

# **Analysis of the potential for expanding the use of cargo bikes in the Czech Republic**

**A. Seidlová<sup>1</sup>, M. Ledvinová<sup>2</sup>**

<sup>1</sup>*University of Pardubice, Studentská 95, 53210, Pardubice, Czech Republic, E-mail: andrea.seidlova@upce.cz*

<sup>2</sup>*University of Pardubice, Studentská 95, 53210, Pardubice, Czech Republic, E-mail: michaela.ledvinova@upce.cz*

## **Abstract**

The article deals with the factors that influence people's motivation to use cargo bikes as an alternative to cars. Cargo bikes are means of transport with a minimal impact on the environment, and their wider use can contribute to improving sustainable mobility in cities. In the Czech Republic, bicycles are quite popular, especially for recreation and sports. In regions with suitable conditions, bicycles are often used for trips to work and, to a lesser extent, for shopping. It can therefore be assumed that there is a certain potential for wider use of cargo bikes, which are currently used rather rarely. Based on a questionnaire survey, the article examines the circumstances under which respondents would be willing to use a cargo bike. The aim is primarily to define the potential user of a cargo bike and the conditions for increasing the motivation to use cargo bikes.

**KEY WORDS:** *cargo bikes; sustainable mobility*

## **1. Introduction**

The history of cargo bikes dates to the end of the 19th century in England, when cargo bikes began to be used mainly for the delivery of fresh food, such as milk and pastries, but also for the delivery of mail and for the needs of small craftsmen. [11] Later, cargo bikes spread to other European countries and America, and in the first half of the 20th century they were a relatively common part of transport, especially in cities. The importance of cargo bikes began to decline in Europe and America after the Second World War with the boom in motoring and new technologies. During the 1960s and 1970s, cargo bikes practically disappeared in Europe and America. The return of cargo bikes has occurred in some European countries and the USA in the new millennium mainly in connection with the promotion of the principles of sustainable mobility, environmental protection, and a healthy lifestyle. The possibility of using an electric drive has also contributed to wider use. In Asia and Africa, the bicycle became a means of transportation much later than in Europe [2]. In some Asian and African countries, cargo bikes have been used continuously, both for transporting cargo and people. It can therefore be said that cargo bikes are currently used worldwide, but there are regional differences in the way they are used and their perception by residents.

The behaviour of cargo bike users in traffic is addressed e.g., in [8,9,17]. There are regional differences e.g., in the way of using the infrastructure, the way of driving and traffic safety, or even between gender groups of cargo bike users.

Studies dealing with the potential of using cargo bikes point out that the cargo bike can be a suitable alternative to the passenger car [4,5,7]. Cargo bike sharing systems, which have become more widespread in European countries in recent years, also have the potential to increase the number of cargo bike users [3,4], especially for people who for some reason cannot or do not want to own a cargo bike and do not use it regularly.

## **2. Analysis of factors influencing the use of cargo bikes in the Czech Republic**

In the Czech Republic, cargo bikes are used much less than in countries with a long tradition of bicycle transport. Bikes for courier services have seen a greater spread in recent years, but they are still a rarity in the field of private use. Deciding on the possibility of using a cargo bike is influenced by objective, subjective and social factors. The authors dealt with local conditions and legislation, which are among the objective factors, in previous works. A questionnaire survey is a suitable tool for the analysis of objective and social factors. Surveys of transport behaviour, focused on the modal split in the Czech Republic, usually include bicycle transport. They usually distinguish the purpose of the journeys, but do not specify separately the use of cargo bikes.

### **2.1. Structure of potential and existing users of cargo bikes**

In 2021, a survey was carried out as part of the public cargo bike rental project in the city of Brno, which examined the opinions of users of the rental company on the use of cargo bikes. [18] The results of this survey have been based on the situation in the city of Brno and on the opinions of users who have had at least one experience using a rental bike. Our paper is focused on finding out the general potential for the use of cargo bikes in the Czech Republic. To find out the interest in cargo bikes, it is therefore advisable to contact diverse respondents from different regions of

the Czech Republic. We processed data from a questionnaire survey conducted in the period February 8 - March 20, 2024 [12]. The survey was realised online on a public basis via Google Forms and 179 respondents participated, of which 173 responses were usable.

