

## CARSHARING AS AN ELEMENT OF MOBILITY MANAGEMENT

Kubera M., Ślusarczyk B.\*

**Abstract:** A phenomenon noticeable nowadays, especially among the younger part of society, is departing from the need to own possessions to the attitude of sharing them with others, thus implementing the assumption of the sharing economy. The possibility of using individual transport rental per minute, especially passenger cars, is a convenience for residents who may meet their transport needs fast and comfortably, without incurring fixed fees and, additionally, in an environmentally friendly form. Therefore, this article attempted to characterize the users of carsharing, understood as a sustainable transport service implementing the assumptions of the sharing economy. The research carried out on a sample of 1176 respondents indicated that people using shared mobility demonstrate the desired – sustainable transport behavior, among others, consisting of an increase in the amount of travelling on foot and by bicycle while limiting travelling by private cars. In addition, the study showed that working people and students use carsharing to meet their transport needs. Secondly, the most popular time of operation of the service is in the evening, from 6 p.m. to 10 p.m., and the leading purpose is personal matters, which are dealt with the help of this type of shared mobility.

**Key words:** carsharing, sharing economy, sustainable development, city transport, mobility management

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### Introduction

Urban mobility management in the 21st century has become a great challenge for entities responsible for the organization of transport in cities. National, European and global mobility policy aims to reduce exhaust emissions from transport activities, emphasise ecological means of mobility and encourage or even exert pressure through bans or additional charges on users of traditionally powered vehicles (Castanho et al., 2019). On the other hand, city dwellers want to meet their transport needs quickly, cheaply and comfortably, without having to wait long for public transport and need to travel long distances to get to a stop or destination. Hence, the emergence of the possibility of making travelers, especially those within the city,

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\* **Marcin Kubera**, PhD, Pomeranian University, Starogard Gdanski, Poland;

✉ e-mail: marcin.kubera@twojestudia.pl,

ORCID: 0000-0002-6163-0650

**Beata Ślusarczyk**, University Professor, Czestochowa University of Technology, Czestochowa, Poland; North- West University, South Africa;

✉ e-mail: beata.slusarczyk@pcz.pl,

ORCID: 0000-0002-7276-8372

using shared means of transport, and especially commercially available cars, has become an interesting form of movement for many residents.

The carsharing service, which has been operating in Polish cities for a few years, may be considered an alternative and sustainable means of public transport based on the assumptions of the sharing economy. The dynamic development of new technologies in the 21st century allowed the establishment and operation of many online platforms and mobile applications. This facilitated the exchange of a wide range of products and services between their users, owners, or consumers, such as bikes, scooters, motor scooters, parking spaces, electronic and household appliances, clothing, car journeys or short-term rental of apartments. As pointed out by Benjaafar, Kong, Li and Courcoubetis (2019), the popularity and universality of this phenomenon are also due to social factors, such as concern for the environment, an increase in altruism among young and educated people and an increased population density in urban areas.

### **Literature Review**

The aforementioned phenomena occur in science and economics and are known as sharing economy, which is based on the assumption of a better use of resources by sharing, transferring, making available, exchanging or co-sharing products. Frenken (2017) stated that “the sharing economy has existed as long as humanity”. Sharing goods without new technologies has always been common among families, friends, and neighbors. These are trusted people due to emotional bonds and past interactions. In such a close community, goods were often borrowed for free. This was due to social obligations and not for commercial purposes (Kurowska-Pysz and Kunikowski, 2021). On the other hand, lending or sharing goods with strangers was rare due to the lack of information about the credibility of a stranger. As Szor (2014) rightly points out, the key change occurred with the advent of the Internet, which made people begin sharing with strangers.

Sharing is linked to making the entire goods available for a specified period (e.g., car rental or house sharing allowing different consumers to use the car or house at different times), but sharing may also involve access to some of the goods (e.g., carpooling, in which a partner is entitled to one seat in a car). Irrespective of whether this practice is combined or not with money transactions, in material terms, it is the same type of sharing of a physical resource, i.e., the implementation of assumptions of the sharing economy. An important aspect is that a given material good does not change its owner. A characteristic feature of the sharing economy is primarily consumers who give each other access to their physical and material goods for free or at an appropriate price, sharing them.

An example of the sharing economy is the carsharing service, which is increasingly common in Polish cities and has become an alternative method of public transport for many residents (Ogata et al., 2022; Dacko-Pikiewicz and Wróblewski, 2017). As noticed by Hui, Ding, Zheng and Lou (2017), the service consists of car rental per

minute, thus ensuring the maximum possible availability of vehicles to the maximum number of individual users.

Carsharing is a service of sharing vehicles with two main objectives: environmental and social. According to Arbeláez and Plepys (2021), using this service positively affects the mobility in cities, reduces exhaust emissions and reduces the need for car ownership (Aguilera-García et al., 2022; Guyader et al., 2021). However, a third aspect to bear in mind is economics, which is very important in Polish realities. The service does not generate fixed costs, which is favorable for many users, particularly young people. Ceccato and Data (2018) consider it a “new means of transport”, combining traditional private and public transport characteristics. Mounce and Nelson (2019) believe that the service is most often introduced in urban areas with a good public transport network, which proves that carsharing is complementary to public transport while not competing with it. The possibility of renting a vehicle for a short period, minutes or hours in real-time, using mobile applications, distinguishes carsharing from traditional car rental services. Independence in the process of beginning and ending a service, without the need for the presence of the operator’s staff on the site, according to Teram, Peltoma, Rolim and Baptist (2018), is a feature distinguishing this type of shared mobility (Hu et al., 2021; Gauer et al., 2022).

