

## KNOWLEDGE OF SECONDARY SCHOOL STUDENTS IN BELGRADE AS AN ELEMENT OF FLOOD PREPAREDNESS

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### Abstract

The consequences of the floods that inundated the territory of Serbia in 2014 indicated a high level of citizen unpreparedness to respond to the situation. Starting from this fact, the basic idea of this research is to examine the level and correlation of certain factors with the students' knowledge about floods as natural disasters. The aim of the research is a scientific explanation of the correlation between students' knowledge about floods and these factors. The research consisted of a survey conducted on a sample of 3,498 respondents who make up 8.96% of the students population. The respondents were students from 19 secondary schools, out of a total of 54 at the territory of 11 affected municipalities of the city of Belgrade. The research results suggest that flood related knowledge is influenced by the students' gender, education and employment status of parents, education acquired in school and in the family, while the knowledge of safety procedures for responding to floods is influenced by fear, gender and the educational level of parents. These results can be used in creating educational programme strategies to enhancing preparedness for response.

**Key words:** natural disasters, floods preparedness, secondary schools, knowledge, Belgrade.

## ЗНАЊЕ УЧЕНИКА СРЕДЊИХ ШКОЛА У БЕОГРАДУ КАО ЕЛЕМЕНТ СПРЕМНОСТИ ЗА РЕАГОВАЊЕ НА ПОПЛАВЕ

### Апстракт

Последице поплава које су захватиле територију Србије током 2014. године указале су на висок ниво несpreмности грађана за реаговање у насталој ситуацији. Руководећи се тиме, основна идеја овог истраживања је да се испитају ниво и повезаност одређених фактора са знањем ученика о поплавама као природним катастрофама. Циљ истраживања представља научна експликација повезаности знања ученика о поплавама и споменутих фактора. Истраживање је остварено методом анкетирања, на узорку од 3498 испитаника, који чине 8,96% популације. Испитаници су ученици 19 средњих школа од укупно 54, колико их има на територији 11

угрожених општина Града Београда. Резултати истраживања указују на то да на знање о поплавама утичу пол ученика, образованост и запосленост родитеља, едукација у школи и породици, док на познавање безбедносне процедуре за реаговање приликом поплава утичу страх, пол и образованост родитеља. Наведени резултати могу се искористити приликом стварања стратегија образовних програма, што би допринело унапређењу спремности за реаговање у условима природних катастрофа изазваних поплавама.

**Кључне речи:** природне катастрофе, поплаве, средње школе, перцепција, знање, Београд.

### *INTRODUCTION*

The analyses of the total number of natural disasters at the global level clearly show an increase in these phenomena, and if their consequences are analysed together with geospatial, climatic and general demographic trends, we obtain data that support the thesis of the necessity of improving the population's disaster response preparedness (Authors, 2014; Dewan, 2013; Zhang et al., 2014). Speaking about the territory of the Republic of Serbia, we can say that the degree of vulnerability of the population and their material goods is not uniform, but varies depending on the type of natural disaster and expected potential damage (Dragicevic et al., 2011). Floods and torrential floods are the most frequent phenomena of the "natural risks" in Serbia. Their frequency, intensity and diffusion across the territory make them a continual threat to the ecological, economic and social spheres (Petrović et al., 2014). The potential floodable area, for the waters of a return period of 100 years, cover the surface of 16000 km<sup>2</sup>, affecting 500 larger settlements, 515 industrial objects, 680 km of railroads and about 4000 km of roads. The most vulnerable area is the northern part of Serbia (Vojvodina), where, in the coastal part of the Danube River (specifically the Tisa, the Tamis and the Sava), there are about 12900 km<sup>2</sup> of potentially floodable land.

