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Local Resilience to Natural Hazards in Serbia. Case Study: The West Morava River Valley

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Abstract: During the past decade, the valley of the West Morava in the central part of the Republic of Serbia experienced several natural hazards that have changed the life of the inhabitants. The aim of this paper is to show how people perceive natural hazards in the areas where they do not have catastrophic consequences for the entire population. The perceptions of natural hazards were examined according to similar studies and collected through surveys and interviews. The obtained stratified sample information was coded, and the results are expressed in the parameters of descriptive statistics, using T-test and ANOVA. The population is partially affected if inhabited locations are in the threatened part of the West Morava River valley and if their activities have direct consequences by natural disasters. They emphasize the importance of the political influences and mass media, but they show the need for additional information on prevention and protection. That is where they see geography as profession that sublimates all knowledge of natural disasters, unlike others that are more narrowly skilled. The results of the research are the starting point for further regional comparisons, which will complement the picture of the people's attitude and resilience to natural hazards in Serbia and the Balkan Peninsula.

Keywords: natural hazards; resilience; sustainability; Serbia; the West Morava River

1. Introduction

Natural processes become hazards when they impact humanity [1]. Natural hazards are not the biggest threat to humanity [2], but, depending on the characteristics of their consequences, can affect the area to a smaller or greater degree. Hyndman and Hyndman [3] found that there was a link between the development level of an area and damage that can be caused by natural hazards. Developed areas invest in infrastructure quality, but also in prevention. Blaikie et al. [2] explain why the poorer population is more vulnerable to natural hazards, citing impossibility of engaging risk assessment experts and making adequate architectural solutions, bad location selection and quality of housing construction, and lack of insurance and savings. The increase in the frequency of natural hazards has brought them to the front pages of the media [4] and into the focus of people's interest. This research was initiated on the basis of a study by Bronfman et al. [5] and questions and comments by population were referred to geographers, in the absence of experts such as seismologists, hydrogeologists, and meteorologists in the West Morava River valley, the area that increasingly faces natural hazards.

In the literature, it is easier to find research relating to people in areas that have experienced natural hazards, compared to the research relating to areas experiencing natural hazards that, with different intensity, disturb everyday life. The West Morava River valley is a large region in Serbia that has experienced several types of natural hazards over the past decades. In this area of over 2380 km^2, not all residents were endangered by the same hazards. Depending on the natural hazard, some people sometimes were observers and sometimes victims. Natural hazards were not so strong to cause leaving the area, but they definitely made various impacts on the perception of life and nature, as discussed in this paper.

The objective of the study is to explain the facts in function of sustainability of living in the West Morava River valley. The main part of the paper, the results and discussion, is organized in accordance to proving the sustainability of living in the region. Exploration about the inherited knowledge about natural hazards is in the subtitle "Results and Discussion". Traditional concerns of ancestors about the descendants try to ensure their sustainability of living. The second part searches the answer about the present perception of natural hazards. The next part analyses the possible ways of prevention, in the means of insurance, perception of the term vulnerable zone, cost of living, aid of the government, etc. All mentioned facts are in function of sustainability of life quality. The fourth part is perception of participants about the mitigation of natural hazard consequences. The last part tries to show the solution on how to help to local population in prevention, protection and education. It recognizes geographers as insufficiently used potential. At the same time, their engagement provides sustainability for them. Before the results and discussion, this paper provides information about the study area, a review of well-known natural disasters in the West Morava River valley, methods of exploration, as well as description of the samples and variables.

2. Study Area

The West Morava River valley is a large natural entity with an area of 2386.2 km^2 with 429,439 inhabitants, according to the 2011 census. Therefore, about 6.0% of the population lives on 2.7% of the territory of the Republic of Serbia [6]. Both absolute and relative majority of the population lives on its most spacious part of the altitudinal belt up to 300 m (Table 1). The West Morava River valley extends in the west–east direction. It is situated between the mountains: Kablar (885 m), Vujan (857 m), Kotlenik (748 m), and Gledić (922 m) in the north, and Ovčar (985 m), Jelica (929 m), Stolovi (1375 m), Goč (1124 m), and Jastrebac (1491 m) in the south. The West Morava River valley is of composite character and consists of five depressions (Požega, Čačak-Kraljevo, Vrnjci, Trstenik, and Kruševac) and the same number of narrowings. This valley has great economic significance for Serbia. The current research covers five municipalities in the West Morava River valley, which include large cities after which the depressions of the composite West Morava River valley are named.

Table 1. Hypsometric distribution of population and settlements in the West Morava River valley.

