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Environmental attitudes among Serbian university students

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ABSTRACT

This article aims to analyse the attitudes of Serbian university students towards environmental issues and risks, as it is crucial to understand these attitudes to shape future environmental policies and promote sustainability initiatives. The survey, which covered socio-demographic, economic, and environmental variables, gathered insights for understanding environmental awareness and important factors promoting pro-environmental behaviour among youth. In total, 165 responses were obtained. A Chi-square test of independence and a logistic regression model was employed for analysis. The survey results show university students perceive inadequate recycling habits (65%) and limited green spaces (73%) in their cities. They consider the environmental risks considerable, possibly leading to migration (66%) and urban depopulation (47%). They advocate for increased awareness campaigns (66.7%) and greater use of renewable energy (64.2%), as well as stricter penalties for environmental violations (61.8%). The analysis revealed a significant relationship between self-assessed environmental awareness and actual environmental behaviour, with students who reported higher awareness being more likely to engage in environmentally friendly actions. Gender and family recycling habits were significant predictors of environmental behaviour, with females and students from the families with recycling practices more likely to exhibit pro-environmental behaviour. These results indicate that the surveyed university students have developed environmental habits and awareness. Supporting youth is central to tackling environmental issues and promoting sustainable behaviour. In addition to educational efforts in Serbia, this requires comprehensive government and civil society initiatives.

KEYWORDS

Serbian university students, environmental awareness, sustainable development, environmental attitudes, risks

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1 INTRODUCTION

Environmental issues and related risks have become a global concern, affecting every aspect of human life (Stevanović, Jovanović and Hanić 2019). One such effect can be seen in climate migrations since only in 2021, natural disasters displaced 23.7 million people globally (European Migration Network Inform 2023). Given that this trend is expected to continue, a paradigm shift in individual behaviour towards the environment is necessary, particularly regarding environmental attitude. In the literature, environmental attitude (EA) is defined as "the collection of beliefs, affect, and behavioural intentions a person holds regarding environmentally-related activities or issues" (Schultz et al. 2004: 31). As one of its very strong predictors, EA affects people's pro-environmentalism (Rosa and Collado 2019; Miller et al. 2022), environmental habits, culture (Asan, Mile and Ibraim 2014), and ability to solve environmental problems in the long term (Gurbuz and Ozkan 2019). At the same time, an individual's EA is influenced by various factors, primarily education, which significantly affects their environmental knowledge and behaviour (Kirbiš 2023).

When discussing EA, it is important to note that, according to Yapici et al. (2017), the attitude consists of three components: cognitive (knowledge and beliefs), affective (emotional response), and behavioural (past and present actions). In practice, this means considering what individuals know about environmental issues, their beliefs regarding them, the emotional responses they have towards them, and the actions they are likely to take in response. In line with this, EA is related to risk perception since perceiving environmental risks affects environmental behaviour where according to Bradley et al. (2020), the higher the environmental risk perception is, the higher risk response behaviours are.

To comprehensively understand current environmental issues, it is essential to explore the environmental attitudes held by various stakeholders, as these attitudes shape future environmental policies and sustainability initiatives and, as pointed out by Petrović, Nikolić and Ostojić (2018), affect human behaviour patterns. One specific group of stakeholders is university students, who not only live in very different environmental conditions than their parents but also actively participate in the current social and environmental paradigm. In general, numerous studies highlight the positive effects of nature on university students' health and well-being, especially due to their technologically focused lives (Puhakka 2021). This group of stakeholders is also important since they are future leaders, decision-makers, environmental educators and creators of future environmental educational strategies (Zwickle et al. 2014; Shafiei and Maleksaeidi 2020; Piscitelli and D'Uggento 2022; Cvetković et al. 2024) who have the potential to facilitate the transition from a human-centred to an ecosocial society (Chang et al. 2022). Moreover, university students' individual environmental attitudes can impact wider community environmental performances such as universities (Bonhi et al. 2024).

To understand university students' environmental behaviour, different authors explored several factors affecting it. For instance, Chuvieco et al. (2018) examined university students from Spain, Brazil, and the UAE to analyze their real environmental practices. The authors found that students' self-perception of environmental concerns was most clearly

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related to their sustainability practices. Gurbuz and Ozkan (2019) explored the environmental consciousness levels of university students from Turkiye, finding that most of the students couldn't describe environmental pollution. This lack of understanding was followed by the lack of punishment and sanctions, as the two most rated reasons for problematic environmental behaviour in Turkiye. Another research study by Shafiei and Maleksaeidi (2020) explored the pro-environmental behaviour of university students through the protection motivation theory. Their study, involving Iranian students, identified several key determinants of pro-environmental behaviour: environmental attitude, self-efficacy, perceived costs of pro-environmental behaviour, and perceived intrinsic and extrinsic rewards associated with current environmentally unfriendly behaviours. Shutaleva et al. (2022) focused on youth between 14 to 34 years living in Ekaterinburg, Russia and found that eco-behaviour was encouraged and that the ecological behaviour of their parents had no influence on their environmental behaviour. However, women were more likely to be environmentally oriented. At the same time, the influence of socio-demographic characteristics on environmental behaviour practices revealed no significant statistical relationships. At the same time, it was found that if the income was increasing, the environmentally friendly behaviour should improve as well. Additionally, Torroba Diaz et al. (2023) found a direct and significant impact of ambient intelligence on the environmental knowledge of Spanish university students, indicating that students with higher ambient intelligence also possessed greater environmental knowledge. Similarly, Torres et al. (2023) explored the General Ecological Behavior (GEB), including data on the environmental connection, awareness, and behaviours of students from Portugal, aged between 18 and 65 years. The authors found that the majority of Portuguese university students believed that environmental issues were not a primary concern for Portugal, where climate changes were a result of natural processes.

