



Roman **NOVOTNY** • Martin **ROVNAK** • Lenka **STOFEJOVA** •
Peter **ADAMISIN** • Matus **BAKON**

ANALYTICAL VIEW ON PERCEPTIONS OF SELECTED ENVIRONMENTAL PROBLEMS IN EASTERN SLOVAKIA: A GENERATIONAL PERSPECTIVE

Roman **Novotny**, PhD (ORCID: 0000-0001-9095-5633)

Martin **Rovnak**, PhD (ORCID: 0000-0003-3969-6482)

Lenka **Stofejova**, MsC (ORCID: 0000-0001-5695-4047)

Peter **Adamisin**, PhD (ORCID: 0000-0002-8077-4078)

Matus **Bakon**, PhD (ORCID: 0000-0002-8850-9738)

– *University of Presov in Presov, Faculty of Management, Department of Environmental Management*

Correspondence address:

Konstantinova 16, 080 01 Presov, Slovakia

e-mail: martin.rovnak@unipo.sk

ABSTRACT: The aim of the paper was to evaluate and compare respondents' views from eastern Slovakia on selected environmental issues from a generational perspective. The study used an online questionnaire survey to collect the data. According to the results, each generation views the severity of environmental problems differently, with Generation Y placing the highest priority on them and the Baby Boomers placing the lowest. Based on the performed statistical testing, we can confirm a statistically significant difference between individual generations of respondents on the question of the Covid-19 pandemic's positive impact on the environment, but no statistically significant difference between individual generations of respondents on whether they think waste sorting and recycling reduces the amount of waste deposited in landfills or whether they think waste sorting and recycling increases the amount of waste deposited in landfills.

KEYWORDS: environmental perceptions, environmental attitudes, environmental problems, generational perspective, eastern Slovakia

Introduction

In the current age of modern, rapidly changing social, economic, scientific and technical conditions, human society faces global environmental problems that have a destructive impact on nature and the planet in general (Shcheblyakov et al., 2019). The main environmental problems of mankind include air pollution, water pollution, soil contamination, climate change, depletion of natural resources, waste, illegal landfills, plastics in the oceans, noise pollution and others. The activities of human civilisation and their globalisation are the dominant actors in the constant changes of the global environment in the current scenario (Singh and Singh, 2017). The following sections list several studies that examine selected environmental problems in terms of perceptions of different groups of people.

Perception of the environment is one of the pillars of sustainable development and the state of the environment may be based on a series of indicators that can be assessed on an objective scale, such as the concentration of certain pesticides in groundwater, the concentration of particular air pollutants and the number of endangered species, but the consideration of public opinion about their environment is of high interest too and can be interpreted as a driving force for actions to improve the environment (Sachs, 2015; Carlsen and Bruggemann, 2020). An interesting source of such information can be found on the Numbeo (2021) website, based on information collected directly from people living in the area. Collected information is the basis for the study by Carlsen and Bruggemann (2020), which examined environmental perception in 33 European countries based on eight indicators through the application of partial ordering methodology. The results show that the most important factors for the overall environmental perception were found to be 'noise and light pollution' and 'dissatisfaction with green and parks in the city,' while 'water pollution,' 'dissatisfaction with garbage disposal' and 'air pollution' apparently play a less dominant role.

The need to recycle used materials has become an urgent environmental problem. Waste recycling has several positive effects on sustainable development and significantly reduces the demand for virgin raw materials and the amount of waste in landfills. Fiorillo (2013) analysed the determinants of household recycling in Italy with particular emphasis on social behaviour. Five different materials were examined: paper, glass, plastic, aluminium and food waste. The results of the probit regressions suggest that membership in non-profit associations, church participation, the habit of talking about politics and reading newspapers are significantly correlated with household recycling behaviour, while gender, age, education and household income play the most significant role. Findings also show that having waste recycling bins

in the home improves household recycling behaviour for all materials, whereas not having recycling bins has a negative impact on household recycling results. In the case of electrical waste, Islam, Dias and Huda (2021) used a questionnaire survey to examine young consumers' perceptions and patterns of disposing of waste electrical and electronic equipment. The results of the study showed that although consumers were aware of what e-waste is, there is a significant lack of knowledge about collection points and current recycling programs. It was also found that most respondents tended to dispose of e-waste in a correct way, suggesting that awareness-raising programs are necessary to prevent the incorrect disposal of this type of waste. The reasons for disposal and the frequency of buying new products were positively related to household income.

