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MICROMOBILITY REVOLUTION – CHALLENGES AND POTENTIALS

Key Words

Micromobility;
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Street redesign;
Legislation;
Safety

Abstract

Modern cities and their transportation systems are challenged by new mobility options – micromobility. Electric scooters as the advanced successors of the Segway have flooded the streets of modern cities precisely because of their positive features. They are easy to use, environmentally friendly, faster than traditional public transportation and more compact than a bicycle, allowing users to travel quickly and cheaply and retain complete autonomy of their movement. Regardless of whether they are private vehicles or part of an organized transport service offer, e-scooters are increasingly more important in the daily modal share in urban areas. On the one hand, this seems like a dream come true for the future of mobility, but the reality points to the potential problems that these changes are bringing and which must be addressed appropriately. The street profile has its spatial limitations and usually separates non-motorized and motorized users, and this could be disrupted by new micromobility options. Even in the cases of shared spaces, these vehicles could change the usual mobility pattern. Also, the legislation does not recognize e-scooters and we cannot legally define and protect them, nor we can assign them a place in the street profile. Special attention

must be paid to the safety issue for all traffic participants, especially for pedestrians and vulnerable categories. This paper will give a brief overview of the present situation of micromobility in urban areas worldwide and in Serbian cities. Furthermore, it will consider the possibilities and preconditions for its wider use.

1. INTRODUCTION

Rapid technological advancement and innovations lead to continuous social changes, which consequently has an impact on the development of the complete traffic system. Standard vehicles powered by fossil fuels are being replaced by electric and hybrid vehicles – more environmentally friendly and cleaner ones. Drivers do not have to operate vehicles since this is done by a computer. Due to the development of artificial intelligence, computers have made the implementation of autonomous vehicles possible. Artificial intelligence has enabled the development and testing of the V2X system for informing, warning and communication, which encompasses V2V, V2I, V2P, V2N[1] technologies. The collection and usage of data in real time, development of new transportation modes, such as drones, electric bicycles and electric scooters, represent further technological advancement, developed with the aim of sustaining urban mobility and creating intelligent and ecologically clean cities.

Bicycles, skateboards, electric bicycles and the most recent transportation mode which is the subject of this paper – electric scooters – are representatives of a relatively new concept – micromobility. Although this idea has been present since the 1960s, micromobility has been actively considered since the development of modern electric scooters – the ones that can be seen on the streets nowadays. An electric scooter represents a motorized version of the classic scooter, which is separately produced for children and adults. An adult electric scooter usually weighs up to 15 kilograms, has a 250-watt motor and a 250-watt-hour lithium-ion battery. The maximum speed of these e-scooters is up to 30 km/h, although there are some which can travel at the speed of up to 50 km/h [1].

Today, electric scooters are present in the traffic as private means of transportation and as part of the flexible public transport service offer. The largest number of these vehicles is part of the offer of different public services. However, due to their characteristics and reasonable price, they are often bought by users. This transportation mode, particularly as part of the public transport service offer, had its major expansion in 2017. This continued during 2018, when the Lime Company was founded. This company enabled renting of e-scooters in more than 100 countries worldwide [2].

Popularity of this transportation mode rose rapidly, primarily due to favourable features of e-scooters. Their efficiency is seen in the fact that they are easy to use,

[1] V2X – „vehicle to everything“, V2V - „vehicle to vehicle“, V2I – „vehicle to infrastructure“, V2P – „vehicle to pedestrian“, V2N – „vehicle to network“

environmentally friendly, faster than the traditional public transport and more compact than bicycles, thus allowing the users to travel quickly, cheaply and in a flexible manner while retaining the complete autonomy of movement. An additional advantage of this transportation mode is its availability. Namely, after using an electric scooter, users can leave it at any location around the city.

By the end of 2018, electric scooters mostly replaced bicycles and electric bicycles so there were 85 000 e-scooters in 100 cities in the USA. In the same period in the USA, 38.5 million of trips were realized by e-scooters, out of which 40% of the trips were in Los Angeles, San Diego and Austin [3]. Similarly, in all larger European cities, the offer of public renting of e-scooters has been enabled. Thus, it is estimated that Paris has approximately 20 000 e-scooters, Copenhagen about 7000, while in Cologne this number is estimated to reach 40 000 by the end of the year [4]. In Belgrade, approximately 35 000 e-scooters were sold during the period of several months in 2019 [5].

Figure 1 represents the share of individual mobility services from the moment they were enabled until 2018. This figure proves the above-mentioned fact that electric scooters had experienced the expansion in a short period of time.