In the previous 10-year return period, a large number of floods were recorded in the territory of the Republic of Serbia. The territory of Serbia was affected by serious floods in the following years: 1999, 2000, 2005, 2006, 2007, 2009. Heavy rainfall over the area of Serbia, northern Bosnia and eastern Croatia in May 2014 caused large floods. These flooding events, according to their characteristics (size of affected area, duration, consequences, etc.) surpassed all the previous ones and caused serious consequences in the territory of Belgrade region and particularly in the Municipality of Obrenovac. The refusal of the population to be evacuated and the panic spread when the river overflowed its banks, led to the situation where 25,000 residents were evacuated from Obrenovac in only two days. Such reactions of the population, but also failures of the local self-government to conduct evacuation, prompted the analysis of the level of awareness among population about vulnerability to flooding and their

consequences in the Belgrade region, i.e. in the territory that is particularly susceptible to this natural disaster. Correlation between education and natural disaster risk reduction is a very important research question. A large number of researchers have examined the connection between knowledge and natural disaster response preparedness (Muttarak & Pothisiri 2013, Öcal 2010; Authors, 2015). The relevant literature provides a wide range of definitions of natural disaster preparedness, which can conditionally be reduced to knowledge and specific activities undertaken both proactively and reactively in order to prevent or reduce the negative consequences of natural disasters. Guided by the results of the aforementioned research studies, we conducted a survey to examine knowledge as one of the elements of preparedness for responding to a natural disaster caused by flooding. In this research, we decided to examine students' knowledge in terms of determining a strategy of further action and enhancement of preparedness.

### *METHODS*

Bearing in mind the frequency and consequences of catastrophic floods that occurred in the Republic of Serbia in 2014, the authors of the paper examine the level and factors of impact on the knowledge of secondary school students in Belgrade concerning natural disasters caused by flooding. The knowledge of students is viewed as one of the most important elements of preparedness to respond to such natural disasters. The research was conducted with the aim of providing a scientific explanation of the existence of correlation between certain factors (gender, age, parents' education, school achievement, media, previous experience, fear) and the students' knowledge about natural disasters caused by flooding. The survey included secondary schools in the City of Belgrade.

The survey was conducted on the sample of 3,498 respondents. The respondents were selected by the proportional stratified sampling from the population of secondary school students in Belgrade, which consisted of 63,106 students in 2014. The first criterion for stratification was that secondary schools had to be from the municipalities affected by the consequences of flooding, and these were eleven of seventeen municipalities in the City of Belgrade. The second criterion for stratification was to include the secondary schools focused on social sciences and the secondary schools focused on mathematics and natural sciences, which together have 39,017 students. An independent random sample, constituting 8.96% of the subpopulation, was drawn from the thus defined stratum. This means that 19 secondary schools, 10 socially oriented and 9 mathematically oriented, were randomly selected from 54 secondary schools in the affected Belgrade municipalities, making up 35.18% of the subpopulation. Furthermore, by applying the method of random selection from the list of available classrooms, 2 - 6 classrooms from K1, K2, K3, and K4 (depending on

the number of classrooms in a particular school) were selected, and then all students who attended classes in the selected classrooms on that day were surveyed. This technique of sampling provided satisfactory representativeness of the sample, and the sample size ensured reliability of conclusions about the basic group/population.

We checked the representativeness of the sample against the characteristics of the general student population. Thus, for example, male students constituted 49.8% of the sample, while female students accounted for 50.2%. As regards the structure of the sample in terms of school grade, level of interest in certain professions for which the students are educated, educational structure and employment status of parents, there is also a significant degree of matching.

A specially designed instrument was used in the survey. It included 7 items related to independent variables (gender, age, education of mother and father, employment status of parents, household members, average grade in school) and 20 questions relating to knowledge of students about flooding (questions regarding knowledge, perception and familiarity with safety response procedures, fear, education acquired in school and in the family, consequences, desire to learn more, feeling of being protected in schools, training, introduction of subjects, ways and willingness to obtain information, flooding experience, etc.). The instrument was corrected, in terms of sentence errors and the order of some questions, based on the results obtained from the pilot surveys conducted in 2013.

With respect to the analysis, two approaches are applied to determine what really affects and what ostensibly affects student knowledge about floods. The first approach examines the correlation of the actual knowledge, which involves identifying the definition of floods, of students about floods and the selected influencing factors, whereas the second approach examines the relationship between student “flooding preparedness perception” and their own knowledge and selected influencing factors.

