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Original scientific paper

Survey results on the level of support for greater bicycle use in Strumica

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Abstract – **In this article, a survey of level of support of bicycle mode of transport in Strumica is presented. A sample of answers from 300 citizens has been statistically analyzed in order to reveal how the general public and different categories of inhabitants respond to such policy. The results show vast support for greater use of bicycle among all categories of respondents.**

Keywords – **Bicycle, survey, policy support**

I. INTRODUCTION

Traffic congestion and loss of time, lack of parking spaces, low traffic safety, and increased harmful emissions from motor vehicles are problems that every local government has been trying to solve. It has been widely accepted nowadays, that a proper answer to these challenges is to accept and implement a policy for development of sustainable urban transport system. The core of this policy is to discourage the use of automobiles in cities and to support other cleaner modes of transport.

However, a review of current modal split in Macedonian cities shows that the bicycle transport takes part with less than 2% of all urban trips [1]. This is true for all macedonian cities. Great contribution to such situation comes from the fact that the bicycle as a mode of transport has been entirely neglected for many decades. There is no at all, or there is poor bicycle infrastructure, while the ownership and usage of automobile has increased significantly and has become dominant mode of urban transport.

In recent years, with the increasing concern of the public with the urban traffic problems and pollution, the concept of sustainable urban mobility emerges as a possible solution. However, the local governments in Macedonian cities seem to be restrained to fully implement a policy of sustainable urban transport, due to the mixed reaction from the citizens. On one hand, the public requires clean environment and better quality of life in cities, but on the other hand, there is a negative reaction when measures such as parking fees and restriction of car movement is implemented.

A valuable help to politicians with policy making process would be a survey that will investigate the level of support for certain sustainable transport solutions.

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In this article, a survey done in the city of Strumica is presented. The objective of the survey is to investigate the level of support of policy for greater investment in bicycle infrastructure and support for greater use of bicycle in the city.

According to the census from 2002 Strumica has 54676 citizens [2]. In year 2018 there were 11909 registered vehicles [3]. Currently, the total length of bicycle lanes is 4845 m. Mostly, those lanes are marked by horizontal signalization only and are positioned on the pedestrian sidewalks.

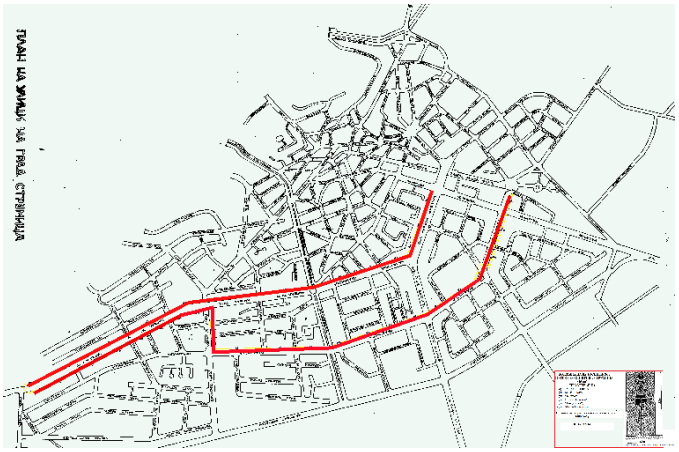

Fig. 1. Current bicycle lanes in Strumica

II. SURVEY METHODOLOGY

For the purpose of this research a survey has been done by interviewing over 300 citizens on the streets of Strumica during three days in April 2019. The locations where the survey took place, were carefully chosen in order to get representative sample that would include different categories of population. The locations were: the city's green market, center city and the city's biggest shopping mall. The survey has been supported by the local government and the local media that informed the citizens about the purpose and time of the survey.

There were total of 300 valid responses. The results of the survey have been analyzed using the SPSS statistical software package.

Data about age, household size, car ownership, bicycle ownership, current usage of bicycle and the major obstacles for bicycle use today, have been collected. The final two questions were whether they would support a policy of local government that would promote greater use of bicycle and whether they would use bicycle more often if the bicycle infrastructure was improved.