Altitudinal Belt	Area		Settlements		Population		Population Density
	km sq	%	Number	%	Number	%	Pop/km sq
≤300	1265.4	53.0	137	59.6	379,284	88.3	299.7
301–499	751.5	31.5	75	32.6	45,953	10.7	61.1
≥500	369.0	15.5	18	7.8	4202	1.0	11.4
Total	2386.2	100.0	230	100.0	429,439	100.0	179.9

Source: Comparative Population Overview 1948–2011. Data by settlements, vol. XX, SORS, Belgrade, 2014; Real Estate Cadastre Service of the Republic of Serbia; Topographic. map 1:300.000, list Kragujevac, 1988; Author's processing.

3. Natural Hazards in the West Morava River Valley

As a general trend in Southeast Europe (SEE), the frequency and severity of extreme climatic events are increasing due to climate change [7].

The West Morava River valley has been hit by various types of natural hazards over the last two decades. In the following text, only the largest ones are listed. In the 1980s, earthquakes hit the Kopaonik system of mountains, which forms a mountain hinterland southward from the West Morava River valley [8–10]. The small population on the mountainous sides did not represent a more vulnerable critical mass, and therefore not much of the attention was paid. Earthquakes were felt in the West Morava River valley, but did not disturb life in it. A Mw = 5.4 earthquake occurred on 3 November 2010 near the City of Kraljevo, in the West Morava valley (latitude 43.765 N, longitude 20.713 E) and was followed by a sequence of more than 650 aftershocks with a magnitude greater than 1.0 [11]. Despite the moderate magnitude of the event, two people were killed, many others were injured, and the total damage to the city is estimated at more than 150 million dollars [12]. Changes in ground water circulation, liquefaction features, and rockfalls have also been reported in some places. The earthquake occurred in SE-NW-trending Čačak-Kraljevo Basin, also known as West Morava Graben. This basin was formed by activation of several deep and secondary shallower faults during Lower Miocene and represents the largest of the intradinaric depressions. Depths proposed by different agencies for the main shock range between 2 and 30 km. Moment tensor solutions show a mostly strike-slip component on an EW or NS trending fault, with either normal or reverse component depending on the solutions. Kraljevo earthquake probably involved in the activation in a strike-slip regime of an EW-trending fault located in the northern rim of the West Morava Graben, while the seismicity of the past decades was mostly confined to the southern rim of that basin [13].

Only one earthquake severely restricted the lives of residents in the West Morava River valley. However, the torrential flows of the tributaries of the West Morava, as well as the river itself, have caused great damage. According to Kostadonov [14], the most important torrential events in Serbia occur in the South and West Morava River basins, where the proportion of high, medium, and small water shows greater unbalance, indicating the intensive erosion processes in watersheds. Petrović et al. [15] state that according to the data from the former Department of Torrent Control at the Ministry of Forestry and Mining in the former Yugoslavia, excessive torrential floods in the West Morava River occurred approximately every three years (1921, 1924, 1929, 1932, 1937, 1940). After World War II, harmful torrential floods occurred in almost all regions in Serbia in 1947, 1948, 1951, 1953, 1957, 1961, 1963, 1965, 1967, 1969, 1970, and 1972. Ristić et al. [16] said that the period from May to the first half of June was marked as the primary maximum in most watersheds (the West Morava River and its tributary the Ibar River). In this period, the high water levels were the result of intensive rainfall of a few-hours duration. The daily and monthly maximums of precipitation were recorded at almost all the rain-gauge stations in Serbia in the period from May to June. The period from February to the first half of March was noted as the secondary maximum. The absolute maximal values of discharge Qmax were recorded in the periods with frequent extreme events at most profiles. However, the values of Qmax were also recorded in the periods with rare extreme events at some profiles, as a consequence of specific climate and hydrological conditions including: a sudden rise in air temperature during the winter that caused snow melt and often coincided with a long low intensity rain; snow precipitation at the end of winter followed by a sudden rise in air temperature and fast melting; along with a few sequential rain events during the summer that caused a reduction of infiltration and water storage capacity of the soil. Between large-scale torrential flood events that occurred in the torrential network in recent years, the River Gruža, in the West Morava Basin, spilled in 1999. Milanović et al. [17] wrote about the great floods that threatened the settlements of Kruševac and Trstenik in May 2005. Then, they wrote about two outflows of the West Morava in 2009. During that June, Vrnjačka Banja and the surrounding settlements were under water due to the heavy precipitation and flooding of the Vrnjačka River, when 20 local bridges were damaged or completely destroyed and one person died in the Gračac River. In November of the same year, upstream, Požega experienced floods of West Morava and Golijska Moravica, turning the villages Tatojevica and Prijanovići into a 'devastated wetland'. In Serbia, catastrophic floods occurred in May 2014, affecting neighbouring settlements of the West Morava River. Public water management company 'Srbija vode' estimated that by their intensity and