The issues of both carsharing and the sharing economy are the subjects of a lively international academic discussion (Benoit et al., 2022; Fang and Li, 2022; Wei et al., 2022; Wróblewski, 2020); however, very few studies concerning the emergence and operation of the sharing economy sectors in Poland have been carried out so far. The research gap in the conducted research is also noticeable, concerning, among others, the impact of the service on the transport behavior of its users and the lack of analysis of the use of the service in Polish realities on a national scale. This article is inscribed in the research area by analyzing the research conducted on a sample of 1176 system users. The rich material collected is a significant contribution to the national research into the operation of carsharing in the context of the sharing economy and sustainable transport in Polish cities.

The functioning of car sharing and the sharing economy would not be possible without activities related to mobility management. Mobility management, according to the definition of the European Mobility Management Platform: "(...) the concept of promoting sustainable transport and managing the demand for the use of cars by changing the attitudes and behavior of travelers." Mobility management is based on 'soft' measures, including information, communication, organization of services and coordination of activities of various partners. “Soft” measures are most often designed to improve the effectiveness of “hard” measures used in urban transport (infrastructure elements, such as new tram lines, roads or bicycle paths). They do not require large financial investments while maintaining a high cost-benefit ratio. Mobility management is becoming increasingly important for the future of transport (Ślusarczyk, 2020). Reliability and safety of the transport service, on the one hand, the transport service determines the ability of enterprises to run a business; on the other, for society, it affects the ease of access to places of employment and loading

zones and unloading related to trade. Therefore, a priority in mobility management in transport is believed to shape society's communication behaviour.

Attempts to scientifically describe carsharing, in the context of the sharing economy have been made by many authors in recent years (Golalikhani et al., 2021; Alencar et al., 2021). It is worth mentioning Hahn, Ostertag, Lehr, Büttgen and Benoit (2019), who presented the impact of carsharing business models on the intentions of use in the sharing economy. While referring to the existing conceptual framework of user participation in sharing business models, by factor testing, they identify the significance of various dimensions of carsharing business models as well as the gap between attitudes and behavior in the sharing economy by defining appropriate dimensions of the carsharing business model (Ritter and Schanz, 2021; Baumgarte et al., 2021; Ayu et al., 2020). An interesting issue linked to trust as an element combining the sharing economy with carsharing is raised by Bossauer, Neifer, Pakusch and Staskiewicz (2019). They present the ratings and reviews issued as central mechanisms to deal with the information gap related to the lack of information about the shared vehicle renter. The authors assess the extent to which technology and smart contracts are appropriate technologies to meet these challenges. The safety issue in carsharing, which, according to the authors, quickly gained popularity due to mobile platforms of the sharing economy, was addressed by Hartl, Sabitzer, Hofmann and Penz (2018). In the article, they analyzed one of the possible risks of carsharing platforms, the growing number of car accidents among teenage drivers who are more susceptible to newly adopted digital platforms and more at risk of a car accident than adult drivers.

Along with introducing the carsharing platform, it was easier for teenagers to gain access to cars than before. Based on the conducted research, the authors concluded that carsharing entering the market significantly increases the number of accidents among teenage drivers. The German sharing economy market based on the carsharing service was discussed by Vaskelainen and Münzel (2018), who, in their article, described the effects of institutional logic in the context of the business model development in the German carsharing industry, which also applies to entities in many other sharing economy markets beyond the German carsharing.

An environmental study of the carsharing and sharing economy was undertaken by Vith, Oberg, Höllerer and Meyer (2019). Building on a qualitative comparative analysis of 16 leading global cities, their findings reveal four framings of the sharing economy: 'societal endangerment,' 'societal enhancement,' 'market disruption,' and 'ecological transition.' Ali Aden, Zheng, Ullah and Safdar notice that car sharing has been launched in different cities worldwide to mitigate severe transportation problems such as traffic congestion, air pollution, and traffic safety. Carsharing services promise environmentally sustainable and cost-efficient alternatives to private car ownership, contributing to more environmentally sustainable mobility, as addressed by Brendel, Lichtenberg, Morana, Prinz and Hillmann (2022). Palm, Södergren and Bocken (2019) analyzed cities' potential roles in managing the sharing economy. Shared mobility options, such as car sharing, are often claimed to

be more sustainable, although evidence at an individual or city level may contradict these claims. Lyaskovskaya and Khudyakova (2021) examined the relationship between the sharing economy and achieving the Sustainable Development Goals in three directions, i.e. by analyzing the conditions for the emergence of the sharing economy, tracking the evolution of the theory of the sharing economy and by examining the quantitative impact of sharing the development of the economy for the implementation of sustainable development goals.

