

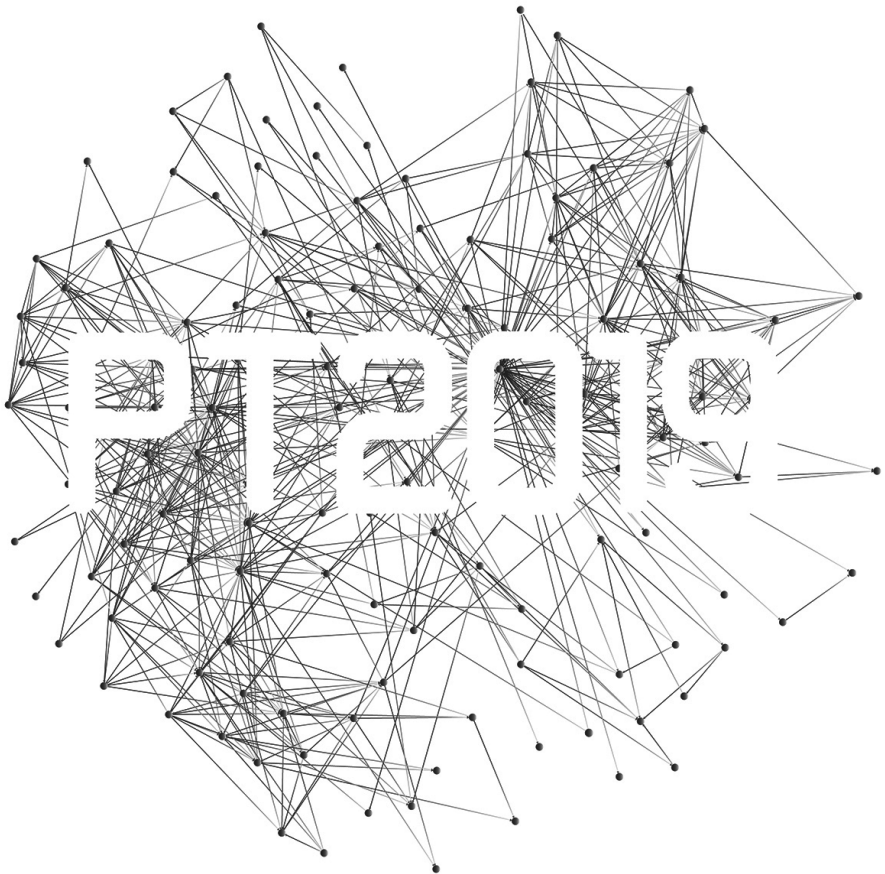
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6th INTERNATIONAL
ACADEMIC CONFERENCE ON
PLACES AND TECHNOLOGIES

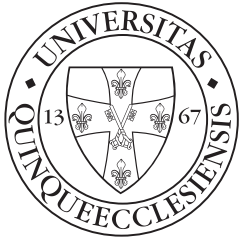
PLACES AND TECHNOLOGIES 2019

THE 6th INTERNATIONAL ACADEMIC CONFERENCE ON
PLACES AND TECHNOLOGIES

EDITORS: Dr Tamás Molnár, Dr Aleksandra Krstić-Furundžić, Dr Eva Vaništa Lazarević, Dr Aleksandra Djukić, Dr Gabriella Medvegy, Dr Bálint Bachmann, Dr Milena Vukmirović
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PLACES AND TECHNOLOGIES 2019

**KEEPING UP WITH TECHNOLOGIES TO TURN BUILT HERITAGE INTO
THE PLACES OF FUTURE GENERATIONS**

**CONFERENCE PROCEEDING OF THE 6th INTERNATIONAL ACADEMIC
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UPGRADING URBAN MOBILITY: THE APPLICABILITY OF CYCLING APPS IN BANJALUKA

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ABSTRACT

Although many European cities have already developed bike-centric urban transportation networks, labeled as highly sustainable, efficient and safe, the urban centers of Southeast Europe still have to embrace and implement this trend which demands a proper political, regulatory and planning setting. However, it should be underlined that bicycle transportation could have an important impact on the general state of environment, society, traffic and urban image, and as such, it could be used as a newly generated competitive advantage of SEE cities. The accelerated technological progress provides multiplying possibilities for development and upgrading, targeting different urban systems and networks. Bicycle transportation also uses the benefits of new technologies, which is especially important in cities which still do not have appropriately developed cycling infrastructure and need to adjust their urban features to the emerging cycling ecosystems.

