons for these results could be linked, on the one hand, to some bus lines being purposed to ensure movement in urban areas, to establish connections between smaller towns or villages, and to ensure their accessibility to regional centres; on the other hand, bus services form higher final ticket prices compared to train journeys based on distance travelled, which inevitably affects demand.

If we differentiate the data for coach and international passenger transport and urban passenger transport, we will notice a similar trend of development in the complex indicator of transport performance (see Figure 5).




*Source:* National Statistical Institute of the Republic of Bulgaria (2022).

Figure 5. Development of transport performance by coach and international passenger transport and urban passenger transport in Bulgaria, 2012–2021

More serious declines were recorded for coach and international passenger transport at the end of the studied period, as seen in the decreased number of passenger-kilometres (from 101 million in 2012 to 61 million in 2021) and the drop in average transport distance (from 70.1 km in 2012 to 60.5 km in 2021). Unfortunately, these indicators still lack data from the National Statistical Institute (NSI) for 2022, which does not allow us to determine current trends after the end of the health crisis.

There was a marked decrease in terms of transport performance in urban passenger carriage at the end of the period compared to its beginning, by more than two and a half times. This is linked to a simultaneous decrease in the number of passengers from 343,741 (2012) to 229,403 (2021) and in the average distance travelled from 8.6 km (2012) to 5.5 km (2021). These facts show that it is necessary for transport companies to consider scenarios with which to attract the population to public transport both for coach and urban transport.

Another important alternative for travellers is air transport, known as the most expensive transport option. In addition to its high cost, however, it also has the undeniable advantage of covering long distances the fastest. It is for this reason that we can observe a growth in demand during the studied period, ignoring the force majeure years of 2020 and 2021 (see Table 4, Figures 6 and 7).

Based on statistical data, a growth of 9.362% was reported in 2022 compared to 2012 in terms of transported passengers. This can mainly be traced back to the temporary closure of Varna Airport in 2012 in accordance with the concessionaire's investment program, as well as the continuous expansion of the airport's portfolio of destinations, whose main function in Bulgaria is to serve international passenger traffic to and from the country.

Table 4. Development of passenger transport by air in Bulgaria, 2012 – 2022

| Years | Passengers carried | Absolute change of passengers carried | | Growth rate (increase or decrease) (%) | | Index (%) | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | thousands | 2012=100 | chained | 2012=100 | chained | 2012=100 | chained |
| 2012 | 2,211 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2013 | 2,269 | 58 | 58 | 2.623 | 2.623 | 102.623 | 102.623 |
| 2014 | 2,375 | 164 | 106 | 7.417 | 4.672 | 107.417 | 104.672 |
| 2015 | 2,240 | 29 | -135 | 1.312 | -5.684 | 101.312 | 94.316 |
| 2016 | 2,337 | 126 | 97 | 5.699 | 4.330 | 105.699 | 104.330 |
| 2017 | 2,198 | -13 | -139 | -0.588 | -5.948 | 99.412 | 94.052 |
| 2018 | 2,470 | 259 | 272 | 11.714 | 12.375 | 111.714 | 112.375 |
| 2019 | 2,693 | 482 | 223 | 21.800 | 9.028 | 121.800 | 109.028 |
| 2020 | 591 | -1,620 | -2,102 | -73.270 | -78.054 | 26.730 | 21.946 |
| 2021 | 603 | -1,608 | 12 | -72.727 | 2.030 | 27.273 | 102.030 |
| 2022 | 2,418 | 207 | 1,815 | 9.362 | 300.995 | 109.362 | 400.995 |

*Source:* Author's calculations based on a database from the National Statistical Institute of the Republic of Bulgaria.

