

PROSPECTS FOR THE DEVELOPMENT OF CYCLING TRANSPORT IN THE BIG CITIES OF BULGARIA

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Abstract: *The essential role of transport in our everyday lives makes it one of the most important and fundamental topics for the residents of every larger city in Bulgaria. Congested and intense traffic in the territory of the country's large cities, delays when traveling to work and the large number of cars worsen the quality of life and the urban environment in general. Traffic and transport largely determine how a city looks. They are key to the economy and can have significant negative effects on the quality of life in the city, due to road safety problems, noise pollution, exhaust gas pollution and even increased travel time due to being stuck in traffic jams. To overcome these effects, it is necessary to constantly promote urban policies aimed at reducing motorized traffic and stimulating the use of public transport, cycling and walking as ways of getting around the city.*

This report analyzes the positive and negative aspects of using bicycle transport in urban conditions. The state of bicycle transport in the territory of large cities in the country is examined and the possibilities for combining it with public passenger transport are presented. The main directions for improving the bicycle infrastructure in cities are analyzed and a reasoned proposal is made for the construction of systems for public use of bicycles.

The main objective of the report is to identify and outline specific guidelines for the development of bicycle transport in the territory of large cities in Bulgaria and to clarify how following these guidelines will favor the sustainable development of their urban mobility.

Key words: *bicycle transport, bicycle infrastructure, public bicycle systems.*

INTRODUCTION

The Republic of Bulgaria is located on 111 thousand square kilometers of territory and has a population of 6.437 million people [1]. According to these characteristics of the country, it can be defined as large cities with over 100 thousand inhabitants, which are respectively Sofia, Plovdiv, Varna, Burgas, Ruse and Stara Zagora. In large cities, various types of public transport are used, they are located on a significant territory and the distances that are overcome daily by their residents are significant. Also, in large cities, road traffic is extremely intense and leads to problems with congestion caused by exhausted throughput capacity of their infrastructure.

The increased traffic in the territory of the country's large cities, delays to work and the large number of cars worsen the quality of the urban environment. In addition to leading to losses for the economy, caused by hours wasted in waiting, the poor urban environment negatively affects the physical and mental health of the population. Therefore, the European Commission promotes policies to reduce motorized traffic in the city - stimulating the use of public transport, cycling and walking, implemented with measures that predispose people to reduce the number of car trips.

CHARACTERISTICS OF BICYCLE TRANSPORT IN URBAN ENVIRONMENTS

The bicycle is a highly efficient means of transportation in urban conditions. Like other types of passenger transport, the bicycle has its strengths and weaknesses, related to its nature and the objective conditions in which it is used. The advantages of bicycle transport in urban conditions are expressed through the following characteristics:

1. Bicycle transport is free transport. The costs of purchasing, maintaining and using bicycles are significantly lower than those for a private car, and at the same time, bicycle transport is the most energy efficient compared to other types of passenger transport [2].

2. Bicycle transport is distinguished by its speed, maneuverability and adaptability. Its small size makes the bicycle a suitable means of transportation in traffic jams, during rush hours and significantly reduces the time needed to move around the city, especially when combined with public transport.

3. Bicycle transport does not pollute the environment. It does not emit harmful substances and gases, and does not create noise discomfort. Bicycle transport does not consume traditional fuel and is not affected by fluctuations in oil prices.

4. Bicycle transport is beneficial for human health. Using a bicycle is associated with moderate physical activity. This is an opportunity for many people who work in a big city and lead a sedentary lifestyle to significantly improve their health. Also, cycling creates more opportunities for contact with nature and social interaction.

5. Bicycle transport in urban conditions improves road safety. It is often believed that cycling in the city is a dangerous activity. The experience of other countries shows that the more cyclists there are on the road, the more serious road accidents decrease. The reason for this is that drivers become more careful when there are many cyclists. In this way, stimulating bicycle transport improves road safety throughout the city and for all road users.

The development of bicycle transport in large cities will undoubtedly improve their urban environment, and an attractive urban environment makes local people more positive, happy and able to work, and in turn attracts more tourists and investments to the respective settlements.

The disadvantages of bicycle transport when used in the city are the following:

1. The poor suitability for using the bicycle in bad weather (rain, snow, winter frosts). This circumstance introduces natural restrictions on the use of the bicycle and gives this type of transport a well-pronounced seasonality. In our climate, the number of days when using a bicycle is possible and favorable is not small at all - summer in Bulgaria, for example, provides far more sunny days than in Amsterdam, The Hague or Copenhagen, and we know that the listed cities are world famous for the mass use of bicycles. Spring and autumn also provide wonderful opportunities for using a bicycle.

2. The bicycle is an easily accessible object of appropriation. There is no system for prevention or protection of cyclists' property in urban areas in Bulgaria.