III. ANALYSIS OF THE SURVEY RESULTS

Participants in the survey have been divided in three age categories: below 18, between 18 and 50, and above 50 years of age. As can be seen from Table 1, 13% of responded were under 18 years old, 54,3% between 18 and 50 years and 32,7% above 50 years old.

A great majority of respondents of 86,7% said that they would support bicycle promotion policy, only 1,3% would not, and 12% did not know.

In order to test if there is significant difference in responses from the different categories of age, two statistical tests have been performed. The z-test and the standard residuals (table 1) have shown that the null hypothesis that there is no significant difference in responds from different categories of age cannot be rejected at significance level of 0,05.

TABLE 1. Age category vs support of bicycle policy

age * policy support Crosstabulation

		policy support			
		"yes"	"no"	"don't know"	Total
below 18	Count	33_a	1_a	5_a	39
	Expected Count	33,8	,5	4,7	39,0
	% within age	84,6%	2,6%	12,8%	100,0%
	% within policy support	12,7%	25,0%	13,9%	13,0%
	Std. Residual	-,1)	,7	,1	
18 to 50	Count	145_a	1_a	17_a	163
	Expected Count	141,3	2,2	19,6	163,0
	% within age	89,0%	,6%	10,4%	100,0%
	% within policy support	55,8%	25,0%	47,2%	54,3%
	Std. Residual	,3	-,8)	-,6)	
above 50	Count	82_a	2_a	14_a	98
	Expected Count	84,9	1,3	11,8	98,0
	% within age	83,7%	2,0%	14,3%	100,0%
	% within policy support	31,5%	50,0%	38,9%	32,7%
	Std. Residual	-,3)	,6	,7	
Total	Count	260	4	36	300
	Expected Count	260,0	4,0	36,0	300,0
	% within age	86,7%	1,3%	12,0%	100,0%
	% within policy support	100,0%	100,0%	100,0%	100,0%

Each subscript letter denotes a subset of policy support categories whose column proportions do not differ significantly from each other at the ,05 level.

The Chi-square test (table 2) also confirms the result that there has been no difference among different categories of age regarding the bicycle policy support.

According to the Chi-square test p = 0,654 > 0,05, so the null hypothesis that there is no difference in approval of policy can not be rejected. Because 4 cells violate the assumption that number of counts should be greater than 5, the look at the likelihood ratio 0,653 >0,05 again confirms the same result.

TABLE 2. Age category vs support of bicycle policy chi-square test

Chi-Square Tests

Value	df	Asymp. Sig. (2-sided)
2,447[a]	4	,654
2,451	4	,653
,304	1	,581
300		

a. 4 cells (44,4%) have expected count less than 5. The minimum expected count is ,52.

The analysis of the survey results related to the car ownership and bicycle policy support is given in table 3.

Out of 300 respondents, 12,3% said that their household does not own a car, 56,3% own one car and 31,3% that own two or more cars.

86,5% of those with no cars, 88,2% of those household with one car and 85% of those with two or more cars, support the policy. The wide support among all categories is obvious, but it is interesting to notice the high percent of support even by households that own two or more cars.

The z-test shows that the null hypothesis of no significant difference between different categories ca not be rejected at level of significance of 0,05.

The chi-square test confirms this result (table 4) since p = 0,093 > 0,05.

Regarding the chi-square test, 4 cells violate the assumption that number of counts >5 so the look at the likelihood ratio 0,128 >0,05 again shows that the null hypothesis cannot be rejected.

The next analysis is about the bicycle policy support and ownership of bicycle. The respondent's households were divided in four categories: households that do not own a bicycle, ones with one bicycle, ones with two bicycles and ones with three or more bicycles.

Out of sample of 300, 12% have no bicycle at all, 40,3% have one bicycle, 34,3% have two bicycles and 13,3% have three or more bicycles (table 5). These results show that the bicycle ownership in Strumica is rather high.

The results of the analysis of the bicycle ownership vs support of bicycle support is given in tables 5 and 6.