To determine the environmental attitudes and perceived risks that are associated with environmental factors among university students in Turkiye, Yapici et al. (2017) researched this relationship. The results indicate that environmental education is a lifelong process and can't depend only on educational institutions, as evidenced by the varying results among different faculties. For instance, university students in health-related faculties exhibited significantly higher environmental attitudes than those in social science. Varah et al. (2020) examined the environmental attitudes and behaviours of Indian university students by focusing on three core factors regarding their relationship with the environment: ecocentric (the earth is fragile and human activities can have detrimental effects on humans survival); technocentric (technology is altering the laws of nature); and dual-centric (humans' dual nature towards the environment). The study included students from both urban and rural areas. The authors found that most university students, both from urban and rural areas, were well-informed about the current critical status of our natural resources. However, university students from rural areas tended to have better environmental attitudes. Additionally, those with ecocentric views were more likely to engage in environmental activism and recycling activities. Conversely,

university students with technocentric attitudes were more into promotional activism and consumerism behaviours, but were less likely to support recycling efforts. Finally, university students studying life sciences exhibited better environmental attitudes compared to those studying physical sciences.

In a similar study, Değerli and Sunal (2022) explored the level of knowledge and environmental attitudes of university students in Turkiye. They found a positive relationship between students' environmental attitude scores and their perception of environmental risks, although the correlation between these factors was not strong. However, a study conducted by Evert, Coetzee and Nell (2022) on students from a South African university found that students' environmental attitudes tended more towards utilisation, an anti-environmental factor, rather than the pro-environmental factor of preservation.

According to findings in the literature review by Li et al. (2019), factors influencing individuals' environmental behaviour can be divided into individual and external. Individual variables include socio-demographic factors such as gender, age, education, marital status, place of residence, and personal economic situation, alongside psychological variables such as attitudes, beliefs, and norms. For instance, in a meta-study by Gökmen (2021) based on 257 publications and an overall sample of 12,188 females and 9,915 males, it was found that gender variables affected environmental attitudes in favour of females, but at a low level. In a similar study done by Wang, Hao and Liu (2021) regarding the effects of individual and population ageing on pro-environmental behaviour, data from 31 countries revealed a positive relationship between ageing and pro-environmental behaviour. At the individual level, this means that older people are more interested in participating in environmental behaviour. At the national level, society which has a greater share of older persons encourages individuals to behave in a more sustainable way. However, research by Verachtert (2023) on Flemish pupils from Belgium found that although the older generation acts more sustainably, the transmission of sustainability attitudes and behaviour was not just a top-down process where parents influenced children; children also actively contributed. When talking about external factors such as norms, Piscitelli and D'Uggento (2022) found that respondents were more conscientious in recycling those elements required by law such as plastic, paper and glass compared to non-mandatory such as waste oil, proper disposal of batteries and electric cables.

Following this division, some research focused on socio-demographic factors, such as the studies by Yapici et al. (2017), Gurbuz and Ozkan (2019), Piscitelli and D'Uggento (2022), and Değerli and Sunal (2022), since university students' behaviour is shaped by their environment, including variables like family income, parental education, parental occupations, place of residence, etc. It is important to note that studies gave different results. For instance, Yapici et al. (2017) found no significant correlation with participant age, educational background of parents, occupation of parents, or family monthly income, while Gurbuz and Ozkan (2019) concluded that as the mothers' education levels increased, the environmental awareness of their children increased as well, while fathers' education 'did not reveal any significance. However, Değerli and Sunal (2022) found that university students coming from households with

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a medium income were more positively oriented towards the protection of the environment.

Given that socio-demographic factors differ within a specific country context, it is important to examine environmental attitudes with a focus on individual countries, as human-environment interactions are often influenced by cultural factors (Tam and Milfont 2020). In that aspect, we chose to focus on Serbia for several reasons. First, previous research, including studies by Chuvieco et al. (2018) and Cvetković et al. (2024), points to culturally driven differences in environmental attitudes among university students. Second, Serbia faces a range of environmental challenges that make it a particularly relevant case for studying these attitudes. According to the Environmental Performance Index (EPI) in 2022, which assesses the extent to which a country addresses climate change mitigation, ensures ecosystem vitality, and maintains environmental health, out of 180 countries, Serbia is ranked 45th, while in some categories such as Air Quality, it is positioned 108th. This is in line with the research done by Mitić et al. (2023) which finds that economic growth is often prioritised over environmental concerns in countries like Serbia. Thirdly, few studies comprehensively approached this issue in Serbia focusing on students. For instance, Stanišić and Maksić (2014) explored environmental education in Serbian primary schools while Srbinovski and Stanišić (2020) explored the dimensionality of the revised New Environmental Paradigm Scale in Serbian and Macedonian culture in elementary and secondary schools. Additionally, Stanišić, Maksić and Nenadić (2023) focused on predictors of environmental awareness among primary school students in Serbia.

