

# Development of Bicycle Transport in the City of Sofia as Part of the Concept for Stable Urban Mobility

**S D Tzvetkova**

University of National and World Economy, Sofia, Bulgaria

E-mail: svetlatzvetkova@abv.bg

**Abstract.** The concept for Stable Urban Mobility, included in the European Commission's Green Paper titled "Towards a New Urban Mobility Culture", consists of encouraging the combination of different types of public transport with different types of individual transport. The new concept for urban mobility also suggests reaching common goals for economic prosperity and recognizing the right to mobility by managing the quality of life and protecting the environment. The Green Paper states the following: "Encouraging walking, cycling and constructing the appropriate infrastructure" which makes it clear that bicycle transport and its related infrastructure are an inseparable part of stable urban mobility. However, the city of Sofia presently does not have a developed bicycle infrastructure. Incorporating bicycle traffic within the city's transport framework is not only necessary, it has to become a part of the priorities of the city's transport system. The purpose of the report is to substantiate the necessity for the development of bicycle transport in Sofia and to indicate the guidelines for its future development. The more stably built an urban transport system is and the more corresponding it is to citizens' needs and to the problems of modern urbanized environments, the higher the guarantees are for the city's stable development in society's favor.

## 1. Introduction

The large number of automobiles, the dynamic of urban traffic and the increased traffic worsen the quality of the urban environment and are the main cause for air pollution in the city of Sofia. About two thirds of the city's population travels with their own personal cars or by buses, which are slow, depreciated and harmful to the environment. The city also has trolley and tram transport but due to the poor maintenance of the tram infrastructure and the decreasing number of trolleys, these types of transport handle only 25% of the passenger flow of the capital's ground urban passenger transport. Sofia's polluted air is one of the main reasons for the growing health issues – namely, respiratory and cardiac problems which start from an early age. Bulgaria holds second place when it comes to the number of fatalities caused by cardio-vascular diseases. In recent years Sofia has become one of the most air-polluted cities with harmful emissions and noise pollution. All of this also has a negative impact on social and economic development. It is apparent that environmental policies have never been a priority in the capital's agenda despite Bulgaria's membership in the EU, which vehemently demands that its member-states adopt stable development practices. It is only recently that Sofia has started a policy for reducing the harmful influence of urban transport on the environment; designing a program for the development of bicycle transport is part of said policy. In order to reduce traffic jams and improve the city's traffic quality, bicycle traffic has to become part of the urban transport system [1]. Therefore, it is imperative that the city of Sofia provide the necessary conditions for it and construct bicycle lanes along with a stable urban transport infrastructure. It is crucial that the city become a modern "green" European city with a healthy and high-quality urban environment which

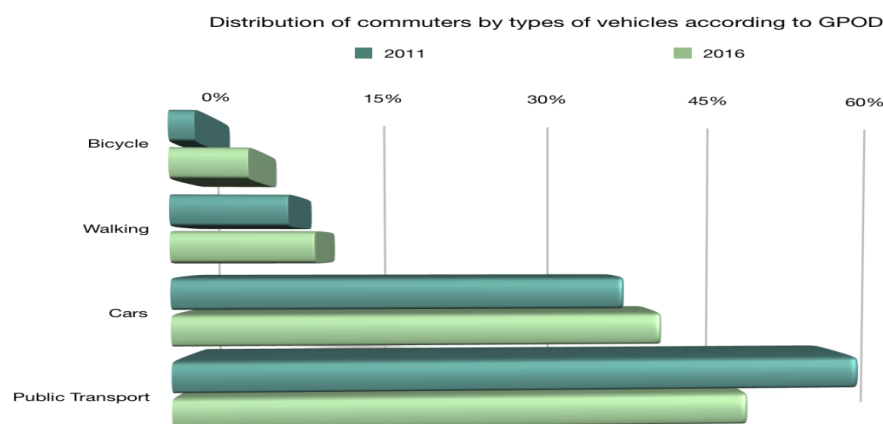


will allow people of all ages to move safely, quickly and comfortably on bicycles. The appealing urban environment will help people become more positive, happy and able-bodied. In turn, the high-quality urban environment will attract more investments and tourists to the city. In practice, increasing bicycle traffic will improve conditions for the other transport traffic participants [2]