TABLE 3. Car ownership and bicycle policy support

car ownership * policy support Crosstabulation

		policy support			
		"yes"	"no"	"don't know"	Total
"0"	Count	32_a	2_b	3_a	37
	Expected Count	32,1	,5	4,4	37,0
	% within car ownership	86,5%	5,4%	8,1%	100,0%
	% within policy support	12,3%	50,0%	8,3%	12,3%
	Std. Residual	,0	2,1	-,7)	
"1"	Count	149_a	2_a	18_a	169
	Expected Count	146,5	2,3	20,3	169,0
	% within car ownership	88,2%	1,2%	10,7%	100,0%
	% within policy support	57,3%	50,0%	50,0%	56,3%
	Std. Residual	,2	-,2)	-,5)	
"2 or more"	Count	79_a	0_a	15_a	94
	Expected Count	81,5	1,3	11,3	94,0
	% within car ownership	84,0%	,0%	16,0%	100,0%
	% within policy support	30,4%	,0%	41,7%	31,3%
	Std. Residual	-,3)	-1,1)	1,1	
Total	Count	260	4	36	300
	Expected Count	260,0	4,0	36,0	300,0
	% within car ownership	86,7%	1,3%	12,0%	100,0%
	% within policy support	100,0%	100,0%	100,0%	100,0%

Each subscript letter denotes a subset of policy support categories whose column proportions do not differ significantly from each other at the ,05 level.

TABLE 4. Car ownership vs policy support chi-square test

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7,952[a]	4	,093
Likelihood Ratio	7,146	4	,128
Linear-by-Linear Association	1,105	1	,293
N of Valid Cases	300		

a. 4 cells (44,4%) have expected count less than 5. The minimum expected count is ,49.

TABLE 5. Bicycle ownership and bicycle policy support

bicycle ownership * policy support Crosstabulation

		policy support			
		"yes"	"no"	"don't know"	Total
"0"	Count	22_a	3_b	11_b	36
	Expected Count	31,2	,5	4,3	36,0
	% within bic ownership	61,1%	8,3%	30,6%	100,0%
	% within policy support	8,5%	75,0%	30,6%	12,0%
	Std. Residual	-1,6)	3,6	3,2	
"1"	Count	113_a	$1_{a,b}$	7_b	121
	Expected Count	104,9	1,6	14,5	121,0
	% within bic ownership	93,4%	,8%	5,8%	100,0%
	% within policy support	43,5%	25,0%	19,4%	40,3%
	Std. Residual	,8	-,5)	-2,0)	
"2"	Count	94_a	0_a	9_a	103
	Expected Count	89,3	1,4	12,4	103,0
	% within bic ownership	91,3%	,0%	8,7%	100,0%
	% within policy support	36,2%	,0%	25,0%	34,3%
	Std. Residual	,5	-1,2)	-1,0)	
"3 or more"	Count	31_a	$0_{a,b}$	9_b	40
	Expected Count	34,7	,5	4,8	40,0
	% within bic ownership	77,5%	,0%	22,5%	100,0%
	% within policy support	11,9%	,0%	25,0%	13,3%
	Std. Residual	-,6)	-,7)	1,9	
Total	Count	260	4	36	300
	Expected Count	260,0	4,0	36,0	300,0
	% within bic ownership	86,7%	1,3%	12,0%	100,0%
	% within policy support	100,0%	100,0%	100,0%	100,0%

Each subscript letter denotes a subset of policy support categories whose column proportions do not differ significantly from each other at the ,05 level.

The z-test shows that there is a difference in bicycle policy support among different categories of bicycle ownership. The standard residual of 3,6 for the household with no bicycle and answer “no” for support of bicycle policy shows the biggest difference, compared to other categories of bicycle ownership. Also the standard residual of -2 for the household with one bicycle and with answer “I don’t know” shows the difference compared to all the others.

The chi-square test confirms the result that there is a significant difference in bicycle policy support between

different categories of bicycle ownership since p = 0 < 0,05 and the null hypothesis that there is difference in approval of policy is rejected (table 6).

6 cells violate the assumption that number of counts >5 so the value of the likelihood ratio 0 <0,05 again confirm the result that the null hypnosis is rejected.