Regarding soil contamination as an environmental problem, much attention is paid to the problem of PCB soil contamination, for example, in the United Kingdom, USA, Canada, Japan, and Sweden. At present, one of the most curious topics in soil contamination in Slovakia is the company Chemko Strážske and its impact on the environment and human health. Currently, this area is one of the most contaminated areas in Europe. One of the production areas was also the production of PCBs. The expected source of pollution is around 2,750 tons of products based on PCBs, part of which was released into the environment mainly in the company's vicinity (in the form of production waste, improper storage or improper disposal). Contamination of sediments in the sewerage of the Laborec River and the Šírava Reservoir exceeds 1000 times the permitted limits of substances in the territory of the Slovak Republic. The content of the mentioned PCB substances caused a partial degradation of the soil. Contaminated soils are a source of environmental contamination and travel long distances in the form of steam or absorbed solids. The behaviour of PCBs in the soil affects the basic properties of the soil. The content of these substances in the soil is also affected by agricultural activity, namely tillage or application of sludge (Danielovič, Hecl and Danilovič, 2014)

Kusá and Piatrov (2020) state that natural resources are burdened by the amount of goods that arise from "hobby shopping", and few consumers are aware of the negative impact of their purchases on the planet, causing serious environmental problems. The generation C (digital lifestyle generation) subsegment, on the other hand, was identified as promising for its potential to adopt pro-environmental consumer behaviour as well as promote environmentally friendly values in other consumer segments. Consumers in the Generation C subsegment are concerned about environmental issues and consider issues related to this topic to be important. However, they think that this issue is inadequately presented and socially under-discussed. They also

think that sellers ignore this topic, which makes it possible to assume that Generation C wants brands and businesses to address this topic actively.

Environmental issues also affect areas such as food, and this trend has also affected consumer views. According to a survey conducted by Łuczka (2019), consumers are placing a greater emphasis on health and environmental concerns as reasons for purchasing organic food, indicating an increase in consumer awareness and a shift from an egoistic to an altruistic approach to how their purchasing decisions affect the natural environment when compared to previous research findings. An increase in the share of regular consumers, a key segment of the organic food market, as well as the fact that online sales are seen as a promising place to buy organic food, are among the identified positive developments.

It is necessary to define these generations because the paper is concerned with hypotheses about generational differences in terms of opinions on various environmental problems and issues. McCrindle (2014) and McCrindle and Fell (2020) divide the generations according to the following table (table 1).

Table 1. Individual generations by years of birth

Generation	Years of birth
Builders	From 1925 to 1945
Boomers	from 1946 to 1964
Generation X	from 1965 to 1979
Generation Y	from 1980 to 1994
Generation Z	from 1995 to 2009
Generation α	from 2010 – current generation of children

Source: author's work based on McCrindle; McCrindle and Fell [20-06-2021].

Gray et al. (2019) examined respondents' reactions from the United States, characterised by age and generational cohort, to the presentation of small and large hypothetical losses due to climate change. The same participants were then asked to indicate their support for future policy measures to halt these environmental losses. Overall, the results do not suggest that the younger generations experience potential losses as more acute as the older generations; neither age nor the generational group correlated with the perceived severity of environmental losses or the support of future measures to prevent them. A more robust predictor of both dependent variables was the orientation towards environmental values (biosphereism) and the political

orientation they themselves stated. A multi-country study to support measures to reduce the risk of climate change through geoengineering also found that the age of participants was not a factor (Visschers et al., 2017). On the contrary, Gifford and Nilsson (2014) suggest that older people are more interested in the environment and show a greater affinity for engaging in a wide range of small-scale pro-environmental behaviours (e.g., Fair Trade goods purchases or recycling). They suggest that this observation may be due to the generational cohort (not strictly age-related) differences.