Considering the relationship between new trends of cycling in SEE cities and the evolving technological platform, the paper will focus on the case of Banja Luka (Bosnia and Herzegovina) and the application of two apps- bikecitizens i nextbike.

The impact of these apps on urban mobility and cycling efficiency will be analyzed and evaluated, creating a starting point for the next phase of bike-friendly transformation of the city. The increased number of cyclists (stimulated by the use of these apps), as well as the modifications of (non)existing cycling infrastructure, would contribute to life quality, environmental awareness and the extended scope of professional knowledge targeting urban planning, design and decision-making.

The selected case study of Banja Luka will provide an insight into actual implementation/use of cycling-friendly apps, enabling the elaboration of the existing and preferred patterns of urban mobility, while simultaneously defining the recommendations for further development of cycling networks.

Keywords: urban mobility, bicycle transportation, cycling apps, Banjaluka, bike citizens, nextbike

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INTRODUCTION

Using applications to improve urban mobility is just a small part of the broader concept of smart city. Charles Landry (Landry, 2000) points out that the new economic platform of cities is based on: the development of information technology, communications technologies and other modern industries. The concept of creative cities is based on new urban development by: increasing awareness of the contribution of creative industries and innovations, freeing up the creative potential of the local community, strengthening and training entrepreneurs' participation in the creative and cultural sector. The problem of mobility in modern cities is more pronounced. Today's technology can and must contribute to solving these problems, and utilizing applications in day-to-day traffic is one of the ways we can do that. In this sense, bicycle traffic is also figuring with the types of trails and lane materials, their marking and similar, as well as the techno-technological ranges of modern times, such as micro radars, smartphone applications, and in general idea related to smart cities concept. Particularly developed applications like Nextbike and Bike Citizens are in use of bikes in the city. It has been estimated that in the coming years the number of cyclists will increase as a result of technological progress, largely due to the relatively new innovations. As John Pucher and Ralph Buehler say, the system of public bicycles and electric bicycles accelerated the use of this vision of transport to the future, and thus the modern city (2017). Of course, this is only a part of a wider image, so besides innovative applications and bike sharing systems, it is necessary to work on building a new infrastructure, which may and should include the construction of common infrastructure forms such as bicycle trails and lanes, as well as construction of facilities that weren't in the context of bicycle traffic until recent time. There is the construction of special cycling roundabout for cyclists, bridges built only for bicycle traffic, parking lots, canopies, special bicycle garages, various barrier separators, and many other elements and systems that enrich this type of traffic and make it more accessible and desirable.

CYCLING IN BANJALUKA

The use of bicycles as a means of transport is part of many European studies, charter and research carried out during the past decade / past years (Puecher & Buehler, 2017), which are concerned with sustainable development and therefore sustainable traffic.

In the strategy of the European Bike Federation (ECF) of 2017, it is stated that cycling infrastructure should provide a safe and attractive ride with the aim of increasing the number of bicycle users on the account of automobile traffic as well as comfortable, safe, direct and attractive routes and routes that are connected (European Cyclists' Federation, 2017). On the other hand, although for a long time in the plans and strategies for the development of cycling, in the first half of 2018, Banjaluka implemented a significant step in that direction and introduced a bike sharing system. Most of the cities in our region share the same problems. The chronic lack of infrastructure for smooth cycling is just one of many. The period of transition from one social system to another, the financial gloom, the traumatic close past influenced the planning, which had no room for adequately addressing this issue. And not just planning, but also implementing the planned. Today, it is necessary to observe the modern city in context and in relation to current trends in the introduction of bicycle traffic. The reasons for this are extremely simple, such as traffic jams, air pollution, noise pollution, but adaptation to standards that are propagated in EU countries and cities.

