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# THE USE OF THE NEW ECOLOGICAL PARADIGM SCALE TO MONITOR THE ENVIRONMENTAL ATTITUDES OF POLISH STUDENTS BEFORE AND AFTER THE IPCC SPECIAL REPORT ON GLOBAL WARMING OF 1.5°C

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**Purpose:** In October 2018, the IPCC Special Report on Global Warming of 1.5°C was published. The Youth Climate Strike took place in many Polish cities. Over the last few years, there has been a noticeable change in the approach to environmental protection in Poland, which has been observed both in the media and in everyday life. The aim of the article is to present how the environmental awareness of Polish students has changed following specific events and changes in the general approach to environmental protection in Poland.
**Design/methodology/approach**: The study was conducted using the New Ecological Paradigm Scale questionnaire and a questionnaire checking the state of knowledge about the natural environment as well as about the causes and consequences of its pollution. The study was conducted in 2016 on a group of 624 students of various faculties and universities in several Polish cities, repeated in 2021 on a group of 700 students.
**Findings:** After 5 years, the results were similar, especially concerning the environmental knowledge. The only significant change concerned beliefs about the reality of a serious ecological crisis and the negative impact of human activity on the environment. An increase of the level of knowledge was observed mainly regarding current and widely discussed issues such as smog.
**Practical implications:** According to the results, the increase in awareness of the harmfulness of human activity is not accompanied by significant increase in environmental knowledge, therefore it is worth to improve environmental education.
**Social implications:** Polish students are more aware of the harmfulness of human activity and the perspective of environmental crisis than before, therefore they are presumably more interested in environmental issues and willing to learn about the natural environment and its protection.
**Originality/value:** The article provides a comparison of results of research conducted before and after important events and significant changes in the country.
**Keywords:** New Ecological Paradigm Scale, environmental awareness of students, environmental attitudes, environmental knowledge, fear of environmental crisis.
**Category of the paper:** Research paper.

## 1. Introduction

In the second half of the 20th century, when the foundations of modern environmental awareness were being formed in the Western Europe and in United States of America, Poland, for various reasons, remained outside the mainstream of this process. Environmental issues did not garner much interest and were most often identified with protection of the natural environment understood in a very traditional sense.

New issues brought on by the anthropogenic nature of the growing global environmental crisis (Jonas, 1996) did not arouse much interest. The sustainable development strategy promoted by the UN (Our Common Future, 1987) and the European Union was treated as a problem of the distant future, affecting future generations rather than those currently living (Pastusiak, 1999).

Public attention was mainly drawn to the spectacular activities of radical supporters of "deep ecology" (Devall, Sessions, 1995; Dziubek-Hovland, 2004; Gliński, 1988, 1996; Żuk, 2001; Through environmentalism to freedom, 2014). Protests against the construction of the Czorsztyńska Dam in the Pieniny Mountains, the nuclear power plant in Żarnowiec, and the bypass in the Rospuda Valley were often met with opposition and suspicion as to the intentions of the protesters (Tomasiewicz, 2004; Leszczyński, 2007; Feliksiak, 2007; Niedbał, 2014), due to the radicalism of the slogans and shocking forms of manifestation. For conservative and moderate circles, environmentalism was most often associated with left-wing radicalism.

This attitude was exemplified in a study conducted on a group of 300 students in 2012 (Ciążela, 2014) regarding the support for various institutions and aid initiatives; namely aid for groups of people who had no influence on the bad situations that befell them, aid for people who were (presumably) responsible for their difficult situation (e.g. addiction treatment center), as well as initiatives related to protection of the environment such as e.g. protection of endangered animal species. As the results of this study indicate, initiatives related to environment protection received very low level of support. An environmental organization received even lower support than post-accident aid for motorcyclists (who are associated with fast and reckless driving and thus tend to be perceived as being responsible for their situation).

The change in attitudes towards environmentalism began to occur gradually due to the increase of information about growing threats, including the information about the growing number of victims of the increasing air pollution in Polish cities. Polish Smog Alert was the first mass pro-environmental social movement in Poland. Public opinion was also greatly impressed by a series of reports providing a radical assessment of the threat of a climate catastrophe, announced since October 2018 by the Intergovernmental Panel on Climate Change (IPCC) established by the UN. The first report of the series was the Special Report on Global Warming of 1.5°C (2018), warning of serious consequences of the temperature increase.

