The Impact of Human Activity on Environmental Elements Based on the Results of a Primary Research

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Abstract: Our global economy and society face many challenges every day. Issues such as reducing inequalities, alleviating poverty or even tackling environmental problems are becoming increasingly pressing. The push for sustainability and environmental protection has gained unprecedented momentum. It is clear that improving our quality of life is only possible if economic, social and environmental aspects are addressed simultaneously, as they are closely interlinked. There is already a large body of literature on the extent to which the economic, social and environmental subsystems are interdependent. Economic and social systems play a key role in protecting the values of the environment. Running the economy and maintaining society requires significant amounts of energy and resources, most of which come from the natural environment. However, environmental resources are not inexhaustible and have their limits. The growth of the economy and society puts increasing pressure on the environment, often causing serious damage. Growth cannot be sustained without infinite resources, which is why the principles of sustainability or conscious consumption are gaining increasing attention. We cannot manage our consumption habits and resource use without an appropriate level of responsibility, as we must also think about future generations. One of the key messages of sustainability is precisely that we need to act more consciously. To become more sustainable and environmentally friendly, it is essential to change our mindsets, habits and lifestyles. All this requires a change of direction, simultaneously and for everyone. This study is essentially an attempt to shed light on the role of human activity on environmental elements and what respondents perceive as the most positive or rather negative impacts of human activity. In addition to a literature review, it also presents the results of a primary research study that can help to further understand the relationship between human activity and the elements of the environment.

Keywords: sustainability; awareness; climate change; environmental elements

1 Introduction

The economy, society and the environment are closely interlinked and have a very significant impact on each other [1] [2] [3]. The economy and society require huge amounts of energy and resources to function, much of which is extracted from the natural environment. However, the resources of the environment are not unlimited, so our economic activities not only gradually deplete non-renewable resources, but also cause significant damage and strain to the natural environment [4]. This is why the issue of sustainability or awareness has become increasingly important [5]. We need to shape our consumption patterns and resource use with the interests of future generations in mind, and sustainability can be primarily conceptualised in this way [6]. Sustainability in this form is also embodied in a kind of future-oriented thinking, as we think not only about meeting our current needs, but also about the future, and what is more, we consider not only our own quality of life, but also that of future generations [7]. However, sustainability is not only about consumption or quality of life [8], but also about the sustainability of environmental values and condition [9]. No one wants to live in an environment that is unlivable, polluted or potentially detrimental to healthy living, so clean air and soil, water quality or even the state of the climate are equally valued in this issue. This study aims to take the concept of sustainability beyond consumption patterns and to focus on how this is reflected in our natural values. The economy and society are responsible for the state of the environment [9]. Industry, production, logistics, the multitude of businesses all have a significant environmental footprint [10]. Sustainability would require that the economy, society and the environment as subsystems are in harmony with each other [11] in such a way that environmental values are protected [12]. The state of the air, soil, water, vegetation, fauna, climate or even rocks and minerals play a key role in this.

Sustainability in this form is any purposeful effort, action, deed or change that is directed towards protecting, conserving and ensuring the availability of these environmental values and elements for future generations [13]. The study seeks to highlight that the economy and society are responsible for the state of the environment. Additionaly,whatever activities that are undertaken within these subsystems, they all have some impact on the aforementioned environmental elements [14]. It is a well-known saying: it is not man for the economy, but the economy for man. Thinking this further in this aspect, we can also say that it is not the natural environment for man, but man and the natural environment should be in true harmony with each other [15], which means that we do not fully consume its resources and do not have a negative impact on the state of our environment. This has been the subject of the primary research questions that this paper seeks to summarise.

2 Literature Review

The concept of sustainability should not be confused with other definitions of green, such as green transition or climate change [16]. It is important to see the difference between these [17] before conducting research on these topics. While sustainability is mostly a process approach, climate change is the result of a specific process. Being sustainable means striving to achieve a longer-term goal of better relations and relationships with our environment, whereas climate change is a measure of how much our lack of awareness or our damaging actions are already felt by our environment. The two concepts are different in this respect, yet they are linked, because if we were more sustainable in all aspects of our lives, it would have a noticeably positive impact on climate change [18]. It could also be said that climate change is a condition that we already perceive, while sustainability is everything, the effects of which we will only really perceive later [19]. The focus of this paper is now on what the outcome and impact of not being sustainable enough is and what it causes to the natural environment. The concept of climate change is much more precise than sustainability [20]. It refers to the extent to which the Earth's climate is changing to the extent that it causes changes in temperature, precipitation, wind patterns or atmospheric conditions over the long-term. As these change, so does the change in air quality, soil condition, water purity or the biosphere of flora and fauna [21]. Human and economic activity can affect these separately [22], but it is sufficient to have a negative impact on only one of these factors. All elements of nature - being complex systems - interact closely with each other, so that, for example, air pollution is unlikely to leave other environmental elements unaffected.

Our planet is already in a state of constant change [23], but with the expansion of human activities and human habitat in general, this change is only increasing [24]. Human activity has become a catalyst for the degradation of natural assets and these negative changes in the state of natural assets can be clearly observed. The present study was precisely interested in how much respondents perceive the footprint of human activity on natural values and where the most significant adverse human impact can best be detected. What form does this take in concrete terms? The expansion of industrial society is exacerbating pollution, increasing resource use and emissions [25] Business organisations are also increasingly required to report and report on their impact on the environment [26]. One of the most significant consequences of human activity is global warming and the greenhouse effect [27]. Greenhouse gas emissions are being driven further by industrial growth, which is trapping more heat in the Earth's atmosphere, raising the average annual temperature [28] [29]. It has been mentioned previously that it is sufficient to cause changes in just one environmental element to bring about further adverse processes. Increases in average temperature cause heat waves, upsetting the previous natural and habitual order of certain climatic features. Such a rise in temperature can be detrimental to human health, but can also cause