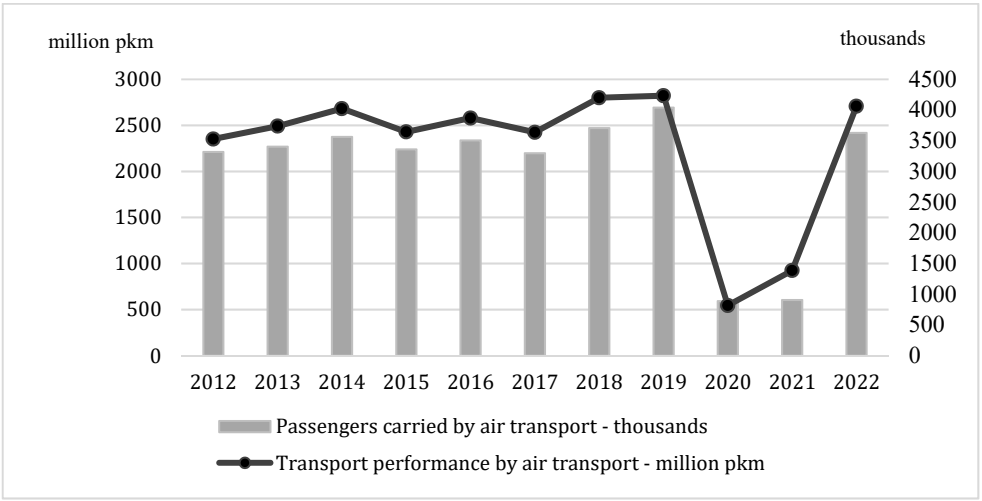



Figure 6. Development of passenger transport by air in Bulgaria, 2012 – 2022

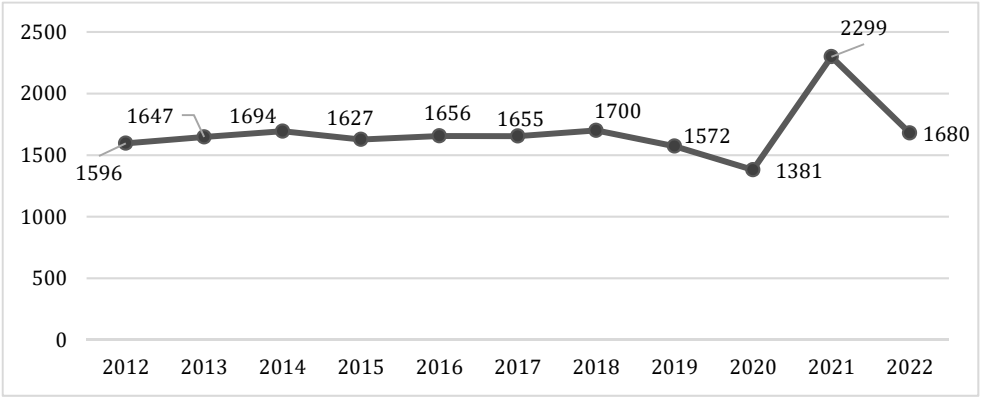



Figure 7. Changes in average transport distance (passenger-kilometres) by air in Bulgaria, 2012 – 2022

The most successful year for Bulgarian air transport was 2019, when 2,693,000 passengers were carried. It should be noted that airline operators have found a serious niche in the transport market in the form of low-cost flights. In recent years, budget transport solutions have attracted many travellers with their flexible offers, which provide the traveller with the opportunity to make individual decisions related to additional services that affect the final price. These services include seat selection, online booking, food and beverages, luggage volume and size, etc. The application of this business model by airlines is profitable in terms of regular travellers who prefer to reduce the cost of flights based on additional services, but those who fly relatively infrequently may prefer to take advantage of the full range of services, which also provides them with maximum comfort.

An interesting year is 2021, when we can observe that there were only 603,000 passengers and the average transport distance reached its peak at 2,299 km. If the purpose of aviation is to cover great distances, we see that this year was in fact a success. These results should be approached with a certain degree of scepticism given the clarification made by the NSI when disclosing this information, specifically, that "In connection with the epidemic situation related to the spread of COVID-19 in the Republic of Bulgaria and the temporary suspension of the study at the border points, all data on visits of foreign citizens to Bulgaria for the period January–June 2021 and September–December 2021 have been provided by the Ministry of the Interior, as well as the data on the trips of Bulgarian citizens abroad for the purpose of the visit and countries are for the months of July and August 2021" (NSI, 2023).

Another alternative for passengers is waterway transport in Bulgaria, which is developing due to the presence of an outlet to the Black Sea and a navigable river, the Danube, but we should note that passenger demand is low, with quite narrow limits during that period ranging between 90,000 (2014) and 214,000 (2022) (see Table 5, Figures 8 and 9).

The lack of interest in maritime transport was also present in previous periods, with passengers choosing this alternative from 2007 to 2012 ranging from 3,000 in 2009 to 17,000 in 2010, representing a miniscule share compared to the other types of transport. Though relatively more preferred, river transport also shows little interest. It is notable there was a total growth of 62% comparing 2022 to 2012 on a fixed base and by 16% from 2021 to 2022 when chain linking the data.