3. The need to use muscle power for propulsion. As it turned out, this can also be considered an advantage. The discomfort is greater on terrain with a serious slope or when the distances traveled by bicycle are too long.

Considering the advantages and disadvantages of the bicycle as a vehicle for urban conditions, it becomes clear that it definitely makes sense to stimulate more intensive use of bicycles for urban transportation - all large cities in Bulgaria have good potential and an extremely large number of unused opportunities in this direction.

DEVELOPMENT OF BICYCLE INFRASTRUCTURE IN MAJOR CITIES IN BULGARIA

The main guidelines for the development of bicycle infrastructure in large cities in Bulgaria can be grouped as follows: 1) Maintaining the existing bicycle network; 2) Developing the main bicycle network; 3) Building bicycle routes for walking and cultural tourism; 4) Creating conditions for bicycle parking and other facilities for cyclists.

An important part of the policy for the development of bicycle transport is the maintenance of bicycle routes and the environment around them. Well-maintained bicycle infrastructure attracts more cyclists, improves road safety and is an indicator of the municipality's attitude towards cyclists' problems. In addition to maintaining existing bicycle routes, it is a good idea to consider infrastructure improvements for greater safety, comfort and reduced travel time. This will reduce the risk of

accidents, increase the usability of bicycle routes and people's satisfaction with the bicycle infrastructure [3].

Places for recreational cycling in the big city are mainly larger parks and green spaces and the connections between them. In parks, the combination of cyclists and pedestrians is often conflict-free, although with more intense pedestrian or bicycle flows, separation is necessary for greater safety and comfort for all. Many people, before becoming active cyclists, cycle mainly in parks and suburban areas. Improving the conditions for recreational cycling also attracts new cyclists. Once they have gained some experience in cycling, they are more likely to start using bicycles for their daily trips.

Whether organized or independent, accessibility to the cultural attractions of cities by bicycle must be ensured. To this end, it is necessary to build bicycle routes between cultural attractions, improve the infrastructure along the routes and install bicycle racks near the entrances to the sites.

Bicycle parking is an integral part of the bicycle infrastructure. The availability or lack of bicycle parking spaces can significantly influence people's choice of whether to travel by bicycle [3]. One of the main reasons for not using a bicycle as a means of transport in large cities is the fear of theft. For this reason, it is necessary to build secure bicycle parking spaces and carefully plan unsecured bicycle parking spaces – choosing the location and model of bicycle racks. Increasing the number of bicycle parking spaces in the city is a constant process, for which it is good to allocate funds annually. However, it is also possible to create additional incentives aimed at institutions, companies and citizens in order to accelerate the process of increasing bicycle parking spaces.

Any infrastructure, facility or service provided that facilitates cyclists improves the general climate of the city and is an indicator of the municipality's attitude towards bicycle transport, and hence towards urban mobility problems. From public bike pumps, bike rails at stairs, to stands to support the right foot while waiting at traffic lights, and even inclined trash cans where waste is thrown away on the go – they are all created to encourage cyclists to feel wanted in the city and do not require significant investments.

COMBINING BICYCLE TRANSPORT WITH MASS URBAN TRANSPORT

Creating facilities for combining public transport with cycling makes the use of public transport more attractive, flexible and competitive with car travel. Bicycles can cover short or medium distances to and from public transport stops, which significantly improves transport services in neighbourhoods [4]. Figure 1 shows an example of an intermodal cycle journey in an urban environment.



Fig. 1. Sample scheme for intermodal travel in urban conditions

Combining train and bicycle provides an opportunity for both commuting to work in large cities from surrounding settlements, and for bicycle tourism. For bicycle transportation, the passenger applies at the ticket office and pays 3.00 leva, regardless of the kilometer distance [5]. The place for bicycles is on the platform of the carriages, i.e. the vestibule in front of the toilet. However, the capacity is insufficient (1-2 bicycles per carriage). In order for bicycle tourism to be attractive, it is good to have the opportunity to board a group of people with bicycles without the need for prior reservation.

Creating more opportunities for combining different types of transport at the so-called "intermodal centers" stimulates alternative modes of transport. Reaching public urban transport stops by bicycle significantly improves transport service in urban areas [6]. The most suitable places for building bicycle stations to replace bicycles with public transport are metro stations (there is a metro only in the city of Sofia), railway and bus stations, stops where different public transport lines overlap or those that are relatively far from poorly served areas.

Bicycle stations can be an important link in the public transport chain, offering better integration of bicycles into intermodal travel chains. Good bicycle parking facilities at key locations are an important element influencing the choice to cycle. Wherever there is or is expected to be a concentration of parked bicycles, they should be placed in well-organized, convenient and safe bicycle parking facilities. This in itself will encourage more widespread use of bicycles for urban mobility.