droughts, for example in agriculture [30]. Soil erosion and vegetation drying can result if the precipitation pattern of an area changes following a rise in temperature, or if the condition of natural water bodies or the quantity of water in natural streams changes [31]. The impact of human activity can be clearly assessed through changes in these factors and their condition. Rising average temperatures can also create additional problems [30] Melting polar icecaps, rising sea levels, flooding, and the submergence of previously permanently landlocked areas can all occur, with a concomitant reduction in human habitat. With climate change, we may experience changes in weather patterns, extreme weather events, an increase in natural disasters, and adverse weather events that are becoming more frequent and intense. Increasingly, forest fires, droughts, heavy rains, floods [31] can occur, affecting not only people, residential areas or infrastructure, but also the very important agricultural sector and, not least, elements of the natural environment [32]. However, this is not the only area where sustainability or lack of future-orientation is manifested [33]. Water quality is deteriorating, oceans are acidifying, as carbon dioxide accumulated in the atmosphere is also sequestered by seas and oceans, thus reducing the overall quality of water. Deterioration in water quality brings in direct proportion the damage to marine life, which damage species biodiversity [34].

Climate change puts species that cannot adapt quickly to changing ecological conditions in a very difficult situation. Unfortunately, this can catalyse species extinction, or in the worst case, lead to the complete disappearance of species [34]. The consequences are unpredictable, and can lead to a disruption of ecological stability [35] In addition to water quality, the condition of the soil should be a major concern [36]. Given that agriculture is still important for feeding humanity and generating GDP, the impact on this sector is not a minor issue [37]. Climate change exacerbates the problems of agriculture, as climatic conditions can have a significant impact on crop yields or livestock health [38]. In hot weather, diseases spread more, poor air quality causes respiratory problems, while pest infestations can have a negative impact on crop yields, and some animal species can spread diseases more intensively. It is hard to argue that human activity has not generated the phenomena mentioned above [39]. In recent decades, the world economy has expanded at an unprecedented rate, and the world population has skyrocketed compared to earlier periods in history [40], which has further increased humanity's energy needs. The rise in population has also meant that more and more land has had to be taken away from its natural habitat, cities are growing and expanding, while at the same time natural living space is shrinking [41]. However, human activity is not limited to more intensive use of resources or even more living space. In many cases, sustainability is linked to consumption and perhaps there is a realistic justification for this. As consumption needs expand, humanity needs more and more energy and living space, while at the same time the amount of waste produced is increasing dramatically [42]. Waste recovery remains a major challenge in many countries, as countries around the world are not at the same level of development and material resources [43].

In addition, people need to be culturally and socially up to the task and pay much more attention to avoid littering, collect and separate waste consciously and strive for conscious and rational consumption in order to avoid producing so much household waste [44]. Again, waste that is not properly managed and disposed of can cause significant degradation of elements of the natural environment, in particular soil degradation [45], water quality, air purity, and serious damage to flora and fauna. In addition, human activity can also lead to excessive water use [46], which can compromise security of supply, reduce water levels and the availability of clean drinking water for all. Not to mention that harmful human activities and accumulated wastes can reduce soil fertility, render entire parcels of land uncultivable and contribute to the degradation of soil water retention capacity [36]. Deforestation not only reduces biodiversity [34], but can also threaten the healthy ecosystem and balance of the region by reducing species' habitat [47] [48]. In addition to soil, human activities can also have adverse impacts on deeper soil layers [45], as inappropriate mining activities can also result in a range of environmental degradation, landslides and natural disasters. All of these can clearly be traced back to the impacts of human and, more narrowly, economic activities, and it is worth further investigating the actual impacts of human activities on each environmental element [49].

3 Material and Methods

The primary research underlying the study was to investigate the attitudes of respondents from different generational groups towards issues related to the environment and sustainability through a complex questionnaire. The sample population was the Hungarian population. Data were collected using a snowball method and no restriction was applied to the sample. A total of 5245 questionnaires were returned during the survey, but due to data cleaning, biased responses and incomplete completion, only 4,830 evaluable questionnaires were returned. The data collection started in January 2024 and lasted until the end of February, preceded by the testing of the questionnaire in December 2023. The primary reference point for defining the themes of the questionnaire was the relevant literature. Along the literature sources and current research directions, we developed a beta version of the questionnaire, which was finalised and sent out as is, depending on the results of the pre-testing. Our aim was to map the attitudes and attitudes of the sampled respondents towards sustainability issues, holding up a mirror to their own sustainability and environmental impact of their lifestyles. We were interested in seeing to what extent the age of the respondents, their subjectively assessed level of knowledge about environmental protection and sustainability, how they assess the impact of their own lives on the environment, and how they view their options for protecting certain environmental elements influence their individual environmental awareness. The results of the

questionnaire presented in this paper are based on responses to closed questions, where nominal and metric scaling questions (Likert and semantic differential scales) were included. With regard to the scale interval, an even scale from 1 to 4 was chosen due to the scale preference for individual respondents. In contrast to the odd-numbered scale, we opted for the even-numbered scale because it eliminated the middle value, chosen by many for simplicity, which could bias the results significantly. Thanks to the even number scale, we obtained clearer and clearer answers from the respondents, which clearly serves to improve our research results and conclusions. In our study, descriptive statistics and bivariate and multivariate results were used to process the sample in the form of cross tabulation analysis and analysis of variance. For the latter, a significance value of 5% was taken as the relevant value. The sample composition is shown in the table below.