Table 5. Development of passenger transport by water in Bulgaria, 2012 – 2022

| Years | Passengers carried | Absolute change of passengers carried | | Growth rate (increase or decrease) (%) | | Index (%) | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | thousands | 2012=100 | chained | 2012=100 | chained | 2012=100 | chained |
| 2012 | 195 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2013 | 143 | -52 | -52 | -26.667 | -26.667 | 73.333 | 73.333 |
| 2014 | 90 | -105 | -53 | -53.846 | -37.063 | 46.154 | 62.937 |
| 2015 | 115 | -80 | 25 | -41.026 | 27.778 | 58.974 | 127.778 |
| 2016 | 119 | -76 | 4 | -38.974 | 3.478 | 61.026 | 103.478 |
| 2017 | 109 | -86 | -10 | -44.103 | -8.403 | 55.897 | 91.597 |
| 2018 | 114 | -81 | 5 | -41.538 | 4.587 | 58.462 | 104.587 |
| 2019 | 102 | -93 | -12 | -47.692 | -10.526 | 52.308 | 89.474 |
| 2020 | 91 | -104 | -11 | -53.333 | -10.784 | 46.667 | 89.216 |
| 2021 | 152 | -43 | 61 | -22.051 | 67.033 | 77.949 | 167.033 |
| 2022 | 214 | 19 | 62 | 9.744 | 40.789 | 109.744 | 140.789 |

*Source:* Author's calculations based on a database from the National Statistical Institute of the Republic of Bulgaria.

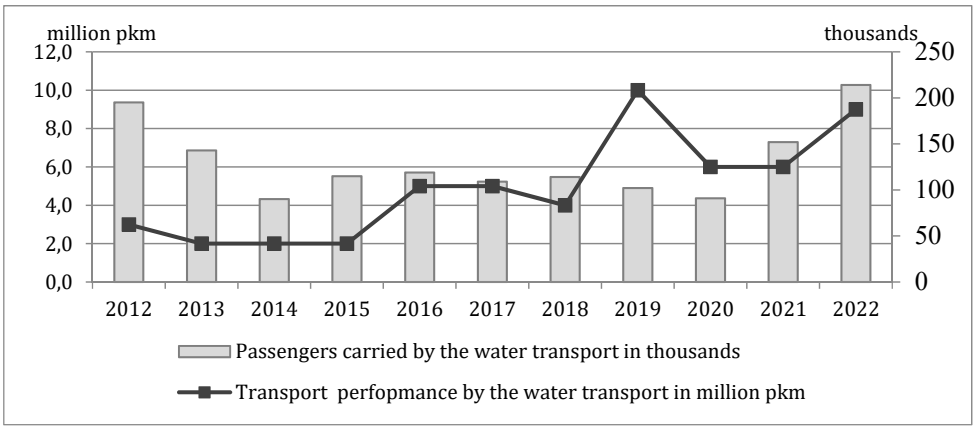



Figure 8. Development of passenger transport by water in Bulgaria, 2012 – 2022

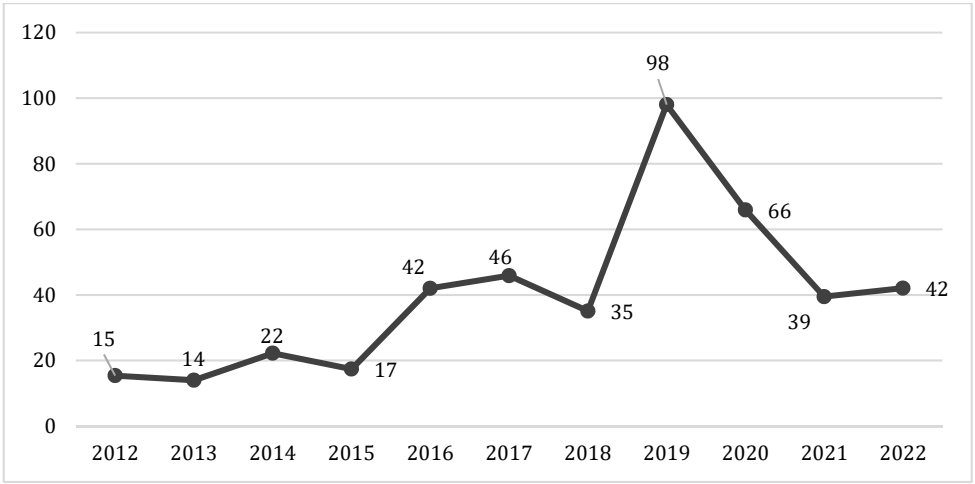



Figure 9. Change in average transport distance (passenger-kilometres) by water, 2012 – 2022

The low intensity in operating this mode of transport is in contrast with the latest guidelines of EU transport policy, which are subordinated to the construction of a sustainable transport system that meets economic, social, and environmental needs, as well as being fully integrated and competitive, i.e., the goal is to achieve "greener" transport. It is water transport that provides significant opportunities related to increasing efficiency and improving environmental performance. The importance of maritime spaces for the socio-economic development of Europe necessitates the alignment of transport policy objectives with those of the integrated maritime policy for the European Union.