The impact of Coronavirus infection (COVID-19) on the current situation must also be mentioned, because it is a major problem that not only affects the population's health, but also the environment in various ways. Shakil et al. (2020) reported that the current outbreak of COVID-19 has had a significant impact on environmental factors. Their study presented a critical analysis of 57 studies on the relationship between COVID-19 and the environment, published in nine journals by May 2020. They conclude that the COVID-19 pandemic has led to an improvement in the quality of the environment. However, these reductions were due to lockdown and were persistent during the lockdown period. It is not known whether the quality of the environment will persist in the long term.

Research methods

The study focuses on evaluating and comparing views of respondents from eastern Slovakia on selected environmental issues from a generational perspective. The study used a survey technique to collect the data. In order to find out the environmental awareness of individual generations and their views on environmental issues, we used a survey technique in the form of an online questionnaire to collect the data. The questionnaire contains 4 questions in which we wanted to find out socio-demographic data of the respondents and 17 questions about views and attitudes to selected environmental problems, which we dealt with in the theoretical background of the paper.

Since the contribution is focused on generations' attitudes to selected environmental problems, it was necessary to determine the age range of the examined generations. McCrindle (2014) and McCrindle and Fell (2020) introduced dividing into six generations: Builders, Boomers, Generation X, Generation Y, Generation Z and Generation α . Due to the current epidemiological situation and needed technical skills, it would be difficult to obtain a sufficient number of responses from respondents from the oldest generation (Builders), so this category was not included. The youngest generation, which is called Generation α , was also omitted. The reason for not including this generation is that the age is too young to understand the issue.

Between 07.02.2021 and 05.03.2021, an online questionnaire survey was conducted. The answers of the questionnaire survey were analysed using descriptive and inductive statistical methods. The obtained data were analysed using SPSS Statistics 27.0.1.0, a statistical programme.

Results of the research

Two hundred one respondents attended the online questionnaire survey. Most respondents ($n = 52$) were included in the Generation Z, followed by respondents from Generation X ($n = 51$) and Generation Y ($n = 50$). The least respondents were within the Boomers generation ($n = 48$). The percentages can be seen in figure 1.

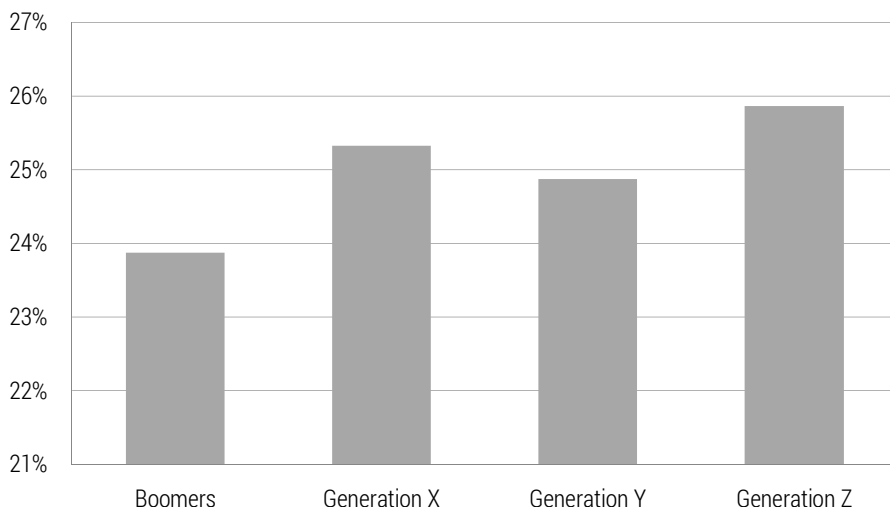


Figure 1. Percentage of respondents in individual categories of generations

Source: author's work.