Table 1

Sample composition by age and education of respondents

		Count	**Percent**
Individual responsibility in environmental degradation	I have absolutely no responsibility	418	8,65
	I'd rather not be responsible	1301	26,94
	I am more responsible for it	1998	41,37
	I am fully responsible for it	1113	23,04
Sustainable conscious living	Not sustainable at all	307	6,36
	Rather not sustainable	1230	25,47
	More sustainable	2408	49,86
	Fully sustainable	885	18,32
School education	Basic level (8 general)	451	9,34
	Secondary school (vocational school, upper secondary school)	2525	52,28
	Advanced degree - BSc. (college)	1220	25,26
	Advanced degree - MSc. (university)	634	13,13
Generational affiliation	Generation BB (1940 - 1964)	324	6,71
	Generation X (1965-1979)	944	19,54
	Generation Y (1980 - 1994)	1105	22,88
	Generation Z (1995 - 2007)	2254	46,67
	Alfa generation (2008-)	203	4,20

Source: own research, 2024, N = 4830

4 Results and Discussion

4.1. Role in Environmental Degradation and Subjective Perceptions of Individual Sustainable Living

The results of numerous studies and research show that the individual and household sectors play an important role in protecting the environment, which is unfortunately also true for the reverse - and thus also for environmental degradation and destruction. In our study, we first used a cross-sectional analysis to examine how the sample respondents self-reported their assessment and perception of the impact of their own activities on the environment, and the extent of the impact and responsibility they attribute to it. Respondents were asked to select from four categories (1 - I have no responsibility, 2 - I have rather no responsibility, 3 - I am rather responsible, and 4 - I am fully responsible) the category that best describes their own environmental responsibility. In terms of the percentage distribution of responses, we found that the majority of respondents, regardless of education and age, felt rather responsible for the environment, which was not the highest category. Second, in order was the second response option (2 - I prefer not to be responsible), which grouped respondents who were uncertain, hesitant or preferred to deny. The same pattern can be observed for the proportions appearing in the cross tabulation analysis. Regardless of the educational category, the third response option dominated in all cases, and with a minor correction the same can be said for generational affiliation. In this case, it should be highlighted that the majority of respondents in the youngest age group (generation alpha) feel that they have no responsibility for environmental degradation, as shown by the high response rates. Surprisingly, the majority of the sampled respondents felt less than 10% that they are fully responsible for our environment, which is a rate that could definitely be improved in terms of awareness.

We also investigated whether the two characteristics (education and age) have an impact on the individual sense of responsibility. The null hypothesis is the independence of the two variables (sense of responsibility and age, and sense of responsibility and education). The null hypothesis is rejected if the value is ≤ 0.05. The Khi-square value (less than 5%) indicates that both age and education have a clear effect on individual sense of responsibility. The strength of the effect was measured using Cramer's V value. As this value is below 0.1, it can be concluded that the relationship is noticeable, but not strong at all, i.e. neither education nor age has a strong effect on individual environmental responsibility.

Table 2
Percentage change in respondents' individual environmental responsibility perceptions for the total sample and correlation with age and education

	I have absolutely no responsibility	I'd rather not be responsible	I am more responsible for it	I am fully responsible for it	Pearson Chi-Square	Cramer's V
Basic level	1,718	2,547	3,271	1,801		
Secondary school	3,768	14,824	22,795	10,890		
Advanced degree - BSc.	1,760	6,439	10,290	6,770	***0,000***	0,082
Advanced degree - MSc.	1,408	3,126	5,010	3,582		
Total	**8,654**	**26,936**	**41,366**	**23,043**		
Generation BB	1,242	1,781	2,174	1,511		
Generation X	1,636	5,611	6,998	5,300		
Generation Y	1,822	5,631	9,876	5,549	***0,000***	0,085
Generation Z	3,271	12,671	21,097	9,627		
Alfa generation	0,683	1,242	1,222	1,056		
Total	**8,654**	**26,936**	**41,366**	**23,043**		

Source: own research, 2024, N = 4830

Table 3
Percentage change in respondents' assessment of sustainable lifestyles for the total sample and correlation with age and education

	Not sustainable at all	Rather not sustainable	More sustainable	Fully sustainable	Pearson Chi-Square	Cramer's V
Basic level	1,615	2,588	3,292	1,843		
Secondary school	2,298	13,313	27,184	9,482		
Advanced degree - BSc.	1,222	6,770	13,168	4,099	***0,000***	0,102
Advanced degree - MSc.	1,222	2,795	6,211	2,899		
Total	**6,356**	**25,466**	**49,855**	**18,323**		
Generation BB	1,346	1,139	2,609	1,615		
Generation X	0,766	5,072	9,979	3,727		
Generation Y	1,491	6,211	11,325	3,851	***0,000***	0,106
Generation Z	2,257	11,946	24,389	8,075		
Alfa generation	0,497	1,097	1,553	1,056		
Total	**6,356**	**25,466**	**49,855**	**18,323**		

Source: own research, 2024, N = 4830

Using the same methodology, we also explored how respondents rate and perceive the sustainability of their own lives in relation to the environment. Respondents were again given a choice of four categories (1 - not at all sustainable, 2 - rather unsustainable, 3 - rather sustainable, 4 - fully sustainable) and the null hypothesis for the cross-tabulation analysis was considered full independence (where the Chi-square value is ≥0.05). Again, we found that respondents significantly preferred the third category (the rather responsible response option). We also found the same for the generational breakdown. Based on the Chi-squared value, we found that this was below 5% in all cases, suggesting an effect between individual sustainability ratings and the respondents' education and age. In the present case, the Cramer V value showed that the relationship exists and is slightly stronger than for the previous question (above 0.1).

4.2. Correlation of Lifestyle Impact on Environmental Elements with Respondents' Segmentation Characteristics

Next, we also wanted to know how the sample of respondents evaluated the impact of their own activities and lives on certain elements of the environment. Here, we looked at four environmental elements: soil, air, water and the impact on and lifestyle of wildlife. One-way analysis of variance was used to compare groups based on generational affiliation and education, sustainability lifestyle and individual environmental responsibility. In the present case, our null hypothesis was that the means of the groups based on these characteristics did not differ from the sample mean. The null hypothesis is considered true if the significance value is above 5%.