Seeking the correlation between different characteristics of the respondents and their knowledge and familiarity with safety procedures for responding to natural disasters caused by flooding, we opted the chi-square test of independence (*Chi-Square* -  $\chi^2$ ). Before the statistical analysis, we ensured that there was no violation of one of the assumptions of the chi-square test in terms of the cell frequency, which should be 5 or more (i.e. at least 80 percent of the cells must have the expected frequency). In cases where such assumption was violated, we combined certain group or used other tests, such as the Fishers Exact Probability Test. In determining the level of significance, we chose a significance level of 5%. In order to examine the effect size, we used the *Cramers V*, which takes into account the degrees of freedom. According to Cohen (1988), there are the following criteria: small < 0.10, moderate 0.10 - 0.30 and large > 0.50.

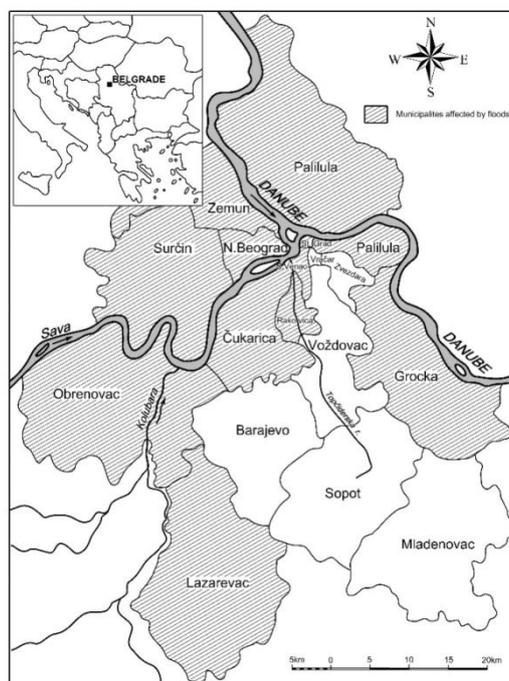


Figure 1. The municipalities affected by floods in Belgrade/Serbia.

Based on the analysed degree of vulnerability of the national territory to flooding as a natural disaster, the city of Belgrade was identified as the most vulnerable and selected to be the territory of research. Belgrade is the largest and capital city of the Republic of Serbia with the population of 1,669,552 inhabitants, or 22% of the total population of the country, including 65,561 secondary school students or 3.93% of all inhabitants of Belgrade (data of the Statistical Office of the Republic of Serbia, 2013). The city covers an area of 3227 km<sup>2</sup> (3.6% of the national territory). In this area there are 17 city municipalities, of which eleven were affected by flooding because they are positioned in the basins of two large international rivers, the Danube and the Sava (Pan-European Corridor No. 7), and in the area of a large number of torrential watercourses, the most important being the rivers Kolubara and Topčiderska (Figure 1). In May 2014, some of the affected municipalities suffered the biggest damage by flooding, since the beginning of flood damage assessments.

## RESULTS

Although it may seem that secondary school students are familiar with the phenomenon of floods, we have learnt that their knowledge is

not satisfactorily. In fact, as many as 94.8% of secondary school students responded that they knew what a flood was. We asked the survey respondents, who claimed to know what a flood was, to circle the correct answer (out of five offered) to the question: "What is a flood"? The question was answered correctly by 87.7% of the students and incorrectly by 11.7% of them. However, some of the respondents who said that they did not know what a flood was circled the correct definition of flood, so that the total percentage of the respondents who knew what a flood was equalled 91.3%. The survey results show that 79% of the respondents know how to behave in the event of flood, which makes 70% of those who have knowledge about this natural disaster.

The survey results indicate (Table 1) that there is a statistically significant correlation between gender and perception of floods ( $\chi^2 = 19.09$ ,  $df = 2$ ,  $p = 0.000$ ,  $V = 0.073$ ), knowledge about floods ( $\chi^2 = 15.55$ ,  $df = 2$ ,  $p = 0.000$ ,  $V = 0.078$ ), and disaster preparedness ( $\chi^2 = 14.78$ ,  $df = 2$ ;  $p = 0.000$ ;  $V = 0.074$ ). Most female respondents (97.8%) answered that they knew what a flood was, while most male respondents (4.9%) answered that they did not know; most female respondents (90.8%) responded correctly to the question of what best described a flood, while male gave the majority of incorrect answers (13.6%); most male respondents (80.7%) circled the correct response procedure, while most female respondents (25.4%) circled the incorrect response procedure.