Males made up 50.2 percent of the survey respondents, while females made up 49.8%. The location of respondents' residence was also inquired about. They could live in either a city or a rural area. Rural area was marked by 48.8% of respondents and city by 51.2% of respondents. Next, we were interested in the region in which the respondents live. As we determined in advance that our survey focuses only on eastern Slovakia, we distributed the questionnaire exclusively to respondents living in the Prešov and Košice regions. 52.7 percent of the addressed respondents who took part in the questionnaire survey were from the Prešov Region and 47.3% from the Košice Region. These socio-demographic variables are further described in table 2.

Table 2. Frequency distribution of socio-demographic variables of respondents

Variable	Category	Boomers	Generation X	Generation Y	Generation Z	Frequency
Gender	Male	17	26	38	20	101
	Female	31	25	12	32	100
	Total	48	51	50	52	201
Residence	Rural area	21	26	21	30	98
	City	27	25	29	22	103
	Total	48	51	50	52	201
Region of residence	Prešov Region	25	29	28	24	106
	Košice Region	23	22	22	28	95
	Total	48	51	50	52	201

Source: author's work.

In the first question, we wanted respondents to prioritise individual environmental issues. Selected environmental problems could be assigned a priority from 1 – lowest priority to 5 – highest priority. Even though not all these problems are known or present in Slovakia, we wanted to find out the general view of generations. If we compare all the answers, regardless of the generation, we find that the largest number of respondents marked the lowest priority 1 to the problem of climate change, with the number of 32 respondents (15.9%). Most respondents marked priority 2 to noise pollution, with a number of 53 respondents (26.4%). Most respondents also assigned priority 3 to noise pollution, but in as many as 68 cases, representing 33.8% of all respondents. Priority 4 was mostly assigned to the environmental problem of polluted air, with 56 respondents (27.9%). Most respondents marked priority 5 to the water pollution, with 81 labels, representing 40.3% of respondents. In general, according to the previous information and the mean priority of individual environmental problems, it can be said that the respondents identified the biggest environmental problems as polluted air ($\bar{x} = 3.80$) and water pollution ($\bar{x} = 3.75$) and the least as noise pollution ($\bar{x} = 2.93$) and climate change ($\bar{x} = 3.46$). When we compare the individual generations and their assignment of priorities from 1 to 5, we find a difference in the answers. In the case of climate change, all generations had the highest number of priorities assigned to the number 5, but the largest difference can be seen between Generation X, which reached the mean score of 3.08, and Generation Z, which reached the mean score of 3.79. The intergenerational difference is not so notable in the case of waste, although 33.3%

($n = 16$) of the oldest generation of respondents (Boomers) identified waste as priority 4, in contrast to generation X, where only 7.8% ($n = 4$) of respondents identified this option, based on the mean scores the largest difference is visible between Generation Z (3.44) and Generation Y (3.98). In the case of the illegal landfills, the biggest difference is between Generation X ($\bar{x} = 3.45$) and Generation Y ($\bar{x} = 4.02$) and in the case of plastics in the oceans, the biggest difference is between the Boomers generation ($\bar{x} = 3.13$) and Generation Y ($\bar{x} = 4.00$). Concerning the problem of air pollution, 41.7% ($n = 20$) of respondents from the Boomers generation indicated priority 4. In comparison, the same rating was given by only 9.8% ($n = 5$) of respondents from Generation X, but based on the mean scores biggest difference was found between Generation X (3.43) and Generation Z (4.13). In the case of the problem of soil contamination, the biggest difference is visible between the Boomers generation ($\bar{x} = 3.00$) and the Generation Y ($\bar{x} = 3.92$) and in the case of the water pollution problem between the Boomers generation ($\bar{x} = 3.42$) and the Generation Y ($\bar{x} = 4.08$). Noise pollution achieved the lowest mean score for all the generations examined, with the exception of Generation X, which achieved the lowest score for the climate change problem. The lowest score was achieved for noise pollution by Generation Z (2.58) and the highest by Generation Y (3.22). From the answers obtained, it is clear that each generation perceives the severity of environmental problems differently. When averaging the results, Generation Y gave the highest priority to environmental issues (3.84), followed by Generation Z (3.57), Generation X (3.38), and generation of Boomers gave the lowest priority to the mentioned environmental issues (3.33). The results of this question are shown in table 3.