The last alternative for passenger transport is urban electrical transport, which is an ecological option for moving passengers in an urban environment.

According to the NSI methodology regarding urban electrical transport, it comprises companies that carry out passenger transport via trolleybuses, electric buses, trams, and metro (NSI, 2022). There were certain fluctuations in the behaviour of passengers during the studied period (see Table 6 and Figure 10).

Table 6. Development of urban electrical transport in Bulgaria, 2012 – 2022

| Years | Passengers carried | Absolute change of passengers carried | | Growth rate (increase or decrease) (%) | | Index (%) | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | thousands | 2012=100 | chained | 2012=100 | chained | thousands | 2012=100 |
| 2012 | 285,859 | * | * | * | * | * | * |
| 2013 | 269,448 | -16,411 | -16,411 | -5.741 | -5.741 | 94.259 | 94.259 |
| 2014 | 254,589 | -31,270 | -14,859 | -10.939 | -5.515 | 89.061 | 94.485 |
| 2015 | 248,081 | -37,778 | -6,508 | -13.216 | -2.556 | 86.784 | 97.444 |
| 2016 | 244,902 | -40,957 | -3,179 | -14.328 | -1.281 | 85.672 | 98.719 |
| 2017 | 279,654 | -6,205 | 34,752 | -2.171 | 14.190 | 97.829 | 114.190 |
| 2018 | 275,131 | -10,728 | -4,523 | -3.753 | -1.617 | 96.247 | 98.383 |
| 2019 | 268,799 | -17,060 | -6,332 | -5.968 | -2.301 | 94.032 | 97.699 |
| 2020 | 193,008 | -92,851 | -75,791 | -32.481 | -28.196 | 67.519 | 71.804 |
| 2021 | 191,815 | -94,044 | -1,193 | -32.899 | -0.618 | 67.101 | 99.382 |
| 2022 | 242,167 | -43,692 | 50,352 | -15.284 | 26.250 | 84.716 | 126.250 |

*Source:* Author's calculations based on a database from the National Statistical Institute of the Republic of Bulgaria.

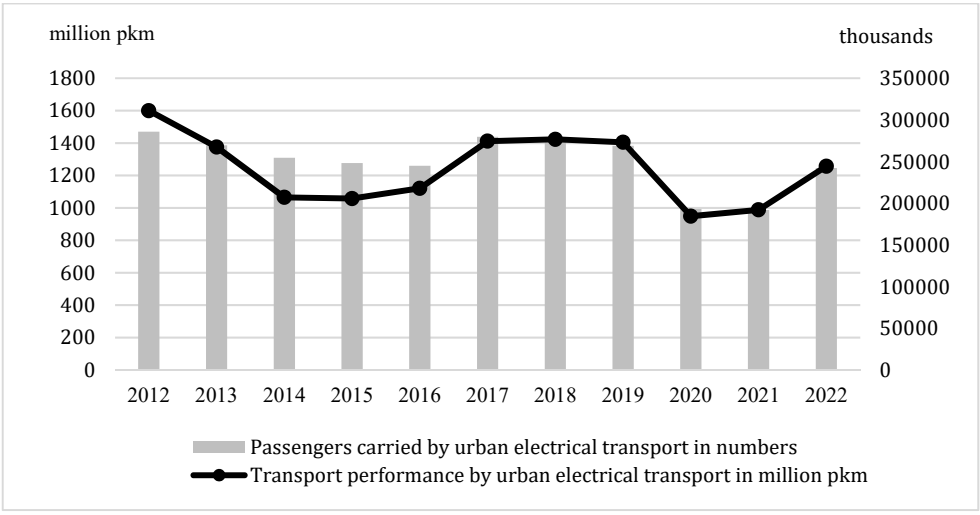



Figure 10. Development of urban electrical transport in Bulgaria, 2012 – 2022

According to the official statistics, the indicator of passengers carried by urban electrical transport in 2022 decreased by more than 15% compared to the beginning of the period. In general, urban transport is not perceived by Bulgarians as a good alternative to private vehicles under the influence of factors such as travel time, comfort, reliability, etc. The outflow from electric transport may to some extent be the result of aging vehicles, which do not always ensure safety or accuracy when moving people. Furthermore, the timely renewal or replacement of vehicles serving urban transport is skipped in many Bulgarian cities, which negatively affects public attitudes towards this alternative.