In the fall of 2019, the Ministry of the Environment in Poland was transformed into the Ministry of Climate. In the same year, the international initiative of the Youth Climate Strike was launched in Poland, activating school youth (Korzeniowski, 2019; Markiewka, 2021). Demonstrations took place in dozens of Polish cities. They were attended not only by secondary school students, but also by parents, teachers and university students. The initiative continues to this day.

Several social campaigns promoting environmental protection and featuring various celebrities were initiated, including: First day without smog and Clean Poland. Commercial advertisements referring to environmental protection also began to emerge, which used to be rare before. Waste sorting bins have become ubiquitous, and plastic cutlery and plastic straws have been replaced with more environmentally friendly options such as paper straws. Microplastic-free cosmetics packaging and even plastic-free credit cards have also appeared. Public transport buses now feature the words "I am environmentally friendly". Clothing stores started to offer sustainable fashion collections. Zero Waste campaigns, encouraging the exchanging of used clothes for example, were initiated.

The presented change in attitudes does not apply to the entire population, however. Despite attempts to modify their attitudes (Pilawa, 2021), conservatives have, for the most part, remained in the same positions (Kisielewska, 2021; Shellenberger, 2021; Klinsky, 2023; Morano, 2023). Such divisions, however, are not features of clearly delineated camps, but rather create various types of inconsistencies and contradictions in the attitudes of specific people (Lasota-Krawczyk, 2024).

In 2020 the COVID pandemic reached Poland. Being locked helplessly in our homes was a new experience, not only for young people. Some researchers have argued that the pandemic is the result of humans interfering with nature (Afelt, 2022).

## 2. Literature Review

The study of environmental awareness in Poland began in the 1980s. Since 1992, nationwide environmental awareness surveys have been conducted on a group of approximately 1000 people. They were carried out by CBOS on behalf of the Institute for Sustainable Development or independently of InE. Environmental awareness studies were also commissioned by the Ministry of the Environment (regardless of the change of its name). In 2010, only 16% of the respondents perceived environmental pollution as a threat, and only 7% of the respondents believed that the depletion of non-renewable natural resources was a problem (Stanaszek, Tędziagolska, 2011).

Environmental awareness increased slowly (Kachaniak, Skrzyńska, Trząsalska, 2014). Studies still indicated a low interest in pro-environmental issues and a failure to recognize its importance in the context of the problems facing Poland. Similarly, Polish citizens surveyed as part of the Eurobarometer, viewed the danger to the natural environment to be a minor problem. For many years, environmental protection was ranked 12th or 13th out of 14 in importance.

In spring 2017, 58% of Polish respondents considered climate change to be a serious problem (the EU average result is 74%). In the fall of 2018, respondents from Poland placed the natural environment, climate, and energy issues (next to unemployment and immigration) in 7th place out of 14. However, by July 2019 this changed and Polish respondents described climate change as a much more serious problem and ranked climate issue 3rd among the issues of concern (Special Eurobarometer 2019).

In Poland, environmental problems, and in particular climate change, began to be noticed only in 2017. One can assume, that this was related to the issue of smog, which started to be widely discussed at that time.

Of the studies on environmental awareness conducted in Poland, some concerned the environmental awareness of the general public, while others of select social or professional groups, including junior high and high school students and university students (e.g. Cichy, 1993; Szulborski, 2001; Kuzior, 2005; Poniedziałek, Rzymski, 2010; Ziemnicka-Wojtaszek, 2011; Bednarek-Gejo, 2012; Rucińska, Szmurło, 2014; Redo, 2017; Janczarska-Bergel, 2018).

The New Ecological Paradigm Scale (NEP) questionnaire is a method used to measure the pro-ecological view of the world. The questionnaire contains questions regarding, among others: the harmfulness of human activities for the environment, belief in a real threat of a serious environmental crisis, and belief in humans' special place among other creatures on Earth. This method has been used in many different countries, including: the United States (Cordano et al., 2003; Levine, Strube, 2012; Carnes, Nix, 2023), Germany (Schleyer-Lindenmann et al., 2018), Turkey (Erdoğan, 2009; Atav et al., 2014), Indonesia (Putu, 2017), Malaysia (Karpudewan, 2021), Spain (Corraliza et al., 2013), Kosovo (Srbinovski, 2019; Veselay et al., 2019; Veselay, 2023), and Nigeria (Ogunbode, 2013).