The results of the survey show that (Table 1) there is no statistically significant correlation between the respondents' age and perception of floods ( $\chi^2 = 1.21$ ,  $df = 2$ ,  $p = 0.124$ ), knowledge about floods ( $\chi^2 = 2.14$ ,  $df = 2$ ,  $p = 0.211$ ) and flood disaster preparedness ( $\chi^2 = 1.78$ ,  $df = 2$ ,  $p = 0.14$ ).

The results suggest that there is a statistically significant correlation between the education of respondent's father and perception of floods ( $\chi^2 = 10.49$   $df = 8$ ,  $p = 0.000$ ;  $V = 0.18$  – moderate influence), knowledge about floods ( $\chi^2 = 49.25$   $df = 8$ ,  $p = 0.000$ ,  $V = 0.07$ ) and flood disaster preparedness ( $\chi^2 = 15.15$   $df = 8$ ,  $p = 0.000$ ,  $V = 0.07$ ). The respondents (97.5%) whose fathers have higher education knew what a flood was, while fewer respondents (12%) whose fathers have an academic degree affected negatively.

The respondents (90.7%) whose fathers have university education responded correctly to the question of what described a flood, while 25% incorrect answers were given by the respondents whose fathers have completed only primary education. The respondents (91.1%) who have one employed parent, circled the correct response procedure, while most (16.7%) respondents whose both parents are employed, circled the incorrect response procedure. Hence, there is a statistically significant correlation between education of the respondent's mother and perception of floods ( $\chi^2 = 87.94$   $df = 8$ ;  $p = 0.000$ ;  $V = 0.17$  - moderate) and knowledge ( $\chi^2 = 11$   $df = 8$ ,  $p = 0.002 > 0.05$ ,  $V = 0.1$  - small) about floods. There is no statistically

significant correlation between the mother's education and flood disaster preparedness for responding to such situations ( $\chi^2 = 35.39$   $df = 8$   $p = 0.20 > 0.05$ ). The respondents (97.2%) whose mothers have university education responded that they knew what a flood was, while 12.1% of the respondents whose mothers have only primary education answered negatively; respondents (89.1%) whose mothers have university education answered correctly to the question of what best described a flood, while 18.5% of incorrect answers were given by the respondents whose mothers have an academic degree. These results were expected to a certain degree because Serbia is still a patriarchal society where fathers usually have a dominant role in the family. The results indicate that there is a statistically significant correlation between school achievement and perception of floods ( $\chi^2 = 15.025$ ,  $df = 2$ ,  $p = 0.005 < 0.05$ ,  $V = 0.04$ ), knowledge about floods ( $\chi^2 = 52.520$ ,  $df = 2$ ,  $p = 0.000 < 0.05$ ,  $V = 0.08$ ), and flood disaster preparedness ( $\chi^2 = 28.981$   $df = 2$ ,  $p = 0.000 < 0.05$ ,  $V = 0.06$ ) (Table 1). The respondents (97.3%) with excellent school achievement answered that they knew what a flood was, while 2,7% of the respondents with average school achievement responded negatively; most respondents (92.1%) with excellent school achievement answered correctly the question of what best described a flood, while most (18.6%) incorrect answers were given by the respondents with average school achievement; most respondents (80.3%) with excellent school achievement (average grade – 4.5-5.00) circled the correct response procedure, while most (19.2%) respondents with average school achievement circled the incorrect response procedure. Such results were expected since the knowledge about floods is equivalent to the knowledge acquired through schooling and school achievement.

*Table 1. Overview of the results of chi-square test of independence for knowledge of flooding*

	Knowledge of flooding							
	Perceptions of knowledge				Knowledge about floods			
	$\chi^2$	df	p	v	$\chi^2$	df	p	v
Sex	19,03	2	0,00	0,07	15,55	2	0,00	0,07
Years	6,83	6	0,33	0,47	17,75	6	0,07	0,07
Father's education	100,4	8	0,00	0,18	49,25	8	0,00	0,12
Mother's education	87,94	8	0,00	0,17	35,39	8	0,00	0,10
Education at school	9,25	2	0,01	0,05	6,64	2	0,03	0,04
Education in the family	10,21	2	0,06	0,05	7,74	2	0,02	0,05
Fear of floods	17,09	4	0,00	0,07	7,77	4	0,01	0,05
Television	91,47	2	0,00	0,17	45,20	2	0,00	0,12
Radio	0,40	2	0,98	0,00	0,66	2	0,01	4,51
Video Games	17,15	2	0,00	0,07	27,14	2	0,00	0,09
Internet	19,09	2	0,00	0,07	20,30	2	0,00	0,08
Lectures	1,61	2	0,44	0,02	11,52	2	0,00	0,06