To better understand the relationship between humans and the natural environment, in terms of its effects on sustainability and environmental awareness, studies on the process of learning about natural disasters are also relevant. Additionally, disaster education serves as a cost-effective tool for risk management and reducing the long-term socioeconomic effects of disasters (Rakuasa and Latue 2023; Torani et al. 2019). In this context, a brief overview of related studies conducted in Serbia is provided. For instance, on a sample of secondary school students from Belgrade, Cvetković et al. (2015) analysed students' perceptions related to earthquakes as a natural disaster and security threat and found that while most students claimed to understand the definition of an earthquake, their knowledge remained incomplete, as 45.9% of respondents were unsure of how to respond during an earthquake. In a similar research, Cvetković (2016) focused on the relationship between educational level and the preparedness of citizens to respond to a natural disaster caused by a flood. On a sample of 2500 respondents from 19 municipalities, 23 cities and Belgrade, the author found that there was a statistically significant relationship between the educational level of respondents and their preparedness for responding to a natural disaster. On a sample coprising both students and teachers in 10 municipalities in Serbia in the Western Morava Basin, Cvetković, Nikolić and Lukić (2024) explored disaster risk reduction. The results showed that there was a notable lack of collaboration between schools, professional institutions, and parents in disaster education. A significant number of respondents felt that introducing disaster-related subjects in schools was unnecessary, so schools and parents did

not prioritize disaster preparedness. Based on the previous, we can conclude that this gap in disaster preparedness of students in Serbia highlights the need for a more robust approach to integrating environmental education into school curricula, enhancing environmental awareness among youth.

Regarding university students, Major et al. (2017) focused on the pedagogy of sustainability at the University of Novi Sad, i.e. the Hungarian Language Teacher Training Faculty in Subotica. Results of this longitudinal survey for the period between 2012 and 2015 showed that the environmental attitudes of university students had significantly increased by the end of their undergraduate education. On the other hand, Nikolic et al. (2020) studied students from the University of Novi Sad, specifically those in humanities and technological sciences. The research aimed to understand their behaviour towards integrating education for sustainable development into higher education. Their research was focused on several components of the concept of sustainable development including the understanding of the concept, its position in the system of higher education, what the sources of information about this concept and who the entities responsible for it were. The results indicate that university students don't think of higher education institutions or themselves as mainly responsible for sustainable development. This could be caused by their feeling of marginalization and doubt that their actions could impact the local community's development.

When observing research done on Serbia's neighbouring countries that share very similar environmental patterns, Cvetković et al. (2024) investigated environmental awareness, knowledge, and safety among university students in Montenegro and North Macedonia focusing on how the educational system, cultural, and socioeconomic factors influenced these aspects. The results show that gender, age, year of study, and study rate have a significant impact on students' attitudes toward environmental awareness, safety, and knowledge. Additionally, socio-cultural and environmental contexts in both countries strongly influence these factors. At the same time, university students from Montenegro demonstrated a higher awareness of the importance of natural resources for human survival and national security compared to those from North Macedonia who were more aware of the direct effects of human activities on climate change. Although university students from both countries showed strong recognition of the importance of biodiversity preservation, the study revealed gaps in environmental education and socio-economic contexts in each country.

Considering the above mentioned aspects, based on the socio-demographic, economic, and environmental variables this research aims to explore university students' attitudes in Serbia towards environmental issues and risks, in terms of whether they are aware of environmental issues in their society, do they recognise the impacts of a deteriorating environment, and understand how these issues might affect their lives, including potential demographic changes such as migrations. These questions are important because research indicates that while university students generally understand environmental problems and hold positive attitudes towards them, there is still a gap when it comes to translating these attitudes into behaviour (Wyss, Knoch and Berger 2022). This can be explained by considering

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three main reasons: individuals are not directly affected by environmental issues; they avoid thinking about the negative consequences of certain environmental issues and have no belief that their actions can change anything in society (Kim and Kim 2024).

For the purposes of this research, we examined the factors influencing surveyed university students' environmental behaviour. The main hypothesis is that there is a significant relationship between the selected socio-demographic variables and the environmental behaviour of university students.

This paper is structured as follows: after the introduction, the second part is dedicated to the methods used in the research. The results of the research and discussion are presented in the third part, while the fourth part explains limitations of the study, and the fifth part presents the conclusion.

