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Environmental attitudes and behaviours of youth in Poland and their determinants based on ICCS 2022 data

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Abstract

This article presents an analysis of the environmental attitudes and behaviours of Polish 8th-grade students as well as their intentions regarding engaging in pro-environmental actions in the future, examining their associations with gender, socio-economic status (SES), and civic knowledge. Drawing on data from the International Civic and Citizenship Education Study (ICCS 2022), the analysis explores students' concerns about environmental threats, their views on environmental protection, reported pro-environmental behaviours including consumer behaviours, and students' expected future engagement in environmental activities. While most students perceive environmental issues as a significant threat to the future of the world, climate change is less frequently identified as a major problem compared to other environmental threats. Additionally, significant differences in perceptions are observed depending on students' socio-economic status and level of civic knowledge. The analysis indicates that girls demonstrate more pro-environmental attitudes and are more likely to report engaging in pro-environmental practices than boys, and demonstrate greater willingness to engage in environmental efforts in the future. The relationship between SES and environmental attitudes and behaviours is more complex—significant differences are mainly observed in attitudes and only in certain behaviours, for example they do not appear in consumer practices or students' declarations regarding future environmental engagement. A higher level of civic knowledge is generally associated with greater care for the environment and more frequent declarations of engaging in pro-environmental behaviours, though some contradictions emerge, particularly regarding economic priorities and consumer choices. The article emphasises the importance of fostering a sense of responsibility for the environment among children and youth, rather than relying on fear-based approaches. It also highlights the need for educational initiatives in the environmental area, particularly those targeting boys and addressing disparities between students from different socio-economic backgrounds.

Keywords: **Environmental attitudes, environmental behaviours, ICCS 2022.**

Postawy i zachowania prośrodowiskowe młodzieży w Polsce oraz ich uwarunkowania na podstawie danych ICCS 2022

Streszczenie

W artykule przedstawiono analizę postaw i zachowań prośrodowiskowych polskich ósmoklasistów, a także intencji związanych z podejmowaniem działań na rzecz środowiska w przyszłości, badając ich zależności z płcią, statusem społeczno-ekonomicznym (SES) oraz wiedzą obywatelską. Na podstawie danych z Międzynarodowego Badania Kompetencji Obywatelskich ICCS 2022 analizowane były obawy uczniów dotyczące zagrożeń dla świata, ich poglądy na temat działań na rzecz środowiska,

deklarowane zachowania prośrodowiskowe, w tym praktyki konsumenckie, oraz wskazywana gotowość do przyszłego zaangażowania na rzecz środowiska. Choć większość uczniów postrzega problemy środowiskowe jako istotne zagrożenie dla przyszłości świata, zmiany klimatu są rzadziej wskazywane jako ważny problem w porównaniu z innymi kwestiami środowiskowymi, jednocześnie występują w tym zakresie istotne różnice w zależności od statusu społeczno-ekonomicznego i poziomu wiedzy obywatelskiej uczniów. Analiza wskazuje, że dziewczęta wykazują bardziej prośrodowiskowe postawy, częściej deklarują wprowadzanie prośrodowiskowych praktyk niż chłopcy i wykazują się większą gotowością zaangażowania na rzecz środowiska w przyszłości. Relacja między statusem społeczno-ekonomicznym a postawami i zachowaniami prośrodowiskowymi jest bardziej złożona – istotne różnice obserwuje się głównie w postawach i tylko w części zachowań, nie występują one np. w praktykach konsumenckich ani w deklaracjach dotyczących przyszłego zaangażowania na rzecz środowiska. Wyższy poziom wiedzy obywatelskiej zazwyczaj wiąże się z większą troską o środowisko i częstszym deklarowaniem podejmowania zachowań prośrodowiskowych, choć pojawiają się tu pewne sprzeczności, zwłaszcza w odniesieniu do priorytetów ekonomicznych i wyborów konsumenckich. Artykuł podkreśla znaczenie kształtowania poczucia odpowiedzialności za środowisko wśród dzieci i młodzieży zamiast podejść bazujących na lęku. Wskazuje także na konieczność wsparcia działań edukacyjnych w obszarze środowiskowym w szczególności skierowanych do chłopców a także pozwalających na zniwelowanie różnic pomiędzy uczniami z różnych środowisk społeczno-ekonomicznych.

