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Danijela Senić[1]
E-mail: senic.danijela@uns.ac.rs
Valentina Mirović[1]
E-mail: plast@uns.ac.rs
Jelena Mitrović Simić[1]
E-mail: mjelena@uns.ac.rs
[1] University of Novi Sad, Faculty of Technical Sciences
Trg Dositeja Obradovića 6, 21000 Novi Sad

MICROMOBILITY – USERS' NEEDS AND ATTITUDES

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Abstract
Micromobility has appeared as a traffic term with the electrification of typical transport means for short relations, such as an ordinary bicycle and a scooter. The paper contains basic information on advantages and disadvantages of micromobility. The paper shows the results of a research study which was conducted as an online survey of micromobility users. The aim of the research study was the overview of the current state regarding the possession of micromobility devices, that is, obtaining information from the respondents related to their plans of micromobility devices purchase in the following two years. Apart from this, the emphasis was on the opinions of the current and future users on the selection of the locations for setting up the micromobility charging stations and on the acceptable time for their recharging.

1. INTRODUCTION

Cycling has become a general phenomenon recently although the bicycle itself has been used since the nineteenth century in Europe. With the introduction of electrification in transport means, new types of vehicles have been created, that is, micromobility devices. A new term also appeared, micromobility.

With micromobility devices a series of new advantages appeared, but downsides, as well, that is, problems. Cycling in a classic sense is directly related with minimum three fields: traffic, medicine and ecology. With micromobility there is a tendency to keep the mentioned fields as primary ones, that is, to reduce traffic congestion in cities with the use of micrmobility, to preserve the health of the population, to pollute

the environment as little as possible, that is, to enable recharging of micromobility devices on the charger which uses renewable energy resources.

Further in the paper, there is information related to the basic characteristics and categories of micromobility devices, as well as the data and results of the research study conducted this year.

2. BASIC CHARACTERISTICS AND CATEGORIES OF MICROMOBILITY

In the previous period, due to the non-existence of accurate and clear divisions, demands and definitions of micromobility devices according to the current Law on Traffic Safety on Roads [1] and Regulation on the Classification of Motor Vehicles and Trailers and Technical Requirements for Vehicles in Road Traffic [2] cities faced significant problems regarding micromobility traffic. Those problems were primarily related to the surfaces designated for their motion, space sharing with other transport means and with pedestrians, safety of micromobility users, and minimal requirements for micromobility devices recharging which should be fulfilled by the cities. The aforementioned problems and doubts should be solved with a change and amendents to the current legislation and adopting new regulations in this field, which is currently being done.

Micromobility represents a set of micromobility devices which can be grouped in the following way: pedelec (maximum continuous rated power is 250 W), lightweight e-bicycle (1,000 W), heavyweight e-bicycle (4,000 W), e-scooter (600 W) and other vehicles of micromobility (500 W), which include hoverboard, segway, e-skateboard and e-roller [3]. Micromobillity devices are currently using batteries such as: SLA (Sealed Lead Acid battery), NiMH (Nickel Metal Hydride battery) and Li-ion (Lithium-ion).

According to Legal Framework and Guildelines for Implementation in the Republic of Serbia a group of experts has determined 11 constructive-technical characteristics which are the miminum to be met by micromobility vehicles. They are: maximum design speed, maximum continuous rated power, maximum vehicle width, maximum vehicle length, minimal wheels dimensions, braking system, minimal clearance, the possession of a device for sound signals and warnings, the possession of a vehicle lighting system, walking mode and the possession of a steering wheel. In some countries, such as Italy, Austria and the United Kingdom, there is legislation in force covering micromobility. In accordance with foreign legal regulations, best practice experiences, and recommendations, Legal Framework and Guildelines for Implementation in the Republic of Serbia has been given requirements for the use of micromobility vehicles. The requirements have been grouped into: approval of the type before the use, vehicle registration, periodical testing, driving license, users training, knowledge of traffic regulations, insurance, wearing a protective helmet, wearing high-visibility clothing in low-visibility conditions, minimal age of the user, as well as the speed limit [3].