Table 3. Priorities assigned to individual environmental problems

Priority	1	2	3	4	5	Mean priority
CLIMATE CHANGES						
Boomers	8	7	5	12	16	3.44
Generation X	11	7	13	7	13	3.08
Generation Y	6	3	18	5	18	3.52
Generation Z	7	3	8	10	24	3.79
Total	32	20	44	34	71	3.46
WASTE						
Boomers	6	5	7	16	14	3.56
Generation X	5	9	12	4	21	3.53
Generation Y	5	3	6	10	26	3.98

Priority	1	2	3	4	5	Mean priority
Generation Z	7	5	14	10	16	3.44
Total	23	22	39	40	77	3.63
ILLEGAL LANDFILLS						
Boomers	4	4	12	12	16	3.67
Generation X	7	6	14	5	19	3.45
Generation Y	4	5	3	12	26	4.02
Generation Z	2	7	15	13	15	3.62
Total	17	22	44	42	76	3.69
PLASTICS IN THE OCEANS						
Boomers	4	15	11	7	11	3.13
Generation X	9	6	13	5	18	3.33
Generation Y	4	2	12	4	28	4.00
Generation Z	6	7	7	17	15	3.54
Total	23	30	43	33	72	3.50
AIR POLLUTION						
Boomers	2	7	8	20	11	3.65
Generation X	7	7	13	5	19	3.43
Generation Y	2	3	9	17	19	3.96
Generation Z	2	3	7	14	26	4.13
Total	13	20	37	56	75	3.80
SOIL CONTAMINATION						
Boomers	4	18	9	8	9	3.00
Generation X	5	6	14	9	17	3.53
Generation Y	3	2	12	12	21	3.92
Generation Z	2	8	20	4	18	3.54
Total	14	34	55	33	65	3.50
WATER POLLUTION						
Boomers	3	6	18	10	11	3.42
Generation X	4	10	10	7	20	3.57
Generation Y	4	1	9	9	27	4.08
Generation Z	4	3	10	12	23	3.90
Total	15	20	47	38	81	3.75
NOISE POLLUTION						

Priority	1	2	3	4	5	Mean priority
Boomers	7	17	9	11	4	2.75
Generation X	3	10	21	10	7	3.16
Generation Y	2	11	21	6	10	3.22
Generation Z	10	15	17	7	3	2.58
Total	22	53	68	34	24	2.93

Source: author's work.

Based on the processing of primary data from the questionnaire survey, we performed analyses of differences and, from a generational perspective, verified hypotheses concerning differences within selected variables (questions).

Hypothesis H1 testing:

- Hypothesis 0: We assume that there is no statistically significant difference between individual generations of respondents and their attitude to whether they think that waste sorting and recycling reduces the amount of waste deposited in landfills.
- Hypothesis 1: We assume that there is a statistically significant difference between individual generations of respondents and their attitude to whether they think that waste sorting and recycling reduces the amount of waste deposited in landfills.

We used the Shapiro-Wilk W test to verify the normality, which showed that the variable does not have a normal distribution ($P = 0.0000$). Therefore we had to use the nonparametric Kruskal-Wallis test.