Słowa kluczowe: **Postawy środowiskowe, zachowania środowiskowe, ICCS 2022.**

1. INTRODUCTION

In the context of current environmental challenges and climate change, there is a growing interest among researchers in understanding the determinants of environmental attitudes and behaviours. Various studies indicate that knowledge alone is insufficient to drive changes in environmental behaviour, highlighting the crucial role of attitudes (e.g., Reynolds & Komakhidze, 2022). In particular, there is an increasing need for a deeper understanding of the factors influencing environmental attitudes and behaviours among children and youth (Busse & Menzel, 2014; Liu & Green, 2024). Numerous studies have explored the relationship between pro-environmental behaviours and attitudes, with many showing statistically significant but weak to moderate correlations between these two domains (see Liu & Green, 2024). While cognitive factors are sometimes included in these analyses, they remain a less explored area in this context.

Sustainability and environmental issues have gained increased attention in recent cycles of large-scale international educational assessments. For instance, in the IEA's Trends in International Mathematics and Science Study (TIMSS) 2023, a dedicated component on environmental attitudes and behaviours was introduced (Reynolds & Komakhidze, 2022), a special focus was placed on sustainability in the IEA's International Civic and Citizenship Education Study (ICCS) 2016 and 2022 (Schulz et al., 2023), and recent PISA cycles have expanded their attention to these topics as well. These international studies provide unique opportunities to analyse various aspects of students' environmental attitudes and behaviours but also their relationships with cognitive skills, in a comparative, cross-national context.

Drawing on data from the latest edition of ICCS conducted in 2022 (Schulz et al., 2023), this article explores the relationships between environmental attitudes, environment-related behaviours, intentions regarding engaging in pro-environmental actions in the future, and factors such as gender, socio-economic background, and level of civic knowledge among Polish 8th grade students. It also examines the relationships between attitudes, behaviours and intentions towards future pro-environmental engagement.

The article addresses a significant gap in the analysis of environmental attitudes and behaviours of Polish youth focusing on an age group crucial for fostering pro-environmental perspectives. It explores the following questions:

1. What are the environmental attitudes, behaviours and intentions towards the future pro-environmental engagement of Polish youth, and is there consistency across the different examined indicators used in the scales?
2. Can coherent patterns be identified between attitudes, behaviours and intentions towards future pro-environmental engagement in relation to gender, socio-economic status, and students' civic knowledge?
3. What kinds of relationships can be observed between environmental attitudes, behaviours and the youth's declared willingness to engage in pro-environmental actions in the future?

2. THE LITERATURE CONTEXT

The literature indicates that individual background characteristics—such as gender, age, education level, income, and socio-economic status—are linked to environmental attitudes and behaviours (e.g., Schahn & Holzer, 1990; Burger, 2005; Franzen & Vogl, 2012). In addition to these demographic factors, numerous other determinants of environmental attitudes and behaviours have been identified, including basic value orientations and levels of trust (e.g., Inglehart, 1990; de Groot & Steg, 2008; Meyer & Liebe, 2010; Franzen & Vogl, 2012), as well as environmental knowledge (e.g., Zimmermann, 1996).

Some of these patterns have also been observed in studies conducted with children and youth. Among the frequently analysed and identified factors influencing environmental attitudes and behaviours in younger populations are: direct experiences with nature (e.g., Eagles & Demare, 1999), family behaviours and peers (e.g., Grønhøj & Thøgersen, 2012; Jia & Yu, 2021; Collado, Evans, & Sorrel, 2017), certain values and a sense of personal responsibility (e.g., Thielking & Moore, 2001; Soares & Nascimento, 2024), as well as environmental knowledge and education, particularly various educational programmes (e.g., Collado, Rosa, & Corraliza, 2020).

In the Polish context, numerous studies in recent years have focused on youth involvement in initiatives such as Fridays for the Future and the Youth Climate Strike and the role and organisation of those movements. However, analyses of the environmental attitudes of children and younger adolescents based on data collected from large, representative samples remain limited.