The advantages of electric bicycles for individuals are: travelling a longer distance with the same energy consumption, and even less in relation to classic bicycles.

On the basis of the research study conducted by German Federal Environmental Agency, it can be concluded that classic bicycles are faster than cars within the range of 5 km, while an e-bicycle is faster than a car within the range of 10 km to 20 km. When using e-bicycles and other micromobiles, natural obstacles (ascent) and weather conditions (headwind or crosswind) are not a challenge, as is the case with a traditional classic bicycle. New micromobility vehicles offer a mobility chance to a group of population which has not been able to use the conventional bicycle due to different health issues.

Micromobility vehicles can be integrated into the combined passenger transport, that is, they can be used at initial and final kilometres of their journeys.

Currently the biggest disadvantages of micromobility are the price of these transport devices in relation to the classic bicycle, lower subventions in relation to electric cars, and the fact that national and European strategies have not been defined properly [4].

Nowadays micromobility is mentioned when talking about smart cities, which successfully manage their resources (first of all, renewable energy sources) in order to improve life quality of their residents.

3. RESEARCH METHODOLOGY AND RESULTS

For the needs of this paper an online survey was conducted and its respondents were micromobility users. The online questionnaire was available in the period between 10.8.2023 and 27.8.2023, when 161 questionnaires were completed. The respondents were mostly the members of different cycling associations / clubs, such as: 'Novosadska Biciklistička Inicijativa' (Cycling Initiative of Novi Sad), association of cyclists 'Drumski vozači' (Road Riders), group 'Bicikliramo' (We Are Cycling), 'Tour de Délvidék' and a group of students from the Faculty of Technical Sciences in Novi Sad. If we consider the spatial scope of the analysis, it can be said that most of the responses were from the territory of the Autonomous Province of Vojvodina, that is, from Novi Sad and the surrounding settlements which gravitate towards the city.

According to gender structure, 54.66% of the respondents are male, while the remaining 45.34% are female. Regarding employment, more than a half of the respondents are employed (55.28%), then there is a group of students with 37.27 %. The third place with 6.21% is the category of the unemployed. The last group is made of the retired, with 1.24%. The respondents belong to the following age groups: no respondent was younger than 18, those aged between 19 and 26 make 46.50%, aged between 27 and 35 make 15.92%, aged between 36 and 50 27.39%, aged between 51 dand 65 make 9.55% and those aged over 65 make 0.64%.

Figure 1 shows the current state of micromobility use. Based on the answers of the respondents, it can be concluded that 90.91% of the surveyed are still using the classic bicycle. In the category of micromobility devices, e-scooters participate with 5.11%, after which there is a group of light e-bicycles with 2.27%. In the third place there is the category of pedelec with 1.14%, while in the last position there are heavy

e-bicycles with 0.57%. There were no users of hoverboard, segway and e-skateboard among the respondents. It is extremely important to study the users' plans for further analyses and the possibilities of planning for their own benefit. Out of all respondents, 56.40% is not planning the purchase of a micromobility device in the following two years. Most of the respondents would invest into a classic bicycle, with 19.77%, while 9.88% would like to buy a light e-bicycle, e-scooter 6.40%, pedelec 4.07%, heavy e-bicycle 2.33%, while hoverboard and e-skateboard – less than 1%. The above mentioned results have been shown in Figure 2.