quantities, floods exceeded the thousand-year probability of occurrence. Stojković [18] notes that the latest floods from March 2016 in Lučani, in the west of the region, affected greater area compared to the May 2014 floods. The livestock were evacuated, while large damages were inflicted on raspberry orchards. Damages were manifested in the form of flooding of infrastructure facilities (roads, bridges) and arable land, endangering the lives of domestic animals, causing electricity failure (damage to substations), affecting drinking water, and so on. After the withdrawal of water there was sludge, wet walls, and unsafe electrical installations left. Water withdrawals also started new landslides.

Between 2001 and 2012, twelve drought periods were registered with an average of 30-day duration. The latest drought event in 2012 was the most severe, lasting for more than 90 days. Its direct estimated damage exceeded 20 million Euros, and indirectly estimated damage was ten times higher [19,20]. Droughts in the region with rich water flows do not have catastrophic proportions, but they strongly affect the prices of agricultural products that are cultivated in a vulnerable area. Marinović et al. [21] note that after long drought periods, many springs dry up, worsening the overall situation of water supply, especially in the summer period when the risk of outbreaks of epidemics is greatest.

Hail is more common than drought, but not very disastrous. Compared to drought, hail has no regional, but only local circumstances. In terms of frequency, it can be called the most common natural hazard, because it occurs more than once a year in a warmer season. Financial circumstances in the local community affect how much it will possess ammunition for hail protection. In addition, an important factor is the financial capacity of an individual, but also their determination to invest in counter-equipment that would protect crops and planted.

In nature, everything is connected, so there is a connection between natural hazards [1]. Natural hazards are mainly triggered by continual erosion of the right river banks and, to a lesser extent, by intensive precipitation. Most of the landslides are suspended or dormant, with reactivation periods of several years to several decades. Another group of landslides is directly triggered by intense precipitation and sudden snowmelt. These are also suspended or dormant landslides with reactivation periods of 5–10 years or more, depending on the precipitation regime. Abolmasov et al. [22] identified the Bogdanje locality and landslides in the vicinity of the Kraljevo areas as typical landslides. Vušković et al. [23] were focused in their research into the characteristics of the landslides of Serbia in the West Morava River valley. Zdravić [24] writes that the landslide threatened residential buildings, road infrastructure, water supply, and sewage networks in nine settlements (Sugubina, Brezovica, Jasikovica, Mijajlovac, Ruišnik, Selište, Milutovac and Riđevštica, and Bogdanje) in the West Morava River valley in the vicinity of Trstenik.

Lukić et al. [25] have provided an overview of studies on natural hazards published by authors from Serbia. After that (2013), the production of the studies was increased [26–31], most likely as a result of the hazards that happened thereafter.

Natural hazards in the West Morava River valley have shown that they can cause death, injury, disease, and mental stress. In material terms, they manifested as property damage and economic loss. They caused the loss of flora and fauna, pollution and loss of amenity, confirming all the potential threats mentioned by Smith [32]. Thus, the extent of the consequences and the damage show the intensity of natural hazards, but they are also a form of warning if natural hazards occur to increased degree.

4. Methods

The paper uses literature on natural hazards in the West Morava River valley. Influence of natural hazards on the population has been explored in the field, through a questionnaire (Supplementary Materials). The results are illustrated by descriptive statistics. Attitudes were measured on a five-point Likert type scale ranging from 1 (strongly disagree) to 5 (strongly agree). The interview was conducted during the summer 2017, in 57 settlements. Questions that were not answered by respondents are subjected to T-test or one-factor analysis of ANOVA (Analysis of

Variance). The group that caused a statistically significant difference was made using the Post Hoc HSD (honest significant difference) Tukey Test. T-test was made with independent samples and compared by arithmetic mean of two groups. As it was not possible to assume the result of comparison, two-tailed tests were used. Some information came from an in-depth interview. The local population provided help in interpreting a part of the results.

5. Sample and Variables

Raosoft (2004) calculator was used for checking the adequacy of sample size. Accordingly, for the population size of 429,439 (the population of Valley of West Morava River), at a confidence level of 95.0%, the sample of 384 respondents was recommended. Taking into account that investigation covered 500 examinees, of which 403 filled in questionnaires correctly (80.6%), the sample was considered representative. According to Babbie [33], the response rate on the level of $\geq$70% is considered to be a good indicator of the measurement scale acceptance.