The NEP questionnaire has been used to investigate the environmental attitudes of various groups, including students (Cordano et al., 2003; Bun Lee, 2008; Erdoğan, 2009; Ogunbode, 2013; Schleyer-Lindenmann et al., 2018; Carnes, Nix, 2023; Spinola, 2023). The NEP questionnaire was also used in studies aimed at examining the relationships between individuals' attitudes and readiness to take actions to help the environment (Cordano et al., 2003), pro-environmental behavior, and knowledge (Levine, Strube, 2012). The NEP questionnaire was also used to measure changes in attitudes regarding the natural environment before and after educational influence (Harraway et al., 2012; Nanni, Allan, 2020), as well as to compare the attitudes of in-service teachers and of students studying to become teachers (Veselay, 2023).

Even though the NEP scale is a method repeatedly used in many countries to examine environmental attitudes, only a few researchers in Poland made use of it. Szostek (2012), Bartczak (2015), Chmura-Rutkowska and Kozłowska (2022) and Kozłowska et al. (2023) used it in their research. Dyr and Prusik (2020) focused on analyzing the psychometric properties of the scale.

## 3. Method and sample

The research presented in this article provides a comparison of the results of the two studies, one from 2016 and a repeated one from 2021. The impetus to repeat the study stemmed from a need to assess whether significant events occurring after 2016 impacted the environmental awareness among Polish students.

The study conducted in 2016 involved 624 university students (389 women and 235 men, age 20-26). 700 students (477 women and 223 men, age 20-26) participated in the study in 2021.

The research group consisted of students from universities in Warsaw, Olsztyn, Bydgoszcz, Toruń, Katowice and Gliwice. Attempts were made to select a group that was as diverse as possible: students of natural sciences, sciences, social sciences, and humanities, as well as military and sports faculties took part in the study. Students of such faculties as, among others: law, international relations, economics, pedagogy, sociology, history, computer science and econometrics, chemical technology, and biotechnology were represented in the study. In 2021, efforts were made to assemble as similar a group of students as possible.

The study used the New Ecological Paradigm Scale (NEP) questionnaire translated into Polish. The questionnaire concerns beliefs about the natural environment, the state of the natural environment, the need for its protection, and the rights and place of people, plants, and animals in the world. Odd items are scored directly, and even items (environmentally unfriendly statements) are scored inversely.

A questionnaire consisting of 15 questions grouped on 5 scales:

- The reality of growth limits - the belief that the amount of resources is limited and that the human population is approaching the limit that the Earth can support.
- Anti-anthropocentrism - the belief that humans do not have the right to interfere with nature in accordance with their needs and the right of plants and animals to exist.
- Fragility of nature's balance - the belief that people seriously harm the natural environment with their activities, with the environment unable to defend itself and to balance the impact of modern industry.

- Rejection of exceptionalism - the belief that man is subject to the laws of nature and cannot control nature.
- Possibility of eco-crisis - the belief that the continuation of human activities which harm the natural environment may lead to a serious ecological crisis.

The second part of the study was a questionnaire containing questions checking the knowledge of the participants. The questionnaire was in the form of a multiple-choice test consisting of 20 questions. The questionnaire is a self-authored. The substantive correctness of the questions was consulted with experts. The questions in the questionnaire check knowledge of the current state of the natural environment, the causes of pollution and its effects on people, as well as ways of protecting it.

1. Cutting down the Amazon forest: a) is indifferent to the rest of the world **b) results in an increase in carbon dioxide in the atmosphere** c) applies only to local communities d) I don't know.
2. Which of the following raw materials is considered the most slowly renewable raw material? a) oil, b) water, c) wood, d) I don't know.
3. CO2 emissions can be reduced by: **a) reducing the use of cars**, b) saving water, c) reducing sugar consumption, d) I don't know.
4. Transitioning from personal car usage to public transport on a daily basis by part of society: a) is enough to solve the problem environmental pollution, **b) will bring some small benefits for improving the state of the environment**, c) will not bring any benefits for the environment if it is not undertaken by the majority of the society, d) I don't know.
5. Which of the following bird species is at risk of extinction in Poland: a) crow, b) pheasant, **c) capercaillie**, d) I don't know.
6. The theory explaining "global warming of the climate" by human activity considers the following as the cause of warming: a) the creation of the ozone hole, **b) the exploitation of fossil fuels leading to CO2 emissions**, c) the development of nuclear energy, d) I don't know.
7. Heating the house with a traditional stove or fireplace: a) is good for the environment, **b) produces smog**, c) is neutral for the environment, d) I don't know.
8. The extinction of bees will have catastrophic consequences for humans, because: a) there will be no honey as an important component of the diet, b) the disappearance of bees will cause colonies of rival wasps to develop, **c) bee-pollinated plants will disappear**, d) I don't know.
9. Undertaking the program of reducing greenhouse gas emissions by only a few of the countries emitting greenhouse gases: a) will destroy the entire project, b) will reduce the effectiveness of the project, but will not make it meaningless, **c) the answer depends on how many and how large emitters will participate in the program**, d) I don't know.

