ANALYSIS OF CYCLIST`S PERCEPTION ON INFRASTRUCTURE AND DECISION TO BIKE

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Abstract—People who use the bike for transportation or pleasure face many challenges in the physical environment. Understanding the role of the road infrastructure in decisions to ride may lead to positive infrastructure policy. The objective of this study is to investigate the potential factors that can influence bicycle commuting in the city of Pristina. The study is designed to explore the arrangements of bicycle infrastructure and to provide recommendations to fulfill the needs of cyclists so as to encourage cycling on urban roads. Data analysis results showed that the quality of facilities strongly influences respondents' assessment, followed by perceptions of reliability, convenience, accessibility, and security. On physically separated bicycle paths, bicyclist`s perception of comfort was mainly influenced by road geometry and surrounding physical conditions. In the case of on-street bicycle lanes, bicyclists paid attention to the effective riding space and traffic conditions. The findings of this study can help inform design and planning of these bicycle facilities. Engineers, planners, and public health workers are interested in understanding how the environment may support cyclists, and how increased cycling activity may affect environmental and public health. Therefore in this paper, planners and engineers, will find useful information about strategies for improving the cycling infrastructure.

Index Terms—Cyclist`s perception, bicycle infrastructure, safety, convenience, accessibility, bicycle commuting.

1 INTRODUCTION

In many countries of the world, cycling is one of the most expressed ways of recreation. A large number of people use the bicycle as a transport daily tool for going to job, as a healthy way of physical activity. Cycling in the cities is more effective and ecological way, which in the same way includes rational and emotional arguments. Cycling is: fun, economic, ecologic, safe and healthy and improves the quality of life. Various assessments of the impacts of bicycling on levels of physical activity, obesity rates, cardiovascular health, and morbidity have concluded that cycling is a healthy activity [1].

Despite these many benefits, cycling in the streets of the city of Pristina is at a very low level. One of the reasons for this low level of bicycle use is also related to the poor urban planning that has been tracking the city of Pristina in the last two decades. During this period, the rapid increase of the motorization rate has affected the planning and construction of the road infrastructure to have the accommodation of motor vehicles as a priority and in this case the necessary infrastructure for the cyclist was not properly addressed. Consequently, in recent years, roads in the city of Pristina are always congested by motor vehicles. Promoting cycling involves providing the appropriate cycling infrastructure. In the previous research it was clearly noted that the existence of special paths for bicycles may result in a 55% increase of bicycle use [2]. Also, it is the fastest and most effective way to move in the city to a distance of up to 5 km, it has a positive impact in longevity and is considered as the first alternative to motorized traffic.

The relationship between environmental perceptions and spatial behavior has interested social scientists for decades. Research from the 1970s in the area of cognitive psychology assumed that individual variables such as attitudes and perceptions are the dominant drivers of behavior [3]

The design of bicycle infrastructure directly affects safety perceptions. Increased perception of cycling crash risk can be found in areas of low density, non-mixed land uses as opposed to compact, mixed-use neighbourhoods. This was even found to be the case when the latter areas experienced greater actual crash risk [4].

Bicycle riding saves money and time. Bicycle riding is an effective, simple and flexible way of movement. Bicycle riding and urban transport are much more environment friendly and have a positive impact on sustainable urban mobility. With the increasing pressures of climate change, severe health consequences and strained capital budgets, there is a growing interest in shifting from over-reliance on motorised transport towards sustainable urban transport modes [5, 6].

According to the latest data, only 1% of the daily movements in the city of Pristina are conducted by bicycle [7]. Based on online surveys, in which 1579 respondents participated, 1.25% of respondents stated that they use the bicycle as the main transport tool in the city of Pristina. From household surveys, regarding the safety of road movement by bicycle, about 39.1% of respondents consider that bicycling in the streets of Pristina is dangerous. However, about 53.6%. of respondents stated that they would use bicycle as a transport mean if the infrastructure and safety for cyclists were improved.