The questionnaire contained questions common to all respondents, focused on basic data about the respondents and their current traffic behavior. It also contained a second separate set of questions for respondents not using a cargo bike, focused on the potential of using a cargo bike in the future. The third separate group of questions for respondents using cargo bikes was focused on their experiences and suggestions for improvement. Quantitative evaluation of individual questions in percentage values is carried out in [12]. Following this, we focus on evaluating the interconnectedness of respondents' answers and description of conditional connections between different groups respondents in this paper.

Of the total number of respondents, women represent 62.4% and men 37.6%. A total of 59.5% of respondents currently use bicycle transport (36.4% women and 23.1% men). This structure points out that the issue of cargo bikes seems most interesting to women who use bicycles. The survey was also attended by 13 respondents (7.5% of all) who used a cargo bike, including 2 women and 11 men. This, together with the fact that up to 63.6% of respondents stated that they had never encountered a cargo bike, points to the fact that cargo bikes are currently rather rare in the Czech Republic and awareness of them is low.

The current dominant mode of transport is the car, among both women and men in almost all age groups (Fig. 1).

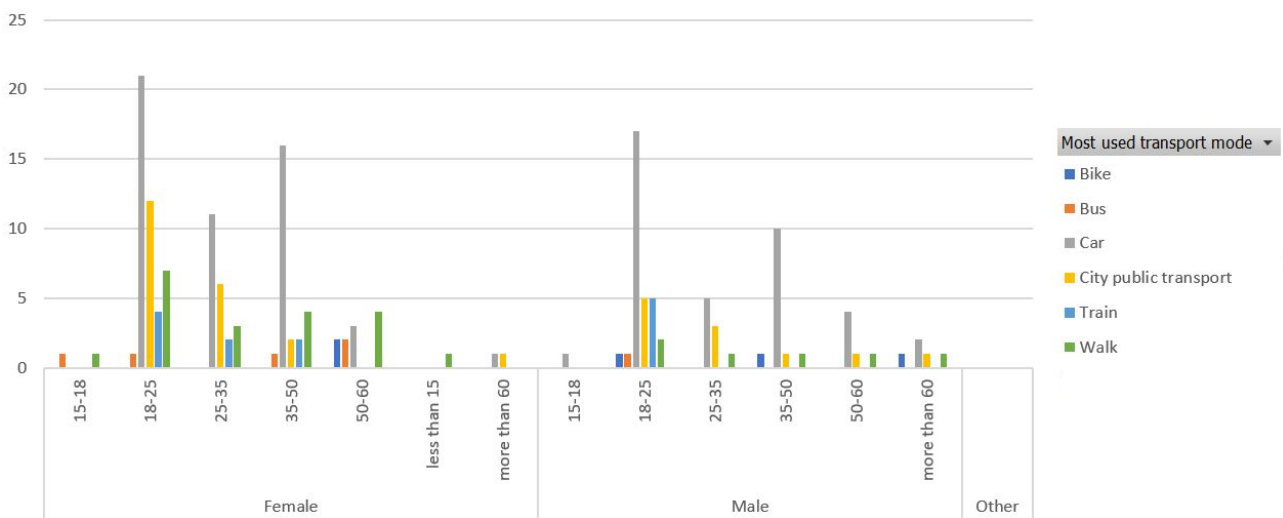


Fig. 1 Most used transport mode – number of respondents

## 2.2. The purpose and way of use the cargo bikes

A total of 54% of respondents who do not currently use a cargo bike state that the main purpose of possible use is shopping and transporting cargo (Fig. 2), which significantly outweighs other purposes. There are no significant differences between men and women in this category.