For the urban transport system's development, the provision of vehicles according to type is of particular relevance (see Table 7).

Table 7. Means of transport for passenger carriage, 2012–2022

| Vehicles | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Cars | 2,806,814 | 2,910,235 | 3,013,863 | 3,162,037 | 3,143,568 | 2,770,615 | 2,773,325 | 2,829,946 | 2,866,763 | 2,830,464 | * |
| Incl. newly registered | 196,614 | 199,963 | 211,033 | 225,868 | 238,877 | 240,121 | 250,489 | 224,564 | 172,761 | 223,238 | * |
| Newly registered cars (%) | 7.005 | 6.871 | 7.002 | 7.143 | 7.599 | 8.667 | 9.032 | 7.935 | 6.026 | 7.887 | * |
| Buses | 22,788 | 227, 920 | 23,040 | 23,470 | 22,928 | 20,628 | 20,442 | 20,318 | 19,080 | 17,352 | 17,534 |
| Incl. newly registered | 738 | 1,015 | 1,345 | 1,285 | 1,596 | 1,377 | 1,379 | 1,203 | 604 | 730 | * |
| Newly registered buses (%) | 3.239 | 0.445 | 5.838 | 5.475 | 6.961 | 6.675 | 6.746 | 5.921 | 3.166 | 4.207 | * |
| Sea passenger ships | 6 | 6 | 9 | 9 | 10 | 2 | 2 | 3 | 10 | 11 | 11 |
| River passenger ships | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 5 |
| Passenger planes | 59 | 58 | 59 | 62 | 66 | 70 | 75 | 87 | 70 | 73 | * |
| Trolleybuses | 501 | 467 | 563 | 540 | 437 | 392 | 376 | 369 | 370 | 379 | 330 |
| Electric buses | * | * | * | * | * | * | * | * | 15 | 45 | 99 |
| Trams | 309 | 280 | 285 | 280 | 280 | 311 | 301 | 313 | 317 | 316 | 301 |
| Metro trains (underground) | 168 | 168 | 208 | 208 | 208 | 208 | 208 | 208 | 268 | 298 | 298 |

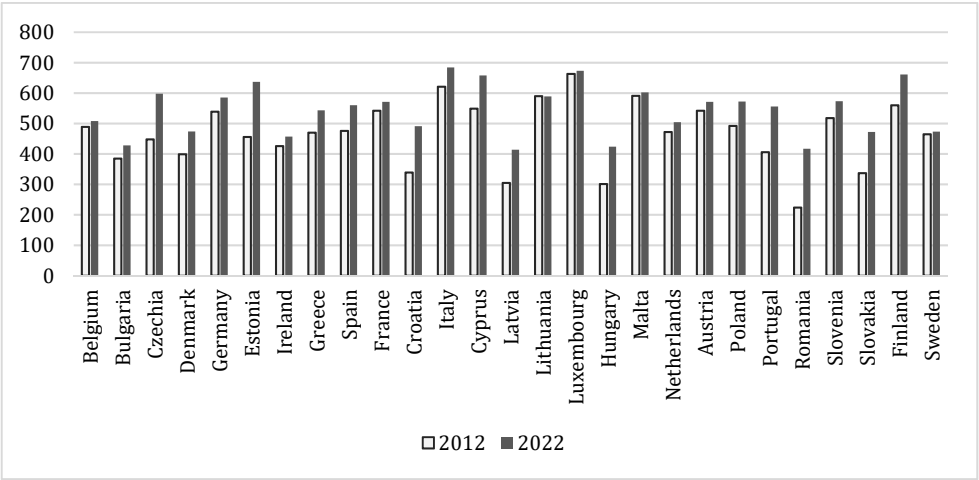
(*) – there are no data from the National Statistical Institute of the Republic of Bulgaria.

*Source:* Author's calculations based on a database from the National Statistical Institute of the Republic of Bulgaria.