Also, the reliability of the measuring instrument was checked by using Cronbach's Alpha Reliability Coefficient. This instrument is among the most commonly used for inner closeness of items composing the scale [34]. In an ideal case, Cronbach's coefficient should be above 0.70 [35,36]. Cronbach's coefficient for the whole scale of 34 items is F1–F6 = 0.76, which is above the value of 0.70. Based on this, it can be said that the scale is highly consistent. Although Cronbach's coefficient for scales with less than 10 items is not expected to exceed 0.70 [34], in this case, only one (F2) is below the mentioned value. As it is above 0.50 (Table 2), the mean inter-item correlation is not calculated.

Table 2. Cronbach's Alpha Reliability Coefficient for question groups.

	Number of Questions	Cronbach's Alpha
F1—Ancestors	6	0.87
F2—Perception of hazards	6	0.63
F3—Life	8	0.75
F4—Prevention	4	0.77
F5—Mitigation	4	0.74
F6—Importance of geographers	6	0.81

Source: Authors' findings.

The sample was stratified and formed based on data on characteristics of the population of West Morava River valley, which was given by Penjišević [6]. Most respondents are men. The relative majority of respondents are aged 31–40, employed, and have acquired secondary education. Most do not live in urban settlements; they were born in the West Morava River valley and have experienced natural hazards (Table 3). The relative majority of respondents settling in the West Morava River valley consider that earthquakes are the biggest threat, followed by floods and landslides, while droughts are in the last place.

Table 3. Socio-demographic characteristics of respondents.

	Variables	Number	%		Variables	Number	%
Sex	Male	210	52.1	Occupation	Farmer	37	9.2
	Female	193	47.9		Employed	184	45.7
Age	Under 21	23	5.7		Unemployed	52	12.9
	21–30	68	16.9		Pupil or student	45	11.2
	31–40	114	28.3		Housemaker	34	8.4
	41–50	69	17.1		Retired	39	9.7
	50–60	49	12.2		Other	12	3.0

Table 3. *Cont.*

	Variables	Number	%		Variables	Number	%
Respondent's origin	Above 61	80	19.9	Experience with hazards	Yes	338	83.9
	Born in the West Morava River valley	307	76.2		No	65	16.1
	Settled in	96	23.8	The biggest threat to the West Morava River valley	Landslides	48	11.9
Place of living	Urban settlement	154	38.2		Earthquakes	195	48.4
	Others	249	61.8		Floods	120	29.8
Education	Without education	11	2.7		Hail	19	4.7
	Graduated from elementary school	60	14.9		Droughts	5	1.2
	Graduated from high school	187	46.4		Other	16	3.9
	Graduated from faculty	145	36.0				

Source: Authors' findings.

6. Results and Discussion

The paper was first sought to determine to what extent the ancestors transferred their knowledge and experiences about natural disasters to their descendants (the respondents) and thus influenced their awareness. The existence of the ancestral stories testifies that natural hazards existed and interfered with the life of the West Morava River valley in the past. Residents of the West Morava River valley say their ancestors talked about floods, hail, and droughts. Given the natural predispositions of the West Morava River valley, the fertile land on which food for the population has been produced is largely concentrated in this valley surrounded by numerous mountain massifs. The biggest threat to agriculture were hazards that had a negative impact on yields.

Most of them do not remember hearing about landslides and earthquakes, but they well remember, for example, earthquakes that were felt in the region during the 1980s. Obviously, these phenomena were not frequent, did not have devastating effects or did not affect a large group of people. This assertion is visible in the values of standard deviation that show a great degree of mutual disagreement among respondents, precisely in terms of earthquakes ($\sigma = 1.73$). Therefore, some of the respondents from the West Morava River valley felt the consequences of the earthquakes, but they were a minority in the sample.

Respondents do not agree about the ancestors' stories and their influence on them to think about natural hazards (Table 4). Those who were thinking about natural hazards while being farmers preventively invested, for example, in greenhouses. Others say they take care of where and what to cultivate, as well as they change purpose on those properties that have been exposed to floods in recent years.

Table 4. Information on certain natural hazards obtained from the ancestors.

Ancestors Talked about the Following Natural Hazards:	M	σ
Floods	4.07	1.33
Landslides	3.46	1.57
Earthquakes	3.37	1.73
Hail	4.13	1.26
Drought	4.05	1.34
Based on ancestors' stories, I was thinking of natural hazards before they hit the West Morava River valley	3.30	1.27

Source: Authors' findings.

Modern living trends and opportunities that affect political, economic, or other migrations are accelerating and increasing the level of mobility of the population [37]. Reduction in the household size and the time spent with relatives will also reduce the flow of information about natural hazards. Most respondents are from the West Morava River valley, but each fourth or fifth (23.8%) immigrated, thus their previous place of living did not necessarily have to be threatened by natural hazards (Table 1).

