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THE CYCLING TRANSPORT IN PRAGUE

Bedřich Rathouský[1,*], Michal Mervart[1]

Abstract *This paper focuses on cycling transport in the capital city of the Czech Republic – Prague. Main goal of the paper is to find out whether available measures for cycling transport support are taken there. The authors focus on the infrastructure dedicated for cyclists in Prague and they primarily focus on the safety of the users. Potentially dangerous and/or not comfortable examples are included as well.*

Keywords *cycling transport, road transport, Prague, safety, modal-split, bicycle paths, bicycle lanes*

1 INTRODUCTION

Cycling transport belongs, besides walking and public transport, among sustainable transport modes. There is general effort of authorities to support cycling transport – and cycling of citizens in general. Many European cities have this transport mode highly developed for many years. In other words, contrary to the situation in the Czech Republic, the share of cycling on foreign transport markets is often higher. Several Czech cities are trying to reach that as well. To reach it, we have to fulfil several conditions.

Among these, the geographical and topographical conditions belong – at least if we don't consider massive usage of electric bikes (e-bikes). From this point of view, flat cities (and their surroundings) are the best option for spreading cycling amongst citizens – not only for commuting to work or to school, but for leisure time active sports. **An adequate cycling infrastructure is still crucial for comfortable and safe bike travelling.** It is, as well, appropriate to offer services for those who don't own a bike – e.g. bike-sharing services, bike rentals. The cycling infrastructure (primary the newly built one) has to respect the needs of other sustainable transport modes – mainly public urban transport.

Czech cities with developed cycling transport are for example Hradec Králové and Pardubice – both mainly thanks to their flat area. Prague is trying to increase the usage of bikes among citizens but the challenges are significant there. Mainly **topographical consequences** (mostly hilly terrain), **dense traffic** on the roads and **urbanistic limitations** have to be faced.

Within the literature review, the authors have searched for literature (scientific papers mainly) oriented on issues related to cycling in large cities. Among the topics solved belong e-bikes, safety consequences related to dense traffic, health impacts of cycling, bike-sharing, as well as cycling infrastructure. For example Deleenheer et al (2017) focus on e-bike sharing system in Prague and development of e-bike

[1] Prague University of Economics and Business, Faculty of Business Administration, Department of logistics, W. Churchill Sq. 4, 130 67, Prague 3, Czech Republic
[2] Prague University of Economics and Business, Faculty of Business Administration, Department of logistics, W. Churchill Sq. 4, 130 67, Prague 3, Czech Republic
[*] corresponding author, phone: +420 224 098 773, e-mail: Bedrich.Rathousky@vse.cz

suitable for Prague conditions. Máca et al. (2020), on the other hand, focus on financial and non-financial rewards as a motivation to use bikes when commuting in cities. Among others they state that modal share of cycling in Prague forms just ca. 1-2%. These values correspond with other literature studied: TSK Praha (2021) – see Chapter 3.

Safety of urban cycling, which is important topic of this paper, is e.g. solved by Graser et al. (2016). They made a survey in Vienna among cyclists and present the results. They e.g. describe safety-related issues and number of accidents on different types of cycling infrastructure. Also Hull and O´Holleran (2014) focus on safety and comfort of using cycling infrastructure on an example of two cities located in the United Kingdom and four cities in Netherlands.

The authors put this **research question**: "*Are available measures for supporting cycling transport in Prague used sufficiently?*"

2 METHODOLOGY

The main **target of the paper** is to present the results of ***in situ* research** of cycling transport support measures currently taken in Prague. As well as to **identify places where the support measures are questionable**. The description of current measures taken in the field of cycling infrastructure in Prague is included in Chapter 4.1. Dangerous and irrational measures the authors have identified during the research are presented in Chapter 4.2.

Primary data gained by the authors are presented further. Besides the literature review, no secondary data have been used in the paper. Authors find this the **added value** of the paper.

For the purpose of this paper, theoretical background of cycling infrastructure was studied in Cach (2017). In **Fig. 1**, main infrastructure dedicated for cyclists is visualized. Left to right: the *dedicated lane*, the *protective lane* and the *pictogram-corridor* are visualized including recommended and minimal values for their widths (in metres).