2 METHOD

After carefully observing the existing literature, a structured questionnaire was prepared for the research presented in this paper. The questionnaire consisted of 15 questions relying on Gurbuz and Ozkan (2019) and Piscitelli and D'Uggento (2022) with certain adjustments due to cultural differences, as discussed in the previous section. The questionnaire was distributed by online services during the winter semester of the 2023/2024 academic year. A survey was conducted among students of state (66.7%) universities, as well as one private (33.3%) university. The surveyed students were from undergraduate and master's studies at the following faculties: Faculty of Organizational Sciences, University of Belgrade; Faculty of Transport and Traffic Engineering, University of Belgrade; Faculty of Technical Sciences, University of Novi Sad; Faculty of Economics, University of Priština with its seat in Kosovska Mitrovica; Faculty of Hotel Management and Tourism in Vrnjačka Banja, University of Kragujevac; and Belgrade Banking Academy, Union University.

The total number of respondents was 165. The first group of questions related to the socio-demographic and economic characteristics of the students, such as gender, parents' level of education, and family income. The other group of questions focused on the students' ecological attitudes towards environmental risks and conservation. The questionnaire was anonymous since this type of survey method enables more openness in sharing information than non-anonymous methods (Murdoch et al. 2014). These questions were selected since they were bound to give a broader picture of whether the surveyed university students' environmental attitudes were affected by family setup. Two questions included a 5-point Likert scale, with 1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree.

The socio-demographic variables we examined are family income, parents' educational levels, gender, university type (public or private), and family recycling habits. Two environmental variables were created based on the university students' self-reported environmental attitudes. The first environmental variable captures self-assessed environmental awareness, while the second measures environmental behaviour, reflecting students' environmentally conscious actions and practices. Both variables were subsequently transformed into binary variables using an appropriate threshold, with the unitary scores indicating stronger environmental awareness and behaviour.

This study aims to assess the effects of socio-demographic factors on university students' environmental attitudes. Moreover, we aimed to test whether there was an alignment between self-assessed environmental awareness and actual environmental behaviour. Specifically, we sought to examine whether students who reported a higher level of environmental awareness also demonstrated environmentally conscious actions and practices. This analysis allows us to determine whether self-perceptions of environmental awareness corresponds with real-world environmental behaviours.

3 RESULTS AND DISCUSSION

Of the 165 responses, 67.9% were filled out by female university students, and 32.1% were filled out by male university students. The majority of the surveyed students study at state universities and are aged 19 to 24 (84.85%), with most of them (27.27%) being in their second year of study. The remaining surveyed university students are aged 25 to 30 (10.3%) and 31 to 40 (4.85%) as presented in Table 1.

Table 1 Gender, age and year of studies

Gender	**n**	**Frequencies (%)**
Female	112	67.88
Male	53	32.12
Age		
19–24	140	84.85
25–30	17	10.30
31–40	8	4.85
Year of study		
I	20	12.12
II	45	27.27
III	37	22.42
IV	40	24.24
Master	23	13.94
Type of University		
State	110	66.67%
Private	65	33.33%

Source: Authors' calculation

A Chi-square test of independence was employed to examine the association between key socio-demographic variables and respondents' environmental behaviour. Additionally, a logistic regression model was built to model and further explore the factors influencing environmental behaviour. This method allowed for identifying potential predictors and deterrents affecting students' environmental consciousness. The SPSS software was employed for the analysis.

Table 2 presents the demographic data for the surveyed variables, such as the education level of the mother and father, as well as the family income. According to the latest census held in 2022, 53.1% of the population aged 15 and over in Serbia have completed secondary school, 17.8% have eight years of education, while 6.3% have no formal education, or have completed

Table 2 Demographic characteristics

Mothers' education	n	Frequencies (%)
Primary school	6	3.64
High school	87	52.73
Faculty	48	29.09
Master	21	12.73
Ph.D.	3	1.82
Fathers' education		
Primary school	4	2.42
High school	98	59.39
Faculty	41	24.85
Master	19	11.52
Ph.D.	3	1.82
Family income (RSD)		
40,000–90,000	44	26.67
90,000–150,000	53	32.12
150,000–300,000	35	21.21
300,000+	33	20.00

Source: Authors' calculation

less than eight years of primary school. At the same time, 24.03% of females, compared to 20.73% men, have obtained higher education or a university degree (Statistical Office of the Republic of Serbia 2023). Our findings align with this data, showing that the majority of mothers and fathers have a high school education, with a notable proportion of mothers (29.09%) holding a university degree compared to 24.85% of fathers.

Regarding family income, most of the surveyed university students (32.12%) reported their family income to be in the range of 90,000–150,000 RSD (approximately 769–1,281 EUR), which is above the minimum average monthly income reported in Serbia for 2023, which was 87,973 RSD (Statistical Office of the Republic of Serbia 2023). The highest family income of over 300,000 RSD (approximately 2,562 EUR) was reported by 20% of the surveyed university students.