When it comes to cars, their total number initially increased, reaching a peak in 2015 when registered cars numbered 3,162,037, and after which the trend reversed, followed by years of decline. The reasons could be objectively related to a decrease in

the size of the population by 834,331 people within the studied period, according to NSI data, hence the smaller number of legally capable motor vehicle drivers and limiting the needs of Bulgarian citizens for personal cars. In addition, levels of financial stability coupled with annual inflation of 16.9% for December 2022 compared to December 2021 (according to NSI data) and fuel prices have contributed to prioritizing the needs of food, education, etc. over those related to the convenience and comfort of individual transport solutions. With this conditioning factor, it can be expected that the citizens of the Republic of Bulgaria will rethink their priorities and that interest in the operation of private motor vehicles will gradually recover to relatively high levels in the long term.

According to Eurostat data for the period 2012–2022, growth in the passenger cars per thousand inhabitants indicator was observed for Bulgaria in the amount of 43, which is significantly less compared to the rest of Central and Eastern Europe. Among EU countries, Romania registered the highest growth of passenger cars per 1,000 inhabitants (+86.2%; +193), followed by Croatia (+44.8%; +152), Hungary (+40.9%; +123), Slovakia (+40.1%; +135), and Estonia (+39.7%; +181) (see Figure 11).




*Source*: Eurostat, 2022.

Figure 11. Motorisation rate of passenger cars in the EU, 2012–2022

Not only are quantitative indicators important, but the age structure of the rolling stock also deserves consideration. In 2022, new cars in Bulgaria (less than 6 months old according to the definition of the Ministry of the Interior), represent about 15%. Approximately 6% of new registrations are of cars up to five years old; 13% are between 5 and 10 years old, and as many as 66% are of cars more than 10 years old (Tomov, 2022).

Regarding the buses used by Bulgarian carriers, we can see that again the highest number was reported in 2015, but the drop was significant in the last available year, with the number of buses reaching 17,534, or 5,936 less compared to the peak year. Obviously, transport operators are affected by a complex macro environment as a result of the health, economic, and geopolitical dynamics that have been observed in recent years. The reported decline in bus passenger transport at the end of the period under study has directly affected the rolling stock in the sector.

In an urban environment, it has been observed that the operation of trolleybuses has decreased over the years. Electric buses first appeared on the Bulgarian transport market in 2020. They are expected to displace trolleybuses, as they allow greater flexibility in determining routes.

The number of passenger planes at the disposal of Bulgarian aviation operators has also been decreasing. In the management of transport processes, especially with passengers, safety is the first concern, which is directly related to the technical serviceability of the means of transport and the qualification of personnel. These are the main priorities of Bulgarian aviation operators, who are trying to overcome the problems caused by lessened passenger flow in recent years and to stabilize their presence in the competitive market in which they have positioned themselves.

Unlike airplanes, the number of maritime and river passenger ships sailing under the Bulgarian flag increased in 2022, but in reality, the Bulgarian fleet includes only 16 vessels, of which 11 are seagoing and 5 are rivergoing. This cannot be accepted as sufficient, given the advantages of water transport and the lucrative potential of cruise travel in the tourism industry.

The transport sector is constantly evolving under the pressure of modern technologies and the increased demands of passengers, which opens up opportunities for transport operators to improve their services and seek high levels of customer satisfaction.

## 3. Opportunities for the development of passenger transport in the Republic of Bulgaria

We associate the development opportunities for passenger transport with both conventional solutions and the potential of modern, high-tech approaches because the symbiosis between the traditional approach and innovations is the basis on which transport processes can be optimized. The rational implementation of transportation should be the basis for these decisions. On the one hand, the expectations and needs of citizens must be met in accordance with their constitutional right to move freely; on the other hand, the interests of carriers must be protected as economic entities that strive for positive financial results from their economic activity; and from a third point

of view, society's ecological commitments for the protection of the environment have to be respected.

Information and communication technologies offer opportunities for optimizing transport processes. One such solution is demand-responsive transport (DRT), which refers to a technology-based and shared mobility service. Instead of following predefined routes, timetables, and fixed stops, on-demand services create virtual stops and operate on different routes; that is, they perform upon demand and as needed. Booking is usually done through an app but can also be done by phone call and/or in a web browser. DRT combines the reliability of conventional public transport with the flexible availability of private cars.

In general, DRT has evolved to become largely an umbrella industry term used for any public transport service that provides flexibility either spatially and/or temporally. At one extreme, DRT can effectively be a publicly operated taxi service, providing fully flexible carriage wherever and whenever the user requests. At the other end of the spectrum, a simple stop-requested bus service could be demand responsive. In between lies a plethora of potential disruptions (e.g., route changes, ride-pooling, etc.) catering to users with a certain level of compromise (Currie, Fournier, 2020).