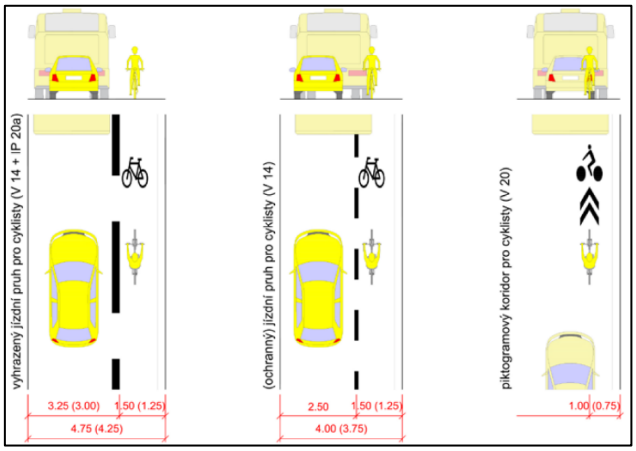

Fig. 1 Infrastructure dedicated for cyclists; source: Cach (2017).

In Fig. 1, the width requirements of passenger cars and busses in relation to the lane/corridor for cyclists is obvious. In the case of pictogram-corridor, it is fully used by busses or any large vehicles as well as partially used by passenger cars. This is obviously not beneficial from the safety point of view.

To be able to reach the hereinbefore specified *target* of the paper and to answer the *research question*, the authors have made an **on-site research** (personal observations) throughout Prague and presenting its results in Chapter 4.

All places considered in Chapter 4 have been **personally visited by bike** in the years 2022 and 2023. The photo-documentation and notes have been taken and used in this paper.

Primary **motivation to write paper on this topic** is that authors are frequent cyclists as well as car drivers in Prague and have faced many dangerous (or at least potentially dangerous) situations in the traffic. Therefore, they would like to point them out in this paper.

3 COMPARISON OF PRAGUE WITH OTHER CAPITALS

According to TSK Praha (2021) the modal-split data of **Prague** speaks in the case of cycling transport only about 1.2%. Contrary, walking forms 39%, public urban transport has 38% and the usage of passenger cars forms 21%. As a best-practices example is usually mentioned the city of Copenhagen – regarding topographical situation absolutely incomparable with Prague.

Koglin (2018) states that the share of cycling transport is 27% in **Copenhagen**. The usage of passenger cars is even higher than in Prague – it's share is 33%. Walking forms 21% and the usage of public urban transport forms 18%. In the field of ecology and sustainability, it is obvious from the comparison of Prague and Copenhagen that higher share of cycling need not necessarily mean lower usage of (not very ecological) passenger cars in the city.

Cycling in **Stockholm**, according to Koglin (2018), forms less than 7%. Public urban transport has ca. 47% and usage of passenger cars has 32% in the modal-split. Walking in Stockholm forms ca. 14%.

4 THE RESEARCH OF CYCLING TRANSPORT IN PRAGUE

The authors of this paper find the **safe cycling infrastructure** the most important for the increase of cycling transport share on the transport market of the city. Primarily, the segregation of cyclists from the motorized traffic is crucial measure. It brings higher cycling transport speeds (shorter travel times), as well.

4.1 Main cycling transport support measures

Hereinafter existing cycling transport support measures in Prague are presented. The on-site research has been done personally by the authors.

4.1.1 Bicycle paths

In total, Prague currently has ca. 215 kilometres of bicycle paths (TSK Praha, 2021). Bicycle paths represent completely segregated (separated) communication from other traffic – thus the safest type of cycling infrastructure. There are **three types of bicycle paths**:

1. paths reserved for cyclists only,
2. paths with the spaces (lanes) specified for pedestrians and for cyclists (painted on the surface of the path and specified by respective traffic sign),
3. path with mixed traffic (specified lanes for different users are not painted).

The type "3" bicycle path from the hereinbefore specified list is the least safe for all the users. The best option regarding safety of the users is, of course, type "1" (see Fig. 2) because of segregation/separation from both the motorized traffic and pedestrians.

Fig. 2 Chodovská street (segregated bicycle path); source: Authors.

Unfortunately, because of lack of space and investment costs, the paths with mixed traffic are the most frequent. Example of type "2" path is in the Fig. 3.

Fig. 3 Chodovská street (lane for cyclists and lane for pedestrians); source: Authors.