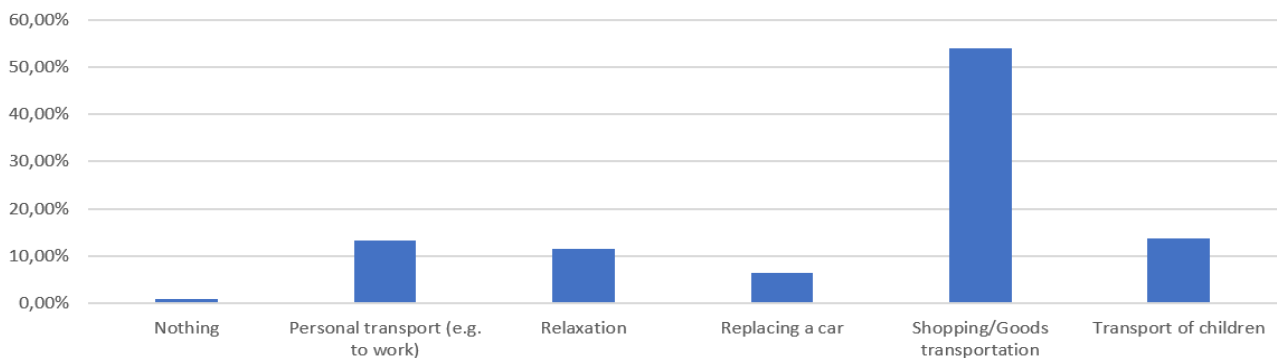


Fig. 2 Preferred purpose of use for respondents not currently using cargo bikes.

There are some differences between the different groups of respondents in the travelling distance category. Respondents who do not currently use a cargo bike expect to use it most often up to a distance of 10 km (36.3% of all). Most women (38.7%) expect transportation up to 10 km and 28.3% even up to 20 km. Men most often assume a distance of up to 5 km (37%) and up to 10 km (31%). Current users of cargo bikes most often reported a distance traveled of up to 10 km (77%), and the remaining 23% reported a distance between 10 and 20 km. The difference between potential and existing users can be a way of expectation and reality. The use of a cargo bike can be physically

more demanding in reality, e.g. with regard to the weight of the bike and the quality of the infrastructure.

Figure 3 shows the relationship between preferred bike type and interest in using a rental or shared bike. This indicator could be helpful to potential rental/sharing operators when compiling a range of cargo bikes. Potential rental/sharing customers would mainly expect three-wheeler with rear loading space (18.7%) and two-wheeler with rear loading space (18.1%). Existing users of cargo bikes, on the other hand, prefer two-wheeler with front loading space and three-wheeler with front loading space. Again, there can be a difference between expectation and reality, mainly in the idea of manoeuvrability and handling characteristics of different types of cargo bikes.

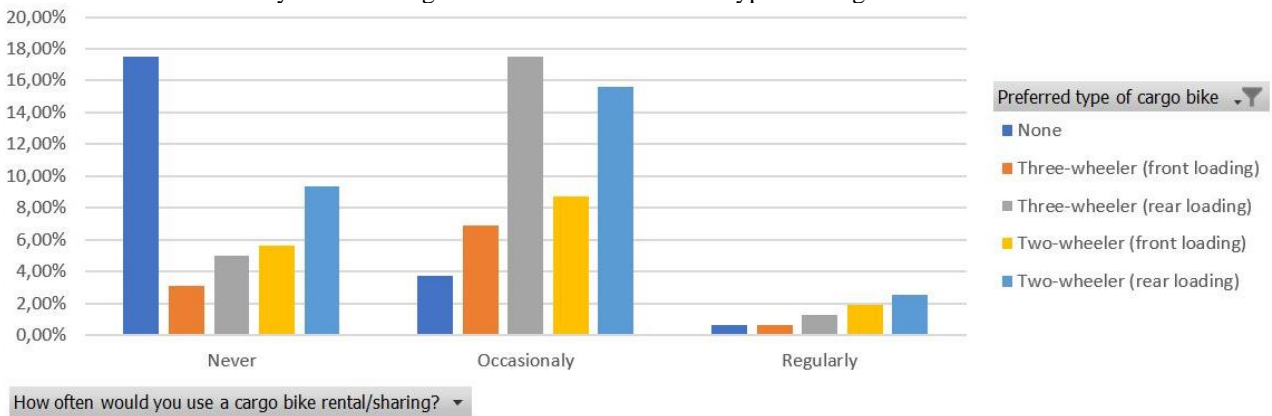


Fig. 3 Preferred type of cargo bike to rent for respondents not currently using cargo bikes.