One of the few exceptions is the Youth (*Młodzież*) study, regularly conducted by the Public Opinion Research Center (CBOS) among students in the final years of secondary school, typically aged 17–19. These studies indicate that approximately two-thirds (69%) of high school students perceive climate change as a threat, while only a small minority deny its existence. Notably, a significant proportion of young people (24%) reported that they have no opinion on the matter (Kawalec, 2022). Climate change is more frequently perceived as a problem by youth from large cities, while students from rural areas are less likely to express concern. Differences are also observed based on school type: students from general secondary schools are more likely to recognize climate change as a threat (77%) compared to those attending vocational schools (first-stage sectoral schools – 40%). Political views also play a significant role in shaping perceptions of climate change. Students identifying with left-wing views are more likely to be concerned about climate change (88%) compared to those with right-wing views (68%) (Kawalec, 2022).

The ICCS 2022 data analysed in this article allow for a closer examination of the attitudes and behaviours of 8th graders representing a slightly younger age group: approximately 14-year-old students. As some studies suggest, this is a crucial age for the development of environmental behaviours and attitudes, which begin to take shape around the age of 7, increase until 10, stabilize until 14, and then gradually decline (Otto et al., 2019). Notably, while environmental behaviour is thought to develop from childhood through early adolescence and start consolidating around age 10, environmental attitudes remain more fluid, continuing to evolve at least into early adulthood (Otto et al., 2019).

3. DATA AND METHODS

This article uses data from the latest edition of the International Civic and Citizenship Education Study (ICCS 2022), organised by the International Association for the Evaluation of Educational Achievement (IEA). ICCS aims to assess the extent to which young people are prepared to participate in social life and take on the responsibilities of being citizens in a democratic society. It is the largest international study examining students' knowledge and understanding of concepts and issues relating to civics and citizenship, as well as their attitudes and civic engagement.

ICCS 2022 was conducted in 22 countries and two German states (North Rhine-Westphalia and Schleswig-Holstein). The analyses in this article cover data gathered from the 8th grade students in Poland (N=4434). The study in Poland was conducted between March 14 and April 29, 2022, and was organised by the Educational Research Institute. The study was based on random samples and gathered data are representative to all 8th grade students in the country. The sampling process was two-tiered: in the first stage, schools were randomly selected, in the second, one or two classes in each school. All students from each sampled class were invited to participate in the study. Detailed information about sampling and the organisation of the study can be found in the ICCS 2022 technical report (Schulz, Friedman, Fraillon, 2024).

Environmental issues and sustainability were among the focus areas in ICCS 2022, considered as key elements of modern citizenship. ICCS 2022 International Student Questionnaire and European Student Questionnaire[1] covered several scales, which included items measuring student's attitudes to environmental protection and students pro-environmental behaviours. Furthermore, this area was also included in the civic knowledge and understanding test.

[1] The International Student Questionnaire was used in all countries participating in the study, the European Questionnaire only in the European ones.

Table A1 in the Annex provides the list of scales and items used in the analyses. They cover various aspects of students' attitudes, behaviours and intentions: a) students' concerns about environmental threats to the world's future, b) students' views on responsibility and actions regarding environmental protection, c) declarations on students' pro-environmental behaviours including consumer behaviours and the undertaking, limiting, or abandoning of certain activities, as well as d) students' reports concerning expected participation in pro-environmental activities in the future.

The associations between selected items and (a) students' gender, (b) their families' socio-economic status (SES), and (c) their level of civic knowledge were analysed. For the SES analysis, the National Index of Students' Socio-economic Background (S_NISB) was used. This index, derived from students' reports, incorporates three components: the highest occupational status of parents, the highest educational level of parents, and the number of books at home (see Schulz, Friedman, & Fraillon, 2024).

To enable clear and better interpretable comparisons and to account for potential non-linear relationships and outliers, the S_NISB was recoded into quartiles, dividing students into four groups based on their families' socio-economic status. Civic knowledge was measured using the ICCS 2022 Civic Knowledge Proficiency Scale (see Schulz et al., 2023; Schulz, Friedman, & Fraillon, 2024).