If there is a willingness to move forward in this direction, then attention must be paid to the

specific forms and activities that arise as a necessity and what are the benefits of the use of bicycles for transport purposes. They must be detected, explained and linked to life in the city, its planning, bicycle traffic itself, and the functioning of city spaces, with the intention of returning the city to a man. Observing Banjaluka as a “green city,” as often apostrophized, we can find the views on the declarative attitudes of our plans on the concept of a green structure, which is referred to as the instrument of forming the city matrix, with the level of green structure and its continuity considered important factors for city planning. There is also the same approach with bicycle infrastructure, whose major plans were made in the seventies of the 20th century, but their implementation has not reached a significant level in relation to the plan. In addition to the existing 9-10 km of bicycle trails and trails, in the back of several years, there were sporadic and unsystematic activities in the town of Vrbas to improve the conditions for bike commuting and cycling traffic in general. The examples of these activities are reflected in the design of cycling strips within the existing pebble surfaces, and in mid-September 2018 the first bicycle lanes were also plotted within the pavement area. Unfortunately, reality has been trying to deny this positive gesture, so the next day on this surface cars were parked improperly. The bike-sharing system in Banjaluka has been in use since March 2018, and as for the current case, has a significant number of rentals, which is in favor of the idea that cycling traffic may be developed in this area (City of Banjaluka, 2018). At present, this system in Banjaluka has four stations and thirty bicycles, which is largely insufficient. According to the data available on the City of Banjaluka website, in the first eight months of use (March to November 2018), this system had over 1000 users with over 11,000 registered rentals. Plans for 2019 imply the construction of another bike sharing system terminal. In order for this system to prosper, it is necessary to invest even more in bicycle infrastructure, in a simple way, to implement a traffic study created several decades ago, with the necessary modifications.

BIKE-FRIENDLY TRANSFORMATION OF THE CITY

Trends for cycling (bike commuting) in SEE and Banjaluka are a bit shy and insecure step in finding their way, using modern technology. Applications intended for better and more intensive use of bicycles in the city, like Nextbikes and Bike Citizens, place Banjaluka on a map with many of the major and most significant cities of Europe. Both applications, each in its own way, allow direct users better and easier access to the city map, but at the same time provide affirmation of the existing and also for the new cyclists in the city. Data obtained using this technology are also used to determine your favorite bicycle routes, but after identifying potentially dangerous locations. It should be noted that in developed countries cycling applications are well-developed, but more focused on the sporting nature of bicycle use, than on the bicycle's character as an alternative and sustainable vision of transport (Pajarito & Gould, 2018). Some studies have shown that the implementation of a public bicycle system can encourage new sections of society to use the bicycle as a mode of transport and thus increase the incidence of cyclists in total traffic (Buehler, 2013). Bike-friendly city transformation, in the context of using bicycle applications, enables flexible mobility, reduced pollution, savings, and positive health effects to users (Shaheen, Guzman & Zhang, 2010).

Nextbike app in Banjaluka

Nextbike application primarily provides bicycle rental, as well as navigation between individual terminals on the city map. In addition, the application allows you to report any bicycle breaks,

insights into your driving history or account balance. Payment is on a one-off, monthly and annual ticket level, with the last two categories providing free half-hour driving each day. What can be burdensome at the very beginning of using this application is the need for a user to register by visiting the system headquarters. After that, the use of the application is quite simple and bicycle rental is further simplified by using the QR code, thanks to which bicycle rental takes only a few seconds. The added value of using this application is the ability to use it in any city where this system is represented in countries such as Germany, Austria, Croatia and others, connecting cities outside the EU with European Union cities. The use of this application (as well as the complete public bicycle system) in Banjaluka for the last year or so has led the city officials to intensify their thinking and to work on the issue of expanding their bicycle infrastructure. Such symbiosis must lead to the reduction of traffic-induced tide, and thus to the improvement of ecological parameters in the city. In this sense, in the SEE region, Slovenia as a country emerged from the disintegration of former Yugoslavia, most of the newly established states of the SFRY did the most in the field of bicycling as a vision of transport, inter alia through the development of so-called SUMP [Sustainable Urban Mobility Plans] translated as “Entire Traffic Strategies”. It is important to note that these plans also stimulate walking, using public transport and a combination of different modes of transport.