According to the results of the survey, 65.7% of students heard about floods as natural disasters in school, and 69.9% of them in the family. This means that the topic of natural disasters is discussed more among the family members than in secondary schools. Judging by the results, there is a statistically significant correlation between school education and perception of floods ( $\chi^2 = 9.252$  df = 2,  $p = 0.010 < 0.05$ ,  $V = 0.05$ ), and knowledge about floods ( $\chi^2 = 6.649$  df = 2,  $p = 0.036 < 0.05$ ,  $V = 0.04$ ) (Table 1). In addition, there is no statistically significant correlation between school education and flood disaster preparedness ( $\chi^2 = 0.092$  df = 2,  $p = 0.955 > 0.05$ ) (Table 1). The respondents (97.1%) who attended relevant school lessons answered that they knew what a flood was, while 5% of those who did not attend such lessons responded that they were not sure or that they did not know; the respondents (88.6%) who attended relevant school lessons answered correctly to the question of what best described a flood, while 11.4 of incorrect answers were given by the respondents who did not attend such lessons.

In further research, we examined the correlation between flood education in the family and the respondents' knowledge. The results show that there is a statistically significant correlation between flood education in the family and perception of floods ( $\chi^2 = 10.211$  df = 2,  $p = 0.006 < 0.05$ ,  $V = 0.05$ ), and knowledge about floods ( $\chi^2 = 7.743$  df = 2,  $p = 0.021 < 0.05$ ,  $V = 0.05$ ). However, there is no statistically significant correlation between flood education in the family and flood disaster preparedness ( $\chi^2 = 3.259$  df = 2,  $p = 0.196 > 0.05$ ) (Table 1). The respondents (97.1%) who were educated within the family answered that they knew what a flood was, while the others who did not receive such education responded that they were not sure or that they did not know; most respondents (89.5%) who were educated within the family answered correctly to the question of what best described a flood, while 13.6% of the incorrect answers were given by the respondents who were not educated within the family.

According to the results, the students are usually informed through television (87.1%) and through the internet (58.9%), and more rarely through lectures (27.1%), video games (14%) or radio (12.8). With respect to the previous question about the desire to learn, we wanted to examine the students' preferences about the way in which they would like to learn more about floods. We established that 57.1% of the respondents wanted to watch educational films and series, 33.1% wanted to participate in workshops, 21.7% wanted to attend lectures, 20.2% wanted to play interesting video games, and 17.1% wanted to learn through case studies. That is why we examined the correlation between the ways of obtaining information and the respondents' knowledge about floods. The results indicate that there is a statistically significant correlation between lectures as means of obtaining information and knowledge ( $\chi^2 = 11.523$  df = 2,  $p = 0.003 < 0.05$ ,  $V = 0.06$ ), while there is no such correlation with the