In support of DRT are data for some European countries that have applied this concept in practice. This statistic shows the size of the demand-responsive transport (DRT) fleet in selected European countries. Of the countries listed, the United Kingdom had the largest DRT fleet with 24,629 vehicles, followed by France with 7,250, Germany with 2,993, and the Netherlands with 1,693 (Statista, 2019).

DRT is usually combined with the concept of ride-pooling (Jintao Ke, et al., 2020). In this new form of mobility, an intelligent algorithm aggregates similar travel requests into shared trips. In this way, several people can use one vehicle at the same time.

In addition to technological advances, management decisions are strongly influenced by the experience everyone has gained by working in an electronically based environment. This also led to the use of knowledge in other post-crisis periods and turned it into widely applied good practices, which have been reflected in passenger transport.

The present study of the development of individual types of transport based on the dynamic indicators of the demand for transport services (passengers transported, work performed, and average transport distance) has found that from 2012 to 2022, certain fluctuations were observed that were largely influenced by the health crisis. In this context, transportation firms should make efforts and react flexibly to the needs of users, as well as make an attempt to segment the transport market according to relatively new combinations of criteria in response to the changes that have occurred (Tsvetkova, 2017).

The limitation of business trips, which we can judge from the NSI data on the indicator "visits of foreign citizens to Bulgaria by country and purpose of the visit (business)", which decreased in 2022 compared to 2019 in the amount of 530,852 (Ministry of Tourism, 2019; NSI, 2023) and the reorientation, whenever possible, to video conference connections for work meetings, is part of the green approach in the management of companies that arose as an invaluable experience during the social isolation of 2020–2021. The use of the electronic environment has had a number of economic effects caused by the reduction of time and financial means needed for the implementation of business relationships in the usual conditions of physical contact between people. The changes in work processes and redirection of some the activities online can be accepted as part of the business world's contribution to environmental protection. These innovative solutions have had a positive impact on the environment, given the reduction of the need to travel to work, but the environmental effects are at the expense of reduced demand for transport services by companies. We must also note the fact that the price of this contribution is indirectly paid by transport operators, through the foregone benefits they suffer as a result of society's accumulated experience in communication and exercising the right to work, mediated by information and communication technologies in the conditions of a pandemic and the use of these knowledge and skills in the new reality. In practice, commercial passenger transport is not objectively expected to recover to its full extent, since the positive effects of remote contact between partners have economic, social, and environmental advantages for the whole society. The exceptions are companies that offer passenger transportation, but they are a relatively limited circle of interested parties.

Therefore, it is possible that a large proportion of people's travel is mainly concentrated on leisure and recreation, and the sector must seek solutions that are attractive and profitable for travellers in order to attract them in the long term and to convert them into loyal customers willing to travel in their spare time. This means that, in a strategic plan, transport companies must look for solutions that are differentiated on the basis of available financial resources, time, and environmental attitudes. Those people who will actually travel should be given the opportunity to choose from a variety of options for making the trip with optimal compromises between price, time, and environmental resources. The offers companies propose can be differentiated: on the basis of price – high, medium, and low class; based on time – short-term trips, medium-duration trips, and long-term trips; based on ecological resources – trips with a high degree of ecological responsibility (by bicycle or electric vehicle), trips with a medium degree of ecological responsibility (rail transport, combined, and mixed transport), and trips with a low degree of ecological responsibility (with conventionally powered personal cars or on planes). Selecting a mode of transport

will include unimodal and multimodal solutions that will simultaneously reflect on travel time, its cost, and environmental resources. In practice, this will mean that the customer, for whom time is a priority, will be able to choose expensive and fast options for movement with a low degree of environmental responsibility. Customers for whom time is not a leading factor in their decision will be offered options with an emphasis on the contribution they will make to the protection of the environment. The idea is that transport companies can take advantage of people's attitudes to be morally satisfied with the fact that they are contributing to limiting climate change and helping preserve nature and its biodiversity for future generations. This is an extremely sensitive topic for a part of society, and the missed benefits in the passenger transport segment can only be compensated with an innovative approach when forming a portfolio of transport services. In this context, packages may be offered by focusing on shorter journeys via means of transport powered by green energy or combined transport that includes green vehicles on roads, by rail, or on waterways, with a view to extending the journey distance with minimal environmental impact per kilometre of average travelled distance. The financial parameters of these packages will be determined on the basis of transport costs, environmental effects, and insurance conditions – that is, it is also necessary for the partners of transport companies like insurance providers to offer coverage that will reward passengers for responsible behaviour towards global environmental problems.