The theoretical description of the carsharing service as an example of the sharing economy in Poland has been taken up by many Polish authors. Górnica (2021) presented the significance of the service in the urban logistics area in terms of the sharing economy in the example of Polish cities and assessed the carsharing system in relation to both positive and negative effects of development. Kawa and Nesterowicz (2022) approached the essence of the concept, the advantages and disadvantages of the sharing economy and the carsharing service in the example of the Panek CarSharing S.A. company. Additionally, based on the observations and analysis of its operations, they formulated the thesis that the sharing economy is the concept aimed at reducing consumerism in the world and popularizing the sharing economy. Michalski, Bednarz and Popiel (2019) presented carsharing as one of the most popular forms of sharing resources in the broader context of changes taking place in the environment of modern man. The authors suggest that changes in the needs of today's consumers and the preferences to meet them are present in the scientific discourse on the sharing economy and a new line of research: social logistics, including urban logistics. Płaziak and Szymańska (2019) presented some alternative forms of urban transport, including carsharing, in the context of the sharing economy. At the same time, the authors suggested that due to the specificity of the order execution, which requires access to a computer or a mobile tool and the Internet and/or a special application, primarily young people use alternative transport services. In addition, a range of features characteristic of the younger digital generation (network generation, Y generation) is conducive to the growing popularity of shared transport among this generation.

Nevertheless, in the literature on urban mobility management, no items were found that concerned the impact of the operation of the service on the transport behavior of the inhabitants of given cities, as well as the impact on the entire process of planning, organizing and controlling activities in the field of urban transport. Therefore, the authors have tried to address an important topic, their opinion, which concerns the interaction of carsharing services with management activities in relation to urban mobility.

### **Research Methodology**

The query of the subject literature, both domestic and foreign, as well as the desk research analysis, made it possible to diagnose the problem and find the research gap. The consequence of the above was preparing an appropriate questionnaire form containing selected questions linked to the existing state of ignorance and cognitive

deficiencies. The questionnaire was addressed to randomly selected users of the service. It is estimated that about 2 million people currently use carsharing (<https://www.rp.pl/transport/art35710711-car-sharing-juz-po-zapasci-nowi-gracze-w-polsce>).

The size of the population was used to estimate the minimum size of the research sample, according to Ostasiewicz et al. (2006).

$$n = \frac{\mu_{\alpha}^2 p(1-p)N}{\mu_{\alpha}^2 p(1-p)w + (N-1)d^2}$$

Where:

$\alpha$  - the level of significance;

$\mu_{\alpha}$  – value from the tables of the distribution function of the normal distribution;

$p$  – structure indicator;

$d$  – maximum estimation error.

It is accepted for the conducted study the confidence interval  $\alpha = 0.95$ , a maximum estimation error of 5% and a fraction ratio of 50%.

$$n = \frac{1,96_{0,95}^2 * 0,5 * 0,5 * 2000000}{1,96_{0,05}^2 * 0,5 * 0,5 + 2000000 * 0,05^2} = 384$$

The minimum sample size for the study population is 384 people. Due to the random nature of the survey and the method of collecting data using the CAWI method, finally, the survey was completed by 1,192 respondents within 2 months of 2022 (August-September). After the data collection cleaning process, 1176 properly completed questionnaires were subjected to final analysis.

The link to the questionnaire form, Google Forms, intended for the users, was shared on social media and social groups of individual operators on Facebook. The analysis of the survey research results was carried out using relevant statistical and descriptive methods. After verifying the compliance of the respondents' answers, which consisted of assessing the statistical material's completeness, databases were created in the MS Excel spreadsheet. The statistical analysis was conducted using the IBM SPSS Statistics package, version 26. It was used to analyze the basic descriptive statistics and the Kolmogorow - Smirnow distribution normality test. The task of the test is to verify the hypothesis on the compatibility of the distribution of a given population with a normal distribution. The compatibility test compares the value of an empirical cumulative distribution function and a theoretical cumulative distribution function of the normal distribution. This test is used for continuous variables; for other types of variables, Pearson's  $\chi^2$  compatibility test should be used. Single-factor variance analyses in terms of the inter-group design were also carried out. During the analysis, the significance level of  $\alpha = 0.05$  was adopted.

The qualitative variables were evaluated using frequency analysis (% , n). To test the multiplicity of the groups, Pearson's  $\chi^2$  compatibility tests were carried out. Pearson's  $\chi^2$  independence tests were carried out with the correlation of two qualitative variables. This test is to verify the hypothesis that two variables describing the general population are independent. When comparing the values observed with the values expected, they indicate a difference, which, if it is large (statistically significant), can be said to be a relationship between one variable and the other. When establishing the relationships between two ordinal variables, the analysis using Spearman's correlation was carried out.

### Research Results

The research on a sample of 1176 service users indicated that nearly half of the respondents (49.74%; 585 people) are those aged 18-25. In a group of men, people aged 26-39 dominated (50.94% of men; 353 people), whereas, in a group of women, people aged 18-25 dominated (69.56% of women; 336 people). People over 65 were the least active in the study; their share in the research sample was only 0.17% (2 people).