4.1.2 Bicycle lanes

This measure is represented by defining the space (lane) for cyclists on the carriageway using horizontal road markings. The markings define edges of the bicycle lane (aka cycle-lane) as well as inform drivers of motor vehicles (passenger cars, busses, trucks etc.) about the presence of bicycle lane. The whole area of the bicycle lane is sometimes painted in a highly visible colour – usually in red (sometimes in blue or green) – to ensure higher safety of cyclists. **Two types of bicycle lanes** are defined:

1. dedicated lanes,
2. protective lanes.

The difference between two specified types is that in the case of **dedicated lane** (see Fig. 4), users other than cyclists must not drive into the lane (unless they are crossing it – e.g. at a crossroads, when parking etc.). The **protective lane**, on the other hand, can be used by large vehicles (busses, trucks etc.) due to their width – i.e. if that vehicle doesn't safely fit into the remaining space on the carriageway. In total, Prague has 120 kilometres of bicycle lanes, of which 66 kilometres are dedicated lanes (TSK Praha, 2021).

Fig. 4 Moskevská street (dedicated lane); source: Authors.

4.1.3 Pictogram-corridors for cyclists

The pictogram-corridor is a formal measure only. The respective road markings (pictograms) just inform cyclists where to drive on carriageway and other road users about possible presence of cyclists on the carriageway. Currently, according to TSK Praha (2021), there are some 36 kilometres of "picto-corridors" defined in Prague and the number is certain to rise. The example is in Fig. 5.

Fig. 5 Francouzská street ("picto-corridor"); source: Authors.

4.1.4 Advanced stop-bars with bicycle boxes

This measure increases safety and comfort of cyclists at regular crossroads thanks to their position in front of other vehicles waiting in the queue. This measure belongs among the cheapest ones and is very effective. In Prague, there are 1,847 crossroads equipped with bicycle boxes (see Fig. 6) – mostly, there are several of them at a crossroads (TSK Praha, 2021).

Fig. 6 Vídeňská street (advanced stop-bar and bicycle box); source: Authors.

4.1.5 Road crossings for cyclists

Road crossings for cyclists are designed at places where cycle paths (cycle lanes) have to reach other side of a road. These crossings may be built as autonomous or combined with crosswalks. For safety reasons it is, naturally, better when the crossings are equipped with semaphores and dedicated for cyclists only. Unfortunately, this is not the rule at all. Two examples of crossings are shown in Fig. 7.

Fig. 7 Sulická and Ryšavého streets (road crossings); source: Authors.

4.1.6 Cycling traffic in one-way streets

This measure allows cyclists to drive in the "wrong way" direction in a one-way street. The road users – both the motor-vehicle drivers and cyclists – are informed about presence of this measure by road markings and traffic signs, of course. One disadvantage has to be mentioned in the field of safety: it is potentially dangerous in the case of lower visibility and/or lack of space (narrow streets). According to TSK Praha (2021), we can find 205 one-way streets in Prague with total length of 37 kilometres. An example of this measure is "picto-corridor" designed in the wrong way of *Hradešínská street* – see Fig. 8.

Fig. 8 Hradešínská street (picto-corridor in the wrong way direction); source: Authors.

4.1.7 Dedicated lanes for cyclists and other named road users

There are sections on the roads/streets where the dedicated lane is not for cyclists only, but for more road users. Typically, for public urban transport (busses, trolleybuses), police, ambulance, fire-fighters and taxi-cars (see Fig. 9).

It may be found beneficial for cyclists, as they are separated from the most of motor-vehicles, but in the case of frequent public urban transport in the area, the safety decreases significantly. The fluentness of this traffic decreases too.

The TSK Praha (2021) speaks about 35 kilometres of these dedicated lanes in Prague. Fig. 9 shows the example of this measure.

Fig. 9 Jugoslávských partizánů street (dedicated lane for cyclists and other named users); source: Authors.

4.1.8 Cycleways

Cycleways (aka cycle-trails or touristic cycleways), marked by traffic signs as seen in the Fig. 10, may be defined separately from cycle paths and cycle lanes, or their routes may be joined – as seen in Fig. 2 (page 3). Better measure is, naturally, the second one – i.e. when they are joined.