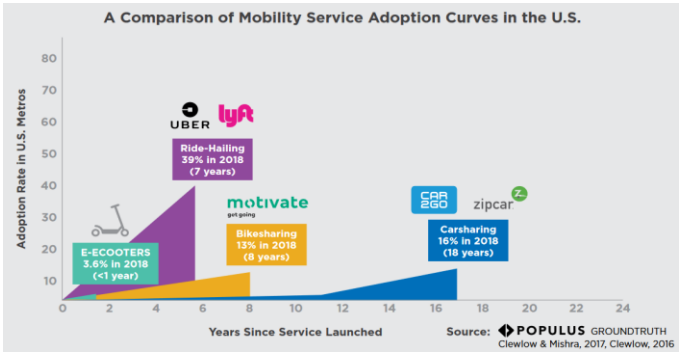

Figure 1. A comparison of mobility rates according to services

2. INFRASTRUCTURE FOR E-SCOOTERS

One of the basic preconditions for the efficient functioning of e-scooters is adequate infrastructure. Currently, this is one of the most important issues micromobility is facing. Physical limitations of the street network and road profile, different structures and characteristics of the base course and the existing separation represent the obstacle for the safe usage of e-scooters.

Traffic experts worldwide agree that streets with the surface course made of cobblestone or sheets, as well as the streets with tramway tracks, are not safe for e-scooter riding. The characteristics of these vehicles, primarily their small wheel circumference and radius, limit their use on the above-mentioned streets.

Although a large number of countries have started introducing amendments to the law in order to properly handle this transportation mode, insufficient attention is still

paid to the development and modification of the existing infrastructure. In the countries and cities where the arrangement and adaptation of the space has already begun, e-scooter users are mostly redirected to the cycling infrastructure. Such examples can be found in Tel Aviv where the existing bicycle lanes are used for e-scooter riding. A similar situation can be seen in Paris, France, where bicycle lanes and paths are used by e-scooter riders. Most American cities represent good examples of the integration of e-scooters into the existing cycling infrastructure network.

In London, Great Britain, the government intends to legalize the use of e-scooters primarily in business zones, parks and campuses. The representatives of the company Voi in Sweden plan to introduce “Zones 20” where e-scooters would be allowed to move. The government in Copenhagen intends to introduce and test 200 electric scooters in the historical city centre, as well as of 3000 e-scooters in satellite zones [6].

For instance, in Texas it is allowed to ride e-scooters on sidewalks, while in Colorado sidewalks are the only places where they can be used. In California, it is strictly forbidden to ride e-scooters on sidewalks, but riding is allowed on the carriageway along the right brink of the sidewalk. In reality, the situation is considerably different, and e-scooters are frequently ridden on sidewalks in spite of the prohibition and warnings that this compromises traffic safety. A similar situation can be found in Serbia, where the use and movement of e-scooters is not regulated, so users frequently ride them on carriageways, sidewalks, bicycle paths, etc. This can be seen in Figures 2a, 2b.

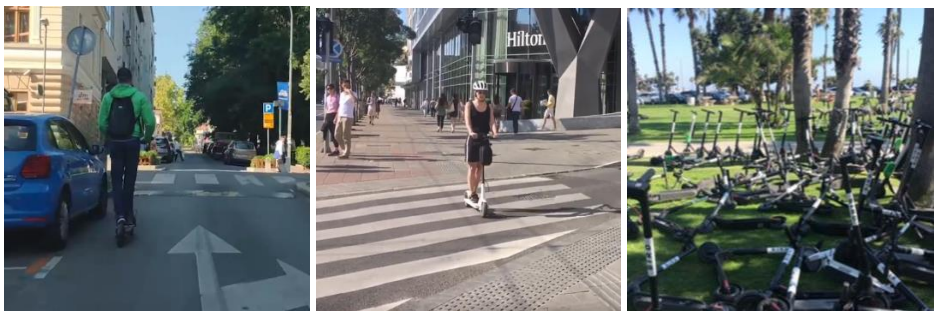

Figure 2. An example of using (a,b) and parking of e-scooters (c)

At the moment there is the issue of parking management as well as the implementation of the equipment necessary for e-scooter charging. Although most companies choose the system of parking on sidewalks, the above-mentioned possibility of leaving e-scooters at any location in the city after using them has had an effect completely opposite to the desired one. Such an example is presented in Figure 2c.

Generally speaking, there are two concepts regarding the redefinition of the space for electric scooters. The first one, based on the example of Germany and several American cities, relies on the complete separation of all user categories. The

second concept is based on the idea of “naked streets” where all traffic users operate in the shared space without separation [7]. However, the current situation in cities, which face both the exponential growth of the e-scooter number in the street network and the lack of space, indicates that the solution could lie somewhere between these two mentioned concepts, and could be a result of their combination and coordination.

3. LEGISLATION

The amendments to the law of the countries where e-scooter services can be used have been induced by a large number of traffic accidents and inadequate behaviour of e-scooter users in traffic.