This result gives reliable information that the activities provided by the economic entities providing the carsharing service and the relevant departments of municipal offices dealing with mobility and transport management in cities must be aimed at young people up to 25 years of age. This information is particularly important in terms of appropriate and effective marketing and operational activities.

In the structure of the respondents, the largest group in the research sample in terms of socio-professional status was working people - 60.37% (710 people), followed by school pupils/students - 38.01% of the respondents (447 people). The unemployed amounted to 1.45% (17 people), and the smallest group was retirees/pensioners - 0.17% (2 people).

As an example of the sharing economy and a type of transport in the city, the carsharing service is used by more than half of the users (51.44%; 605 people) less than once a month. Nearly every tenth respondent (9.52%; 112 people) meets the transport need using shared mobility at least once a week, and 7.66% (90 people) a few times a week. Over  $\frac{1}{3}$  of those questioned (31.38%; 269 people) use the service at least once a month.

In order to provide a more detailed analysis of the service operation, the respondents were asked to tick (multiple responses) time intervals for using carsharing. When interpreting the results of the responses to this question, it should be stated that the largest number of people indicated the evening between 6 p.m. and 10 p.m. 846 people meet their transport needs with shared mobility during this time, which amounts to 38.45% of all the responses, which in total, with the possibility of multiple choice amounted to 2200. Another popular part of the day to meet transport needs using shared mobility is the afternoon, chosen by 668 people, amounting to 30.36% of the obtained results. The night and noon hours were characterized by the lowest frequency, with 213 respondents (9.68% of the responses) and 215 people

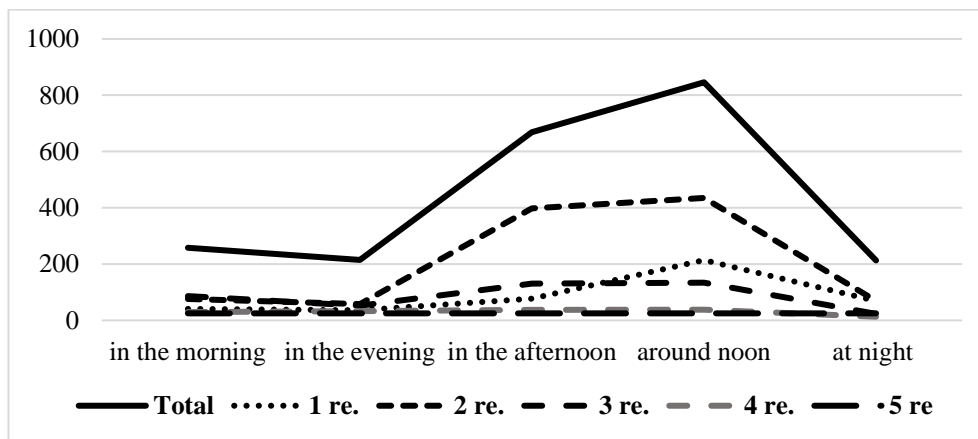
(9.77% of the responses) travelling at that time. 258 respondents use the carsharing service most often in the morning, which translated into 11.73% of all the obtained responses. The results are presented in Table 1.

**Table 1. Frequency of using the service by time of day**

	Number of indications	% of all indications
<b>In the morning (6 a.m. - 10 a.m.)</b>	258	11.73%
<b>Around noon (10 a.m. - 2 p.m.)</b>	215	9.77%
<b>In the afternoon (2 p.m. - 6 p.m.)</b>	668	30.36%
<b>In the evening (6 p.m. - 10 p.m.)</b>	846	38.45%
<b>At night (10 p.m. - 6 a.m.)</b>	213	9.68%
<b>Total</b>	2200	100%

Source: Own elaboration

The frequency of the responses, depending on the number of times of the day ticked by the respondents, is shown in Figure 1.



**Figure 1: Frequency of using the service by time of day**

Source: Own elaboration

The users indicated (possibility of multiple choice, Table 2) that the most frequent reasons for using the carsharing service are, respectively, personal affairs – 734 indications (29.54% of the responses), shopping – 613 indications (24.67% of the responses) and socializing – 562 indications (22.62% of the responses).



**Table 2. Reasons for using the carsharing**

	Number of indications	% of all indications
<b>Commuting to school/university</b>	172	6.91%
<b>Commuting to work</b>	240	9.66%
<b>Shopping</b>	613	24.67%
<b>Socializing</b>	562	22.62%
<b>Personal affairs</b>	734	29.54%
<b>Others</b>	164	6.6%
<b>Total</b>	2485	100%

**Source:** Own elaboration

Commuting to work was indicated by 240 respondents (9.66% of the indications). Commuting to school/university and the response of 'others' were characterized by similar popularity with the indications of 172 and 164.

The above research results can support the service management processes thanks to detailed information related to the use of carsharing. Firstly, shared mobility is used by working people and students to meet their transport needs. Secondly, the most popular time of operation of the service is in the evening hours from 18.00 to 22.00, and the leading purpose is personal matters, which are dealt with the help of this type of shared mobility. At the same time, for entities managing both from the operational side and from the side of urban transport planners, it is important to note that the use of the service for commuting to schools, universities and workplaces is very low. Besides, this means that these transport needs are met by collective or individual transport.