First, the impact of individual activity on each environmental element was measured for groups based on educational attainment. Impacts were asked to be rated by respondents on a four-point Likert scale, with a score of 1 indicating the least impact and a score of 4 indicating the greatest impact. It can be seen that due to the relative co-movement of the sample means and the co-moving standard deviation values, the significance value for each environmental item was below 5%, which in all cases lead us to reject the null hypothesis, i.e. that respondents' educational attainment has an effect on how respondents perceive the impact of their lifestyle on the four environmental items below.

When looking at the average scores of the groups by highest educational attainment, it can be seen that in all cases the highest scores for the impact on environmental elements were found for respondents with secondary education. The majority of respondents with tertiary education scored below the sample average for lifestyle impacts on environmental elements, which is either due to greater awareness or greater attention. Another interesting finding was that the impact on air was rated the highest of all environmental elements by respondents (Table 4).

Table 4
Impact of respondents' lifestyle on environmental elements and education

		Mean	Std. dev.	F	Sig.
Soil	Basic level	2,000	1,389	6,698	***0,000***
	Secondary school	**2,200**	1,215		
	Advanced degree - BSc.	2,080	1,261		
	Advanced degree - MSc.	2,011	1,316		
	Total	2,126	1,259		
Air	Basic level	2,186	1,296	8,249	***0,000***
	Secondary school	**2,398**	1,154		
	Advanced degree - BSc.	2,249	1,197		
	Advanced degree - MSc.	2,226	1,277		
	Total	2,318	1,198		
Water	Basic level	2,215	1,281	8,418	***0,000***
	Secondary school	**2,355**	1,180		
	Advanced degree - BSc.	2,196	1,220		
	Advanced degree - MSc.	2,140	1,258		
	Total	2,274	1,213		
Wildlife	Basic level	2,195	1,322	5,083	***0,002***
	Secondary school	**2,297**	1,224		
	Advanced degree - BSc.	2,234	1,269		
	Advanced degree - MSc.	2,085	1,330		
	Total	2,244	1,261		

Source: own research, 2024, N = 4830 (One-Way ANOVA, sig ≤ 0.05)

The same question was also examined by the age of the respondents. In this case, too, we found that the null hypothesis was not confirmed in any of the cases, i.e. age, i.e. maturity, clearly influences the perception of subjective impact on environmental elements. With regard to the group averages, we found that respondents belonging to generation Z were the most critical towards themselves, as they rated the impacts on soil, air and water as the highest. This is due to the fact that this generation is defined as the "always online" generation, i.e. they spend the most time online and therefore have access to the most information. Many studies and surveys have shown that Generation Z is the most environmentally aware generation, and this was confirmed by our research. However, Generation Y had the highest impact on the living environment, which was also a result of maturity and life experiences (Table 5).

Table 5
Impact of respondents' lifestyle on environmental elements and generational affiliation

		Mean	Std. dev.	F	Sig.
Soil	Generation BB	1,846	1,315	9,666	***0,000***
	Generation X	2,003	1,226		
	Generation Y	2,186	1,264		
	Generation Z	**2,202**	1,237		
	Alfa generation	1,980	1,425		
	Total	2,126	1,259		
Air	Generation BB	1,920	1,229	17,953	***0,000***
	Generation X	2,195	1,163		
	Generation Y	2,336	1,186		
	Generation Z	**2,433**	1,177		
	Alfa generation	2,153	1,390		
	Total	2,318	1,198		
Water	Generation BB	1,914	1,224	13,645	***0,000***
	Generation X	2,148	1,184		
	Generation Y	2,336	1,217		
	Generation Z	**2,358**	1,189		
	Alfa generation	2,163	1,410		
	Total	2,274	1,213		
Wildlife	Generation BB	1,914	1,254	9,091	***0,000***
	Generation X	2,168	1,228		
	Generation Y	**2,312**	1,262		
	Generation Z	2,302	1,246		
	Alfa generation	2,103	1,464		
	Total	2,244	1,261		

Source: own research, 2024, N = 4830 (One-Way ANOVA, sig ≤ 0.05)

We also used analysis of variance to examine the relationship between perceptions of physiological impact on environmental elements and individual perceptions of environmental responsibility. In the present case, we found that the null hypothesis was rejected in all cases, i.e. there is a clear relationship between the two factors under investigation. As for the sample group averages, we found that the respondents who gave the highest mean scores were those who felt more responsible for each environmental factor. It is surprising, however, that in this case the sample means remained below 2.5, as was the case for the previous grouping characteristics (Table 6).

Table 6
Relationship between the impact of respondents' lifestyle on environmental elements and individual responsibility for environmental degradation

		Mean	Std. dev.	F	Sig.
Soil	I have absolutely no responsibility	1,629	1,260	45,991	***0,000***
	I'd rather not be responsible	1,959	1,154		
	I am more responsible for it	**2,315**	1,230		
	I am fully responsible for it	2,168	1,352		
	Total	2,126	1,259		
Air	I have absolutely no responsibility	1,687	1,197	67,735	***0,000***
	I'd rather not be responsible	2,163	1,101		
	I am more responsible for it	**2,515**	1,145		
	I am fully responsible for it	2,385	1,292		
	Total	2,318	1,198		
Water	I have absolutely no responsibility	1,715	1,253	56,976	***0,000***
	I'd rather not be responsible	2,107	1,114		
	I am more responsible for it	**2,463**	1,160		
	I am fully responsible for it	2,338	1,310		
	Total	2,274	1,213		
Wildlife	I have absolutely no responsibility	1,789	1,315	42,847	***0,000***
	I'd rather not be responsible	2,051	1,159		
	I am more responsible for it	**2,407**	1,223		
	I am fully responsible for it	2,346	1,349		
	Total	2,244	1,261		