perception of floods ( $\chi^2 = 1.61$  df = 2,  $p = 0.44 > 0.05$ ) and flood disaster preparedness ( $\chi^2 = 1.13$  df = 2,  $p = 0.56 > 0.05$ ) (Table 1). The respondents (91.6%) who obtained flood related information from lectures answered correctly to the question of what the best described a flood, while 12.5% of incorrect answers were given by the respondents who did not learn from lectures. Furthermore, the results indicate that there is a statistically significant correlation between the obtaining of information through television and perception of floods ( $\chi^2 = 91.47$  df = 2,  $p = 0.00 < 0.05$ ,  $V = 0.17$ ), knowledge about floods ( $\chi^2 = 45.20$  df = 2,  $p = 0.00 < 0.05$ ,  $V = 0.12$ ) and flood disaster preparedness ( $\chi^2 = 10.78$ , df = 2,  $p = 0.005 < 0.05$ ,  $V = 0.06$ ) (Table 1). The respondents (97.7%) who obtained flood related information through television answered that they knew what a flood was, while 2.3% of the respondents who did not obtain flood related information through television responded that they were not sure or that they did not know; most respondents (89.9%) who obtained flood related information through television answered correctly to the question what best describes a flood, while most (10,01%) incorrect answered were given by the respondents who did not obtain flood related information through television; the respondents (79.8%) who obtained flood related information through television circled the correct response procedure, while 20.02% of the respondents who did not obtain flood related information through television circled the correct response procedure. On the other hand, the results show a statistically significant correlation between the obtaining of information through video games and perception of floods ( $\chi^2 = 17.15$ , df = 2,  $p = 0.000 < 0.05$ ), knowledge about floods ( $\chi^2 = 27.14$ , df = 2,  $p = 0.000 < 0.05$ ,  $V = 0.07$ ) and flood disaster preparedness ( $\chi^2 = 8.30$ , df = 2,  $p = 0.016 < 0.05$ ,  $V = 0.09$ ) (Table 1). 96.9% of the respondents who did not obtain flood related information through video games answered that they knew what a flood was, while 3.1% of the respondents who obtained flood related information through video games responded that they did not know. The respondents (89.4%) who did not obtain flood related information through video games answered correctly to the question of what best described a flood, while 10,06% of incorrect answers were given by the respondents who obtained information through video games; the respondents (84.3%) who obtained flood related information through video games circled the correct response procedure, while (15,7%) the respondents who did not obtain flood related information through video games circled the incorrect response procedure. Further on, the results indicate that there is a statistically significant correlation between the obtaining of information through the internet and perception ( $\chi^2 = 19.091$  df = 2,  $p = 0.000 < 0.05$ ,  $V = 0.07$ ), knowledge ( $\chi^2 = 20.304$  df = 2,  $p = 0.000 < 0.05$ ,  $V = 0.08$ ) and flood disaster preparedness ( $\chi^2 = 11.206$  df = 2,  $p = 0.016 < 0.05$ ,  $V = 0.06$ ) (Table 1). The respondents (97.6%) who obtained flood related information through the internet responded that they knew what a

flood was, while 2,4% of the respondents who did not obtain flood related information through the internet answered that they did not know; most respondents (90.4%) who obtained flood related information through the internet answered correctly to the question of what best described a flood, while 13.9% of incorrect answers were given by the respondents who did not obtain information through the internet. The respondents (80.9%) who obtained flood related information through the internet circled the correct response procedure, while 19.1% of the respondents who did not obtain information through the internet circled the incorrect response procedure.

*Table 2. Overview of the results of chi-square test of independence for flood preparedness*

	Flood preparedness				
	v	$\chi^2$	df	p	v
Sex	0,07	14,78	2	0,01	0,70
Years	0,07	9,80	6	0,13	0,05
Father's education	0,12	15,15	8	0,05	0,07
Mother's education	0,10	11,00	8	0,20	0,06
Education at school	0,04	0,09	2	0,95	0,01
Education in the family	0,05	3,25	2	0,19	0,03
Fear of floods	0,05	21,34	4	0,00	0,08
Television	0,12	10,78	2	0,00	0,06
Radio	4,51	0,10	2	0,03	0,04
Video Games	0,09	8,30	2	0,01	0,05
Internet	0,08	11,20	2	0,00	0,06
Lectures	0,06	1,13	2	0,56	0,19

It is very important to examine whether there is a correlation between the respondents' knowledge and their fear of flooding. Based on the collected data, we have established that 44% of the respondents do not have the fear of flooding, 31% have the fear of flooding, while 25% are not sure. As regards the fear of flooding in school, it has been found that 40% of the students feel protected, 38% are not sure, while 22% of the students do not feel safe in school. Judging by the results, there is a statistically significant correlation between the fear of flooding and perception of floods ( $\chi^2 = 17.099$  df = 4,  $p = 0.002 < 0.05$ ,  $V = 0.05$ ), and flood disaster preparedness ( $\chi^2 = 21.343$  df = 4,  $p = 0.000 < 0.05$ ,  $V = 0.05$ ). There is no statistically significant correlation between the fear of flooding and flood knowledge ( $\chi^2 = 7.778$  df = 4,  $p = 0.100 > 0.05$ ) (Table 1). 97.8% of the respondents who have the fear of flooding answered that they knew what a flood was, while (2.2%) the respondents who do not have the fear of flooding answered that they did not know; the respondents (82.3%) who have the fear of flooding circled the correct response procedure, while (17.7%) the respondents who do not have such fear circled the incorrect response procedure.