## 2. Analyzing Bicycle Traffic in the City of Sofia

### 2.1. Data for Using a Bicycle in the City

The main indicator for the dynamic and the mobility in every city is the sorting of travels by different types of vehicles. Figure 1 presents data from a survey done by experts when designing the “Program for Developing Urban Transport Within the Sofia Municipality for the 2016-2019 Period” [3]. The data is about the necessity for determining the percentage of people who use public transport, personal vehicles, bicycle transport and people who prefer to walk. The survey has been carried out within the city of Sofia for 2011 and 2016.



**Figure 1.** Sorting travelling people by types of vehicles

Conclusion: The figure's presentations lead to the conclusion that the percentage of people who use bicycle transport in 2011 is only 2%. It could also be acknowledged that the rate of increase for 5 years is too small – in 2016 it is only 6%. As the figure clearly indicates, the city of Sofia displays an extremely negative trend for the development of bicycle transport.

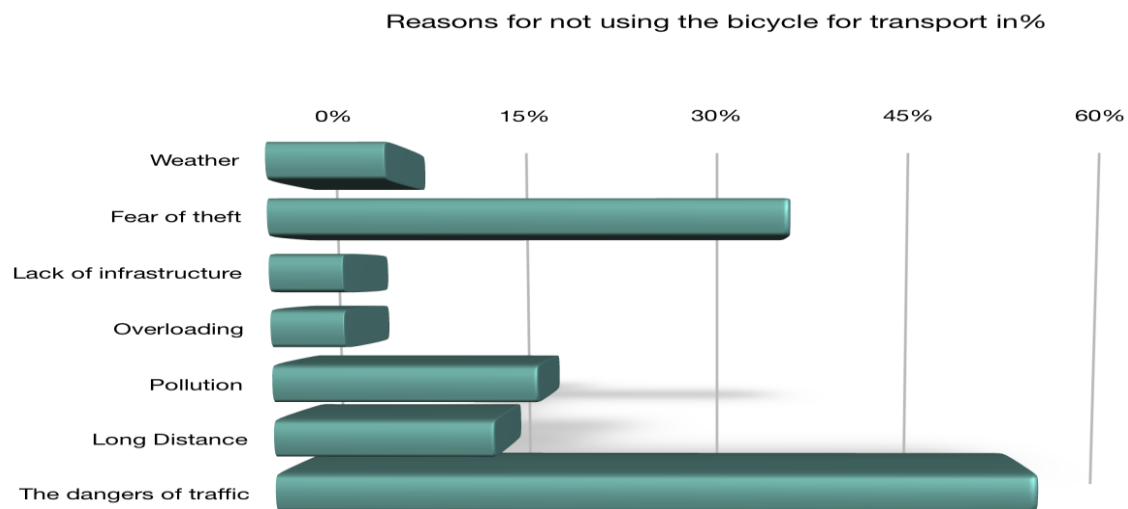
### 2.2. Analyzing Bicycle Ownership

In 2016 the “Velo evolution” Association carried out a survey among 2536 people to determine the number of bicycle owners in the city of Sofia. The survey data shows that bicycle owners comprise only 18.1% of 1000 households or 7% of the interviewees, with most households owning only one bicycle each. Of all the vehicles that citizens use, bicycles comprise only 24.7%, but the majority of them are used only during weekends and holidays.

Conclusion: The percentage of citizens who own a bicycle is extremely low due to the lack of the necessary conditions and they see no point in owning one. The majority of citizens are concerned about the poor road conditions and the probabilities for traffic accidents caused by other traffic participants. Statistics show that in 2016 the city of Sofia has registered a total of 1064 traffic accidents, with 42 fatalities and 1311 injured citizens. The number of accidents involving cyclists for the same year is 444, with 35 fatalities and 409 injured. The majority of the casualties are aged 25-65 [4]. This is an extremely negative statistic, considering the small percentage of people who use bicycles to travel in the city.