Source: own research, 2024, N = 4830 (One-Way ANOVA, sig ≤ 0.05)

Last but not least, the same methodology was used to examine the relationship between subjective impact on sustainable lifestyles and environmental elements. Unsurprisingly, our null hypothesis was rejected in this case as well, and we found that the respondents who gave the highest mean score, i.e. thought they had the greatest impact on each environmental element, were those who lived the most sustainable lifestyle. The implication is that respondents who strive to ensure that their lives do not have a significant impact on the environment are the most critical of themselves and strive not to damage any of the environmental elements. Respondents whose lifestyles could not be described as sustainable at all, or who fall more into the unsustainable category, all scored below the sample average in terms of impact on environmental elements (Table 7).

Table 7
Relationship between the impact of respondents' lifestyle on environmental elements and subjectively perceived sustainability of lifestyle

		Mean	Std. dev.	F	Sig.
Soil	Not sustainable at all	1,723	1,357	15,995	***0,000***
	Rather not sustainable	2,062	1,192		
	More sustainable	2,158	1,186		
	Fully sustainable	**2,269**	1,461		
	Total	2,126	1,259		
Air	Not sustainable at all	1,954	1,305	11,552	***0,000***
	Rather not sustainable	2,284	1,119		
	More sustainable	2,362	1,115		
	Fully sustainable	**2,374**	1,438		
	Total	2,318	1,198		
Water	Not sustainable at all	2,000	1,316	11,457	***0,000***
	Rather not sustainable	2,176	1,137		
	More sustainable	2,319	1,131		
	Fully sustainable	**2,383**	1,450		
	Total	2,274	1,213		
Wildlife	Not sustainable at all	1,980	1,388	8,889	***0,000***
	Rather not sustainable	2,176	1,191		
	More sustainable	2,265	1,178		
	Fully sustainable	**2,371**	1,488		
	Total	2,244	1,261		

Source: own research, 2024, N = 4830 (One-Way ANOVA, sig ≤ 0.05)

4.3. The Relationship between the Different Grouping Characteristics and the Options Seen to Protect Environmental Elements

In the present part of the study, the methodology used in the previous section was used to assess what respondents think about their own individual potential to protect certain environmental factors such as soil, air, water or wildlife. Our basic method was again a one-way analysis of variance, carried out using ANOVA. In this case, we formulate the null hypothesis as we did in the previous subsection. It can be concluded that on the four-point Likert scale, where the highest value represented the greatest opportunity and impact, the majority of respondents gave a higher value to each factor than was seen in the previous question. In the present case, the average scores were above 2.5 with one exception. First, we examined the sample by educational attainment. It can be observed that the null hypothesis was rejected in all cases, as the significance value was below 5% for all four

environmental elements. Again, it can be seen that the respondents with the highest mean value were those with secondary education, who felt that they could do as much as possible to protect the environmental elements. This was noticeable for all environmental factors. Respondents with a primary education were most likely to be able to do the most for living things, those with a secondary education were more likely to be able to do the most for water, those with a tertiary education were most likely to be able to do the most for air, and those with a master's degree were again most likely to be able to do the most for water in their own lives. This is important because it is a reflection on all environmental factors that lead people to make informed choices.

Table 8

Respondents' perceptions of the potential impact of the environmental element on the groups with the highest educational attainment and the relationship between the two factors

		Mean	**Std. dev.**	**F**	**Sig.**
Soil	Basic level	2,166	1,334	19,411	***0,000***
	Secondary school	**2,547**	1,205		
	Advanced degree - BSc.	2,394	1,257		
	Advanced degree - MSc.	2,235	1,371		
	Total	2,432	1,261		
Air	Basic level	2,326	1,288	13,285	***0,000***
	Secondary school	**2,683**	1,155		
	Advanced degree - BSc.	2,602	1,183		
	Advanced degree - MSc.	2,502	1,321		
	Total	2,605	1,202		
Water	Basic level	2,264	1,301	20,682	***0,000***
	Secondary school	**2,709**	1,154		
	Advanced degree - BSc.	2,624	1,184		
	Advanced degree - MSc.	2,479	1,333		
	Total	2,616	1,208		
Wildlife	Basic level	2,335	1,327	11,478	***0,000***
	Secondary school	**2,691**	1,207		
	Advanced degree - BSc.	2,651	1,211		
	Advanced degree - MSc.	2,554	1,347		
	Total	2,629	1,243		

Source: own research, 2024, N = 4830 (One-Way ANOVA, sig ≤ 0.05)

Based on age, we again found that the null hypothesis was rejected here, i.e. we expected to find a significant relationship between age and the conservation of certain environmental elements. Again, we see that the highest scores were again given by members of Generation Z, i.e. they feel the most ambition and aspiration to do something to protect environmental factors. The highest average score for Generation BB respondents was for wildlife, Generation X respondents for air,

Generation Y respondents for wildlife, Generation Y respondents for water, and the youngest Generation Alpha respondents again said they were most concerned about air.