The analysis of using the carsharing service by the users and the popularity of this form of urban transport are related to the factors determining the attractiveness of shared mobility. According to the users, environmental protection and the use of electric vehicles are the least important – 12.93% of the respondents (152 people) pointed out that it is a completely irrelevant factor, and 15.31% (180 people) indicated that it is definitely important. Moreover, the possibility of parking in city centers and at designated areas, which is significant in the opinion of 33.84% of the respondents (398 people), was rated lower, as well as vehicle cleanliness and driving comfort, which was highly rated by 36.22% of those questioned (426 people). For 79.84% of the respondents (938), a rather or definitely important aspect was the one related to the simplicity of the application and the ease of payment. By far, the most important factor is the cost of the journey most frequently and a simple price list for the service (64.12%; 754 people) and the availability of a free car (58.42%; 684 people). For more than half of the respondents, the reliability of the service is a definitely relevant issue (52.13%; 613 people), no need to own a vehicle (51.79%;

609 people), the technical condition of the vehicle (50.94%; 599 people) and the location of free cars. The research results (Figure 2) clearly indicate that for carsharing users, the following issues are significant: the availability of a free car, the cost of the journey and a simple price list and the location of free vehicles.

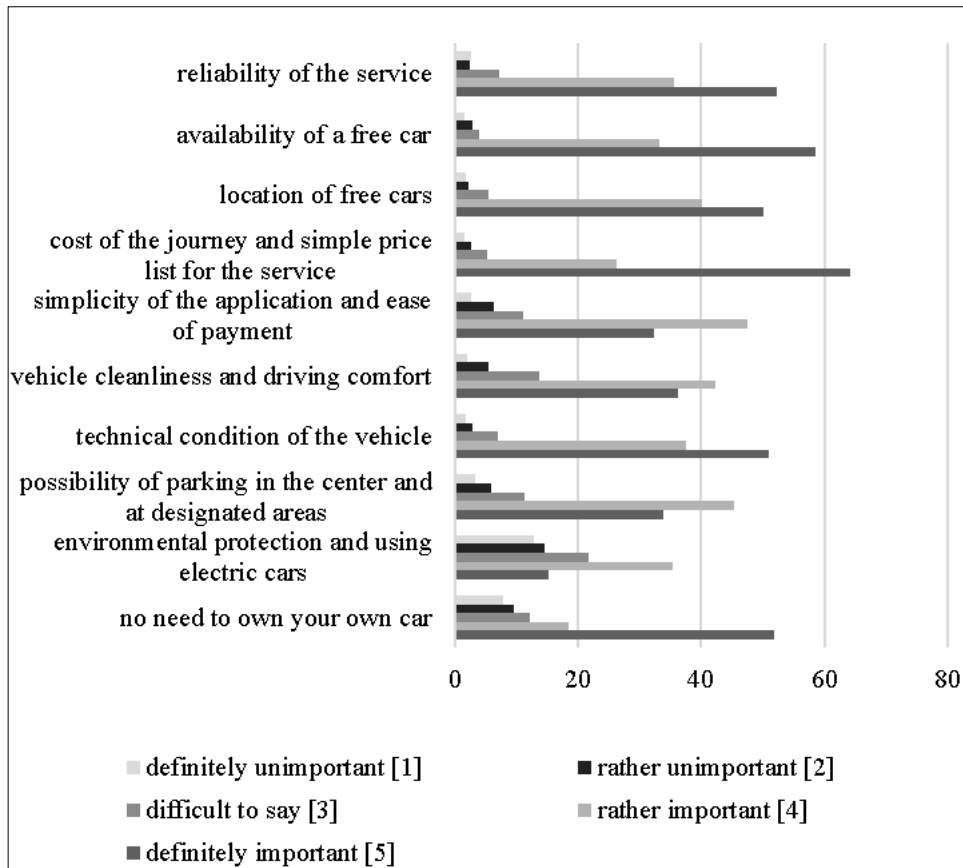
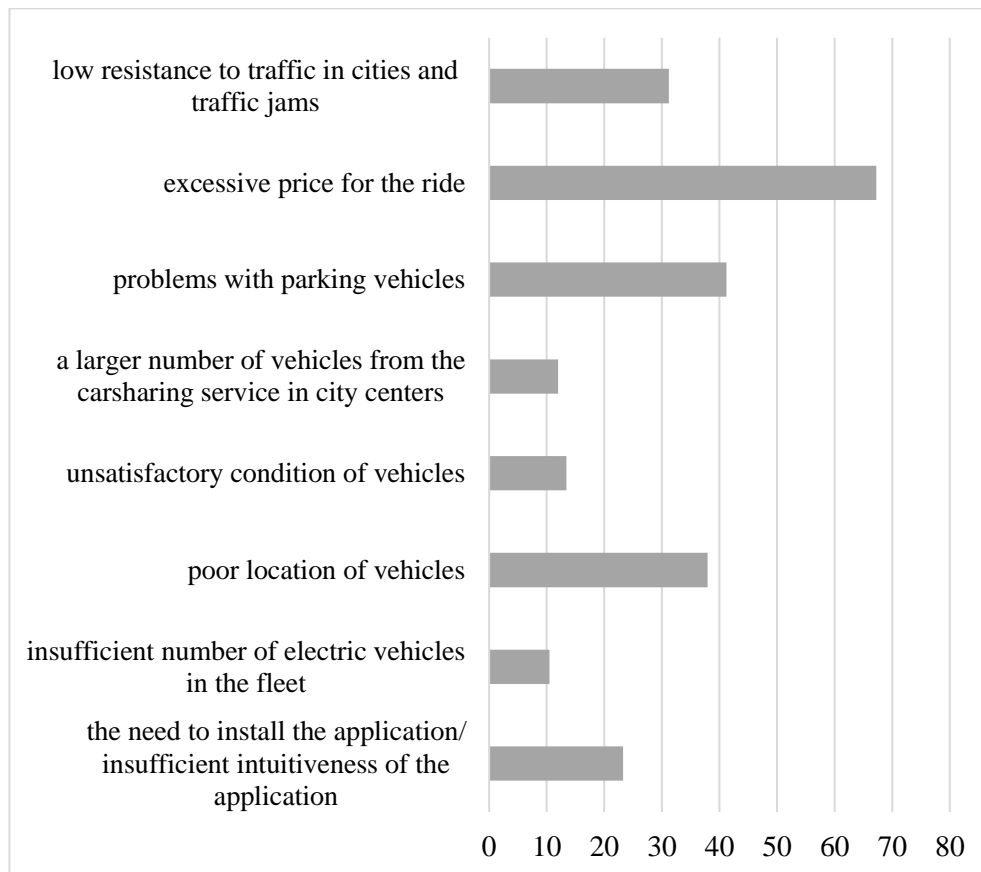