In Table 3, university students assessed levels of environmental risks in the city where they studied using a 5-point Likert scale (1 – strongly disagree, 2 – disagree, 3 – no opinion, 4 – agree, 5 – strongly agree). According to their opinions, air pollution represents the greatest environmental risk (rated 5 in approximately 42% of the responses). This finding aligns with the findings of Piscitelli and D'Uggento (2022) for Southern Italy. In Serbia, approximately 27% of the surveyed university students rated waste pollution 5, and around 26% rated noise pollution 5. These results diverge from those of Piscitelli and D'Uggento (2022), where, after air pollution, students' highest concerns were global warming, deforestation, depletion of natural resources and water pollution. In Serbia, approximately 38% of the surveyed university students rated soil pollution 3, while about 34% rated waste pollution 4. Approximately 24% of university students rated unplanned

Table 3 The participants' rating of the levels of environmental risks in the city where they study (%)

	1	2	3	4	5
Air pollution	5.45	7.27	18.79	26.67	41.82
Water pollution	7.88	20.61	29.70	27.27	14.55
Land pollution	6.67	15.76	38.18	24.85	14.55
Waste pollution	3.03	10.91	24.85	33.94	27.27
Deforestation	13.33	21.21	24.24	24.24	16.97
Climate change (Global warming)	7.88	13.94	26.67	28.48	23.03
Noise pollution	8.48	18.18	26.06	21.21	26.06
Other	24.24	12.12	35.15	15.15	13.33

Source: Authors' calculation

deforestation 4. Shutaleva et al. (2022) found that the main environmental issues in Russia were waste, dirtiness, landfills, unsanitary conditions (82%), deforestation (73.5%), water pollution, poor drinking water (73%), and air quality (71%). Considering these results, it can be said that our findings partially coincide with those of Shutaleva et al. (2022) for Russian cities.

When asked whether there were sufficient green spaces in the city where they studied, approximately 74% of the surveyed university students responded negatively, while only about 26% responded positively. This is in line with the high level of urbanisation in Serbia where in Belgrade, the country's capital city and university centre, the level of green area fell from 19% to 9% leading to what is locally known as concretosis. This can also be related to the research done by Cvetković et al. (2024) where the students from Montenegro and North Macedonia rated biodiversity preservation as vital for humanity. When asked whether their families developed recycling habits, over 65% of the surveyed university students responded negatively, while over 34% responded affirmatively. This result is in contrast with the findings of Piscitelli and D'Uggento (2022) for Southern Italy, where 86% of students reported that their families had developed recycling habits, with the remaining 16% giving a negative response.

Table 4 summarizes the responses regarding the types of waste university students recycle. Plastic is the most recycled (71.4%), followed by paper and cardboard (57.1%), and then glass (35.7%). All these results are consistent with those obtained in the study by Piscitelli and D'Uggento (2022) for Southern Italy, although the percentages differ. Specifically, in Piscitelli and D'Uggento (2022), plastic is recycled the most (98.8%), followed by paper (96.3%), and then glass (93.8%). Varah et al. (2020) for Delhi reported that 23.1% of students usually recycle paper, glass, and cans. Shutaleva et al. (2022) found that 62.5% of respondents recycled plastic and paper waste in Russian cities, a result close to ours. Additionally, Shutaleva et al. (2022) found that 62.5% of the respondents also recycled batteries and electrical appliances, which is not consistent with our finding that only 27.1% of the students recycle electrical and electronic devices.

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Table 4 Types of waste that the respondents recycle

	n	Frequencies (%)
Plastic	50	71.43
Glass	25	35.71
Paper and cardboard	40	57.14
Metal	11	15.71
Electric and electronic devices	19	27.14
Other	19	27.14

Source: Authors' calculation

In Table 5, university students evaluated the development of their environmental awareness using a 5-point Likert scale. A significant proportion of the surveyed university students prefer public transport over automobiles (approximately 47% rated it 5), and they also conserve resources such as water and electricity (about 30% rated it 5). Shutaleva et al. (2022) found for Russian cities that 57% of the respondents used public transport over automobiles, and 43% were mindful of the consumption of resources such as water and electricity. Therefore, our findings regarding these two attitudes in Serbia are consistent with the Shutaleva et al. (2022) findings for Russian cities. When asked whether their environmental awareness was fully developed, 43% of respondents gave a neutral response (rated as 3). This is in line with Nikolic et al. (2020) who also confirmed that Serbian students did not convert their environmental awareness into practice. The surveyed university students also gave a neutral response (rate 3) when asked if they actively participated in environmental protection (41%). Regarding the importance of purchasing products made from recycled materials, 30% of university students disagreed (rated as 2), while approximately 20.6% strongly disagreed (rated as 1). Conversely, 4.85% of the surveyed university students strongly agreed (rate 5) with this statement. This result partially aligns with the findings of Varah et al. (2020) for Delhi, where 12.32% of the students reported usually buying products made from recycled materials. However, it contrasts with Cvetković et al. (2024), who discovered that university students from Montenegro and North Macedonia recognized individual behaviour as a key factor in influencing the environment, including collective action in environmental protection.