Table 9
Respondents' perceptions of the potential impact of a given environmental element on their generational group and the relationship between the two factors

		Mean	Std. dev.	F	Sig.
Soil	Generation BB	2,046	1,305	15,941	***0,000***
	Generation X	2,444	1,244		
	Generation Y	2,410	1,243		
	Generation Z	**2,528**	1,239		
	Alfa generation	2,044	1,415		
	Total	2,432	1,261		
Air	Generation BB	2,145	1,257	21,553	***0,000***
	Generation X	2,628	1,155		
	Generation Y	2,577	1,173		
	Generation Z	**2,709**	1,189		
	Alfa generation	2,232	1,383		
	Total	2,605	1,202		
Water	Generation BB	2,182	1,272	26,760	***0,000***
	Generation X	2,559	1,191		
	Generation Y	2,652	1,175		
	Generation Z	**2,731**	1,179		
	Alfa generation	2,084	1,364		
	Total	2,616	1,208		
Wildlife	Generation BB	2,188	1,328	21,464	***0,000***
	Generation X	2,632	1,184		
	Generation Y	**2,704**	1,210		
	Generation Z	2,700	1,234		
	Alfa generation	2,133	1,385		
	Total	2,629	1,243		

Source: own research, 2024, N = 4830 (One-Way ANOVA, sig ≤ 0.05)

Not surprisingly, we again found a link between individual sense of responsibility and the protection of environmental factors. That is, individual sense of responsibility is associated with the desire to protect environmental elements. This is certainly a positive result, as the sample averages are also much higher. It can be seen that those respondents who consider themselves fully responsible for the environment believe that they can do their best to protect each element.

Table 10
Respondents' perceptions of the potential impact of a given environmental element on the environment, grouped by environmental impact

		Mean	Std. dev.	F	Sig.
Soil	I have absolutely no responsibility	1,907	1,388	55,140	***0,000***
	I'd rather not be responsible	2,218	1,214		
	I am more responsible for it	2,585	1,174		
	I am fully responsible for it	**2,604**	1,324		
	Total	2,432	1,261		
Air	I have absolutely no responsibility	2,098	1,379	49,849	***0,000***
	I'd rather not be responsible	2,438	1,155		
	I am more responsible for it	2,708	1,146		
	I am fully responsible for it	**2,806**	1,207		
	Total	2,605	1,202		
Water	I have absolutely no responsibility	2,081	1,372	57,819	***0,000***
	I'd rather not be responsible	2,421	1,158		
	I am more responsible for it	2,745	1,130		
	I am fully responsible for it	**2,811**	1,244		
	Total	2,616	1,208		
Wildlife	I have absolutely no responsibility	2,005	1,387	66,402	***0,000***
	I'd rather not be responsible	2,457	1,215		
	I am more responsible for it	2,729	1,166		
	I am fully responsible for it	**2,887**	1,245		
	Total	2,629	1,243		

Source: own research, 2024, N = 4830 (One-Way ANOVA, sig ≤ 0.05)

In the present case, we also examined the relationship between the action taken to protect certain environmental elements and the subjectively perceived sustainability of lifestyle. The significance values show that, contrary to the null hypothesis, there is a relationship between the two factors. In the present case, we also found that those who perceived their lives as fully sustainable were also the most able to do the most to protect environmental elements.

Table 11
Respondents' perceptions of the potential impact of a given environmental element on their sustainable living group

		Mean	Std. dev.	F	Sig.
Soil	Not sustainable at all	1,919	1,335	52,881	***0,000***
	Rather not sustainable	2,179	1,216		
	More sustainable	2,529	1,174		
	Fully sustainable	**2,696**	1,409		
	Total	2,432	1,261		

Air	Not sustainable at all	2,029	1,378	43,468	***0,000***
	Rather not sustainable	2,440	1,154		
	More sustainable	2,699	1,093		
	Fully sustainable	**2,781**	1,388		
	Total	2,605	1,202		
Water	Not sustainable at all	1,971	1,363	47,033	***0,000***
	Rather not sustainable	2,467	1,169		
	More sustainable	2,720	1,092		
	Fully sustainable	**2,762**	1,398		
	Total	2,616	1,208		
Wildlife	Not sustainable at all	1,925	1,359	55,505	***0,000***
	Rather not sustainable	2,467	1,196		
	More sustainable	2,721	1,143		
	Fully sustainable	**2,852**	1,402		
	Total	2,629	1,243		

Source: own research, 2024, N = 4830 (One-Way ANOVA, sig ≤ 0.05)

Conclusion and the Limitations of the Research

The analysis conducted in this study suggests that the level of environmental awareness perceived along these questions is clearly related to educational attainment, age and individuals' perceptions of certain dimensions of sustainability. It was found that those with secondary education, Generation Z, are the most sensitive to environmental issues. We also found that the sense of responsibility is not as strong for the groups studied and that sustainable living is clearly associated with the desire to protect environmental elements. This suggests that younger people, in this case Generation Z respondents, are absolutely and measurably more sensitive to environmental issues. All these results can be attributed to the impact of the environmental education in which young people in their twenties have already participated. Thus, it has been shown that environmental education has a measurable impact, mainly in terms of generational differences of opinion. On the basis of education, however, it is surprising that those with tertiary education lagged behind those with secondary education in terms of sample averages. This is not due to lower awareness, but rather to age specificities. Respondents with tertiary education are more likely to be Generation Y or Generation X, so the results are in line with those measured earlier. Although the study draws its conclusions from a large sample, it is not representative. Nevertheless, the study captures the characteristics of the population, which could be a good starting point for further research. The study also shows that those who are trying to organise their lives in a sustainable way are also clearly striving to protect certain environmental elements. Each of these individual objectives is clearly a model of value, which is also a pledge of future survival. Therefore, it is very important that the various educational institutions and NGOs try to do as much as possible to increase knowledge of environmental protection and

environmental elements, to spread the importance of sustainability, so that the older generations can also be inspired by the desire to ensure a viable future for their children and grandchildren.