10. Acidification of the oceans can lead to: a) acid rain and, as a result, the destruction of coastal areas, **b) a decrease in the population of plankton and, as a result, disruption of many food chains**, c) cooling of the climate, d) I don't know.
11. The ozone hole is the result of: **a) the production and emission of freon by humans**, b) the emission of CO2 by humans, c) the release of freon in the process of melting glaciers, d) I don't know.
12. Drinking water on Earth: a) there is enough, b) is scarce only in Africa, **c) is scarce on all continents**, d) I don't know.
13. By polluting water reservoirs with sewage, humans contribute to the excessive growth of algae, which may result in: a) water hardness, **b) gradual transformation of the lake into a swamp or peat bog**, c) an increase in fish population, d) I don't know.
14. If, as a result of climate warming, the water level rises, the consequence for Poland may be: a) an increase in the amount of drinking water, **b) a decrease in land habitation in northern Poland**, c) no consequences for Poland, d) I don't know.
15. The effects of the ozone hole are manifested in humans by: a) respiratory and heart diseases, b) weakening of bones and teeth, **c) skin cancers and eye diseases**, d) I don't know.
16. Humanity, by causing global warming, contributes to: **a) more frequent hurricanes**, b) more frequent volcanic eruptions, c) earthquakes, d) I don't know.
17. The causes of ocean acidification are: **a) dumping plastic waste in the oceans**, b) melting glaciers, c) overfishing, d) I don't know.
18. Air pollution from car exhausts: a) can cause a child to be born without limbs, **b) can cause brain damage to the fetus**, c) poses no threat to the fetus in the mother's womb, d) I don't know.

Questions about how to counteract the ecological crisis:

1. Glass packaging is better than cans because **a) they are easy to reuse**, b) they take up less space as garbage than cans, c) they decompose faster, d) I don't know.
2. In order to decrease "power consumption": a) just disconnect the phone from the charger, **b) you need to remove the charger from the socket**, c) the effects of both actions are the same, d) I don't know.

## 4. Results

The highest results were obtained for the Fragility of nature's balance scale (M = 11.14 in 2016, M = 12.04. in 2021), the lowest - for the Reality of growth limits scale in both 2016 (M = 7.8) and 2021 (M = 8.69). The means on all scales increased. The highest increase of the mean was observed in the scale Possibility of eco-crisis (from M = 10.63 in 2016 to M = 12.7 in 2021).

**Table 1.**
*New Ecological Paradigm Scale – individual scales result comparison*

| Scale | M | | SD | | Median | | Min | | Max | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2016 | 2021 | 2016 | 2021 | 2016 | 2021 | 2016 | 2021 | 2016 | 2021 |
| The reality of growth limits | 7.8 | 8.69 | 2.137 | 2.240 | 8 | 9 | 3 | 3 | 15 | 15 |
| Anti-Anthropocentrism | 10.81 | 11.54 | 2.578 | 2.574 | 11 | 12 | 3 | 3 | 15 | 15 |
| Fragility of nature's balance | 11.14 | 12.04 | 2.181 | 2.104 | 11 | 12 | 5 | 3 | 15 | 15 |
| Rejection of exemptionalism | 9.28 | 9.67 | 2.034 | 2.018 | 9 | 10 | 4 | 3 | 15 | 15 |
| Possibility of eco-crisis | 10.63 | 12.7 | 2.551 | 2.276 | 11 | 13 | 3 | 4 | 15 | 15 |

The percentage of participants agreeing with statements regarding approaching the limits of the human population increased (in 2016, 23.1% rather agreed and 9.1% strongly agreed, in 2021 - 38.9% and 16.7%, respectively %), as well as comparing the Earth to a spaceship with limited room and resources (in 2016, 29.8% rather agreed and 11.7% strongly agreed, in 2021 - 38.1% and 19%, respectively ). A very similar percentage of participants agreed after 5 years with the statement regarding the Earth's numerous natural resources (37.3% somewhat agreed both in 2016 and 2021, while 47.1% strongly agreed in 2016 and 44, 1% in 2021).