Respondents agree that nature has an important impact on the characteristics of life quality. Natural hazards, such as hail or drought, have a great influence on the value of consumer basket and market prices, as confirmed by Bellemare [38]. However, respondents recognize fellow citizens whose activities are not directly affected by natural hazards, which explains their lack of interest or their carelessness in the matter of prevention. One of the respondents noted that natural hazard information mechanisms should be more intense and more aggressive. Some have indicated that the billboards are places where an informative action should begin. Their goal would be to encourage participation of every inhabitant, as this could help both financially and educatively in the prevention.

The population of West Morava River valley has faced with floods, landslides, hail, and droughts over the past decade, thus they are considering how much their local environment is endangered. They agree that they pay more attention to the weather forecast during natural hazards, than afterwards. There is a low degree of agreement that the natural hazard has to be experienced in order to think about it (Table 5).

Table 5. Perception of natural hazards.

Attitudes	M	σ
Nature has an important impact on the characteristics of the quality of life of the population	4.44	0.74
The activity of the population affects how they will treat natural hazards	4.25	0.81
I think how much the local environment is endangered by natural hazards	3.80	1.01
During floods or droughts, I pay more attention to the weather forecast	4.35	0.93
After floods, hail or drought, I continue to pay attention to the weather forecast	3.79	1.15
I did not think about natural hazards until I experienced them	3.53	1.16

Source: Authors' findings.

Although natural hazards cause more or less damage, there are activities that make profits. These are activities that involve damage remediation, such as construction, or activities such as insurance. Respondents are not sure and have not been informed how much natural hazards have affected the increase in interest in property insurance. There are many examples in the world of thinking about this phenomenon [39,40], but as respondents say, Serbia is not so rich to pay insurance and insurance is not 'rooted' in the tradition of the majority of the population. Based on the respondents' comments, some kind of distrust in insurance companies could be noticed. In addition, among the respondents there were also those who had experience with insurance. They say the promised premiums are small compared to the size of the damage. Some of the respondents say that, having insurance for years, they have left more money to insurance companies than they were compensated when they tried to charge insurance for a natural hazard. The T-test showed that the respondents of urban areas agree with the claim that natural hazards have increased interest in property insurance (Table 6). Based on this, it can be said that the performance of insurance companies is better in urban areas. This fact would further lead to organizing special surveys to better determine why this is so. ANOVA singled out respondents aged 31–40 years who, in comparison with others, only agree (Table 7). Respondents commented that residents of the cities of West Morava River valley have more

accessible media to inform and educate them and the time they can devote to education. People living in the countryside do not sit in front of TV and computer, because they do not have time for that.

Table 6. The impact of natural hazards on the population.

Attitudes	M	σ
Natural hazards have affected the increasing interest in property insurance.	3.22	1.57
Natural hazards have affected the price of real estate in vulnerable zones.	3.08	1.67
Natural hazards have affected the owners to decide to sell real estate in vulnerable zones.	2.69	1.61
Natural hazards have affected some people to permanently move from the West Morava River valley.	2.25	1.47
Natural hazards affect the costs of living.	4.48	0.78
Government provided economic aid to the endangered after natural hazards in the West Morava River valley.	3.69	1.05
Public information media only write about the consequences of natural hazards, while rarely deal with prevention and protection.	4.17	0.86
Natural hazards have affected the increasing quality of interpersonal relationships.	4.10	1.07

Source: Authors' findings.

Table 7. One-factor analysis of differences between the participants based on their age (F (4403), critic values according to Snedecor and Cochran table (1980), $p < 0.01$; $F \geq 3.47$; $p < 0.05$; $F \geq 2.44$).

Stances	Activity *	M	σ	F	p
Natural hazards have affected the increasing interest in property insurance.	18–20	3.00	1.76	5.230	0.0001
	21–30	3.25	1.45		
	31–40	3.80	1.40		
	41–50	3.00	1.62		
	51–60	2.82	1.60		
	60+	2.85	1.61		
Natural hazards have affected the price of real estate in vulnerable zones.	18–20	2.78	1.68	6.287	0.0001
	21–30	3.43	1.53		
	31–40	3.66	1.47		
	41–50	2.77	1.67		
	51–60	2.62	1.75		
	60+	2.63	1.73		
Natural hazards have affected the owners to decide to sell real estate in vulnerable zones.	18–20	2.74	1.51	9.219	0.0001
	21–30	3.09	1.46		
	31–40	3.31	1.55		
	41–50	2.42	1.59		
	51–60	2.04	1.50		
	60+	2.10	1.51		
Natural hazards have affected some people to permanently move from the West Morava River valley.	18–20	2.83	1.67	8.032	0.0001
	21–30	2.71	1.43		
	31–40	2.63	1.50		
	41–50	1.99	1.34		
	51–60	1.76	1.33		
	60+	1.70	1.26		

* Note: Sample size by the age group can be found in the Table 2. Source: Authors' findings.