Analyses of relationships between environmental attitudes, behaviours and intentions as well as gender, SES, and civic knowledge were first conducted for the composite scales using multivariate regressions. In the second step, analyses at the item level were conducted. This dual-level structure, with both scale-level and item-level analyses, enables more nuanced interpretations.

To examine the general relationships between gender, socio-economic status (SES), civic knowledge, and pro-environmental outcomes, two regression models for each of the five scales were estimated. Full model results are presented in the appendix (Tables A2–A6) and serve as the basis for the interpretation in the main text. A two-step modelling strategy was used: Model 1 includes gender and SES (s_nisb) along with their interaction, Model 2 adds civic knowledge (standardized using z-scores) and interaction terms with SES and gender. This structure helps to assess the direct effects of gender and SES, as well as the potential mediating or moderating role of civic knowledge. Interaction terms and a quadratic SES term was also included to test for non-linear patterns and conditional effects, reflecting theoretical expectations that civic knowledge and SES may interact in shaping pro-environmental behaviours. The civic knowledge variable was standardized to facilitate interpretation.

In the second step, the relationships at the item level were analysed. This approach enabled a more nuanced view on relationship patterns and was used in order to better grasp the complexity of the phenomenon by detecting items that exhibit distinguishing characteristics. However, when examining direct relationships between attitudes and behaviours, composite scales were used.

Descriptive data and the results of more complex analyses that illustrated differences by gender, SES and students' civic knowledge are presented in the article. The reported figures were obtained through a series of statistical analyses accounting for the complex sampling design and plausible values in the ICCS 2022 study. Differences in percentages between groups (gender and socio-economic quartiles) were calculated using survey-weighted proportions, followed by statistical tests for differences. Civic knowledge differences were estimated using mean comparisons and regression models incorporating plausible values. The regressions controlled for covariates: socio-economic status and gender, with adjusted predictions (marginal effects at mean values of other covariates) to assess the differential impact of environmental concerns on civic knowledge. The standard errors were derived using Jackknife Repeated Replication to ensure robust variance.

4. RESULTS

4.1 Students' concerns about environmental threats to the world's future

Students completing the ICCS questionnaire were asked to respond to 11 statements, four of which were environment-related, indicating the extent to which they believe specific issues pose a threat to the world's future. Among the five issues most frequently identified by students as posing a significant threat to the world's future, four were environment-related, with pollution and water shortages eliciting the highest levels of concern (Wasilewska et al., 2023). Table 1 presents the distribution of students' responses. Almost all Polish 8th grade students perceive the four environment-related issues as significant threats, either to a large extent or to a moderate extent. The highest level of concern was recorded for pollution, with a substantial majority (81.9%) of Polish 8th graders indicating they were concerned 'to a large extent', followed by water shortages (79.5%). Slightly lower percentages were noted for the extinction of species and loss of biodiversity (67.8%), and climate change (65.1%).

Table 1 ***Polish 8th grade students' concerns about environmental threats to the world's future***

Issue	**1. To a large extent**	**2. To a moderate extent**	**3. To a small extent**	**4. Not at all**
IS4G28A Pollution	81.9%	15.2%	2.2%	0.6%
IS4G28D Climate change	65.1%	26.5%	7.0%	1.4%
IS4G28J Extinction of species, loss of biodiversity	67.8%	23.3%	7.3%	1.6%
IS4G28K Water shortages	79.5%	13.2%	5.3%	2.0%

Source: own elaboration based on ICCS 2022 data

Polish students rank among the highest in identifying pollution, water shortages, as well as the extinction of species, loss of biodiversity as major threats to the future of the world. However, for climate change, these percentages are relatively lower compared to other countries (Wasilewska et al., 2023). This generally shows a lower awareness of the problem of climate change among students in Poland. However, it may also reflect the view on climate change as an ideological or world-view based dispute. As already mentioned, studies among slightly older age groups in Poland showed that the declared level of concern about climate change differs depending on students' political views (Kawalec, 2022).