TABLE 6. Chi-square test for bicycle ownership vs bicycle policysupport

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	38,165[a]	6	,000
Likelihood Ratio	30,282	6	,000
Linear-by-Linear Association	,695	1	,405
N of Valid Cases	300		

a. 6 cells (50,0%) have expected count less than 5. The minimum expected count is ,48.

The analysis of the main obstacle for greater use of bicycle in Strumica today has shown that the major concern is about traffic safety. 73,33% complained about low safety, 9,67% said they did not own bicycle, 6,67 % answered that the problem is lack of bicycle parking spaces (figure 2).

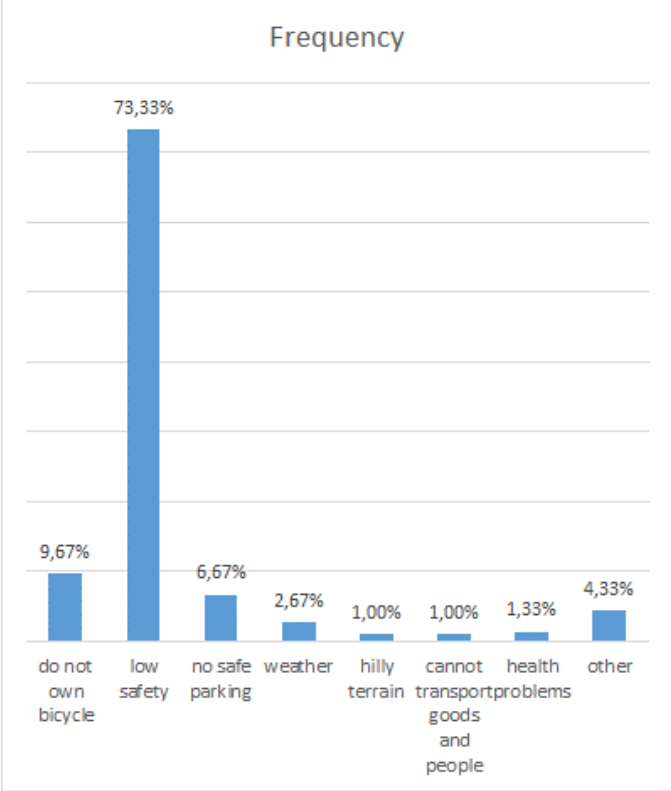

Fig. 2 Main obstacle for greater bicycle use today

Given the perception of the survey respondents that the poor bicycle infrastructure is important reason for low importance of bicycle as transport vehicle in the city, it is interesting to analyze, would they use it more frequently if the bicycle infrastructure is greatly improved.

The answers to this question has been first analyzed in relation with the age of the respondents. The result of this analysis are given in tables 7 and 8.

TABLE 7. Age vs use of bicycle if the infrastructure is improved

age * if better infrastructure Crosstabulation

		if better infrastructure use				
		"no"	"maybe sometimes"	"often"	"everyday"	Total
"below 18"	Count	1_a	9_a	14_a	15_a	39
	Expected Count	3,3	7,2	13,1	15,5	39,0
	% within age	2,6%	23,1%	35,9%	38,5%	100,0%
	% within if better	4,0%	16,4%	13,9%	12,6%	13,0%
	Std. Residual	-1,2)	,7	,2	-,1)	
"18 to 50"	Count	8_a	$30_{a,b}$	63_b	$62_{a,b}$	163
	Expected Count	13,6	29,9	54,9	64,7	163,0
	% within age	4,9%	18,4%	38,7%	38,0%	100,0%
	% within if better	32,0%	54,5%	62,4%	52,1%	54,3%
	Std. Residual	-1,5)	,0	1,1	-,3)	
"above 50"	Count	16_a	16_b	24_b	42_b	98
	Expected Count	8,2	18,0	33,0	38,9	98,0
	% within age	16,3%	16,3%	24,5%	42,9%	100,0%
	% within if better	64,0%	29,1%	23,8%	35,3%	32,7%
	Std. Residual	2,7	-,5)	-1,6)	,5	
Total	Count	25	55	101	119	300
	Expected Count	25,0	55,0	101,0	119,0	300,0
	% within age	8,3%	18,3%	33,7%	39,7%	100,0%
	% within if better	100,0%	100,0%	100,0%	100,0%	100,0%

Each subscript letter denotes a subset of if better infrastructure use categories whose column proportions do not differ significantly from each other at the ,05 level.