### 2.3. Safety

Figure 4 shows the perception of cargo bike safety by respondents who do not currently use a cargo bike, according to whether they currently use a standard bike.

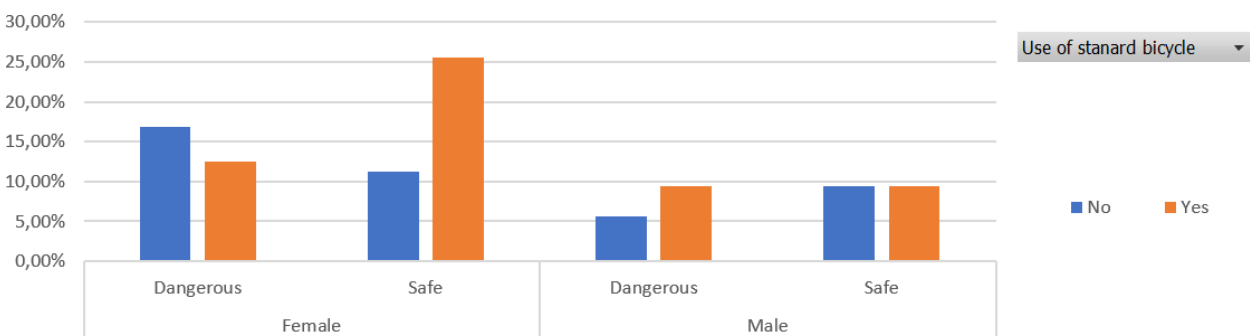


Fig. 4 Perception of cargo bike safety by respondents not currently using cargo bikes.

The difference here is that as many as 67% of women who ride a standard bike consider a cargo bike safe, while among men who ride a standard bike it's only 50%. This may be due to the predominant riding style of each group (cautious vs risky).

### 2.4. Characteristics of potential cargo bike user

Based on data on existing cargo bike users, most users are male. The typical user uses a two-wheeler with front loading space for distances up to 10 km. They are predominantly owners of cargo bikes, but this may also be influenced by the very limited possibilities for renting/sharing cargo bikes in the country. Existing users also commented on the infrastructure used, which they largely consider only partially suitable or unsuitable for cargo bikes with insufficient parking areas.

Women predominate among potential users who do not currently use cargo bikes. This user group would prefer a three-wheeler with rear loading space and two-wheeler with rear loading space for distances up to 10 km. Three-fifths of all respondents would use a hire/sharing service if they used a cargo bike.

## 3. Possibilities of the public and private sector to increase the motivation to use cargo bikes for personal needs

Cargo bikes represent a modern, sustainable, and environmentally friendly mode of transport for which there is still room for greater expansion in the Czech Republic. Both commercial entities and public administration can participate in this. The range of cargo bikes for sale on the Czech market has been expanding in recent years and dealers are often among their users and main promoters. What is missing on the Czech market, and according to the survey

could have some prospects, are shared cargo bike systems. When introducing such a system to the Czech market, it would be possible to use the experience with standard bike-sharing systems, which are already relatively well established here. The price of the rental, which must be competitive with the cost of other modes of transport, would certainly play a crucial role in this case. There are possibilities for promotional sponsorship or cooperation with the public sector in the form of subsidies. Given the current state of infrastructure and the lack of facilities for cargo bikes, the entry of cargo bike-sharing into the Czech market would probably be more expensive than in countries with developed infrastructure.

Cities in the Czech Republic use several tools to increase sustainable mobility. It would be appropriate to integrate cargo bike transport into these tools. These tools include the Sustainable Urban Mobility Plan, which should contain both measures related to bicycle transportation and city logistics. It is a strategic document, so its potential for the integration of cargo bikes into urban logistics is very high. Other documents include the Territorial Plan (especially for cycle infrastructure measures) or so called cyclogenerel.

Local authorities in cities can use, for example, a handbook [13] to create and update their strategic documents, which will also include measures for cargo bikes. To promote the use of cargo bikes, cities can use, for example, a manual [1].