The existing laws could not follow the increasing popularization and development of this transportation mode. Consequently, the use of e-scooters is currently prohibited in some countries. For example, in Britain it is illegal to ride electric scooters on public roads, sidewalks and bicycle lanes and paths. In addition, an e-scooter rider has to be at least 14 years old [8]. E-scooter riders are fined with £300 and 6 penalty points on their driving licence. In theory, e-scooter riding is allowed only with a valid driving licence for mopeds, a registration plate, insurance, a homologated helmet, paid vehicle tax, etc. In practice, no driver or vehicle fulfils these predefined conditions, so the use of e-scooters is considered to be illegal except on private properties. Similarly, the use of e-scooters is technically prohibited in Denmark.

Some countries such as Germany and France have already defined or are currently classifying a new vehicle group (PLEVs – “personal light electric vehicles“ [9]. In Singapore, electric scooters are treated as PMD (“personal mobility devices“), while in Poland there is an initiative for amendments to the law in order to introduce a new vehicle category (PTD – “personal transport device“), which would allow the use of e-scooters of slower speed on sidewalks and cycling infrastructure [10].

In California, obligations, possibilities and conditions required for using e-scooters are thoroughly defined by the law. First, a driver has to possess a driving licence, i.e. a licence for operating an electric scooter. The use of cycling infrastructure (paths of class II and IV) is allowed at the maximum speed of 25 km/h. It is allowed to ride an e-scooter on the street with the 40km/h speed limit, but only if the e-scooter moves at the speed of up to 25 km/h. Also, it is allowed to use the roads with the speed limit of up to 56km/h, with the previous permission of the authorities. In this case, the speed of the e-scooter must not exceed the 25 km/h speed limit [11].

In Serbia, there are no regulations regarding the use of e-scooters. However, certain amendments to the existing Law on Road Traffic Safety have been announced. The Road Traffic Safety Agency has proclaimed the amendments to the law to start in 2020. Until then, the users are only offered experts' recommendations, which are mainly related to the use of protective helmets and careful operation of e-scooters.

4. MICROMOBILITY SAFETY

Despite their numerous advantages and possibilities, electric scooters have aroused strong public opposition. The main opponents of this transportation mode are cyclists. Namely, they are placed under a lot of pressure due to the need for sharing the infrastructure and the fact that their safety is jeopardized. Pedestrians, as the second largest group which opposes this new trend, state the same reasons. They are generally the most vulnerable category since in most countries riding e-scooters on sidewalks has not been regulated by law yet. As a consequence, traffic accidents including pedestrians are very frequent.

The data for the year of 2018 from 110 hospitals in 47 American cities show that there were approximately 1500 recorded injuries caused by the use of e-scooters. Out of the total number of casualties, eight people were killed [12].

A study conducted in Austin, Texas, for the period of three months (from September to November) found out that 271 people had been injured as a consequence of using e-scooters. A more thorough analysis showed that during the observed three-month period at each 100 000 trips by e-scooters 20 people were injured. In the total sample, 58% of the injured were the users younger than 30. Head injuries (48% of the respondents) and fractures (35%) were the most frequent. It is important to mention that in the total number of the injured, 62% were novice users, while only 4% of the users wore a helmet while riding [13].

In spite of the frequent occurrence of injuries, but due to the lack of regulations, certain companies, organizations and associations offer only recommendations related to using e-scooters. These recommendations are treated as the system of pre-legislative activities until the amendments to the law or new laws are adopted.

5. CONCLUSION

The established trends and expansion of new transportation modes within the concept of micromobility ask for the change of the previous attitudes and perceptions of the traffic system as a component of the city. The most recent representative of this concept – e-scooter – has shown that certain countries and cities are not prepared for the abrupt changes that this transportation mode brings. This is confirmed by numerous negative consequences whose number is continuously rising.

Although certain countries have started to change and improve their traffic and legal systems, this process is long-lasting and requires considerable effort in order for the first significant results to be noticed. So far, Serbia has not taken any measures in dealing with these new changes. Therefore, it will have to actively and seriously address this issue. The first and most important step in dealing with this issue is the improvement of legislation in order to form a basis for taking further actions. A good example is set by Germany, France, Singapore, Poland, etc. In their legislation, these countries have defined or classified a new vehicle category. This can be a good starting point for defining domestic laws and by-laws. The amendments to the law enable the incorporation of this new transportation mode

into the existing traffic system; they offer the possibilities of arranging and constructing the required infrastructure, and sanctioning of improper behaviour of traffic users. During the process of e-scooter implementation, all users that could be affected by this transportation mode should be considered, particularly pedestrians and cyclists. The examples seen around the world offer the solution of using shared spaces or part of the infrastructure, which requires all users to make certain concessions. Therefore, the improvement of the legislation and traffic system makes the solid basis which will provide equal conditions to all participants in traffic.

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