References

[1] Strange, T., Bayley, A. (2008) Sustainable Development: Linking Economy, Society, Environment. OECD Insights. OECD Publishing. Paris. https://doi.org/10.1787/9789264055742-en

[2] Mensah, J., Ricart Casadevall, S. (2019) Sustainable development: Meaning, history, principles, pillars, and implications for human action: literature review. Cogent Social Sciences. 5(1) https://doi.org/10.1080/23311886.2019.1653531

[3] Garlock, T. M., Asche, F., Anderson, J. L. (2024) Environmental, economic, and social sustainability in aquaculture: the aquaculture performance indicators. Nature Communications 15. 5274 (2024) https://doi.org/10.1038/s41467-024-49556-8

[4] Griggs D., Stafford-Smith M., Gaffney O., Rockström J., Öhman M. C., Shyamsundar P., Steffen W., Glaser G., Kanie N., Noble I. (2013) sustainable development goals for people and planet. Nature. (2013) 495, No. 7441, pp. 305-307, https://doi.org/10.1038/495305a, 2-s2.0-84875346108

[5] Vogt, M., Weber, C. (2019) Current challenges to the concept of sustainability. global sustainability. 2019;2:e4 https://doi.org/10.1017/sus.2019.1

[6] Damico, A. B., Aulicino, J. M., Di Pasquale, J. (2022) What Does Sustainability Mean? Perceptions of Future Professionals across Disciplines. Sustainability 2022, 14, 9650, https://doi.org/10.3390/su14159650

[7] United Nations (2019) Department of Economic and Social Affairs, Population Division.How Certain Are the United Nations Global Population Projections?Population Facts No. 2019/6, December 2019

[8] Stiglitz J. E., Fitoussi J-P., Durand, M. (2019) Measuring What Counts: The Global Movement for Well-Being New York: New Press

[9] Purvis, B., Mao, Y., Robinson, D. (2019) Three pillars of sustainability: in search of conceptual origins. Sustainability Science 14. pp. 681-695, https://doi.org/10.1007/s11625-018-0627-5

[10] Kabát, L., Lincényi, M. (2024) Economic development and business environment in EU countries under the social media support. Acta Polytechnica Hungarica, 21(11), 29-48, https://doi.org/10.12700/APH.21.11.2024.11.2

[11] Fischer, M. (2023) The Concept of Sustainable Development. In Sustainable Business, Springer Briefs in Business, Springer. Cham. https://doi.org/10.1007/978-3-031-25397-3_2

[12] Thompson P. B., (2017) The spirit of the soil: agriculture and environmental ethics. Second edition. Routledge. New York

[13] Ly A. M., Cope M. R. (2023) New Conceptual Model of Social Sustainability: Review from Past Concepts and Ideas. International Journal of Environmental Research and Public Health. 2023 Mar 31;20(7):5350. https://doi.org/10.3390/ijerph20075350 PMID: 37047965; PMCID: PMC10094592

[14] Vass, V., Farkas, Z. (2024) Environmental effects of alkaline degreasing for automotive, boat and machine industry purposes. Acta Polytechnica Hungarica, 21(10), 379-392, https://doi.org/10.12700/APH.21.10.2024.10.24

[15] Urdan, M. S., Luoma, P. (2020) Designing Effective Sustainability Assignments: How and Why Definitions of Sustainability Impact Assignments and Learning Outcomes. Journal of Management Education. 44(6) pp. 794-821, https://doi.org/10.11 77/1052562920946798

[16] Tseng, M. L., Tan, K. H., Geng, Y., Govindan, K. (2016) Sustainable consumption and production in emerging markets. International Journal of Production Economics Volume 181, November 2016, pp. 257-261

[17] Moore, J. E., Mascarenhas, A., Bain, J. (2017) Developing a comprehensive definition of sustainability. Implementation Science 12, 110, https://doi.org/10.1186/s13012-017-0637-1

[18] Sakalasooriya, N. (2021) Conceptual analysis of sustainability and sustainable development. Open Journal of Social Sciences. No. 9, pp. 396-414, doi: 10.4236/jss.2021.93026

[19] Traerup, S. (2022) The role of climate technologies in green transition pathways. Field Actions Science Reports, Special Issue 24, pp. 28-31

[20] Kakaki, S. (2013) climate change: its causes, effects and control. journal of educational and social research. 3(10), p. 73

[21] Burger, M., Wentz, J., & Horton, R. (2020) The law and science of climate change attribution. Columbia Journal of Environmental Law, 45(1) https://doi.org/10.7916/cjel.v45i1.4730

[22] Dyllick, T., Muff, K. (2016) Clarifying the Meaning of Sustainable Business: Introducing a Typology From Business-as-Usual to True Business Sustainability. Organization & Environment. 29(2), 156-174, https://www.jstor.org/stable/26164761

[23] Morelli, J. (2011) Environmental sustainability: a definition for environmental professionals, Journal of Environmental Sustainability. 1, Issue 1, Article 2, https://doi.org/10.14448/jes.01.0002

[24] Salas-Zapata, W. A., Ortiz-Muñoz, S. M. (2019) Analysis of meanings of the concept of sustainability. Sustainable Development. 2019;27, pp. 153-161, https://doi.org/10.1002/sd.1885

[25] Lamperti, F., Mazzacuto, M., Roventini, A., Semieniuk, G. (2019) The green transition: public policy, finance, and the role of the state, Quarterly Journal of Economic Research. Duncker & Humblot. Berlin. Vol. 88, Issue 2, pp. 73-88, https://doi.org/10.3790/vjh.88.2.73

[26] Jørgensen, S., Mjøs, A., Pedersen, L. J. T. (2022) Sustainability reporting and approaches to materiality: tensions and potential resolutions. Sustainability Accounting, Management and Policy Journal. 13(2). pp. 341-361, https://doi.org/10.1108/SAMPJ-01-2021-0009

[27] Munasinghe, M. (2001) Exploring the linkages between climate change and sustainable development: a challenge for transdisciplinary research Conservation Ecology 5(1):14

[28] Fox, M., Zuidema, C., Bauman, B., Burke, T., Sheehan, M. (2019) Integrating public health into climate change policy and planning: state of practice update. International Journal of Environmentel Reserach and Public Health. 2019 September 4;16(18) https://doi.org/10.3390/ijerph16183232