Unfortunately, most local authorities focus on personal mobility when planning sustainable mobility. Larger cities do have elaborated SUMP, but they are only marginally involved in freight transport. However, it should be noted that more than half of all trips in urban areas are made for the purpose of transporting goods ([14] reports up to 60%). It should be noted that this is not only transport in trucks, but a large part is precisely from the daily transport of goods by individuals to households. For this reason, it is necessary for the local government to include in its measures to increase the share of sustainable modes of transport also measures that will enable the full use of an alternative to the passenger car, i.e., the cargo bike.

As an example, it is possible to present the city of Pardubice, where, according to [10], bicycle transport is currently used for 14% of trips. It is due to both the suitable geomorphological location and the size of the city. Bicycle transport is suitable for shorter journeys, in Pardubice up to distance of 3-6 km. According to [10], cyclists in Pardubice have a total of 151.2 km of routes at their disposal. Almost 40% of these routes are shared paths for pedestrians and cyclists. This brings problems in terms of width arrangement and safety, especially on routes with a greater intensity of cyclists. These are paths with shared traffic for pedestrians and cyclists, which do not have sufficient width for the passage/traffic of cargo bikes. Only less than 3% of the trails are separate cycle paths and approx. 1.5% are paths for pedestrians and cyclists with separate traffic. However, accidents also occur on routes that are insufficiently separated from intensive car traffic. Up to 24.4% of routes lead on roads without measures, i.e., shared with car traffic [6].

As part of the processing of SUMP, a problem map for pedestrian and bicycle traffic was created [16] and at the same time a map of bicycle routes was updated [19]. The analysis identified as a problem the lack of completeness of the routes and precisely the high proportion of routes shared with pedestrians. However, the entire analysis was focused on personal bicycle transport. Even though SUMP for the city of Pardubice deals with freight transport, cargo bike transport is not part of the analysis of freight transport (not even within the scope of city logistics).

In its measures for the development of bicycle transport until 2035, the Pardubice SUMP focuses mainly on increasing safety, either in the form of separation from motor transport (increase of paths separated from motor transport by approx. 3% to approx. 43% share of cycling routes in 2035) or in the form of reserved or protective lanes (these should make up approx. 23% in 2015) or by calming traffic (routes on roads with a speed of up to 30 km/h should make up approx. 34% in 2035). Even if this plan does not implicitly address cargo bike transport, it is possible to see that smaller cargo bikes could use 57% of bicycle routes in 2035.

Regarding bicycle parking, most of the existing bulk racks are not suitable for cargo bikes, and SUMP does not implicitly count for such racks either.

As you can see, even a cycling city like Pardubice does not pay attention to cargo bike transport in its strategic document - SUMP, but also in others (Territorial Plan, Cyclogenerel).

#### 4. Conclusions

To motivate people to use cargo bikes in a targeted way, it is first necessary to define who the potential users of a cargo bike could be and what their needs could be. The conducted survey provides basic indicative data on potential users of cargo bikes in the Czech Republic. It shows that there is a certain interest in cargo bikes and therefore room for their greater expansion.

Both the public and private sectors can contribute to increasing the motivation to use cargo bikes. Local authorities in cities have the opportunity to take cargo bikes into account in their development plans and to participate, for example, in the promotion of bike-sharing schemes.

#### References

1. 20 Good Reasons to Ride a Cargo Bike. 2019. [online cit.: 2024-06-28]. CycleLogistics – CityChangerCargoBike. Available from: <http://cyclelogistics.eu/publications/mayors-guide-to-cargo-bikes/>
2. Antonova, T. 2020. A Short History of Cycling Outside the West. [online cit.: 2024-06-20] We love cycling. Available from: <https://www.welovecycling.com/wide/2020/01/15/a-short-history-of-cycling-outside-the-west/>.