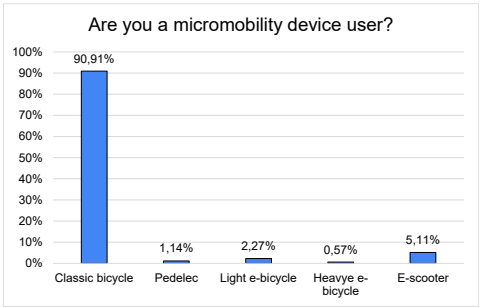

Figure 1. Current micromobility users

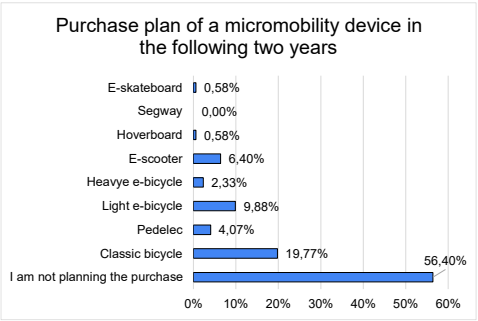

Figure 2. Potential micromobile users

Currently 80% users recharges their transport devices at home, while only 20% has a chance to recharge their micromobility devices while they are at work (Figure 3).

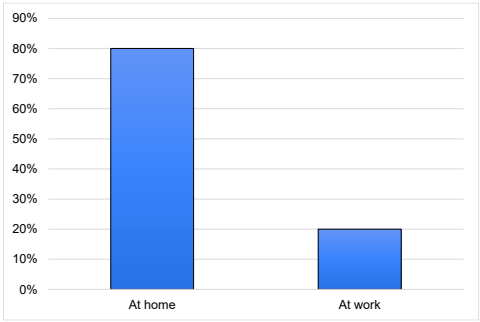

Figure 3. Current charging location

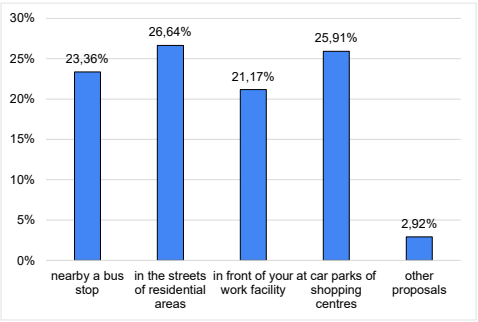

Figure 4. Preferred sites for future charging stations

The respondents were asked in the survey where they would put micromobility chargers if they could affect the location determination. The result was the following: 26.64% of the respondents voted for placing the charging stations in the streets of residential areas, 25.91% would choose the ones at the car parks of shopping centres, 23.36% of the respondents suggest having a charging station nearby bus

stops and 21.17% think that they should be in front of the facilities where they work. The remaining 2.92% have another proposal (Figure 4).

Figure 5 shows the percentage amount of the acceptable time of charging of e-scooters and e-bicycles. According to the received responses, it can be concluded that a significant percentage, more precisely 75.46% of the respondents think that the accpetable micromobility charging time is less than 4h. Then, in the secoond position,19.33%, there is a group of respondents who think that the acceptable charging time is between 5 and 6h. For a significantly less percentage, that is, 2.97% of the respondents think that the appropriate charging time is between 7 and 9h, and the remaining 2.23% would accept their micromobility device charging time longer than 9h. It is important to determine the acceptable distance of the charging stations in the street network. In Figure 6 it can be noticed that 16.87% of the respondents want that there is a charging station at every kilometre, 56.25% think that the most adequate distance is between 2 and 4 km, 21.88% of the respondents are in favour of the distance between 5 and 7 km and the remaining 5% are in favour of the distance which is over 7 km.