### 2.3. Reasons for Which Citizens Do Not Use a Bicycle

The main reasons for which people do not cycle are the dangers that could arise on the road, as well as the fear of bicycle theft [3]. The increased number of traffic accidents in the city of Sofia, the poor condition of the road infrastructure and the inappropriate behavior of the other traffic participants endanger the lives of cyclists (see fig.2).



**Figure 2.** Reasons for which citizens do not use bicycle transport

Data: “Velo evolution” Association, based on a survey carried out among 143 people in 2016

Note: The analysis is based solely on active cyclists and does not examine the problems of non-cyclists

Conclusion: In order to satisfy cyclists’ needs, the first priority should be the implementation of adequate measures for differentiating bicycle road-beds and constructing secure bicycle parking lots to improve citizens’ culture and tolerance for cyclists.

#### 2.4. Reasons for Which Citizens Would Start Traveling by Bicycle

Over 60% of the residents declare that they would not cycle even if travel conditions are improved (see Table 1). It is interesting to note that in Bulgaria cycling is viewed more as a hobby or a sport, whereas Western European countries such as Germany and the Netherlands have a built-in bicycle culture, cycling there is something normal and people use their bicycles every day, not just on weekends and holidays, and they cycle to work.

**Table 1.** Reasons for which citizens would start traveling by bicycle

<i>Type of reasons</i>	<i>% of citizens</i>
If separate bicycle lanes are constructed	17.9 %
If bicycle lanes are differentiated as part of the roadway	15.1 %
If cycling conditions in the city are improved	11.9 %
If the necessary conditions for cycling to work are provided	7.9 %
If safe cycling courses are organized	3.0 %
I would not cycle in the city under these conditions	63.7 %

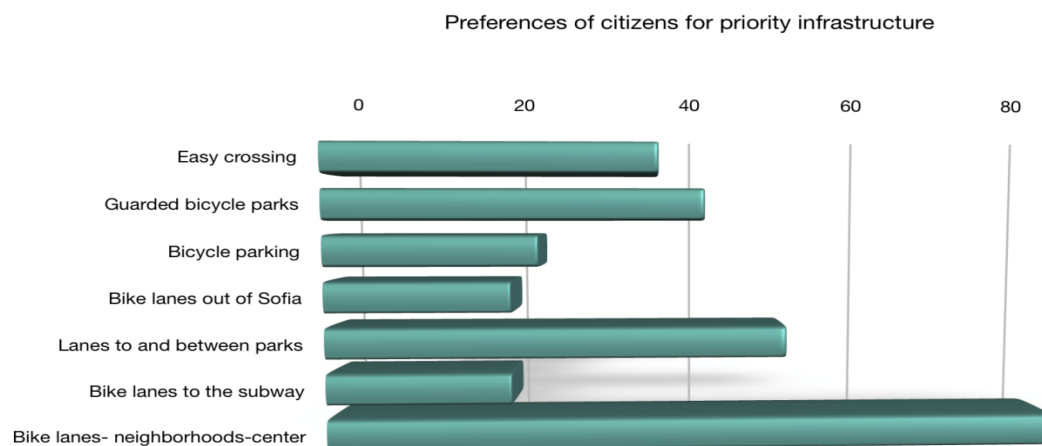
Data: “Velo evolution” Association, 2016, a survey carried out among 2536 people

Conclusions: Unfortunately, cycling is extremely unpopular in Bulgaria. Therefore, comprehensive measures need to be taken to increase road safety and especially boost the image of cycling and popularize it through investing in the construction of a bicycle infrastructure, organizing various

cycling events, media relationships for more coverage, articles about cycling, politicians and the municipality setting a personal example among employees about cycling, etc [3].

### 2.5. Preferences of Citizens for Priority Bicycle Infrastructure

The figure's data (see. fig. 3) shows the desires and expectations of cyclists. The main issue for cyclists is the lack of bicycle lanes. The indication for the need of bicycle lanes from the neighborhoods to the center clearly shows people's willingness to cycle to work or to school. People who ride their bicycles in parks or for sport also point out the lack of bicycle lanes and their desire for those [5].