**Table 2.**
*The reality of growth limits – results comparison*

| Statement | M | | SD | | Median | | Min | | Max | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2016 | 2021 | 2016 | 2021 | 2016 | 2021 | 2016 | 2021 | 2016 | 2021 |
| 1. We are approaching the limit of the number of people the Earth can support. | 2.83 | 3.36 | 1.198 | 1.190 | 3 | 4 | 1 | 1 | 5 | 5 |
| 6. The earth has plenty of natural resources if we just learn how to develop them. | 1.81 | 1.87 | 1.009 | 1.026 | 2 | 2 | 1 | 1 | 5 | 5 |
| 11. The earth is like a spaceship with very limited room and resources. | 3.16 | 3.46 | 1.113 | 1.161 | 3 | 4 | 1 | 1 | 5 | 5 |

**Table 3.**
*The reality of growth limits – percentage distribution*

| Statement | SD | | MD | | U | | MA | | SA | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2016 | 2021 | 2016 | 2021 | 2016 | 2021 | 2016 | 2021 | 2016 | 2021 |
| 1. We are approaching the limit of the number of people the Earth can support. | 14,3% | 6,1% | 29,5% | 24% | 24% | 14,3% | 23,1% | 38,9% | 9,1% | 16,7% |
| 6. The earth has plenty of natural resources if we just learn how to develop them. | 2,6% | 2,3% | 7,4% | 8,6% | 5,6% | 7,7% | 37,3% | 37,3% | 47,1% | 44,1% |
| 11. The earth is like a spaceship with very limited room and resources. | 6,3% | 5,3% | 24,7% | 20% | 27,6% | 17,6% | 29,8% | 38,1% | 11,7% | 19% |

SD: Strongly disagree, MD: Mildly disagree, U: Unsure, MA: Mildly agree SA: Strongly agree.

The percentage of participants who strongly agreed with the statement, that plants and animals have as much right as humans to exist, increased (57.1% in 2016 and 66.7% in 2021), as did the percentage of participants who strongly disagreed with the statement that humans were meant to rule over the rest of nature (19.4% in 2016 and 33% in 2021).

**Table 4.**
*Anti-Anthropocentrism – results comparison*

| Statement | M | | SD | | Median | | Min | | Max | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2016 | 2021 | 2016 | 2021 | 2016 | 2021 | 2016 | 2021 | 2016 | 2021 |
| 2. Humans have the right to modify the natural environment to suit their needs. | 3.35 | 3.52 | 1.188 | 1.204 | 4 | 4 | 1 | 1 | 5 | 5 |
| 7. Plants and animals have as much right as humans to exist. | 4.22 | 4.42 | 1.133 | 0.997 | 5 | 5 | 1 | 1 | 5 | 5 |
| 12. Humans were meant to rule over the rest of nature. | 3.25 | 3.59 | 1.265 | 1.311 | 3 | 4 | 1 | 1 | 5 | 5 |

**Table 5.**
*Anti-Anthropocentrism – percentage distribution*

| Statement | SD | | MD | | U | | MA | | SA | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2016 | 2021 | 2016 | 2021 | 2016 | 2021 | 2016 | 2021 | 2016 | 2021 |
| 2. Humans have the right to modify the natural environment to suit their needs. | 15,7% | 20,7% | 41% | 44,4% | 11,7% | 6% | 25,6% | 23,7% | 5,9% | 5,1% |
| 7. Plants and animals have as much right as humans to exist. | 4,3% | 2,6% | 7,2% | 5,6% | 8% | 5,3% | 23,4% | 19,9% | 57,1% | 66,7% |
| 12. Humans were meant to rule over the rest of nature. | 19,4% | 33% | 27,7% | 26,4% | 20,2% | 15,6% | 23,4% | 17,1% | 9,3% | 7,9% |

SD: Strongly disagree, MD: Mildly disagree, U: Unsure, MA: Mildly agree SA: Strongly agree.

The percentage of participants who strongly agreed with the statement that human interference with nature often has disastrous consequences increased (33% in 2016 and 50.4% in 2021) and, to a lesser extent, with the statement that the balance of nature is delicate and easily upset (23.6% in 2016 and 35.9% in 2021). The percentage of participants who strongly disagreed with the statement, that the balance of nature is strong enough to cope with the impacts of modern industries, increased (19.6% in 2016 and 29.3% in 2021).