In the previous studies it was assessed that land use and design policies can influence human behaviour in regard to bicycle use [8]. Some authors compared the use of bicycle in different countries and provided the reasons for that. Pucher et al. (1999), suggested that with the right set of policies, cycling might experience a dramatic increase in terms of use. They stress the fact that Danish, German and Holland cities, give priority to cyclists in certain parts of the roads, crossroads and routinely employ advanced green lights and traffic-calmed streets) [9].

The city of Pristina is categorised with high urban density and mixed-use development and with lack of proper infrastructure for cyclist. Based on this, another study from Buchler et al. (2006) stress that urban high densities, short travel distances, low incomes, higher costs of owning, driving and park-

ing a car, safer cycling conditions are the main reasons for using bicycles [10].

There are little studies that have assessed the frequency of bicycle movement through descriptive analysis (rather than rigorous modelling efforts). Surveys of the general commuting population have shown that the most important factors affecting the choice of a commute mode are travelling time, comfort, needing a car for work or other purposes) and costs [11]. Therefore, many avid bicyclists do not select bicycles as a transport tool to work because of the long distance and the consequent high travel times that bicycling would entail [12].

2 Objective and Hypothesis

This paperwork is part of a wider study which focuses on the perception of the danger, respectively the safety of bicyclists, where more influential factors are involved and consequently there will be a tendency to deal with the problem of search in a broad and deeper way. Due to the nature of the publication, the treatment in this paperwork will be partial with a prime objective that is, testing the perception of factors that affect the safety and comfort of the bicycle infrastructure. Consequently, this hypothesis will be tested:

- H_1: Various factors that are related to the bicycle infrastructure (safety convenience, accessibility) do not have a significant impact on the use of bicycles as a form of transport

The findings from this study will be of interest to promote cycling on the road as an ecological and sustainable form of transport. Also this paperwork can serve for urban planners, when designing urban planning, to take into account the creation of cycling infrastructure and safety conditions for accommodating cyclists in the urban road network.

3 Data Source and Survey Administration

Data for this study were collected in the Kosovo capital, Pristina. The city of Pristina has about 200,000 inhabitants, while the district reaches up to 500,000 [13]. The study area is defined based on the analysis of the commuting population, according to locally available census data and housing data within Pristina.

The data used for this paperwork were taken from field traffic survey, which were used for designing Urban Mobility Plan for the city of Pristina [14]. The survey was conducted in the period between March and May 2017.

3.1 Area structure – Survey Zones

The hierarchy of the inner area of Pristina is accomplished by external zones within the defined area of interest, followed by destinations outside Pristina agglomeration.

In order to provide a more detailed description of the differences about cycling, the conurbation has been divided into three areas (Fig.1), in areas in the central part of the city of Pristina, in peripheral areas and in neighbouring municipalities. Each of these areas has its own characteristics.

Fig. 1. Map of the city of Pristina.

3.2 Profile of respondents

For the purpose of this research, 140 respondents were interviewed, of whom 68% were males and 32% females.

The profile of respondents is shown in Fig.2.

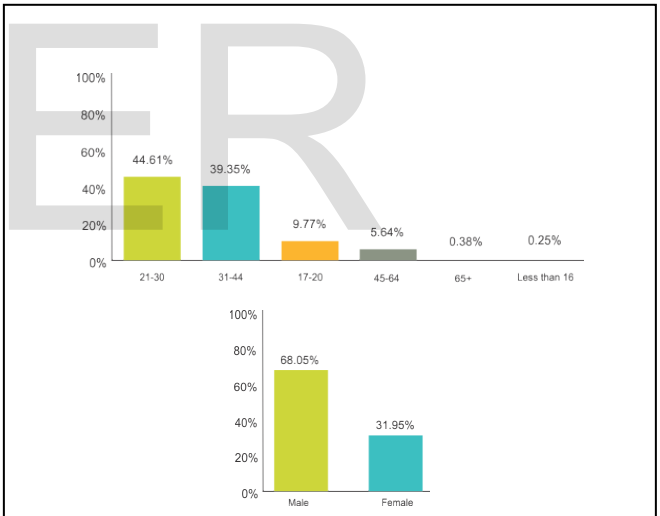

Fig. 1. The profile of respondents

4 Descriptive Analysis of Data and Results

In the first part of this paperwork, the main questions were linked to main mode of transport to workplace/school). In this part of the study respondents were asked about the transport mode they use for daily movements, how often they use bicycle and to what distance. The study shows that the use of personal car is main mode of transport to workplace/school.