Therefore, when forming a portfolio of services, the focus should be placed on those customers willing to reduce their levels of comfort and speed at the expense of the environmental parameters of the transport process. This means that transport companies must also reorient themselves to changes by investing in rolling stock renewal and implementing sustainable practices. These changes in the activities of market participants are inevitable because people are increasingly informed and aware of the consequences of human activity on the climate and natural resources, and many of them are inclined to support the transition to a circular economy by limiting as much as possible the exploitation of transport alternatives which are a threat to the environment in which we live.

As is well known, a key objective of the common transport policy is precisely sustainable development. This requires an integrated approach aimed at ensuring the effective functioning of EU transport systems, including that of Bulgaria.

The energy-efficiency-first principle has been implemented in the air transport sector. There, the deployment of more energy efficient engines contributes to decreasing the environmental footprint of flights as well as more resource efficient use of sustainable aviation fuel (SAF). There are different production routes for SAF with several different raw materials available such as: municipal solid waste, cellulosic waste,

crops and plants, renewable electricity, water, and carbon dioxide ($CO_2$) (European Union Aviation Safety Agency, 2024)

The gradual introduction of SAF on the European air transport market will represent an additional fuel cost for airlines, as such fuel technologies are currently more expensive to produce than conventional aviation fuels. This is expected to exacerbate the pre-existing issues regarding a level playing field on the EU air transport market with respect to aviation fuels and to cause further discrepancies among aircraft operators and airports (European Parliament, 2023).

Given the fact that 400 million passengers embark or disembark annually in ports of Member States, including around 14 million on cruise ships, a special incentive is needed for renewable fuels of non-biological origin (RFNBO). This incentive is justified by the fact that these fuels have a high potential for introducing renewable energy into the fuel mix for ship bunkers, not only by their significant decarbonisation potential but also their expected production costs in the short and medium term. When produced from renewable electricity and carbon captured directly from the air, synthetic fuels can achieve up to 100% emissions savings compared to fossil fuels. They also have significant advantages compared to other types of sustainable fuels in terms of resource efficiency of the production process, particularly in terms of water consumption. However, RFNBO production costs are currently much higher than the market price of conventional fuel and are expected to maintain such higher costs in the medium term (European Parliament, 2023a).

The measures implemented by the EU to protect the environment within the borders of the common European space will change the conditions of the transport market, as new technologies have their advantages, but they also come at a price.

## Conclusions

The answer to the question, "How is Bulgarian passenger transport developing in the conditions of a dynamically changing environment?", is not easy because in addition to the economic interests of this market segment, the human factor also plays a special role.

Based on the theoretical overview of the features of passenger transport, we could summarize:

1. Passenger transport is distinguished by features related to human movement flows. The criteria by which passenger transport is classified are diverse and adapted to the characteristics of each transport alternative.

2. The vehicles used by the various transport modes for carrying passengers have to ensure a comfortable and safe journey.

In the course of the research, we have arrived at several important generalizations regarding the development of passenger transport in Bulgaria:

1. During the studied period, passenger transport in Bulgaria developed at variable rates, influenced by environmental factors. The most affected by the pandemic in 2020–2021 was aviation, reflecting global trends, but the positive fact is that air carriers are gradually recovering their market positions, driven by the ambition to reach and surpass pre-crisis levels.

2. A decrease can be observed in the total number of passengers transported and overall transport performance in 2022 compared to 2012. This decline is due to a decrease in bus and rail transport indicators. It is too early to point out objective reasons because the consequences of the health crisis should still be taken into account for 2022. But this may be due to an indisputable demographic trend in our country: the 2022 population (6,447,710) decreased by 834,331 people compared to 2012 (7,282,041), which has invariably been reflected on interest towards passenger transport in general.

3. In Bulgaria, every transport alternative has rolling stock for servicing passenger carriage needs. Water transport is the least developed, and our country has a relatively small sea and river fleet. Bus services play a leading role in passenger transport. Although the absolute number of vehicles is decreasing in this segment, it had the largest relative share according to the indicators of transported passengers and performed work reported in the country's total transportation activities.

From a practical standpoint, two main directions can be identified in which there are opportunities for development in the future of passenger transport:

The first direction is invariably related to the hegemony of information and communication technologies, which are widely used in the transport sector, including the passenger carriage segment. Demand-responsive transport (DRT), for example, refers to a technology-based and shared mobility service.

The second direction is related to the need to look for transport solutions that offer people the opportunity to choose options based on reasonable compromises on the criteria of price, time, and environmental resources.

## Conflicts of interest

The author declares no conflicts of interest.

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