Table 5 The respondents' assessment of environmental awareness development (%)

	1	2	3	4	5
My environmental awareness is fully developed.	1.82	10.91	43.03	27.27	16.97
When purchasing products, it is important to me that recycled materials are used.	20.61	30.30	28.48	15.76	4.85
I avoid the unnecessary use of printed materials.	13.33	24.24	24.24	16.36	21.82
I actively participate in environmental protection.	9.09	21.82	41.21	15.15	12.73
I use public transport more than a car.	15.76	7.27	15.76	13.94	47.27
I am mindful of resource consumption (water, electricity, etc.).	6.06	7.88	27.88	27.88	30.30

Source: Authors' calculation

Table 6 Attitudes of the respondents on demographic factors influenced by environmental risks

	n	Frequencies (%)
Family planning	76	46.06
Rural area depopulation	68	41.21
Urban area depopulation	79	47.88
Ageing population	57	34.55
Migrations	109	66.06

Source: Authors' calculation

Table 6 provides a summary of the surveyed university students' perspectives on demographic factors influenced by environmental risks. The majority (66%) believes that environmental risks can impact population migration, while approximately 48% think these risks can lead to urban depopulation. Furthermore, 46% of the university students perceive an influence on family planning due to environmental risks. Additionally, around 41% and 34.6% of the university students believe that environmental risks can respectively contribute to rural depopulation and population ageing.

The surveyed university students responded affirmatively that sustainable development entailed societal development meeting human needs with available resources without compromising natural systems and the environment, with 71.5% agreeing and 21.8% unsure about this definition. These results are in line with Nikolic et al. (2020) in terms that university students in Serbia are mostly familiar with the meaning of sustainable development.

Table 7 summarises university students' attitudes towards key practices and policies for reducing environmental risks and promoting sustainable development. Most of the surveyed university students (66.7%) believe in raising awareness among citizens about environmental protection, followed by 64.2% advocating for promoting the use of renewable energy sources. Additionally, 61.8% think stricter environmental protection penalties should exist, while 58.8% support stronger legal regulations. Furthermore, 50.3% of the surveyed university students endorse initiatives that promote recycling and waste reduction.

The relationship between self-assessed environmental awareness and actual environmental behaviour was examined using a Chi-square test of independence. The cross tabulation revealed that among the surveyed uni-

Table 7 Attitudes of the respondents toward key policies for reducing environmental risks and promoting sustainable development

	n	Frequencies (%)
Encouraging the use of renewable energy sources	106	64.24
Stricter penalties for environmental protection	102	61.82
Stricter legislative regulations	97	58.79
Initiatives promoting recycling and waste reduction	83	50.30
Raising awareness among citizens about environmental protection	110	66.67

Source: Authors' calculation

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versity students who did not engage in environmentally friendly behaviour, 73.3% reported low self-assessed environmental awareness, while only 26.7% reported high awareness. Conversely, among the surveyed university students who did engage in environmentally friendly behaviour, 65.3% reported high self-assessed environmental awareness, compared to 34.7% who reported low awareness. This suggests that the surveyed university students who engaged in environmentally conscious actions were more likely to perceive themselves as having higher environmental awareness. The Chi-square test confirmed this association, yielding a statistically significant result, $x^2(1, N = 165) = 24.794$, $p < 0.001$. This strong significance indicates that there is a meaningful relationship between the way that university students assess their own environmental awareness and their actual behaviour.

The Chi-square test revealed a significant association between gender and environmental behaviour, $x^2(1, N = 165) = 5.64$, $p = 0.018$. Female university students were more likely to engage in environmentally friendly behaviour (77.3%) than male university students (22.7%). On the other hand, the Chi-square test did not reveal a significant association between university type (public vs. private) and environmental behaviour, $x^2(1, N = 165) = 1.76$, $p = 0.185$. This suggests that the type of university attended does not significantly influence university students' likelihood of engaging in environmentally friendly behaviour. The Chi-square test did not reveal a significant association between income levels and environmental behaviour, $x^2(3, N = 165) = 4.83$, $p = 0.185$. However, the Linear-by-Linear Association test approached marginal significance ($p = 0.062$), suggesting a weak trend that higher income levels may be associated with reduced engagement in environmentally friendly behaviour, though this result is not statistically conclusive. Regarding parents' education, we first re-categorized both variables to have only three groups. For the mother's education, the Chi-square test did not reveal a significant association between the education level of the mother and environmental behaviour, $x^2(2, N = 165) = 1.845$, $p = 0.397$. This indicates that the mother's education level does not significantly influence whether a university student engages in environmentally friendly behaviour. In contrast, the Chi-square test revealed a significant association between the father's education level and environmental behaviour, $x^2(2, N = 165) = 9.446$, $p = 0.009$. This suggests that the father's education level has a statistically significant impact on whether a university student engages in environmentally friendly behaviour. The Chi-square test of independence was also used to examine the association between the family's recycling habits and university students' environmental behaviour. The results were significant, $x^2(1, N = 165) = 13.298$, $p < 0.001$, i.e. indicated a significant relationship between the family's recycling habits and environmental behaviour. The surveyed university students from the families with recycling habits were more likely to engage in environmentally friendly behaviour (64.9%) compared to those from the families without recycling habits (35.2%).