**Figure 3.** Preferences of citizens for priority infrastructure

Data: "Veloevolution" Association, a survey carried out among 143 people, 2016

Conclusion: The construction of a primary bicycle network from the neighborhoods to the center as well as bicycle crossings at busy intersections should be a priority. Connecting the green areas in the city with bicycle road-beds will help them function as a system for improving the possibilities for bicycle rides in the city.

## 3. Recommendations for the Stable Development of Bicycle Transport in the City of Sofia

### 3.1. Building a Bicycle Infrastructure

The construction of new bicycle lanes and the maintenance of the ones that already exist, as well as the environment around them, should be priority number one for the future development of bicycle transport in Sofia. In order to guarantee safety, reduce travel time and improve cyclists' comfort of movement, it is necessary to improve the infrastructure [6]. The city of Sofia does not have bicycle road-beds from the big residential districts to the center, or a bicycle ring around the center of Sofia – for faster movement. An indicative example in this regard is the city of Münster, Germany. The availability of a park with bicycle lanes in the inner city allows its citizens to move about undisturbed by automobile traffic. This will reduce the risk of accidents and increase the number of cyclists. In addition, it is necessary to connect bicycle routes to subway stations, i.e. provide an opportunity to combine the bicycle transport and the subway as well as construct guarded bicycle parking lots in the city and at subway stations. Since bicycle transport is an inseparable part of bicycle infrastructure, the availability or the lack of bicycle parking spaces can have a significant impact on people's choice to cycle. Designing a separate plan for bicycle parking is a good practice, especially for larger cities, in order to help improve the development of the spaces and the capacity for bicycle parking lots and maintain an actual map of parking spaces. This will provide an opportunity to track the usability of bicycle parking lots and correct the number of parking spaces when necessary. Information about

bicycle parking lots could be inserted in printed or interactive bicycle maps. A good bicycle lane network in the center is also a necessary start for the establishment of a system for public bicycles.

### *3.2. Developing a System for Public Bicycles*

Public bicycles are individual means of public transport. They are bicycles which are usually placed at special stations throughout the city and are only available to every citizen after a specific registration and/or payment, depending on the chosen system [7]. Denmark, Germany and the Netherlands are typical examples. They complement the mass public transport network by allowing people to reach places that are inaccessible for large vehicles. The positive influence of introducing public bicycles has helped people who do not own a bicycle or live far from the center start cycling. Mass urban transport becomes increasingly appealing when public bicycles help traverse the relatively short distances which, however, take far longer with motorized transport due to traffic jams. A campaign for the establishment of a system for public bicycles has to be large-scale enough in order to have a bigger impact on citizens and attract more customers. Based on a study of the systems in Paris, Barcelona, London, Vienna, etc., it is advisable to start with no less than 100-120 bicycles placed at about 10 stations. When it comes to the desire for establishing a system for public bicycles, a thorough survey should be carried out, and the public opinion and the task should be analyzed. Before establishing the system, informational campaigns should be organized to make citizens aware of the service. The introduction of public bicycles should be done after there has been a minimum conscription of bicycle lanes in the city. Usually the system for public bicycles starts at the center of the city where the usability of bicycles is the largest. Subsequently, the system could extend to other parts of the city as well.

### *3.3. Building Suburban Bicycle Routes*

Sofia's proximity to five mountains, two dams and the cultural landmarks in the city's suburbs provides big opportunities for developing suburban tourism. Creating commodities for cycling to these destinations is an alternative to driving – a new experience and active vacation which citizens need, considering the sedentary lifestyle. Even people who have little cycling experience would be able to try cycling – during a holiday, on a comfortable and safe road-bed. This could enhance their cycling skills and encourage them to use bicycles as a means of transportation in their everyday travels [3]. In order to stimulate bicycle tourism and stable transport, facilitations for cycling in the suburban routes of public transport should be introduced. Providing more commodities and opportunities for cycling out of town will stimulate more people to prefer it for their vacation. Whether it is organized or individual, the opportunity for access to cultural landmarks by bicycle will be a huge advantage to the city as a tourist destination. For this purpose, it is necessary to build bicycle routes between cultural landmarks and improve the road-bed infrastructure, especially at intersections and crossings. Bicycle stands should be installed near the entrances to the sites, routes should be marked, informational panels with maps should be available and printouts of the city's bicycle map should be distributed. The practice of renting bicycles should be encouraged, seeing how it is commonly accepted in Western countries.