Bin et al. [41] found that flood zone designation and insurance premiums convey risk information to potential buyers in the coastal housing market. Respondents in West Morava River valley (Table 8) could not say with certainty whether natural hazards affected the price of real estate in vulnerable zones. Employees in Real Estate Agencies consulted outside this survey, in the form of interviews, claim that property prices are not lower in vulnerable rural areas. The extent to which a particular zone is endangered can be predicted in the event of floods, landslides, and earthquakes. Floods in the West Morava River valley are frequent, and the population outside the urban areas already knows how to behave in economic terms. Swamped spaces are used for those purposes where there is no a problem if rivers flow out. Hail is an unpredictable natural hazard and endangers agriculture [42], so it is necessary to act preventively in terms of selecting more resistant plant species and their varieties, or by building physical protection of crops and plantations [43]. In the event of drought, it has regional proportions, therefore, as in the case of hail, it should be fought indirectly.

Table 8. Differences concerning the respondents on the basis of the type of settlement in which they live (M—mean value, σ—standard deviation, t—value, *p*—importance level ($p < 0.01$)).

Stances	Gender	M	σ	t (403)	*p*
Natural hazards have affected the increasing interest in property insurance.	Town Other	3.71 2.91	1.29 1.66	6.784	0.000
Natural hazards have affected the price of real estate in vulnerable zones.	Town Other	3.66 2.73	1.46 1.69	7.497	0.000
Natural hazards have affected the owners to decide to sell real estate in vulnerable zones.	Town Other	3.36 2.28	1.43 1.57	7.621	0.000
Natural hazards have affected some people to permanently leave the West Morava River valley.	Town Other	2.92 1.84	1.48 1.29	7.698	0.000

Source: Authors' findings.

The T-test showed that respondents from urban areas agreed that natural hazards affected the price of real estates in vulnerable zones. This confirms that there are differences in the formation of real estate prices in urban and rural areas. The analysis by age, using ANOVA, singled out respondents in age category between 31 and 40 years, who also agree that natural hazards affected the price of real estate in vulnerable zones. This age category of respondents can be called well informed, because they are the ones who start families, take loans, and buy real estate [45]. Real estate prices in urban areas are formed, among other things, on the basis of the quality of the facilities, which were affected by the 2010 earthquake.

Although they could not agree, because they did not consider that they were well informed or did not think about it, the respondents showed a great degree of disagreement that they due to any natural hazard decided to sell real estate in vulnerable zones (Table 8). Respondents from rural areas, according to the results of the T-test, do not agree that owners decide to alienate their property in vulnerable zones. According to ANOVA, the result was mostly influenced by respondents who were uneducated or had only primary education, as well as all respondents above the age of 41. This can be evidence of the importance and impact of education on perceiving the local community.

Researching how much this intensity of natural hazard is the main reason for leaving and moving from the region, the following answer was reached. Respondents expressed disagreement with the view that natural hazards have affected some of them to permanently move from the West Morava River valley. This finding is supported by research [46], which showed that migration and displacement associated with natural hazards is just as complex as migration and displacement associated with long-term or slow-onset environmental changes. High value of standard deviation motivated performing additional tests. Respondents from urban areas said they were indecisive, uninformed, or unaware of the fact that natural hazards have affected some people to permanently

leave the West Morava River valley. Respondents from other settlements do not agree with the above statement. The rural population is linked to the land, mostly tillaging it, and, compared to respondents from urban areas, is considered less mobile. Due to their attachment to the land, their response can be considered important. It shows that the population of this region resists the difficulties caused by natural hazards. A statistically significant difference occurred among the respondents of different degrees of education, because the respondents of high school education are indecisive and have no opinion, while they have a high value of standard deviation, which indicates their mutual disagreement (Table 9). Respondents over the age of 41 disagree that natural hazards have affected some of them to permanently leave the West Morava River valley, while the younger ones have not expressed a clear view. The older population is more inert, which affects their attitude and explains the result that is obtained. Therefore, age could be added to Schrover's [47] statement that chain migration is a common phenomenon and the likelihood of chain migration changes over time and vary according to class, gender, marital status, and legal status.