Secondary impacts of using cycling applications should be popularization and self-improvement, but also a stimulus to build a new cycling infrastructure as it provides the most essential conditions for using bicycles for the purpose of transport. The existence of cycling infrastructure affects, to a large extent, the use of bicycles as a means of transportation. Banja Luka, with its approximately 200,000 inhabitants, is in the order of medium-sized cities, and what is characteristic of middle-sized towns is largely a bicycle infrastructure (Heinen, Maat & van Wee, 2013). Research shows that construction and micro-level facilities (canopies, parks and the like) have a great influence on bicycle selection as a mode of transport (Rybarczyk & Wu, 2014). The bike sharing system and the Nextbike application is now featured with characteristic parking-bikes. Activating this or any other application for bicycle riding should trigger both, the individual and the city.



Figure 1: Nextbike sharing system (photo by Mladen Milaković) and screen with map of Banjaluka

Nicholas Law introduces the concept of an active city, in which a man provides a natural movement or motion. “The central zones of many European cities are now mostly pedestrians and cyclists” (Law, 2003, p. 6). Construction of new caravans and bridges for car traffic is not a solution. “Adding a freeway lane to solving the traffic jam problem is just like giving up a fight in

obedience!” (Mumford, 1955, p. 5). Returning the city to people, pedestrians and “pedestrians” on two wheels is a way to make the city more human and greener, giving it a new look.

Bike Citizens app in Banjaluca

In the application market there are many options for navigation, finding a desired address, and so on. One of the applications that is tailored to bike commuting is Bike Citizens, which is a navigation and a travel guide for over 450 European cities (Road.cc, 2017). The Banjaluca is still in the test phase, and in the future it will probably be fully active. Its database is constantly updated, offering the user the choice of longer or shorter routes, asphalt or pebble. This application is a very useful tool that the user can navigate to different places of interest, offering him the opportunity to choose one of the possible combinations during the ride. Exploring the city is possible with voice control, which can be of great use while cycling. Application maps can be purchased, or you can get them with no charge, if you ride a bike long enough every day. Like the Nextbike application, Bike Citizens also stimulated bicycle riding in the city in a positive sense, which has the effect of reducing traffic jams, improving ecological parameters and so on. Such applications offer an upbuilding of collectivity, and through various campaigns motivate users to drive bicycles more and more, and through the Bike Citizens platform, it is possible to bid for any campaign whose purpose is to promote bike commuting on a daily or weekly basis within school or business activities. Smartphone apps can be designed to excite the sense of community between different users on bicycles and ultimately cause positive effects on user behavior (Cheng & Lee, 2015).

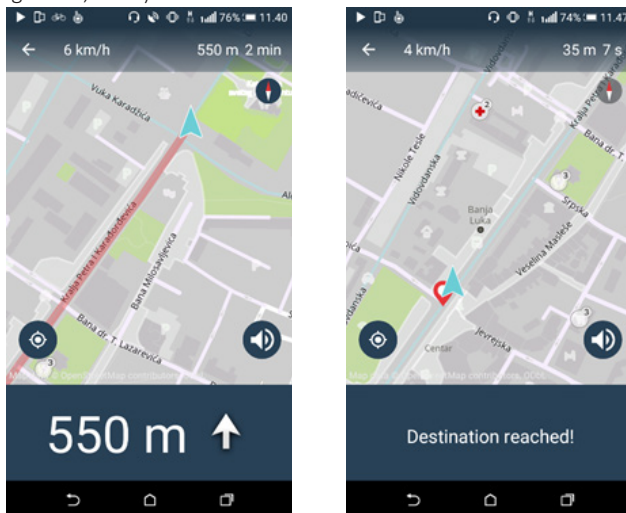


Figure 2: Bike Citizens screen with map of Banjaluca

According to the information available on the official Bike Citizens website, users of this application have traveled nearly 130,000 kilometers on their bikes (2019) during one week. This data is impressive and over time the number should be even bigger. With little effort, Banjaluca will contribute to that number, becoming more bike friendly city.