### *DISCUSSION*

The issue of correlation between gender and preparedness for responding to flooding as natural disaster is a current topic (Ikeda, 1995; Mulilis, 1999). Comparing the results with previous surveys, some matching results are noticeable, particularly with respect to a better preparedness of female respondents in terms of knowledge about natural disasters (Tomio et al. 2014). Examining the preparedness for responding to natural disasters at the level of household, Tuohy et al. (2014) also concluded that women were more prepared.

The correlation between age and knowledge or preparedness to respond to natural disasters is also an important issue. Numerous studies have confirmed that senior citizens are better prepared to respond, have more knowledge, but also experience more serious consequences due to physical weakness.

Starting from the research studies that indicate that the level of education has an impact on reducing the consequences of natural disasters (Öcal 2011), we wanted to examine whether there was a correlation between the educational level of the parents and students' knowledge about floods as natural disasters. Muttarak and Pothisiri (2013) confirm that the level of formal education of individuals is correlated with their preparedness to respond to natural disasters, which is operationalised through knowledge, plans, stocks, etc. Edwards (1993) confirmed that the level of education is correlated with natural disaster preparedness. Accordingly, it was expected that the students whose fathers have higher education would show more knowledge, taking into consideration that they possess knowledge that can be transferred to their children. The results are similar with respect to the education of mothers.

The places or media from which the respondents obtained information about floods have emerged to be a primary factor of influence on the knowledge of respondents related to flooding as a natural disaster. It is well known that children receive their first knowledge at home from household members, in school from teachers, but also through the process of non-formal education. In addition to the aforementioned, certain skills are acquired through watching television, using the internet, playing computer and video games, etc. Shaw et al. (2004) have established that education acquired in the family and local communities in Japan has a greater influence than education acquired in schools. On the other hand, Öcal (2011) states that students who have some form of education about natural disasters in schools have a higher level of knowledge and it is based on scientific facts, while the knowledge acquired within the family and from the media are without structure, unsystematic and can lead to misconceptions and inaccurate information.

Similar results are presented by Shiwaku and Shaw (2008) who point out that the students in Maiko who were trained in natural disasters in school have a high level of perception. These results are confirmed by

Ronan *et al.* (2001). Shiwaku *et al.* (2007) point out that school lessons about natural disasters can raise awareness about associated risks, but cannot provide a good insight about the importance of prevention measures, as evidenced by the results of our further research. The results of the survey conducted in Nepal by Shiwaku *et al.* (2007) confirm the correlation between education in the family and natural disaster knowledge. The aforementioned research studies were conducted in the countries with a developed disaster education system that includes families, schools and local communities.

The research conducted in Japan with the aim of determining which factors influenced the awareness of students about natural disasters revealed that school had a small impact on the level of disaster awareness (Shaw *et al.* 2004). The results of the survey conducted in Nepal by Shiwaku *et al.* (2007) confirm the correlation between education in the family and natural disaster knowledge. The aforementioned research studies were conducted in the countries with a developed disaster education system that includes families, schools and local communities. Kurita *et al.* (2006) established through research that audio-visual methods of disseminating knowledge about tsunami were the most effective ones. They also highlighted that students had acquired a large part of knowledge through the media. The way in which the students obtained flood related information is a potential factor on which their knowledge depended.