Figure 2: Assessment of the importance of factors determining the attractiveness of the service

Source: Own elaboration

The least attractive factor for the users was the aspect of environmental protection and using electric vehicles in the service. This proves that the attitude of Polish society and the government towards ecology and the aspect linked to the use of fossil fuels is usually indifferent and specific decisions in this regard are postponed. This is important information for the managers of the fleet of vehicles available in the service since the promotion and the possibility of renting by zero-emission vehicle users is a factor of little importance when choosing a service, at least at present.

Among the disadvantages, the following were listed: excessive price for the ride (67.26%; 791 people), problems with parking vehicles (41.24%; 485 people) and poor location of vehicles (37.93%; 446 people). An insufficient number of electric cars in the fleet were indicated the least often (10.46%; 123 people), as well as a larger number of cars from the carsharing service in city centers (11.99%; 141 people) or unsatisfactory condition of vehicles (13.44%; 158 people), which is shown in Figure 3.

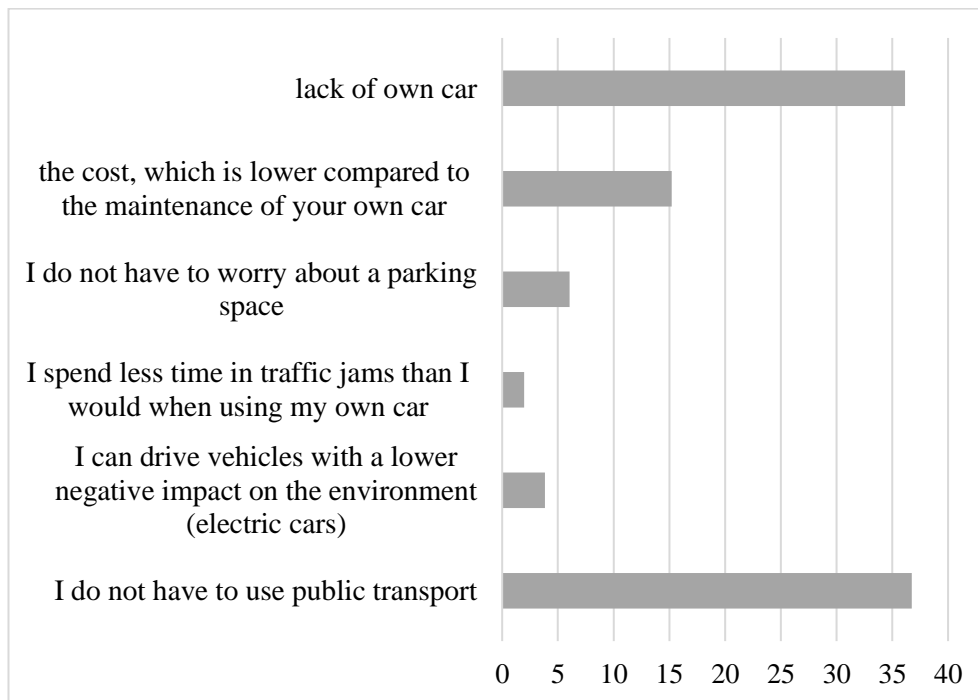


**Figure 3: Disadvantages of the carsharing service in the opinion of the users**

Source: Own elaboration

The most frequently indicated disadvantage of the service indicated by the users, which is an excessive price for the ride, is identical to the indicated most important factor determining the attractiveness of carsharing (Figure 3). The aspect of an insufficient number of electric vehicles in the fleet was indicated the least often, proving that the issue of low-emission vehicles is of little importance for people travelling by shared vehicles in Poland.