**Table 6.**
*Fragility of nature's balance – results comparison*

| Statement | M | | SD | | Median | | Min | | Max | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2016 | 2021 | 2016 | 2021 | 2016 | 2021 | 2016 | 2021 | 2016 | 2021 |
| 3. When humans interfere with nature it often produces disastrous consequences. | 3.83 | 4.3 | 1.162 | 0.910 | 4 | 5 | 1 | 1 | 5 | 5 |
| 8. The balance of nature is strong enough to cope with the impacts of modern industries. | 3.56 | 3,76 | 1.042 | 1.092 | 4 | 4 | 1 | 1 | 5 | 5 |
| 13. The balance of nature is very delicate and easily upset. | 3.76 | 4 | 1.031 | 1.022 | 4 | 4 | 1 | 1 | 5 | 5 |

**Table 7.**
*Fragility of nature's balance – percentage distribution*

| Statement | SD | | MD | | U | | MA | | SA | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2016 | 2021 | 2016 | 2021 | 2016 | 2021 | 2016 | 2021 | 2016 | 2021 |
| 3. When humans interfere with nature it often produces disastrous consequences. | 4,8% | 1,4% | 13% | 6% | 9,3% | 4,3% | 39,9% | 37,9% | 33% | 50,4% |
| 8. The balance of nature is strong enough to cope with the impacts of modern industries. | 19,6% | 29,3% | 35,1% | 35% | 30,4% | 21,7% | 11,2% | 10,4% | 3,7% | 3,6% |
| 13. The balance of nature is very delicate and easily upset. | 2,9% | 2% | 11,7% | 10,1% | 15,5% | 9,9% | 46,3% | 42,1% | 23,6% | 35,9% |

SD: Strongly disagree, MD: Mildly disagree, U: Unsure, MA: Mildly agree SA: Strongly agree.

An almost identical percentage of participants agreed with the statement that human ingenuity would insure the Earth from becoming an unlivable planet (in 2016, 37.5% mildly agreed and 11.7% strongly agreed, in 2021 - 37% and 9%, respectively, 9%).

**Table 8.**
*Rejection of exemptionalism - results comparison*

| Statement | M | | SD | | Median | | Min | | Max | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2016 | 2021 | 2016 | 2021 | 2016 | 2021 | 2016 | 2021 | 2016 | 2021 |
| 4. Human ingenuity will insure that we do not make the earth unlivable. | 2.65 | 2.79 | 1.040 | 1.090 | 3 | 3 | 1 | 1 | 5 | 5 |
| 9. Despite our special abilities humans are still subject to the laws of nature. | 3.66 | 3.86 | 1.121 | 1.054 | 4 | 4 | 1 | 1 | 5 | 5 |
| 14. Humans will eventually learn enough about how nature works to be able to control it. | 2.97 | 3.01 | 1.174 | 1.130 | 3 | 3 | 1 | 1 | 5 | 5 |

**Table 9.**
*Rejection of exemptionalism – percentage distribution*

| Statement | SD | | MD | | U | | MA | | SA | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2016 | 2021 | 2016 | 2021 | 2016 | 2021 | 2016 | 2021 | 2016 | 2021 |
| 4. Human ingenuity will insure that we do not make the earth unlivable. | 5% | 5,7% | 16% | 23,9% | 29,8% | 23,6% | 37,5% | 37% | 11,7% | 9,9% |
| 9. Despite our special abilities humans are still subject to the laws of nature. | 4% | 3,3% | 15,7% | 10,4% | 14,4% | 12,4% | 42,1% | 44,7% | 23,7% | 29,1% |
| 14. Humans will eventually learn enough about how nature works to be able to control it. | 11,5% | 7,9% | 22,9% | 32,6% | 26,1% | 20,6% | 29,6% | 30,9% | 9,8% | 8,1% |

SD: Strongly disagree, MD: Mildly disagree, U: Unsure, MA: Mildly agree SA: Strongly agree.

The percentage of participants who strongly agree with the statement that humans are seriously harming the natural environment has almost doubled: from 27.2% in 2016 to 53.9% in 2021. The percentage of people who strongly disagree that the ecological crisis is exaggerated has increased almost fivefold (from 8.8% in 2016 to 40.7% in 2021). The percentage of participants who strongly agreed with the statement that if things continue as they are, has more than doubled (from 22.8% to 50.4%), we will soon experience a major ecological catastrophe.