CONCLUSIONS

In the time of expansion of smart devices and their applications, their place in a variety of ways takes also a modern city. Among the many new opportunities, one of the best that the city can use and utilize is to become a city for humans, not for machines. The use of applications to improve and promote bicycle traffic is one of the ways for the city to be scaled for a man, with reduced pollution and noise. Banjaluka is not and should not be an exception within this. The presence of the public bicycle system with the accompanying application for rental – Nextbike, has led to an increase in the number of cyclists on the streets of Banjaluka, construction of new parking lots and canopies, and making cyclists more visible in traffic. What is a special gain in such a situation is the fact that the city authorities have begun to pay extra attention to bike commuting, which in itself should lead to the construction of new cycling infrastructure facilities in Banjaluka. The Bike Citizens application locates Banjaluka, currently, among over 450 cities in Europe, but also wider. Such kind of promotion was almost unimaginable in an urban environment like Banjaluka. By virtue of its character, Bike Citizens may be a little more intended for users who are for the first time in a city, which does not prevent others from utilizing its capabilities. Both applications should be an initial, immaterial impulse that will, inter alia, cause adaptation of the existing infrastructure to enable and improve bicycle traffic, construction of new infrastructure and facilities in the function of bicycle use as a mode of transport in the modern city, improvement of the social environment for better acceptance bicycle as a means of transport, and better acceptance of cyclists as participants in the traffic. What can be a starting point in cities such as Banjaluka, is to begin with adapting the existing infrastructure to the needs of cyclists as participants in traffic. This adaptation implies introducing the concept of road-sharing, separating one part of the infrastructure network for bicycle lanes and strips, at the expense of car traffic, improving existing traffic signaling, restoring existing bicycle parking by replacing “combs” with “staple”, introducing the possibility for cyclists to drive in both directions in one-way streets, which would be kept up-to-date in the Nextbike and Bike Citizens databases.

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REFERENCES

- Bike citizens. 2019. “Bike Citizens helps to get people on the move in 450 cities”. .” Last modified March 02. Accessed March 02, 2019. <https://www.bikecitizens.net/cities/>
- Beuhler, Ralph et al. 2013. “Are bikeshare users different from regular cyclists?” Transportation Research Record: Journal of the transportation research board, no. 2387 (December): 112-119.

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- Cheng, Yun-Maw and Lee, Chao-Lung. 2015. "Persuasive and engaging design of a Smartphone App for cycle commuting." *The Journal of Mobile User Experience*, no. 4:1 (March): 1-5.
- European Cyclists' Federation. 2017. "EU Cycling Strategy – Recommendations for Delivering Green Growth and an Effective Mobility System in 2030". Brussels: ECF.
- Grad Banjaluka. 2018. "U funkciji sistem javnog iznajmljivanja bicikala." Last modified March 30. Accessed February 28, 2019. <http://www.banjaluka.rs.ba/%D0%BE%D0%B4-%D0%B4%D0%B0%D0%BD%D0%B0%D1%81-%D1%83-%D1%84%D1%83%D0%BD%D0%BA%D1%86%D0%B8%D1%98%D0%B8-%D1%81%D0%B8%D1%81%D1%82%D0%B5%D0%BC-%D0%B8%D0%B7%D0%BD%D0%B0%D1%98%D0%BC%D1%99%D0%B8%D0%B2%D0%B0/>
- Heinen, Eva, Maat, Kees & van Wee. 2013. "The effect of work-related factors on the bicycle commute mode choice in the Netherlands", *Transportation*, no. 40(1) (January): 23-43.
- Landry, Charles. 2000. *The creative city: A toolkit for urban innovators*. London: Comedia, Earthscan publications ltd.
- Low, Nicholas. 2003. "The active city" *Urban policy and research*, no. 21(1): 5-7.
- Mumford, Lewis. 1955. *From the ground up*. New York: Harvest books.
- Pajarito, Diego and Gould, Michael. 2018. „Mapping frictions inhibiting bicycle commuting.“ *International journal of geo-information*, no. 7 (October): 396.
- Pucher, John and Buehler, Ralph. 2017. "Cycling towards a more sustainable transport future" *Transport Reviews* 37, no. 6: 689-694.
- Road.cc. 2017. "Cycling app of the week: Bike Citizens" Last modified August 24. Accessed February 28, 2019. <https://road.cc/content/tech-news/228201-cycling-app-week-bike-citizens>
- Rybarczyk, Greg and Wu, Changshan. 2014. "Examining the Impact of Urban Morphology on Bicycle Mode Choice." *Sage Journals*, no. 41(2) (April): 272-288.
- Shaheen, S., Guzman, S. & Zhang, H. 2010. „Bikesharing in Europe, the Americas, and Asia.“ *Transportation Research Record: Journal of the Transportation Research Board*, 2143, 159–167.