Table 9. One-factor analysis of differences between the participants based on their activity (F (4403), critic values according to Snedecor and Cochran table (1980), $p < 0.01$; $F \geq 3.47$; $p < 0.05$; $F \geq 2.44$).

Stances	Activity	M	σ	F	*p*
Natural hazards have affected the increasing interest in property insurance.	Without school	2.64	1.91	4.479	0.0042
	Primary school	2.62	1.65		
	Secondary school	3.28	1.61		
	Faculty	3.43	1.41		
Natural hazards have affected the owners to decide to sell real estate in vulnerable zones.	Without school	2.27	1.68	4.283	0.0054
	Primary school	2.05	1.47		
	Secondary school	2.83	1.67		
	Faculty	2.81	1.51		
Natural hazards have affected some people to permanently leave the West Morava River valley	Without school	1.55	1.21	5.821	0.0007
	Primary school	1.68	1.23		
	Secondary school	2.50	1.57		
	Faculty	2.23	1.35		

Source: Authors' findings.

Keller and De Vecchio [1] prove that the consequences of natural hazards can be mitigated. This requires an integrated approach that includes scientific understanding, land-use planning and regulation, engineering, and proactive hazard preparedness. Respondents from the West Morava River valley agree that floodsand droughts can be prevented. Respondents say that providing material resources would help in regulating the coasts around the water flows that are prone to spillage. The development of irrigation system, based on the waters of the West Morava and its tributaries, as well as on groundwater, would mitigate the effects of drought. Regarding landslides and hail, respondents think they can be prevented, but they do not agree with each other. They are talking about financial problems when procuring hail missiles. Earthquakes cannot be prevented, but consequences can be foreseen, and in the future, preventive measures can be taken for anything that can be disturbed and threatened by an earthquake, such as the one that happened in 2011. There are standards that apply in areas that are prone to earthquakes. Among them are those who refer to the construction prevention, that is, building objects designed for earthquake-prone areas. Respondents from the West Morava region are agreed that there is no prevention of causes and consequences of landslides, hail and droughts. They cannot be sure to say that there are no preventing measures for causes or consequences of floods. In addition, the degree of their mutual agreement is low (Table 10). In recent years, most people have been affected by floods in the West Morava River region. Respondents also made remarks that some answers would be given in accordance with the political orientation. Namely, those who favor the authorities are more informed, notice and appreciate its activities in terms of, first and foremost, help provided to endangered families, and then other actions concerning the

prevention of causes and consequences. Others use material losses of the endangered to criticize the authorities and promote their political options. According to Hilhorst [48] hazard management brings hazards under control as far as possible. In Serbia, frequent natural hazards have resulted in the analyses of foreign experiences on hazard management, which is still insufficient to apply to other countries' experiences. According to Đorđević and Stanković [49] and based on the respondents' answers (Table 6), in the last decade, the state has been providing economic help to endangered people during natural hazards in the West Morava River valley. Otašević et al. [50] talk about the help from ordinary people and situational altruism. Researching the claim of some residents of the West Morava River valley, the question on interpersonal relations during natural hazards is included in the research. Respondents confirmed that natural hazards affected the increasing quality of interpersonal relationships.

Table 10. Opinions on the prevention of natural hazards in the West Morava River valley.

	M	**σ**	**M**	**σ**
	Can be prevented		Actions to prevent	
Floods	4.39	0.90	2.52	1.16
Landslides	3.61	1.37	2.28	0.98
Hail	3.80	1.37	2.46	1.04
Drought	4.25	0.98	2.17	1.00

Source: Authors' findings.

Keller and De Vecchio [1] indicate the importance of informing people so they can be organized at the local level. They should have prepared decisions in case of natural hazards, which concern the most functional organization of time and resources. According to the respondents, awareness on hazards (characteristics, prevention, etc.) is most effective if it is implemented through: media (TV, radio, newspapers) 49.1% (198), educational system 24.6% (99), Internet with emphasis on social networks 14.4% (58), activation of geographers and similar professions (seismologists, hydrogeologists, meteorologists) in the local environment 10.7% (43), or other 1.2% (5). However, respondents agreed that public information media write about the consequences of natural hazards, while rarely dealing with prevention and protection.