A binary logistic regression analysis was conducted to examine the factors influencing the university students' environmental behaviour. The independent variables considered were gender, university type, income, education of mother, education of father, and family

recycling habits, with variables selected using the forward stepwise (likelihood ratio) method.

The final model included gender and family recycling habits as significant predictors. The model was statistically significant, $x^2(2) = 20.651$, $p < 0.001$, indicating that it reliably distinguished between the university students who engaged in environmentally friendly behaviour and those who did not. Hosmer and Lemeshow test suggests that the model's predictions are consistent with the actual observed outcomes ($x^2(2) = 8.695$, $p=0.369$). The model correctly classified 77.8% of the cases. Gender was found to be a significant predictor, with the females being more likely to engage in environmental behaviour ($B = -0.975$, $p = 0.009$). The odds ratio for gender ($Exp(B) = 0.377$) indicates that males are 0.377 times as likely as females to engage in environmental behaviour, or conversely, that females are more likely than males to engage in environmentally friendly behaviour. This suggests that being female increases the odds of engaging in environmental behaviour. Family recycling habits were also significant, with the university students from the families without recycling habits being 0.264 times less likely to engage in environmentally friendly behaviour ($B = -1.333$, $p < 0.001$). These results suggest that gender and family recycling practices significantly influence university students' likelihood of engaging in environmental behaviour.

Relating to the literature, Gurbuz and Ozkan (2019) found a statistically significant difference between their mothers' education level and the university students' environmental attitudes. This result does not align with our findings. Contrary to our results, Gurbuz and Ozkan (2019) did not find a statistically significant difference between the fathers' education level and the university students' environmental attitudes in Turkiye. However, Gurbuz and Ozkan (2019) concluded that family income significantly impacted students' environmental attitudes. This result is consistent up to some level with our findings for Serbia. Our results are also in line with Cvetković et al. (2024) in terms of gender emerging as the most significant predictor in the domain of contributions to environmental safety, and families playing a key role in environmental awareness.

By considering the above, we can determine that the surveyed university students in Serbia are aware of environmental issues in their society and recognize the impacts of a deteriorating environment, particularly regarding air pollution. This affects their decision to prefer public transport over cars. They are also in favour of raising awareness among citizens about environmental protection, with the majority of them believing that environmental risks can impact population migration. However, few respondents prioritized recycled materials when purchasing products,

Table 8 Logistic regression result

	B	Wald	df.	Sig.	Exp(B)
Gender	-0.975	6.829	1.000	0.009	0.377
Family recycling habits	-1.333	13.925	1.000	0.000	0.264
Constant	3.294	15.188	1.000	0.000	26.942

Source: Authors' calculation

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or actively participated in environmental protection. This leads to the conclusion that there is still a gap when it comes to translating these attitudes into behaviour, which is in line with Nikolic et al. (2020) and Wyss, Knoch and Berger (2022).

4 LIMITATIONS

This study has several limitations. The first one is the sample size. While the sample provides useful findings, the relatively small size limits the generalizability of the results. Given the importance of the topic, it would be beneficial for future research to include a larger and more diverse sample that covers a wider demographic spectrum, such as students from different regions, countries or fields of study. This could lead to a more comprehensive understanding of the factors that influence the environmental behaviour of different student populations.

The second limitation relates to the self-reported data. The study relies on participants' self-assessment of their environmental awareness and behaviour, which may be subject to bias due to social desirability or inaccuracies in personal perception. Participants may overestimate or underestimate their actual environmental behaviour, which could distort the results. A more objective measure of behaviour, such as observational data or verified actions, like recycling logs, could provide a more reliable analysis of actual environmental practices.

Another limitation concerns the cross-sectional nature of the study. The data were collected at a single point in time, which limits the ability to draw conclusions about causal relationships between environmental awareness, behaviour, and influencing factors. A longitudinal study could provide more insight into the way in which these variables interact over time and whether certain behaviours or attitudes change due to external influences, such as policy changes or environmental education programs.

Future research should aim to build on these limitations to gain a more holistic view of the determinants of environmentally friendly behaviour.

5 CONCLUSION

Given the climate change era we are currently living in, it is important to highlight the significance of environmental attitudes in addressing those global environmental issues. This paper focuses on university students as future leaders, decision-makers and educators relating to environmental issues.

The analysis identified several significant relationships regarding the factors influencing university students' environmental behaviour. A strong association was found between the self-assessed environmental awareness and actual behaviour, with the university students who engaged in environmentally friendly behaviour being more likely to report high self-assessed awareness. Gender was also a significant factor, as female university students were more likely to engage in environmentally friendly behaviour compared to male university students. Family recycling habits were found to have a significant impact as well, with the university students from the families that recycled being more likely to engage in environmentally friendly behaviour. However, no significant associations were found between public and private universities, income levels, or the mothers' education and

environmental behaviour. In contrast, the fathers' education level did show a significant influence. These results indicate that self-assessed awareness, gender, and family recycling habits are key predictors of university students' environmentally friendly behaviour, with further confirmation being provided by binary logistic regression.