### CONCLUSION

Judging by the results of the research, there is a statistically significant correlation between the gender of the respondents, on one hand, and perception, knowledge and disaster preparedness for responding to natural disasters caused by flooding, on the other hand. Female respondents have a better perception and knowledge, while male respondents are more prepared to react in such situations. Flood education should focus on developing the capacity of girls to respond, and on developing boys' perception and knowledge of floods. On the other hand, such a statistically significant correlation does not exist with the age of the respondents or previous experience of their fathers, mothers, grandfathers and grandmothers. Furthermore, the results show a statistically significant correlation between the education of the father and mother, on one hand, and knowledge, perceptions and disaster preparedness for responding to natural disasters caused by flooding on the other hand. In addition, the results indicate a statistically significant correlation between education in the family, perception and knowledge of natural disasters caused by flooding. When it comes to education in school, it is also correlated only with perception and knowledge. The fear of flooding affects the perception and familiarity with safety response procedures. A statistically significant correlation has been established between the obtaining of flood related information

through television, the internet, video games, radio and lectures, and knowledge of natural disasters caused by flooding. On the other hand, there is no correlation between the radio and lectures, and the perception of flooding.

The research results indicate a great importance of education about natural disasters caused by floods, both in school and in the family. In view of that, the educational policy makers can use these findings to perform a thorough analysis of primary and secondary school curricula and determine to what extent the relevant content is incorporated in the curricula. Undoubtedly, it imposes on us an obligation to continue researching this topic and find strategies of working with students in a way to enhance their preparedness for responding to natural disasters caused by flooding.

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## ЗНАЊЕ УЧЕНИКА СРЕДЊИХ ШКОЛА У БЕОГРАДУ КАО ЕЛЕМЕНТ СПРЕМНОСТИ ЗА РЕАГОВАЊЕ НА ПОПЛАВЕ

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### Резиме

Последице поплава које су захватиле територију Србије током 2014. године указале су на висок ниво неспремности грађана за реаговање у насталој ситуацији. Руководећи се тиме, основна идеја овог истраживања је да се испитају ниво и повезаност одређених фактора са знањем ученика о поплавама као природним катастрофама. Циљ истраживања представља научно објашњење повезаности знања ученика о поплавама и поменутих фактора. Истраживање је спроведено са циљем научног објашњења постојања повезаности одређених фактора (пол, године, образовање родитеља, успех у школи, медији, претходно искуство, страх) са знањем ученика о природним катастрофама изазваним поплавама. Истраживањем су обухваћене средње школе на подручју Града Београда. Истраживање је спроведено на узорку од 3498 испитаника. Испитаници су изабрани методом пропорционалног стратификованог узорка из популације ученика средњих школа у Београду, која је 2014. године бројала 63.106 ученика. Као први критеријум за стратификовање узете су средње школе из општина које су биле погођене последицама поплава, а то је једанаест од седамнаест општина Града Београда. Као други критеријум за стратификовање узете су средње школе друштвеног усмерења и средње школе природно-математичког усмерења које заједно имају 39.017 ученика. Из тако дефинисаног стратума извучен је независни случајни узорак који чини 8,96% подпопулације, односно, из 54 београдске средње школе у угроженим општинама, на случајан начин изабрано је 19 средњих школа, и то 10 друштвеног и 9 природно-

математичког усмерења, што чини 35,18% подпопулације. Надаље, методом случајног одабира са списка расположивих учионица, изабране су од 2 учионице до 6 учионица првог до четвртог разреда (у зависности од броја учионица у конкретној школи), а потом су у изабраним учионицама анкетирани сви ученици који су тог дана присуствовали настави. Применом наведене технике узорковања обезбеђена је задовољавајућа репрезентативност узорка, а величином узорка поузданост у закључивању на основном скупу – популацији.

Резултати истраживања указују на то да на знање о поплавама утичу пол ученика, образованост и запосленост родитеља, образовање у школи и породици, док на познавање безбедносне процедуре за реаговање приликом поплава утичу страх, пол и образованост родитеља. Наведени резултати се могу искористити приликом осмишљавања стратегија образовних програма, што би допринело унапређењу спремности за реаговање у условима природних катастрофа изазваних поплавама.

Добијени резултати указују на велики значај едукације о природним катастрофама изазваним поплавама у школама и породицама. Сходно томе, творци образовних политика могу на основу ових налаза извршити детаљну анализу наставних планова и програма за основну и средњу школу и утврдити у којој мери су овакви наставни садржаји укључени у наставне програме. Свакако, то нас обавезује да и даље вршимо истраживања на ову тему и проналазимо стратегије деловања на ученике у циљу подизања нивоа њихове спремности за реаговање у природним катастрофама изазваним поплавама.