### *3.4. Integrating Bicycle Transport into Public Urban Transport*

Transporting bicycles in ground urban transport is not explicitly regulated in the capital's mass urban transport. Therefore, it is necessary to adopt certain measures in that regard. Bicycles could be relegated to chargeable oversized hand luggage and it has to correspond to the condition that it will not pollute or damage the vehicle, nor will it create inconveniences for the other passengers. The transportation of bicycles in ground urban transport should be permitted under conditions similar to the ones in the subway and with limitations on the number of bicycles allowed aboard one vehicle. Railway transport and bicycle transport can also be combined by changing the vehicle at railway stations. Bicycle parking lots should be installed at passenger railway stations and stops in the city of Sofia, as well as at railways in other populated areas which are exit points for everyday trips to Sofia. It is advisable that bicycle parking lots be guarded or at least situated within the station or near its entrance, like in Amsterdam and Münster. As a main "entrance" to the city, the central railway station



should have a covered guarded bicycle parking and it should be suitable for the creation of bicycle road-beds from the stations to the city, which will facilitate and stimulate people to combine bicycles with railway transport. In Germany transporting a bicycle aboard a train is something ordinary; there is even a special car solely reserved for bicycles. Creating facilitations for combining mass urban transport with bicycles makes the use of public transport more appealing, more flexible and more competitive to driving a car and, at the same time, it encourages people to ride bicycles.

### *3.5. Measures for Improving Road Safety for Bicycle Transport*

Cyclists are very dependent on the other traffic participants and their culture. About 75% of traffic accidents involving cyclists end with injuries and fatalities, whereas with other accidents they are about 10%. Additionally, road danger is the main reason why people who own bicycles do not use them as an everyday means of transportation. Statistics in other countries indicate that the higher number of cyclists on the road reduces the number of cyclist fatalities per km traveled distance. The reason is that drivers become more cautious in the presence of multiple cyclists. Road safety for cyclists can be improved by: creating zones with a speed limit of 30 km/h – in residential districts and in the center; improving dangerous intersections and crossings – for example, creating a stop line for cyclists placed ahead of the stop line for motorized traffic; adding bicycle lanes to cross-walks; extending the road surface for bicycle lanes across intersections if the bicycle lanes are major; creating intermediate refuges and expanded sidewalks when crossing; narrowing the roadway and reducing the radius of curb stone curves; controlling the observation of traffic rules by all traffic participants; sanctioning the other traffic participants if they endanger the lives of cyclists; improving road safety education and training in schools, driving courses and exams[8]. Very often cyclists feel most endangered at intersections and crossings. Some places in the city of Sofia are still difficult to cross and with very high risks for cyclists. Introducing basic traffic and road safety rules to children is essential to providing them with permanent discipline and enhanced transport culture. In Bulgaria road safety training is mandatory in schools. Multiple companies and NGOs also organize road safety campaigns, especially for children. In addition to training children at school, special road safety training should also be given to future drivers. In the process of training future drivers, special attention should also be given to actions with regard to the presence of cyclists and the bicycle infrastructure on the road – i.e. predicting their behavior and respecting their privileges. Aside from the ability to ride a bicycle, cycling in urban conditions poses challenges for which cyclists should also be prepared. It is highly advisable that cyclists be as familiar with road traffic rules as drivers of motorized vehicles. Observing the basic rules for road safety and behavior on the part of cyclists would reduce the number of road conflicts and accidents.