The results of the survey on the transport mode are presented in Table 1.

TABLE 1
THE RESULTS OF THE SURVEY

Main mode of transport	
Car (on your own)	34,81%
Walk	24,01%
Bus or coach	23,43%
Car Driver (with passenger/s)	5,30%
Car (as passenger)	3,86%
Taxi	2,89%
Cycle	1,25%
Motorbike or moped	0,58%
Light or Heavy Goods Vehicle (LGV or HGV)	0,10%
Other	3,76%
Bicycle Frequency	
More than 3 times a week	0,3%
Several times a week	4,3%
Several time a month	6,4%
Several time a year	3,3%
Rarely	14,0%
Never	71,7%
Trip distance	
<500 m	21,37%
500-800 m	43,46
800-1500 m	21,3%
>1500 m	13,87%

As noted in Tabela 1. around 43.97% use the car as the mode of transport to workplace/school, (Car-on your own 34,81%, Car Driver -with passenger/s 5,30% and Car -as passenger 3,86%). Whereas, only 1,25% use the bicycle as the main mode of transport.

In the second part of the research, respondents have provided their assessment on the factors that affect the safety and comfort of riding a bicycle, namely the comfort, convenience and accessibility (Table 2).

The answers of the respondents, in regard to the infrastructure conditions for cyclists and factors that have an impact in safety, convenience and accessibility are presented in Table 3.

TABLE 3
THE RESULTS OF THE PERCEPTIONS

	Perceived Importance	Mean		Mode
Safety	Good signage	1.88	2.24	2
	Free from cars	2.30		2
	Safe Lanes	2.01		2
	Safe Area (maintain to prevent breakage etc)	2.79		3
Convenience	Suitable topography	4.08	2.37	4
	Bicycle Path	1.33		1
	Pedestrian conflict	2.60		3
	Convenient bicycle lane	1.49		1
Accessibility	Availability and accessibility	2.38	2.55	2
	Proximity to trip origin and destination	2.44		3
	Suitable service time	3.12		2
	Continuity and connectivity of bicycle lanes	2.28		3
Infrastructure	Availability of good condition infrastructure	2.57		3

As shown in Table 3, the average answer for each factors is lower than 3 (six-point Likert scale), except for topography (Suitable topography) which was ranked with 4.08 and Suitable service time me 3.12. According to this respondents are happy with the infrastructure for bicycling in the city of Pristina.

TABLE 2
FACTOR THAT AFFECT SAFETY, CONVENIENCE AND ACCESSIBILITY

Statistics													
	Safety				Convenience				Accessibility				Infra-structure
	Good sign-age	Free from cars	Safe Lanes	Safe Area	Suitable topography	Bicycle Path	No pedestri-an conflict	Convenient bicycle lane	Availability and accessi-bility	Proximity to trip origin and destina-	Suitable service time	Continuity	Overall satisfaction
Mean	4.59	3.45	4.12	2.10	1.75	4.22	2.60	3.62	4.39	3.74	3.26	4.84	3.81
Median	5.00	3.00	4.00	2.00	2.00	4.00	3.00	4.00	5.00	4.00	3.00	5.00	4.00
Mode	5.00	4.00	4.00	2.00	2.00	4.00	3.00	4.00	5.00	5.00	2.00	5.00	4.00
Std. Dev.	.583	.897	.654	.796	.520	.684	.852	.624	.784	1.27	1.35	.402	.612
Variance	.340	.805	.429	.635	.271	.469	.726	.390	.615	1.63	1.83	.162	.375
Range	2.00	4.00	2.00	3.00	2.00	3.00	3.00	3.00	4.00	4.00	4.00	2.00	2.00
Min	3.00	1.00	3.00	1.00	1.00	3.00	1.00	2.00	1.00	1.00	1.00	3.00	3.00
Max	5.00	5.00	5.00	4.00	3.00	6.00	4.00	5.00	5.00	5.00	5.00	5.00	5.00