The impact on the management of the service is also exerted by the motivation and the reasons for which people choose carsharing for their transport needs (Figure 4).



**Figure 4: Factors encouraging the use of carsharing**

Source: Own elaboration

Among the factors encouraging the use of the service of shared mobility, the most often indicated was the lack of own car (36.14%; 425 people), no need to use public transport (36.73%; 432 people) and a lower cost compared to the maintenance of own car (15.22%; 179 people). The factor encouraging the use of carsharing the least (1.96%; 23 people) was less time in traffic jams – transport congestion, compared to the use of own vehicle. The response seems to be obvious since, so far, the Polish road transport legislation has included no regulations facilitating shared vehicle driving. On short sections of the major city arteries, traffic signs are used, allowing the movement of, e.g., electric vehicles using bus lanes, but this is often of little importance in the case of congestion occurring on the significant part of the route. The second least encouraging factor was the possibility of driving cars with a lower negative impact on the environment (electric vehicles). This response was ticked by 3.83 % of the respondents (45 people). One person did not reply.

The most important inducement should be the optimal cost of the service, which, in combination with the comfort of driving a shared vehicle, makes the user willingly utilize the service. The price range acceptable to customers brings about that they

use this form of transport when they do not have their car. On the other hand, the higher comfort of travelling by a passenger car than by public transport is the factor encouraging people for whom the comfort aspects are important to use carsharing. They may include the availability and location of vehicles ready to be rented when maintaining the reliability of the service, i.e., the guarantee of the execution of the journey without fault on the part of the operator. At the same time, the factors affecting the attractiveness of carsharing meet the assumptions of the logistic principle of 7R; since the right customer – the shared mobility user wants to use the right transport service with the right – appropriate quality, the implementation of which requires the right number of vehicles, at the right time and place, for which they can pay the right price.

The carsharing service significantly affects the transport behavior of its users. The conducted research indicates that the respondents, due to the use of shared mobility, demonstrate sustainable operations in terms of meeting transport needs, which are presented in Table 3.

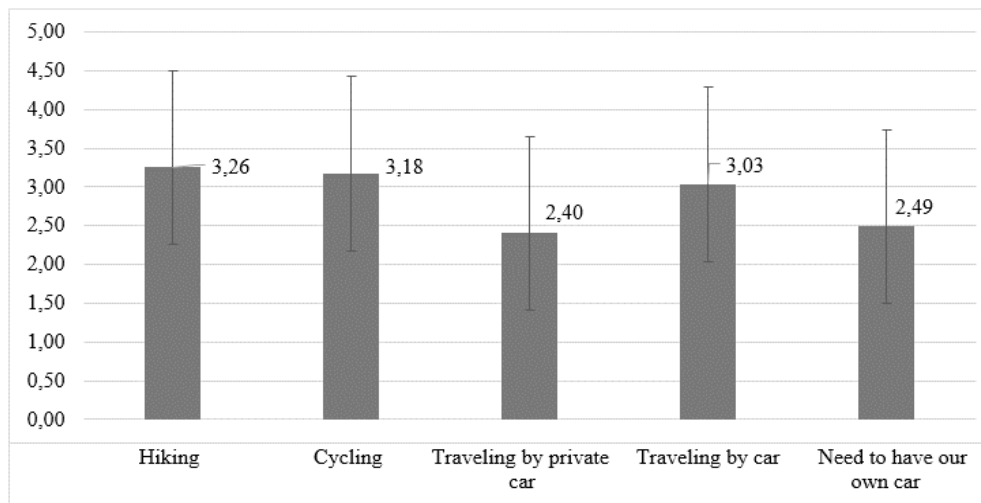
**Table 3. Crosstab for the purposes of using the carsharing service**

	<i>M</i>	<i>SD</i>
<b>How does the use of the carsharing service affect your traveling on foot?</b>	3.26	1.25
<b>How does the use of the carsharing service affect your traveling by bike?</b>	3.18	1.15
<b>How does the use of the carsharing service affect your traveling by your private car?</b>	2.40	1.32
<b>How does the use of the carsharing service affect your length of the travel segments taken by car?</b>	3.03	1.03
<b>How does the use of the carsharing service affect your need to possess your own car?</b>	2.49	1.15

Source: Own elaboration

The respondents concluded that the use of shared mobility increased the amount of travelling on foot and by bike and, at the same time, limited the number of journeys taken by a private car or the need to possess own car. The least impact of carsharing was observed among the users in the case of the length of the travel segments taken by car, where the average rating amounts to 3.03 (Figure 5).

The above research results prove that the carsharing service contributes to such behaviors of the users that are considered sustainable in urban mobility. They are friendly to the environment and society, and the economic effect is noticeable.