### *3.6. Awareness and Communication with Citizens*

The city's image, the environment's quality, the manner of using public spaces, etc. result from complex interactions and making political and expert decisions, from settlements by compromise with all interested parties, from financial possibilities, communication with citizens, etc. [9]. However, in every step several options should be taken into consideration in order to reach better decisions. In recent years transparency and communication with citizens have become especially important. The successful bicycle policy is expressed in the public internet space as a separate page or section in the webpages of the municipality or the public transport authorities, where plans for a new bicycle infrastructure, reports and analyses of bicycle traffic, suggestions and signals from citizens regarding bicycle infrastructure, etc. can be published. Creating offices for informing citizens about the capabilities of urban mobility is a good practice. The high quality of designing and executing bicycle infrastructure and urban furnishing influences the quality of the entire urban environment. Therefore, it is important to create a unified "cycling" style when designing bicycle infrastructure, road surfaces, details, signalization, signage, signs for orientation, bicycle stands and parking lots, etc.

### *3.7. Actions for Making a Successful Bicycle Policy*

The measures for encouraging bicycle traffic go hand in hand with: measures for reducing automobile traffic; determining a budget for bicycle infrastructure, management and monitoring; events like a

European Week of Mobility and other undertakings which can prove successful in coordination with various actions for establishing a new urban mobility culture. It is appropriate to form a bicycle commission to discuss current cycling issues in the city – such commissions function in several European cities like Wrocław, Vienna, Bratislava, etc. A qualified team dealing with bicycle infrastructure has to make citizens aware of innovations as well as the good and bad practices in the area. The policy for urban development planning has to be inextricably bound to the desires and security of cyclists. When designing every new project for new construction, reconstruction or a major overhaul of streets or public places, the passing of cyclists, even if it is not included in the bicycle plan, should also be taken into account. The simultaneous construction of streets and bicycle lanes will spare authorities money and inconveniences if the addition of a new bicycle lane becomes necessary subsequently.

#### **4. Conclusion**

The ever-growing number of automobiles in the city of Sofia often makes city traffic difficult and significantly increases travel time. Therefore, many people would choose bicycles as an alternative means of transportation. Bicycles could become a reliable transport, especially for traveling across the busy central part of the city. The city of Sofia holds significant potential for developing urban and suburban bicycle routes. Very often people own bicycles but they use them only during vacations due to the lack of a built-in infrastructure and conditions for safe movement. If new bicycle lanes are built and the ones that already exist are maintained well, this will attract more citizens to this way of traveling and it will create prerequisites for the stable development of bicycle transport in Sofia. An urban bicycle network should be integrated with the other types of public transport in order to achieve comfort and effectiveness when using bicycles as a conductive means of transport to subway stations and stops. If the accessibility by bicycle to cultural landmarks in the city and around it is improved, the city will become a more appealing tourist destination, which is especially significant within the context of Sofia being a candidate for cultural capital of Europe in 2019[10]. Cycling improves the health condition of the city's residents, especially children, and it helps preserve the environment. The development of bicycle transport is in the context of creating stable urban mobility for the EU's member states and it should become a priority in the policy for the future development of the city of Sofia.

#### **5. References**

- [1] Strategy for developing the transport system of the Republic of Bulgaria by 2020, p. 40;
- [2] Plan for the development of Sofia Municipality 2007-2013;
- [3] "Program for the Development of Bicycle Transport Within the Sofia Municipality for the 2016-2019 Period", pp. 23-27;
- [4] National Statistics Institute – 2017, "Traffic Accidents in the Republic of Bulgaria for 2016";
- [5] "Velo evolution" Association;
- [6] "Program for the Development of Bicycle Transport Within the Sofia Municipality for the 2012-2017", pp 45-47;
- [7] Sofia Municipality's "General Plan for Traffic Organization";
- [8] Strategy for improving road and traffic safety in the Sofia region, 2012-2020, pp. 17-19;
- [9] Modification of the Common Spatial Development Plan of SM – 2009;
- [10] Velikova, E (2017), "Trends in the planning and construction of the tourist destination", *Jornal Real Estate Property & Business*, Vol.1(1), pp. 41-45.