The regression models for students' concern about threats to the global environment scale (s_envcon), which has a national mean of 50.93 (SD = 8.49), show consistent differences by gender, with girls scoring around 1.7 to 2.2 points higher than boys. In Model 1, students from higher SES backgrounds tend to report slightly higher levels of concern, though this association weakens once civic knowledge is included in Model 2. Standardized civic knowledge shows a meaningful association with environmental concern: a one standard deviation increase corresponds to an increase of approximately 1.75 scale points. The interaction term suggests that this association may be less pronounced for students with higher SES, although the effect is modest. The increase in explained variance between models (from $R^2 = 0.04$ to $R^2 = 0.10$) indicates that civic knowledge adds relevant explanatory value, though most of the variation in concern remains unexplained by the model.

Table 2. presents item-level differences in students' concerns about environmental threats by gender, SES, and civic knowledge. When comparing students' declarations across groups, climate change exhibits the largest and statistically significant differences between students from different socio-economic backgrounds. Students from higher SES families (4th quartile) are substantially more likely to perceive climate change as a threat to a large extent (76.2%) compared to those with lower SES families (1st quartile) (52.4%). Similar relationships with SES are observed in relation to water shortages. These two items at the same time show the smallest differences in answers between girls and boys.

In contrast, pollution and loss of biodiversity displayed a different pattern. There is no significant difference in concern between students from the highest and lowest SES quartiles. However, gender differences are apparent, with girls consistently reporting significantly higher levels of concern than boys.

Civic knowledge was strongly associated with concern levels across all four environmental issues. Students who perceived specific issues as significant threats to the future of the world consistently demonstrated significantly higher civic knowledge scores, also after controlling for SES and gender. The largest differences in civic knowledge between high- and low-concern groups were observed for climate change (64.4 scale points), followed by pollution (57.4 points) and water shortages (53.9 points).

Table 2 ***Students' concerns about environmental threats to the world's future—differences by gender, SES, and civic knowledge***

	Difference in percentages between girls and boys (percentage points), SE	**Difference in percentages between SES IV–I quartile (percentage points), SE**	**Difference in civic knowledge (ICCS 2022 Civic knowledge proficiency scale points), SE**	**Difference in civic knowledge (ICCS 2022 Civic knowledge proficiency scale points) for the mean value of SES and gender, SE**
IS4G28A Pollution	3.37 (0.81)***	0.16 (1.16)	57.41 (10.98)***	46.44 (9.13)***
IS4G28D Climate change	3.26 (1.21)*	6.28 (2.05)***	64.39 (5.66)***	49.72 (5.04)***
IS4G28J Extinction of species, loss of biodiversity	6.31 (1.32)***	3.3 (2.02)	39.79 (6.06)***	31.9 (5.43)***
IS4G28K Water shortages	2.55 (1.34)	4.8 (1.53)***	53.9 (6.52)***	43.51 (6.02)***

Source: own elaboration based on ICCS 2022 data

* p<0.05, ** p<0.01, *** p<0.001.

Note: Differences in percentages between students a) girls and boys b) SES IV–I quartile, stating the issue poses a threat "to a large extent" or "to a moderate extent"; Differences in civic knowledge between students stating that particular issue pose a threat "to a large extent" or "to a moderate extent" and those stating that it doesn't pose a threat ("not at all") or only "to a small extent".

4.2 Students views on responsibility and actions regarding environmental protection

Students participating in ICCS 2022 were also asked for their views on five statements concerning approaches to responsibility and actions regarding environmental protection. As presented in Table 3, almost all 8th grade students in Poland agreed that countries need to work together to preserve the world's natural resources, with 94.7% either strongly agreeing or agreeing. Additionally, 70.6% supported the idea that Poland should contribute to protecting the environment in other countries. However, the smaller share of students (61.8%) believe that governments should focus more on protecting the environment than on supporting economic growth. Overall, students largely agree that countries should collaborate and take action to protect the global environment, though their views differ regarding how much of a priority this issue should be or the extent of the costs the country should bear as a result. Students were also asked about the role of individuals in environmental protection. The vast majority of 8th graders in Poland believe that responsibility for environmental protection also lies with individuals: 89.2% agree with the statement that all human beings should take responsibility for preserving the natural world, and 89.3% that every citizen needs to contribute to reducing pollution (see also Wasilewska, 2023).