**Table 10.**
*Possibility of eco-crisis – results comparison*

| Statement | M | | SD | | Median | | Min | | Max | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2016 | 2021 | 2016 | 2021 | 2016 | 2021 | 2016 | 2021 | 2016 | 2021 |
| 5. Humans are severely abusing the environment. | 3.83 | 4.37 | 1.043 | 0.859 | 4 | 5 | 1 | 1 | 5 | 5 |
| 10. The so-called ecological crisis facing humankind has been greatly exaggerated. | 3.20 | 4.04 | 1.156 | 1.082 | 3 | 4 | 1 | 1 | 5 | 5 |
| 15. If things continue on their present course, we will soon experience a major ecological catastrophe. | 3.61 | 4.29 | 1.115 | 0.900 | 4 | 5 | 1 | 1 | 5 | 5 |

**Table 11.**
*Possibility of eco-crisis – percentage distribution*

| Statement | SD | | MD | | U | | MA | | SA | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2016 | 2021 | 2016 | 2021 | 2016 | 2021 | 2016 | 2021 | 2016 | 2021 |
| 5. Humans are severely abusing the environment. | 2.6% | 1.6% | 12.5% | 3.9% | 11.1% | 4.1% | 46.6% | 36.6% | 27.2% | 53.9% |
| 10. The so-called ecological crisis facing humankind has been greatly exaggerated. | 8.8% | 40.7% | 20.4% | 38.7% | 25.2% | 9.1% | 33.7% | 7.1% | 12% | 4.3% |
| 15. If things continue on their present course, we will soon experience a major ecological catastrophe. | 4.5% | 1.3% | 13.9% | 4.9% | 20.7% | 7.9% | 38.1% | 35.6% | 22.8% | 50.4% |

SD: Strongly disagree, MD: Mildly disagree, U: Unsure, MA: Mildly agree SA: Strongly agree.

The level of knowledge turned out to be similar after five years. The average score is M = 13.38 in 2016 and M = 14.02 in 2021.

**Table 12.**
*The level of knowledge - results comparison.*

| | M | | SD | | Median | | Min | | Max | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **2016** | **2021** | **2016** | **2021** | **2016** | **2021** | **2016** | **2021** | **2016** | **2021** |
| **Knowledge** | 13.38 | 14.02 | 3.159 | 3.024 | 14 | 14 | 1 | 1 | 20 | 20 |

The highest percentage of participants provided correct answers to questions about the decline of bees (95.3% in 2016 and 95.9% in 2021) and the use of glass packaging (89.7% in 2016 and 92.4% in 2021). Both in 2016 and 2021, the lowest percentage of participants gave the correct answer to the question about the causes of global warming (44.9% and 48.6%, respectively). The largest increase in the percentage of correct answers occurred in the case of questions about the causes of smog (65.4% in 2016 and 86.6% in 2021) and the amount of drinking water in the world (51.6% in 2016 and 67.8% in 2021).

**Table 13.**
*Environmental knowledge - the percentage of correct answers*

| No. | Question | % 2016 | % 2021 |
|---|---|---|---|
| 1 | Cutting down the Amazon forest… | 80,4 | 86,7 |
| 2 | Which of the following raw materials is… | 55,6 | 51,3 |
| 3 | CO2 emissions can be reduced by… | 91,8 | 83,85 |
| 4 | Transitioning from personal car usage to public transport… | 48,55 | 54,57 |
| 5 | Which of the following bird species is at risk of extinction in… | 55,6 | 54 |
| 6 | The theory explaining "global warming of the climate"… | 44,9 | 48,6 |
| 7 | Heating the house with a traditional stove or fireplace… | 65,38 | 86,57 |
| 8 | The extinction of bees will have catastrophic consequences… | 95,35 | 95,87 |
| 9 | Undertaking the program of reducing greenhouse gas emissions… | 45,83 | 53,71 |
| 10 | Acidification of the oceans can lead to.. | 63,14 | 66,42 |
| 11 | The ozone hole is the result of… | 64,10 | 65,71 |
| 12 | Drinking water on Earth… | 51,60 | 67,85 |
| 13 | By polluting water reservoirs with sewage, humans contribute to… | 82,69 | 83,57 |
| 14 | If, as a result of climate warming, the water level rises… | 80,28 | 88,57 |
| 15 | The effects of the ozone hole are manifested in humans by… | 75,64 | 74,28 |
| 16 | Humanity, by causing global warming, contributes to… | 44,87 | 52 |
| 17 | The causes of ocean acidification are… | 64,26 | 66,42 |
| 18 | Air pollution from car exhausts… | 51,28 | 53,42 |
| 19 | Glass packaging is better than cans because… | 89,74 | 92,42 |
| 20 | In order to decrease "power consumption"… | 87,33 | 75,85 |

## 5. Discussion

Comparing the results of both studies, a significant change occurred only in the case of questions regarding the reality of the ecological crisis and serious damage to the environment by humans.