Factors that are related to safety and convenience are rated very low. In regard to convenience factor), Bicycle Path is assessed with lowest average value of 1.33 and modus 1 and convenient bicycle lane with 1.49 and modus 1.

Through the ANOVA test, F values calculated for all factors (safety, convenience, accessibility), are higher than the value. Hence, Ho Hypothesis is rejected.

In table 4, ANOVA of factors (safety, convenience, accessibility) are presented.

TABLE 4
FACTOR THAT AFFECT SAFETY, CONVENIENCE AND ACCESSIBILITY

	Model	Sum of Squares	df	Mean Square	F	Sig.
Safety	Regression	1.007	4	.252	12.537	.000[b]
	Residual	2.811	140	.020		
	Total	3.818	144			
Convenience	Regression	1.054	4	.264	13.351	.000[b]
	Residual	2.764	140	.020		
	Total	3.818	144			
Accessibility	Regression	1.604	4	.401	25.348	.000[b]
	Residual	2.214	140	.016		
	Total	3.818	144			

Regression analysis is given in the table 5.

TABLE 5
THE RESULTS OF THE PERCEPTIONS

Regression Model	R	R square
$Y = 1.85 + 0.087 \cdot (S) + 0.106 \cdot (C) + 0.75 \cdot (A)$	0.69	0.421

S-Safety; C-Convience; A:Accessibility

4.1 Testing Hypothesis

From the results of the statistical analyses, is concluded that:

Different factors that describe the available infrastructure (safety, Convenience, accessibility) have a significant effect on the use of bicycles as a form of transport.

4 CONCLUSION

For this research, data from cyclists' surveys on urban roads of the city of Pristina have been used for measuring the cyclist`s perception on infrastructure, respectively the key factors that affect in assessing the suitability of the bicycle infrastructure.

Bicycle infrastructure in the city of Pristina received bed scores, and several factors have a strong influence on respondents' assessment of the availability of bicycle infrastructure and their decision to bike.

Safety conditions while riding a bicycle have a strong influence on the respondent`s assessment of the bicycle infrastructure followed by convenience and accessibility.

The findings from this research show that, the condition of bicycle infrastructure needs to be improved, the continuity of the bicycle network needs to be maintained and the most important is the improvement of security conditions

The survey results reveal that many commute trips in Pristina are well within bicycling range in terms of distance, however due to inadequate transportation infrastructure is automobile oriented, people drive their cars even for short distances.

Respondents have stated that the lack of bike lanes as the most important reason that keeps them from bicycling. This reveals the fact that a connected bicycle network is the backbone of a successful bicycle program and there is an immediate need to establish a bicycle network on campus consisting of bicycle lanes, routes and trails, connected to the surrounding residential areas. Lack of signaling and the vehicular traffic has a negative impact on biking. Many respondents stated that they do not feel safe about vehicular traffic. The relevant authorities should put more effort into discouraging and using enforcement against the unsafe behaviors of car drivers.

The findings from this study will be of interest to promote cycling on the road as an ecological and sustainable form of transport. Also this paperwork can serve for urban planners, when designing urban planning, to take into account the creation of cycling infrastructure and safety conditions for accommodating cyclists in the urban road network.

A conclusion might elaborate on the importance of the work or suggest applications and extensions. Authors are strongly encouraged not to call out multiple figures or tables in the conclusion—these should be referenced in the body of the paper.

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