3. **Becker, S.; Rudolf, C.** 2018. The Status Quo of cargo-bikesharing in Germany, Austria and Switzerland. German Environment Agency. Framing the Third Cycling Century. Bridging the Gap between Research and Practice, 168–180.
4. **Bissel, M.; Becker, S.** 2024. Can cargo bikes compete with cars? Cargo bike sharing users rate cargo bikes superior on most motives – Especially if they reduced car ownership. *Transportation Research Part F: Traffic Psychology and Behaviour*, 101: 218-235.
5. **Bjørnarå, H. B.; Berntsen, S.; J Te Velde, S.; Fyhri, A.; Deforche, B. et al.** 2019. From cars to bikes – The effect of an intervention providing access to different bike types: A randomized controlled trial. *PLOS ONE*. 2019, 14 (7).
6. Brožura ParduPlán. [online cit.: 2024-06-28]. Available from: <https://parduplan.cz/dokumenty/>.
7. **Carracedo, D.; Mostofi, H.** 2022. Electric cargo bikes in urban areas: A new mobility option for private transportation. *Transportation Research Interdisciplinary Perspectives*, 16.
8. **Dalla, Ch.; Donnelly, G.; Gunes, S.; Goodchild, A.** 2023. How cargo cycle drivers use the urban transport infrastructure. *Transportation Research Part A: Policy and Practice*, 167.
9. **He, Y.; Sun, Ch.; Huang, H.; Jiang, L.; Ma, M. et al.** 2021. Safety of micro-mobility: Riders' psychological factors and risky behaviors of cargo TTWs in China. *Transportation Research Part F: Traffic Psychology and Behaviour*. 80: 189-202.
10. Jak šlape cyklistika? [online cit.: 2024-06-28]. Available from: <https://parduplan.cz/jak-slape-cyklistika/>
11. **Kirkels, M.** 2016. Short history of the cargo bike. The cargo bike: Undervalued all-rounder with promising future. [online cit.: 2024-06-20] International Cargo Bike Festival. Available from: <https://cargobikefestival.com/news/short-history-of-the-cargo-bike/>.
12. **Kopecký, M.** 2024. Analýza využívání nákladních kol pro osobní potřebu [online cit.: 2024-06-20]. Bachelor thesis. University of Pardubice. Faculty of Transport Engineering. Ing. Andrea Seidlová, Ph.D. Available from: <https://dk.upce.cz/>.
13. Mayor's Guide to Cargo Bikes. 2019. [online cit.: 2024-06-28] CycleLogistics – CityChangerCargoBike. Available from: <http://cyclelogistics.eu/publications/mayors-guide-to-cargo-bikes/>
14. Městská logistika v kontextu SUMP. [online cit.: 2024-06-28]. Available from: <https://www.akademiamobility.cz/aktuality/1237/mestska-logistika-v-kontextu-sump>
15. Plán udržitelné městské mobility statutárního města Pardubice. [online cit.: 2024-06-28]. Available from: <https://drive.google.com/file/d/1BFCmjQZEEysfzFoBIn3Gs498ttT8k3PK/view>
16. Problémová mapa cyklistické a pěší dopravy. [online cit.: 2024-06-28]. Available from: [https://parduplan.cz/wp-content/uploads/2021/08/D2\\_Problemova-mapa-CaP.pdf](https://parduplan.cz/wp-content/uploads/2021/08/D2_Problemova-mapa-CaP.pdf)
17. **Riggs, W.; Schwartz, J.** 2018. The impact of cargo bikes on the travel patterns of women. *Urban Planning and Transport Research*. 6 (1): 95-110.
18. **Šindelář, M.** 2021. Veřejná půjčovna nákladních kol: vyhodnocení pilotáže a návrh provozního modelu. [online cit.: 2024-06-20] Brno: Nadace Partnerství. Available from: <https://www.cyclurban.eu/wp-content/uploads/2021/09/kargo-report-v3-final.pdf>.
19. Síť cyklistických tras na území města-Pardubice a okolí. [online cit.: 2024-06-28]. Available from: [https://parduplan.cz/wp-content/uploads/2021/10/E9\\_Sit-cyklisticky-ch-tras-na-uzemi-mesta-Pardubice-a-okoli.pdf](https://parduplan.cz/wp-content/uploads/2021/10/E9_Sit-cyklisticky-ch-tras-na-uzemi-mesta-Pardubice-a-okoli.pdf)