According to the results of the study conducted in Poland in 2022 on a group of 260 students (Kozłowska et al., 2023), the percentage of people believing, that there is a threat of the environmental crisis, turned out to be even higher. This may be due to both growing awareness and, at least partly, due to the demographics of the selected group, which consisted of 86% women. Women tend to have more pro-environmental attitudes (Xiao, McCright, 2013). More than half of the participants were students of the Faculty of Educational Studies. Students of pedagogical faculties tend to have more pro-environmental attitudes (Ciążela, 2021b). Diversity of pro-environmental attitudes depending on the faculty was also found in a study conducted on a group of students in Nigeria (Ogunbode, 2013).

Optimism about natural resources has not changed. The belief in human creativity, which will prevent the Earth from becoming an uninhabitable planet, has also proven to be unchanged. As part of a study conducted almost at the same time as the one conducted by the author of this article in 2021, in the USA (Carnes, Nix, 2023), participants (513 students and graduates of the University of Texas) mostly expressed faith in the Earth's abundant resources, as well as rather agreed that human creativity would prevent Earth from becoming an uninhabitable planet. It is worth mentioning that the participants generally presented rather pro-environmental attitudes. The results for these two statements were the lowest (Carnes, Nix, 2023). In a study conducted on a group of pedagogy students in Kazakhstan, 75% strongly agreed with the statement (Ciążela et al., 2024) In the polish study the optimism is not so strong, but still more than half of participants beliefs in the abundance of natural resources on Earth (Kozłowska et al., 2023).

When it comes to faith in human ingenuity, it may result from the fact that more and more environmentally friendly solutions are being introduced, such as, among others, electric cars. However, the disadvantages and difficulties of those solutions are rarely discussed. Some people may receive information about very revolutionary ideas. However, recipients may remain unaware of how difficult putting these inventions into practice is and what a distant prospect they are. The belief in human ingenuity may also have been related to the development of COVID-19 vaccines preceding the study.

A significant increase in the number of correct answers in the part concerning the knowledge was observed in the case of the question about the causes of smog, which was the subject of the ongoing campaign at that time. However, the increase in the percentage of correct answers to questions about the causes and effects of global warming, which in 2016 received the lowest percentage of correct answers, was insignificant, even though global warming was also a current topic at that time. It is almost paradoxical that, on the one hand, students are afraid of the environmental crisis, but, on the other hand, less than half of the participants know one of the main causes of the potential crisis.

A positive phenomenon is the increase in awareness of the amount of drinking water in the world. The low percentage of correct answers in 2016 was disturbing. There was a decrease in the number of correct answers to questions concerning basic issues related to everyday

environmental protection activities, i.e. reducing CO2 emissions and saving electricity, which in 2016 were among the questions which were answered correctly by the largest number of participants. The results indicate, that there was a decrease in knowledge of everyday environmental protection methods, which is rather unexpected.

Research conducted on a group of pedagogy students (Ciążela, 2021a) and high school students (Ciążela, 2023) showed that the social media is main source of knowledge about environmental protection among young people, followed by news portals. Nowadays, informal education plays a greater role than formal education does. Social campaigns regarding environmental protection do not reach recipients as much as expected (Ciążela, Tuszyńska, 2019, Ciążela 2021b). The lack of transfer of systematic knowledge both within formal and informal education may be one of the possible reasons for only a slight increase in the level of knowledge.

## 6. Summary and conclusions

Polish students' attitudes towards the environment have not changed significantly, apart from recognizing the negative impact of humans on the environment and believing in the reality of a serious ecological crisis. Students are characterized by unwavering optimism about the Earth's natural resources and faith in human ingenuity that will prevent the Earth from becoming unlivable. Students' environmental knowledge level also turned out to be similar to that of five years ago. An increase in the awareness of a serious threat does not correlate with a significant increase in knowledge, even concerning the reasons for and the consequences of said serious threat.

An obvious conclusion from the research is the need for solid environmental education to be a part of formal education. However, environmental awareness consists not only of objective knowledge, but also of an individual's beliefs and attitudes regarding the natural environment and its protection. Attitudes can influence our perception of information, as well as our willingness to obtain more information and to act to protect the environment. As informal education currently plays a significant role in shaping environmental awareness, it would be worth paying more attention to the content presented on social media.

Considering the publication of many alarming reports on the state of the natural environment, including IPCC reports on the threat of a climate catastrophe, it seems incomprehensible that young people remain optimistic, despite their growing awareness of the threat. Presumably, despite concerns about the perspective of a crisis, there is still an optimistic narrative that reaches young people and shapes their beliefs.

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