[29] Murshed, M., Nurmakhanova, M., Elheddad, M., Ahmed, R. (2020) Value addition in the services sector and its heterogeneous impacts on CO2 emissions: revisiting the EKC hypothesis for the OPEC using panel spatial estimation techniques. Environmental Science and Pollution Research. 27(31) pp. 38951-38973, https://doi.org/10.1007/s11356-020-09593-4

[30] Schuurmans, C. (2021) The world heat budget: expected changes Climate Change (pp. 1-15): CRC Press

[31] Chen, X.M., Sharma, A., Liu, H. (2023) The Impact of Climate Change on Environmental Sustainability and Human Mortality. Environments 2023, 10, 165, https://doi.org/10.3390/environments10100165

[32] Lipczynska-Kochany, E. (2018) Effect of climate change on humic substances and associated impacts on the quality of surface water and groundwater: a review. Science of The Total Environment. 640, pp. 1548-1565

[33] Markulev, A., Long, A. (2013) On sustainability: an economic approach. Staff Research Note. Productivity Commission. Canberra

[34] Shivanna, K. R. (2022) Climate change and its impact on biodiversity and human welfare. Proceedings of the Indian National Science Academy.

2022;88(2) pp. 160-171, https://doi.org/10.1007/s43538-022-00073-6, Epub 2022 May 2, PMCID: PMC9058818

[35] Humbatova, S. I., Hajiyeva, N., Garai-Fodor, M, Sood, K., Grima, S. (2024) The impact of economic growth on the ecological environment and renewable energy production: Evidence from Azerbaijan and Hungary. Journal of Risk and Financial Management, 17(7) 275 https://doi.org/10.3390/jrfm17070275

[36] Gama, J. (2023) The Role of Soils in Sustainability, Climate Change, and Ecosystem Services: challenges and opportunities. ecologies. 2023; 4(3) pp. 552-567, https://doi.org/10.3390/ecologies4030036

[37] Şimşek, E. K., Kara, M., Kalıpçı, M. B., Eren, R. (2024) Sustainability and the Food Industry: A Bibliometric Analysis. Sustainability 2024, 16, 3070, https://doi.org/10.3390/su16073070

[38] Lamperti, F., Mazzacuto, M., Roventini, A., Semieniuk, G. (2019) The green transition: public policy, finance, and the role of the state, Quarterly Journal of Economic Research. Duncker & Humblot. Berlin. 88(2) pp. 73-88, https://doi.org/10.3790/vjh.88.2.73

[39] Morawicki R. O., Díaz González, D. J. (2018) Food Sustainability in the Context of Human Behavior. The Yale Journal of Biology and Medicine. 2018 Jun 28;91(2) pp. 191-196

[40] Lenton, T. M., Xu, C., Abrams, J. F. (2023) Quantifying the human cost of global warming. Nature Sustainability 6, pp. 1237-1247, https://doi.org/10.1038/s41893-023-01132-6

[41] Dasgupta, P., Dasgupta, A., Barrett, S. (2023) Population, Ecological Footprint and the Sustainable Development Goals. Environmental and Resource Economics 84, pp. 659-675, https://doi.org/10.1007/s10640-021-00595-5

[42] Abubakar, I. R., Maniruzzaman, K. M., Dano, U. L., AlShihri, F. S., AlShammari, M. S., Ahmed, S. M. S., Al-Gehlani, W. A. G., Alrawaf, T. I. (2022) Environmental Sustainability Impacts of Solid Waste Management Practices in the Global South. International Journal of Environmental Research and Public Health. 19(19):12717 https://doi.org/10.3390/ijerph191912717

[43] Wilson, D. C. (2023) Learning from the past to plan for the future: a historical review of the evolution of waste and resource management 1970-2020 and reflections on priorities 2020-2030 - the perspective of an involved witness. Waste Management Research. 41 (12) pp. 1754-1813, https://doi.org/10.1177/0734242X231178025

[44] Ferronato, N., Rada, E. C., Gorritty Portillo, M. A., Cioca, L. I., Ragazzi, M., Torretta, V. (2019) Introduction of the circular economy within developing regions: a comparative analysis of advantages and opportunities

for waste valorization. Journal of Environment and Management 230. pp. 366-378, https://doi.org/10.1016/J.JENVMAN.2018.09.095

[45] Keesstra, S. D., Bouma, J., Wallinga, J., Tittonell, P., Smith, P., Cerdà, A., Montanarella, L., Quinton, J. N., Pachepsky, Y., van der Putten, W. H., Bardgett, R. D., Moolenaar, S., Mol, G., Jansen, B., Fresco, L. O. (2016) The significance of soils and soil science towards realization of the United Nations Sustainable Development Goals. SOIL, 2, pp. 111-128, https://doi.org/10.5194/soil-2-111-2016

[46] Li, P., Wu, J. (2024) Water Resources and Sustainable Development. Water 2024, 16, 134, https://doi.org/10.3390/w16010134

[47] Zhou, Q., Zhu, K., Kang, L., Dávid, L. D. (2023) Tea culture tourism perception: A study on the harmony of importance and performance. Sustainability, 15(3), 2838, 1-13, https://doi.org/10.3390/su15032838

[48] Duda-Gromada, K., Bujdosó, Z., Dávid, L. (2010) Lakes, reservoirs and regional development through some examples in Poland and Hungary. Geojournal of Tourism and Geosites, 5(1), 16-23

[49] Klarin, T. (2018) The Concept of Sustainable Development: From its Beginning to the Contemporary Issues. Zagreb International Review of Economics and Business. Vol. 21, No. 1, Sciendo. 2018. pp. 67-94, https://doi.org/10.2478/zireb-2018-0005