Based on the achieved level of significance of the Kruskal-Wallis test ($p = 0.0674$), we can say that there was no statistically significant difference between individual generations. Because the measured p-value is higher than the value of the test statistic value $p = 0.05$, we reject hypothesis H1 and accept hypothesis H0, assuming that there is no statistically significant difference between individual generations of respondents and their attitude to whether they think that waste sorting and recycling reduces the amount of waste deposited in landfills.

Hypothesis H2 testing:

- Hypothesis 0: We assume that there is no statistically significant difference between individual generations of respondents and their attitude to whether PCBs produced in the past by Chemko Strážske are currently a serious environmental problem.

- Hypothesis 1: We assume that there is a statistically significant difference between individual generations of respondents and their attitude to whether PCBs produced in the past by Chemko Strážske are currently a serious environmental problem.

The Shapiro-Wilk W test showed that the variable does not have a normal distribution ($P = 0.0000$), and therefore we had to use the nonparametric Kruskal-Wallis test.

Based on the achieved level of significance of the Kruskal-Wallis test ($p = 0.0939$), we can say that there was no statistically significant difference between the individual generations. Because the measured p-value is higher than the value of the test statistic value $p = 0.05$, we reject hypothesis H1 and accept hypothesis H0, assuming that there is no statistically significant difference between individual generations of respondents and their attitude to whether PCBs produced in the past by Chemko Strážske are currently a serious environmental problem.

Hypothesis H3 testing:

- Hypothesis 0: We assume that there is no statistically significant difference between individual generations of respondents in the question of the positive impact of the Covid-19 pandemic on the environment.
- Hypothesis 1: We assume that there is a statistically significant difference between individual generations of respondents in the question of the positive impact of the Covid-19 pandemic on the environment.

To test the hypothesis, we firstly used the Shapiro-Wilk W test to test normality, which showed us that the variable did not have a normal distribution ($P = 0.0000$). Therefore we had to use the nonparametric Kruskal-Wallis test.

Based on the achieved level of significance of the Kruskal-Wallis test ($p = 0.0001$), we can say that there was a statistically significant difference between individual generations. Because the measured p-value is lower than the test statistic value $p = 0.05$, we reject hypothesis H0 and accept hypothesis H1, assuming a statistically significant difference between individual generations of respondents in the question of the positive impact of the Covid-19 pandemic on the environment. According to the mean scores, it is clear that the most significant differences were achieved between the generation of Boomers, which achieved the lowest score, and Generation Y, which achieved the highest score.

Conclusions

Examining whether younger people, defined by age or generation, are more concerned about environmental issues than older people or generations is an important scientific topic in terms of targeting the right target group in environmental awareness campaigns. The paper aimed to evaluate and compare respondents' views from eastern Slovakia on selected environmental issues from a generational perspective. Based on the questionnaire survey results, it is clear that the severity of environmental problems is perceived differently by each generation, and in general, Generation Y gave them the highest priority, followed by Generation Z, Generation X, and generation of Boomers gave them the lowest priority. Based on the statistical testing, we can state that:

- there is no statistically significant difference between individual generations of respondents and their attitude to whether they think that waste sorting and recycling reduces the amount of waste deposited in landfills,
- there is no statistically significant difference between individual generations of respondents and their attitude to whether PCBs produced in the past by Chemko Strážske are currently a serious environmental problem,
- there is a statistically significant difference between individual generations of respondents in the question of the positive impact of the Covid-19 pandemic on the environment.

Acknowledgements

This article is one of the outputs of the research project of the Slovak Grant Agency VEGA under Grant No 1/0648/21 Creation of a multi-criteria model for evaluating the effectiveness of meeting the goals of the Agenda 2030 for the management of sustainable development. The contribution was also created thanks to the expert assistance of the Energy Cluster of Prešov Region and the financial support of the Environmental Energy Agency (Environmentálna energetická agentúra, n.o.).