BUILDING PUBLIC BICYCLE SYSTEMS IN LARGE CITIES

Public bicycles are conceptually individual means of public transport. They are bicycles, usually located at special stations around the city and are available to every citizen after a certain registration and/or payment, depending on the chosen system. Thus, they complement the mass public transport network by allowing people to reach places inaccessible to large vehicles.

Mass urban transport becomes more attractive when relatively short distances can be covered with public bicycles, which, however, due to traffic jams, take a long time with motorized transport. Public bicycle systems can be seen in many cities and regions throughout Europe. Currently, public bicycles are popular in Western and Southern European countries, while in Eastern Europe they are not evenly distributed. In recent years, however, public bicycles have increasingly entered Eastern European cities.

Currently, the only large Bulgarian city with a public bicycle system is Burgas. The bicycle rental system in Burgas was launched in 2013. under the project "The Bicycle City - a Model of Modern Urban Mobility" under the Small Projects Program funded by the Global Environment Facility. In 2016, the Sofia Municipality developed conditions for the creation of a public bicycle rental system in Sofia through a concession linked to the management of street advertising in the city center. After a long legal dispute between the candidates, the selected contractor was announced in 2020, but the system has not yet been launched [7].

Not all public bicycle systems are the same. They have different qualities and characteristics that can and should be adapted to local conditions. Figure 2 presents an example scheme for the initial introduction of a public bicycle system in large cities in Bulgaria.

Stations are a common feature of most bike share systems. They differ mainly in the technology used. In low-tech stations, the bicycle is mechanically locked, while in high-tech stations the bicycle is locked to an electronically controlled dock.

Access technologies for public bike systems depend on the size of the system, available funding, and the technology used. Bike rental can be done via electronic cards, access codes, keys, or deposits.

The public bike system needs to have a GPS tracking system installed to track the bikes. This allows for tracking of unreturned bikes and for organizing the rerouting of bikes between stations to maintain quality of service.

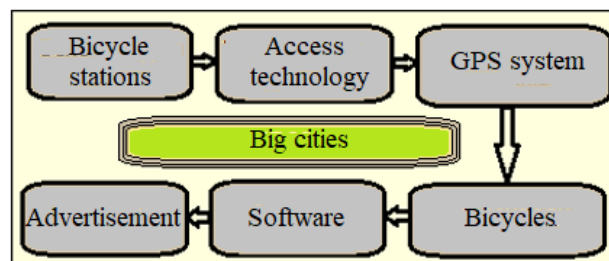


Fig. 2. Sample scheme for the initial introduction of a public bicycle system

Bikes in bike share systems vary in design and quality. However, they share the following common characteristics: sturdy parts, unique design, one size fits all, and the ability to lock the bikes.

Most bike share systems require user registration to use the service, to avoid the loss of anonymously rented bikes and to ensure payment and accountability. Most systems offer a variety of registration methods to increase the accessibility of the service offered.

There are many opportunities to inform about everything related to the bike share system, from promotion to registration and rental methods.

The scope, size of the bike share system and its density are determined by the size of the city, the target user groups and the financial sustainability of the system. In addition to the initial launch of the bike share system, subsequent maintenance, promotion and modernization must be ensured. Regular analyses of bike usage will justify the expansion of the system, changes in the capacity and location of stations, payment methods, accessibility of information and integration with other modes of transport.

CONCLUSION

In conclusion, the following main conclusions can be drawn: 1) Most of the large cities in Bulgaria are relatively compact. The distances from large residential districts to the city center are about 3-5 km., which can be covered on average in 15-20 minutes by bicycle. The relief of large cities in Bulgaria is characterized by the presence of relatively low elevations, which, with a well-chosen route, can be overcome without serious strain; 2) The large number of students and pupils in large cities represents a significant potential for increasing the number of cyclists. They would most easily switch to a bicycle, because it gives them great mobility and requires relatively little money for purchase, maintenance and operation; 3) Improving accessibility to cultural landmarks and creating bicycle cultural routes will make the country's large cities more attractive tourist destinations; 4) The development of a bicycle rental system in large cities will contribute to the sustainable development of urban mobility, and the integration of public bicycles with other types of urban transport is an important way to promote intermodal travel; 5) The high quality of design and implementation of bicycle infrastructure and urban furniture has an impact on the quality of the entire urban environment. It shows that the respective municipality respects cyclists and strives to attract more of them.

The appearance of the city, the quality of the environment, the way public spaces are used is the result of complex interactions of political and expert technical decision-making, of compromise options with all stakeholders, of financial possibilities and active communication with citizens. The development of bicycle transport can be seen as a good reason to make improvements in the overall urban environment. Therefore, actions to develop bicycle transport can be considered to be in the service of all city residents.

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