Geographers and Natural Hazards

A broad concern with danger and hazard problems can be found in the earliest work of geographers. Hewitt [51] gives an overview of works by ancient Greeks, from Strabo's 'Geography' in which he talked about earthquakes and Hippocrates's 'On airs, waters and places' to the latest research. The discussion on geography emerged from communication with the first interlocutor when it was concluded that natural hazards are mentioned only in geographical contents within the elementary education in Serbia. Respondents agreed with the view that geography should be represented in the educational system of Serbia with more hours per week, for example talking about natural hazards, prevention, and protection against natural hazards. Geographers of Serbia dealing with science, such as Dragićević et al. [52–54], Burić et al. [55,56], Kutiel et al. [57], Malinovic-Milicevic et al. [58], Lukić et al. [26], Milanović et al. [59], and Vyklyuk et al. [60], still make a scientific contribution to the study of natural disasters. Geographers, unlike other professions, look at natural hazards from the physical geographic point of view, but also in terms of monitoring the social geographic consequences. Complex observing is necessary and useful in many ways. Respondents respect the opinions of geographers. An absolute majority of the respondents stated that, in the absence of seismologists, hydrogeologists, and meteorologists, they would consult with geographers. They think that geographers can help in prevention and protection against natural hazards. They generally agree with each other that the knowledge of geographers is not sufficiently exploited in society. However,

some of the comments emphasized that geographers are not sufficiently active in prevention and protection against natural hazards (Table 11).

Table 11. Geographers and natural hazards.

		M	σ
Geographers are not sufficiently active in prevention and protection against natural hazards		3.94	1.03
Geographers can help in prevention and protection against natural hazards		4.14	0.91
Geographers, unlike other professions, consider natural hazards in complex terms (both from a physical geographic point of view and in terms of monitoring the social geographic consequences).		4.02	0.89
Geographic contents in the education system should be more dedicated to topics related to natural hazards.		4.28	0.81
Geography should be more represented (more hours per week) in the educational system for practical reasons, such as, for example, prevention and protection against natural hazards.		4.02	1.00
Knowledge of geographers is not sufficiently exploited in society.		4.03	0.86
I would consulted with a geographer in absence of	Seismologist	90.3% or 364	9.7% or 39
	Hydrogeologist	88.3% or 356	11.7% or 47
	Meteorologist	88.1% or 355	11.9% or 48

Source: Authors' findings.

Serbia is a sparsely populated country with small surface. Seismologists, hydrologists, and meteorologists are not professions for which Serbia has budget to finance in each settlement, in order to be "at hand" to the population in case of natural disasters. However, every elementary school has a geographer. In addition, there are unemployed geographers in the labor market who have the necessary education about natural hazards. Engagement of geographers in emergency responders or authorities dealing with emergency preparedness and education, as Fuhrmann et al. [61] points out, supports theirs sustainability and professional justification of existence.

7. Conclusions

If sustainability is observed in all its forms—population, economic, and ecological—then the following can be said about the natural hazards in the West Morava River valley. The respondents' ancestors from the West Morava River valley passed knowledge on the natural hazards that threatened them most. This speaks of their cognition and awareness that protecting descendants in this way can contribute to the sustainability of their lives and existence in the West Morava River valley. Due to the acceleration of the mobility of the population, which has emerged under the influence of economic and political circumstances, it is increasingly difficult to count on the flow of information about experiences in this way. The knowledge of the ancestors testifies to the cyclical processes that cause natural hazards, but they are also valuable for comparing their strengths, forms of manifestation, consequences that they have created, and so on, which can all be used in further predictions. Natural hazards have a significant impact on the quality of life. They correct the standard of the population, and somewhere the price of real estate. Population in the West Morava River valley shows signs of adjustment and adaptation in zones that are more vulnerable to natural hazards in terms of making insurance decisions or real estate transactions in the function of their economic viability and sustainability.

Respondents in the West Morava River valley find that there is not enough effort to prevent natural hazards. Improving the work on the prevention of natural hazards would have a positive impact, in addition to population and economic sustainability, and on ecological sustainability and resilience, which is de facto unavoidable in the future of settling this area. In their opinion, the media play the most important role in informing the population about natural hazards. Therefore, in the future, the role of the media should be emphasized, especially in the educational process, as a significant

factor in the work on prevention and protection against natural hazards. Geographers employed in the profession should transfer their knowledge on natural hazards to pupils within additional activities, while searching for mechanisms to correct the agenda. Geographers who are not active in the profession could be useful in the local environment educating a part of the population that no longer attends educational institutions. They should upgrade their knowledge and be permanently informed about modern understanding and how to act during natural hazards. Understanding the usefulness of the knowledge of the geographer is in favor of their sustainability, given their significant number on the labor market and the possibility of their engagement in emergency preparedness services. Response to natural hazards must seek to strengthen institutions, monitoring, and early warning systems, and the culture of prevention and preparedness in the face of hazard. Since nature's effects are not restricted to political boundaries, research must be extended to the entire area of the Balkans. Only through engagement and perception of everyone can it be easier to deal with natural hazards and disasters.

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