From the results in table 7, it seems that people in Strumica would respond quite positively in terms of greater use of bicycle if the bicycle infrastructure was improved.

38,5% of the youngest category said they would use bicycle every day and another 35,9% said they would use bicycle often. Only 3,3 % answered that they would no use a bicycle.

Similar results have been found for the category of age between 18 and 50. 38% said they would use bicycle every day and another 38,7% said they would use bicycle often. Only 4,9 % answered that they would no use a bicycle.

The answers from the oldest category of respondents are interesting. Very high percent (42,9%) answered that they would use bicycle every day, but at the same time, compared to other age categories, the highest percent (16,3%) said that they would not use the bicycle at all.

The z-test shows that the null hypothesis that there is no difference between answers of different age categories cannot be accepted. There is a difference! The standard residual of 2,7 for age category above 50 shows significant difference of those who responded that they would not use the bicycle.

The same result is confirmed by the chi-square test. The p value is 0,013 < 0,05 at level of significance of 0,05 and the null hypothesis is rejected.

Since 1 cell have expected count less than 5, the look at the likelihood ratio 0,016 < 0,05 confirms the same result.

TABLE 8. Chi-square test of age vs improved bicycle infrastructure

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	16,147[a]	6	,013
Likelihood Ratio	15,644	6	,016
Linear-by-Linear Association	1,419	1	,234
N of Valid Cases	300		

a. 1 cells (8,3%) have expected count less than 5. The minimum expected count is 3,25

How the ownership of cars affects the use of bicycle if the bicycle infrastructure is improved? The analysis of this issue is presented in tables 9 and 10.

Again, the intention of greater use of bicycle is rather positive.

Among those who do not own a car, 54,1% said they would use the bicycle every day. Surprisingly, 21,6% said they would not use the bicycle at all.

33,1% of those with one car said that they would use bicycle every day and another 39,1% that they would use it often. 7,7% would not use bicycle at all.

The support for bicycle is rather high with in a category that owns two or more cars. 45,7% would use bicycle every day 29,8% often, and only 4,3% would not use it at all.

The z-test shows that the null hypothesis should be rejected, that is, there is a significant difference in responses of different categories of people. The standard residuals are the highest for the category that does not own a car (2,8 and -1,8).

TABLE 9. Car ownership vs greater use of bicycle if the infrastructureis improved

car ownership * if better infrastructure use Crosstabulation

		if better infrastructure use				
		"no"	maybe sometimes	often	every day	Total
"0"	Count	8_a	2_b	7_b	20_a	37
	Expected Count	3,1	6,8	12,5	14,7	37,0
	% within car ownership	21,6%	5,4%	18,9%	54,1%	100,0 %
	% within if better	32,0%	3,6%	6,9%	16,8%	12,3%
	Std. Residual	2,8	-1,8)	-1,5)	1,4	
"1"	Count	$13_{a,b}$	$34_{a,b}$	66_b	56_a	169
	Expected Count	14,1	31,0	56,9	67,0	169,0
	% within car ownership	7,7%	20,1%	39,1%	33,1%	100,0 %
	% within if better	52,0%	61,8%	65,3%	47,1%	56,3%
	Std. Residual	-,3)	,5	1,2	-1,3)	
"2 or more	Count	4_a	19_a	28_a	43_a	94
	Expected Count	7,8	17,2	31,6	37,3	94,0
	% within car ownership	4,3%	20,2%	29,8%	45,7%	100,0 %
	% within if better	16,0%	34,5%	27,7%	36,1%	31,3%
	Std. Residual	-1,4)	,4	-,6)	,9	
Total	Count	25	55	101	119	300
	Expected Count	25,0	55,0	101,0	119,0	300,0
	% within car ownership	8,3%	18,3%	33,7%	39,7%	100,0 %
	% within if better	100,0 %	100,0%	100,0 %	100,0 %	100,0 %

Each subscript letter denotes a subset of if better infrastructure use categories whose column proportions do not differ significantly from each other at the ,05 level.