**Figure 5: Average assessments of the impact of carsharing services on selected transport areas, along with 95% confidence intervals**

Source: Own elaboration

The results of the conducted research are identical to the results of the pilot study conducted by Kłos (2021). The presented research results show that 39.7% of respondents came across the sharing economy concept. However, ignorance of this concept does not mean that the respondents did not use services based on the assumptions of the sharing economy. 56.7% of respondents used at least one service provided by the sharing economy. There is a visible relationship between respondents' age and education, as well as their awareness of the sharing economy. The ultimate knowledge of sharing thriftiness occurred in the age group up to 36 and among respondents with higher education.

### Conclusion

In conclusion, it should be stated that the conducted research has broadened the knowledge regarding the impact of the operation of the vehicle-sharing service on the transport behavior of the inhabitants of given cities, as well as the impact on the entire process related to planning, organizing and controlling activities in the field of urban transport. First of all, it was possible to accurately characterize the service users in terms of demographic aspects (age, gender, social status) and their preferences for traveling in shared vehicles (travel destinations, times and frequency). All this affects the mobility management process in cities and facilitates forecasting and organizing both public transport routes and carsharing operators. It is important information in what locations and hours you can expect demand for cars available for the service.

To sum up, it should be stated that carsharing is a good example of the sharing economy, which, by using the solutions of modern technologies, allows the use of a

given good or service with no need to own it. Meeting the transport need takes place in this case with the vehicle provided by the service operator, and the user only incurs the costs related to the distance travelled and the time of renting the vehicle. This enables individual journeys with no need to own a car or use other means of transport. The positive is that the conducted research indicated that in the case of an improvement in the factors determining the attractiveness of the carsharing service, over 84% of the respondents declared making changes in terms of mobility, which are compliant with the principles of sustainable development of transport. The most popular activity indicated in the responses is reducing the use of own vehicle. This activity can be treated as an act of goodwill and an initial effect of the impact of the service, which, in the further development of the shared mobility elements, will lead to more sustainable and radical changes, like the sale of the vehicle owned, deferred in time or complete abandonment of the purchase of the vehicle. This is material for further research in the field of the impact of the carsharing service on the behavior and attitudes of its users. It seems interesting to conduct observations, considerations, and studies on the directions of intensification and expansion of this service and changes in the behavior of shared mobility users.

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## CARSHARING JAKO ELEMENT ZARZĄDZANIA MOBILNOŚCIĄ

**Streszczenie:** Zjawiskiem zauważalnym w dzisiejszych czasach, szczególnie wśród młodszej części społeczeństwa, jest odchodzenie od potrzeby posiadania rzeczy na rzecz postawy dzielenia się nimi z innymi, realizując tym samym założenia ekonomii współdzielenia. Możliwość korzystania z wynajmu transportu indywidualnego na minuty, w szczególności samochodów osobowych, stanowi udogodnienie dla mieszkańców, którzy mogą zaspokoić swoje potrzeby transportowe szybko i wygodnie, bez ponoszenia stałych opłat, a dodatkowo w formie przyjaznej dla środowiska. Dlatego też w niniejszym artykule podjęto próbę scharakteryzowania użytkowników carsharingu, rozumianego jako zrównoważona usługa transportowa realizująca założenia ekonomii współdzielenia. Badania przeprowadzone na próbie 1176 respondentów wskazały, że osoby korzystające z mobilności współdzielonej wykazują pożądane - zrównoważone zachowania transportowe, m.in. polegające na zwiększeniu ilości podróży pieszych i rowerowych przy jednoczesnym ograniczeniu podróży samochodami prywatnymi. Ponadto badanie wykazało, że osoby pracujące i studenci korzystają z carsharingu w celu zaspokojenia swoich potrzeb transportowych. Po drugie, najpopularniejszym czasem funkcjonowania usługi są godziny wieczorne, od 18:00 do 22:00, a wiodącym celem są sprawy osobiste, które załatwiane są przy pomocy tego typu współdzielonej mobilności.

**Słowa kluczowe:** carsharing, ekonomia współdzielenia, zrównoważony rozwój, transport miejski, zarządzanie mobilnością

### 汽车共享作为出行管理的一个要素

**摘要：**如今，尤其是在社会的年轻群体中，一个明显的现象正在从拥有财产的需要转变为与他人分享财产的态度，从而实现了共享经济的假设。每分钟使用个人交通工具租赁的可能性，尤其是乘用车，对于居民来说是一种便利，他们可以快速、舒适地满足他们的交通需求，而不会产生固定费用，而且，这是一种环保的形式。因此，本文试图描述汽车共享用户的特征，将其理解为实现共享经济假设的可持续交通服务。对 1176 名受访者的样本进行的研究表明，使用共享出行的人表现出了理想的可持续交通行为，其中包括增加步行和骑自行车出行的次数，同时限制私家车出行。此外，研究表明，上班族和学生使用汽车共享来满足他们的交通需求。其次，该服务最受欢迎的运营时间是晚上，从下午 6 点开始。到晚上 10 点，主要目的是个人事务，这些都是通过这种共享出行方式处理的。

**关键词：**汽车共享, 共享经济, 可持续发展, 城市交通, 出行管理