The contribution of the authors

Roman Novotny – 30% (literature review, data analysis, interpretation, language correction).

Martin Rovnak – 30% (conception, data analysis, conclusions).

Lenka Stofejova – 20% (literature review, language correction).

Peter Adamisin – 10% (data collection, data analysis).

Matus Bakon – 10% (literature review, data collection).

References

- Carlsen, L., Bruggemann, R., 2020. Environmental perception in 33 European countries: an analysis based on partial order. *Environment, Development and Sustainability*, 22(3), 1873-1896, <https://doi.org/10.1007/s10668-018-0267-z>.
- Danielovič, I., Hecl, J., Danilovič, M., 2014. Soil Contamination by PCBs on a Regional Scale: The Case of Strážske, Slovakia. *Polish Journal of Environmental Studies*, 23(5), 1547-1554.
- Fiorillo, D., 2013. Household waste recycling: national survey evidence from Italy. *Journal of Environmental Planning and Management*, 56(8), 1125-1151, <https://doi.org/10.1080/09640568.2012.709180>.
- Gifford, R., Nilsson, A., 2014. Personal and social factors that influence pro-environmental concern and behaviour: A review. *International Journal of Psychology*, 49(3), 141-157, <https://doi.org/10.1002/ijop.12034>.
- Gray, S.G., Raimi, K.T., Wilson, R., Árvai, J., 2019. Will Millennials save the world? The effect of age and generational differences on environmental concern. *Journal of environmental management*, 242, 394-402, <https://doi.org/10.1016/j.jenvman.2019.04.071>.
- Islam, M.T., Dias, P., Huda, N., 2021. Young consumers'e-waste awareness, consumption, disposal, and recycling behavior: A case study of university students in Sydney, Australia. *Journal of Cleaner Production*, 282, 124490, <https://doi.org/10.1016/j.jclepro.2020.124490>.
- Kusá, A., Piatrov, I., 2020. Perception of global environmental problems by Generation C and its marketing communication preferences. *SHS Web of Conferences*, 74(3), 01021, <https://doi.org/10.1051/shsconf/20207401021>.
- Łuczka, W., 2019. Changes in the behavior of organic food consumers. *Ekonomia i Środowisko*, 70(3), 140-153, <https://doi.org/10.34659/2019/3/40>.
- McCrandle, M., 2014. *The ABC of XYZ; Understanding the Global Generations*. Bella Vista: McCrandle Research Pty Ltd.
- McCrandle, M., Fell, A., 2020. *Understanding Generation Alpha*. Solent Circuit: McCrandle Research Pty Ltd.
- Numbeo, 2021. *Pollution*, <https://www.numbeo.com/pollution/>, [20-06-2021].
- Sachs, J.D., 2015. *The age of sustainable development*. New York: Columbia University Press.
- Shakil, M.H., Munim, Z.H., Tasnia, M., Sarowar, S., 2020. COVID-19 and the environment: A critical review and research agenda. *Science of the Total Environment*, 745, 141022, <https://doi.org/10.1016/j.scitotenv.2020.141022>.
- Shcheblyakov, E.S., Ivanova, N.G., Melnikova, T.V., Farafontova, E.L., 2019. The main environmental problems of mankind and possible solutions. *IOP Conference Series: Earth and Environmental Science*, 315(2), 022083, <https://doi.org/10.1088/1755-1315/315/2/022083>.
- Singh, R.L., Singh, P.K., 2017. Global environmental problems. In: *Principles and applications of environmental biotechnology for a sustainable future*, 13-41. Springer: Singapore, https://doi.org/10.1007/978-981-10-1866-4_2.
- Visschers, V.H., Shi, J., Siegrist, M., Arvai, J., 2017. Beliefs and values explain international differences in perception of solar radiation management: insights from a cross-country survey. *Climatic Change*, 142(3), 531-544, <https://doi.org/10.1007/s10584-017-1970-8>.