Faculties, as key promoters of societal change, should lead efforts to raise awareness of environmental issues among students and in the surrounding communities. Integrating sustainability into formal and informal education is in line with the Serbian National Strategy for Environmental Protection. These measures will create future leaders who are aware of their societal and environmental responsibilities (de Andrade et al. 2018). Additionally, given that more than 65% of the surveyed university students' families did not have established recycling habits, it is important to improve recycling infrastructure and education. Schools and universities should develop peer education programs and provide social and material incentives to encourage collective participation in recycling (Levy and Marans 2012). This is also in line with the goals of the National Environmental Protection Program, which, following the Aarhus Convention, provides for greater public participation in decision-making on environmental issues. Faculties should also raise awareness of resource conservation and sustainable behaviour through various educational channels, in order to ensure broad societal engagement.

While many university students already prefer public transportation and conserve water and electricity, their overall environmental awareness is still underdeveloped. By incorporating environmental sustainability into higher education, faculties can provide students with a deeper knowledge and empower them to advocate for sustainable change. Policies should also target other groups, such as older adults, rural populations, and low-income families, who may have less access to educational resources. Outreach programs, in collaboration with educational institutions, can improve environmental knowledge in these populations. In addition, policies should promote affordable and accessible public transportation and resource conservation campaigns to achieve positive behavioural change.

Socio-demographic factors, such as gender, parental education and family habits significantly influenced the surveyed university students' environmental attitudes. Faculties and schools can reinforce these influences by encouraging peer education and volunteer programs to promote sustainability. Educational institutions should support informal education programs that encourage participation in decision-making, to ensure that socio-demographic factors do not limit environmental engagement.

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Data Availability Statement

Data are available from the authors upon request.

Coauthor Contributions

Aida Hanić: Conceptualization, Writing – Review & Editing. **Jelena Minović:** Methodology, Formal Analysis. **Slavica Stevanović:** Conceptualization, Investigation. **Petar Mitić:** Validation, Visualization, Writing.

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Stavovi o zaštiti životne sredine među studentima univerziteta u Srbiji

PROŠIRENI SAŽETAK

Problem klimatskih promena utiče na svaki aspekt društva, uključujući i sve izraženiji problem klimatskih migracija, s obzirom na to da su samo u 2021. godini prirodne katastrofe raselile 23,7 miliona ljudi širom sveta. S obzirom na to da se očekuje da će se ovaj trend nastaviti, neophodna je promena paradigme u individualnom ponašanju prema životnoj sredini, posebno u pogledu ekoloških stavova. U tom domenu, na osnovu sociodemografskih, ekonomskih i ekoloških promenljivih, ovaj rad ima za cilj da istraži stavove univerzitetskih studenata u Srbiji u pogledu problema i rizika kada je u pitanju životna sredina, pre svega analizirajući da li su studenti svesni postojanja određenih ekoloških problema, da li mogu da prepoznaju buduće tokove kretanja tih problema i da li razumeju kako ovi problemi mogu uticati na njihove živote, uključujući potencijalne demografske promene kao što su migracije.

Kao budući lideri, donosioci odluka i edukatori u oblasti životne sredine, studenti predstavljaju vrlo važnu grupu zainteresovanih strana koji će biti lideri procesa primene i razvoja održivog razvoja. U ovom radu, istraživanje je sprovedeno na ukupnom uzorku od 165 studenata, sa većim učešćem studentkinja (67,9%) u odnosu na studente (32,1%). Većina ispitanika imala je između 19 i 24 godine, pretežno studirajući na državnim univerzitetima. Rezultati istraživanja pokazuju da studenti univerziteta imaju neadekvatne reciklažne navike (65%) i ograničen broj zelenih površina (73%) u svojim gradovima. Oni smatraju da su ekološki rizici značajni, što bi moglo dovesti do migracija (66%) i depopulacije urbanih područja (47%). Zalažu se za povećanje kampanja za podizanje svesti (66,7%) i veću upotrebu obnovljivih izvora energije (64,2%), kao i za strožije kazne za kršenje ekoloških propisa (61,8%). Analiza je pokazala značajnu povezanost između samoprocene ekološke svesti i stvarnog ekološkog ponašanja, pri čemu su studenti koji prijavljuju viši nivo svesti verovatnije angažovani u ekološki prihvatljivim akcijama. Pol i reciklažne navike u porodici bili su značajni prediktori ekološkog ponašanja, pri čemu su žene i studenti iz porodica koje praktikuju reciklažu skloniji ispoljavanju proekološkog ponašanja. Ovi rezultati ukazuju na to da su studenti univerziteta obuhvaćeni istraživanjem razvili ekološke navike i svest. Podrška mladima je ključna za rešavanje ekoloških problema i podsticanje održivog ponašanja. Pored obrazovnih napora u Srbiji, ovo zahteva sveobuhvatne inicijative vlade i civilnog društva.

KLJUČNE REČI

studenti u Srbiji, ekološka svest, održivi razvoj, stavovi prema životnoj sredini, rizici