The chi-square test (table 10) has shown that p = 0,001 < 0,05 and the null hypothesis that there is no difference in responses if better infrastructure is rejected. There is a significant difference.

One cell violate the assumption that number of counts >5 so checking of the value of the likelihood ratio 0,001 <0,05 again shows that there is significant difference between categories of respondents.

TABLE 10. Chi-square test for car ownership vs greater use of bicycleif the infrastructure is improved

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	22,537[a]	6	,001
Likelihood Ratio	22,097	6	,001
Linear-by-Linear Association	1,171	1	,279
N of Valid Cases	300		

a. 1 cells (8,3%) have expected count less than 5. The minimum expected count is 3,08.

IV. CONCLUSIONS

Among important problems that Macedonian cities are faced with, certainly are the traffic congestion, lack of parking spaces and the increased pollution. The voice of public demanding better quality of life and solving of these problems are more loud every day. However, the local governments are sometimes faced with negative public reactions when certain transport sustainable measures are proposed. Measures such as parking fees, restriction of car movement, higher taxes for dirty vehicles, taking traffic lanes for public transport or bicycle lanes, are not always met with public approval. Therefore, before implementing a sustainable transport policy it is important to use all instruments in order to explain to the public the benefits for all of such policy, as well as to check the response of public to certain sustainable measure.

In this article a survey of the public response to a policy for greater support and better infrastructure for bicycle transport mode in the city of Strumica.

The survey included 300 respondents. The analysis of the results of the survey has shown widespread support for bicycle mode over all categories of respondents.

Regardless of the age of the survey participants, the support for bicycle policy ranged between 83,7 and 89%. The statistical tests have shown that there is no difference in support between different age categories.

Similar high support for bicycle support policy has been found in regards with car ownership. 86,5% of those with no cars, 88,2% of those household with one car and 85% of those with two or more cars, support the policy. The wide support among all categories is obvious, but it is interesting to notice the high percent of support even by households that own two or more cars. Again statistical tests have not shown significant difference between different car ownership categories.

The analysis of the level of bicycle ownership in Strumica has shown rather high values. Out of sample of 300, 12% have no bicycle at all, 40,3% have one bicycle, 34,3% have two bicycles and 13,3% have three or more bicycles.

As expected, the analysis of the bicycle support policy in relation with bicycle ownership has shown very high support for the policy in average od 86,7%. However, the statistical tests have shown that there is a difference in support depending on the bicycle ownership category. The biggest difference is in responses of people that do not own a bicycle and in higher than expected number answered that they would not support or don't know if they would support bicycle policy.

Regarding of the level of bicycle use if the bicycle infrastructure is improved, it seems that people in Strumica would respond quite positively.

38,5% of the youngest category said they would use bicycle every day and another 35,9% said they would use bicycle often. Only 3,3 % answered that they would no use a bicycle.

Similar results have been found for the category of age between 18 and 50. 38% said they would use bicycle every day and another 38,7% said they would use bicycle often. Only 4,9 % answered that they would no use a bicycle.

The answers from the oldest category of respondents are interesting. Very high percent (42,9%) answered that they would use bicycle every day, but at the same time, compared to other age categories, the highest percent (16,3%) said that they would not use the bicycle at all.

The results of the survey also have shown intention for greater use of bicycle regardless of the car ownership also.

Among those who do not own a car, 54,1% said they would use the bicycle every day. Surprisingly, 21,6% said they would not use the bicycle at all.

33,1% of those with one car said that they would use bicycle every day and another 39,1% that they would use it often. 7,7% would not use bicycle at all.

The support for bicycle is rather high with in a category that owns two or more cars. 45,7% would use bicycle every day 29,8% often, and only 4,3% would not use it at all.

Here, an unexpected result has been rather high number of participants of survey (21,6%) that do not own a car, and answered that they would not use a bicycle at all.

In general, the results of this survey have shown high support of policy that would give more important role of bicycle as a mode of transport in Strumica. Hopefully, this will encourage the local government to take action in this direction, as part of the efforts to build more sustainable transport system in Strumica.

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