Fig. 10 Cycleway traffic sign; source: Prahanakole.cz

In total, there are more than 530 kilometres of cycleways in the area of Prague – significantly more than the length of cycle paths and cycle lanes is. Thus, using specifically cycleways through Prague does not guarantee safety at all.

4.2 Lessons learned – controversial measures

The authors have found several bad examples of cycling transport support measures (potentially dangerous and/or not comfortable for the cyclists). Individual examples are shown in Fig. 11 to Fig. 14.

Fig. 11 Hradešínská street (potential danger due to the sharp curve of the street); source: Authors.

Fig. 12 Dejvická street (potential danger of reversing cars into the dedicated lane); source: Authors.

Fig. 13 Nábřeží Ludvíka Svobody street (parallel usage of bicycle lane and bicycle path); source: Authors.

Fig. 14 Vídeňská street (not comfortable usage of dedicated lane); source: Authors.

Frequent **unsafe and comfortless measures existence is supported** by the document Median (2021). The respondents – in total 1,515 Prague inhabitants – of the survey have in 60% (on the first place) confirmed that low safety is the main barrier of potential or higher usage of a bicycle in Prague.

In total, 60% of the respondents have answered that **in the case of higher safety and more comfortable usage, they would increase their bike-journeys.** Regarding usage of bikes during summer and winter, 42% of the respondents is using a bike during summer, and only 11% during winter. Electric-bikes are used only by 4% of respondents (during summer), and by 1% during winter. Around 1/3 of the respondents see the topographical character and/or the air quality in Prague as a barrier. Finally, ca. 40% of the respondents find the hygiene issues problematic.

5 FINDINGS AND DISCUSSION

The measures discussed in chapter 4.1 was **primarily oriented on the infrastructure and safety consequences**. The list of analysed measures is, of course, not final. Among other measures, that are already used and are very important too, belong e.g. **bike-stands** that are built to ensure safe parking of bikes at **public transport hubs** (bus-stops, railway stations), schools, hospitals etc. In the year 2021, Prague had almost 4,200 bike-stands (TSK Praha, 2021).

During the research, the authors have identified many measures taken in Prague that are potentially dangerous for all the road users (especially cyclists) or measures that don't make sense quite much. Several **"lessons learned" examples** are shown in the chapter 4.2. In that context e.g. Máca et al. (2020) states that despite there are on average 2.5 bikes purchased by individual households in the Czech Republic, in Prage the average value is only **1.5 bike/household**. Furthermore, the paper states, that

bicycles are mostly used for sport and recreational purposes and not for commuting to work, school etc. **The authors of this paper have the same experience** and fully understand the reasons.

It is important to stress that accident-statistics available are not sufficient source for identification of dangerous places on the roads in the city. If cyclists are not using certain sections of bicycle lanes/corridors because they are scared of using them in the first place, the accident-statistics will obviously not contain any bicycle involved accidents on that particular section of the infrastructure and the responsible authorities will think their measures in the area are absolutely OK.

The research question, specified in the Introduction chapter, has been answered: in Prague, the measures for cycling transport support are used sufficiently, but potentially dangerous usages of these measures have been identified. For documentation see Chapter 4.2.

Dangerous situations outcoming from vehicles parked next to bike-lane is supported e.g. by Graser et al. (2016). General discomfort of cycling infrastructure usage in Prague is supported in Median (2021).

6 CONCLUSIONS

The aim of this research paper was to introduce currently made infrastructural measures in Prague to support cycling transport and significantly increase its share in the modal-split of the city.

Many cities are trying to support cycling transport using various measures and methods. In Prague, besides infrastructural measures discussed in this paper, the **connection between cycling and public urban transport** is established. Last but not least, the **bike-sharing systems** exist for quite a long time.

From the surveys done by the authorities, it is obvious that crucial problem in Prague is the safety of cyclists on the roads. Thus, **the recommendation of the authors is to get focused more on the increase of cyclists' safety (and comfort)** than on number of kilometres of cycling infrastructure. Only then, the citizens will potentially use bikes more than other, usually less ecological, means of transport – typically passenger cars.

The paper may be **beneficial for the authorities** as a sort of feedback regarding what to avoid in the future projects in this field. Unfortunately, the authors have to state that Prague is still not a safe place for cyclists.

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