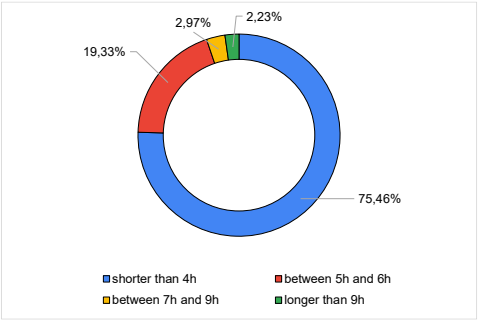

Figure 5. Acceptable micromobility charging time

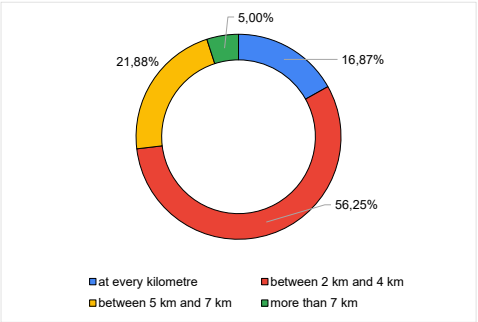

Figure 6. Acceptable distance between charging station

During the analysis an emphasis was on the separation of the classic bicycle from the micromobilitydevice. Out of the total number of classic bicycle users, 58.50% are not cyclotourists, while 13.61% are currently cyclotourists. The remaining 27.89% would choose cyclotourism if there were charging stations for micromobility devices on cycling routes (Figure 7). When it comes to the analysis of micromobility and cyclotourism (Figure 8) it should be emphasised that 57.14% of the users do not use their own micromobility devices for the purposes of cyclotourism. Among the micromobility respondents 28.57% are simultaneously cyclotourists, while only 14.29% would be cyclotourists if there were charging stations along the routes.

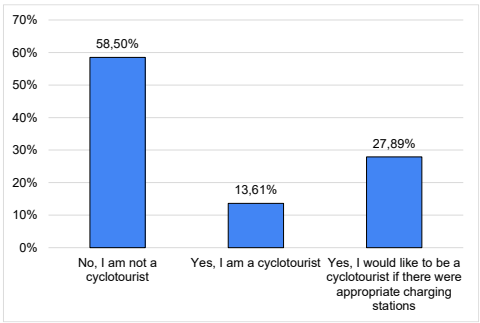

Figure 7. Cyclotourists (classic bicycle)

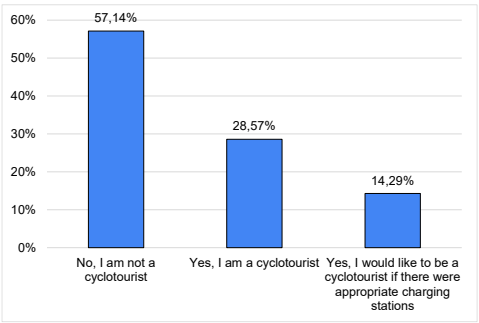

Figure 8. Cyclotourists (micromobility)

4. CONCLUSION

After the analysis of the data obtained in the online survey, it can be concluded that currently over 90% of the respondents use a classic bicycle and only 9.09% are the users or owner of some type of a micromobility devices. Regarding plans for the purchase of a micromobility device in the following two years, out of the total number of the surveyed respondents, 56.40% do not plan a purchase of new transport means, 19.77% want to buy a classic bicycle and 23.83% have a short-term plan of a micromobility device purchase. It should be emphasised that without any campaigns, advertisement or education, more than 20% want to be the user of a micromobility device. This percentage can be significantly increased if certain measures are taken to stimulate the use of this transport mode. Based on the obtained responses of the current micromobility users, 80% recharg their transport means at home and only 20% at work. This distribution implies that currently the number of micromobility charging stations is insufficient. In future the emphasis should be placed on the environment protection, which is only possible if the charging stations are the ones which generate electricity from renewable energy sources. The first step is to enable subsidization of these charging stations which are first ot be installed in front of public institutions, in front of work facilities, nearby bus stops, at car parks of shopping centres and in the streets of residential areas. Apart from this, it is necessary to determine precise locations of charging stations at the city and community level.

According to the obtained data, most respondents, that is, 75.46% think that the acceptable charging time is shorter than 4h. The acceptable distance between the charging stations is from 2km to 4km for 56.25% of the respondents, that is, 21.88% of the respondents say that it is acceptable if they are between 5km and 7km. It is necessary to emphasise that proper functioning and use of micromobility is possible if cities have their own maps within applications showing the precise locations of the stations. When considering cyclotourism, classic bicycle users mostly are not cyclotourists, but 27.89% would become cyclotourists if in the future there are charging stations. Micromobility users mostly are not cyclotourists, although 28.57%

of the respondents are, that is, additional 14.29% of the respondents would be if there are charging stations at certain locations.

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