Table 3 ***Polish 8th grade students' views on responsibility and actions regarding environmental protection***

There are different views about what we should do to protect the environment. How much do you agree or disagree with the following statements?	**1. Strongly agree**	**2. Agree**	**3. Disagree**	**4. Strongly disagree**
IS4G26A Governments should focus more on protecting the environment than on supporting economic growth	11.5%	50.3%	34.8%	3.4%
IS4G26B Every citizen needs to contribute to the reduction of pollution	33,3%	56,0%	9,6%	1,1%
IS4G26C Poland should contribute to protecting the environment in other countries	18,6%	52,0%	25,9%	3,5%
IS4G26D All human beings should take responsibility for preserving the natural world	40.2%	49.0%	9.1%	1.7%
IS4G26E Countries need to work together to preserve the world's natural resources	50.3%	44.4%	4.1%	1.1%

Source: own elaboration based on ICCS 2022 data

Polish 8th graders, compared to students in other countries, exhibit high support for cooperation among countries to preserve natural resources. However, they stand out for having the lowest level of support for the statement that governments should focus more on environmental protection than on supporting economic growth (Wasilewska, 2023). This reflects a notable tension between environmental protection and economic priorities, with nearly 40% of Polish students favouring economic growth over environmental measures.

The scale-level regressions for the scale measuring students' positive attitudes toward environmental protection (s_attenv) with a national mean of 47.41 and SD = 8.31, shows that differences by gender and SES are visible but moderate in size. On average, girls score around 1.8 to 2 points higher than boys, suggesting a slightly more pro-environmental stance. Students from higher SES backgrounds also tend to express more supportive attitudes toward environmental protection, with an average difference of just over half a scale point when accounting for civic knowledge. A one standard deviation increase in civic knowledge is associated with a modest increase of about 0.44 points on the scale, indicating a relatively small contribution of knowledge to students' general environmental attitudes. The model explains a limited share of the variance (R^2 = 0.03-0.04), suggesting that while these factors relate to attitudes, much of the variation is likely shaped by other influences not captured in the model.

Item level results provide a more nuanced picture. The statement: "governments should focus more on protecting the environment than on supporting economic growth" merits special attention when it comes to differences among students based on gender, SES and level of civic knowledge (see Table 4). It shows a negative and statistically significant difference in civic knowledge between those who agree with this statement and those who don't, and is the only item where higher support for the statement is associated with lower civic knowledge scores, suggesting that students with higher civic knowledge levels may place more emphasis on economic issues relative to environmental priorities. Only positive relationships are observed for the other items: a higher level of civic knowledge is associated with stronger agreement with particular statements representing a more pro-environmental attitude. This is observed also after accounting for SES and gender. Among all items, the largest difference in civic knowledge is observed in the case of support for the collaboration of countries to preserve the world's natural resources (77.3 scale points difference), which is the item with which almost all students agree.

When it comes to gender, girls consistently show greater support for the analysed statements, reflecting stronger pro-environmental attitudes. Statistically significant differences between girls and boys are observed across all statements, with the smallest differences found in the general item on international cooperation.

Regarding socio-economic status, the data indicate that higher SES is generally associated with stronger support for pro-environmental attitudes. However, while a statistically significant and notable difference is found for the item emphasising a country's role in contributing to environmental protection globally, the differences for other items are smaller. Some are not statistically significant, including the statement suggesting that governments should prioritise environmental protection over economic growth (difference between SES IV–I quartiles: -0.65 percentage points).

Table 4 ***Students' views on responsibility and actions regarding environmental protection—differences by gender, SES, and civic knowledge***

	Difference in percentages between girls and boys (percentage points), SE	**Difference in percentages between SES IV–I quartile (percentage points), SE**	**Difference in civic knowledge (ICCS 2022 Civic knowledge proficiency scale points), SE**	**Difference in civic knowledge (ICCS 2022 Civic knowledge proficiency scale points) for the mean value of SES and gender, SE**
IS4G26A Governments should focus more on protecting the environment than on supporting economic growth	8.75 (2.71)***	-0.65 (3.38)	-13.82 (3.23)***	-16.18 (2.93)***
IS4G26B Every citizen needs to contribute to the reduction of pollution	5.66 (1.54)***	5.32 (2.04)*	32.34 (5.88)***	22.11 (5.39)***
IS4G26C Poland should contribute to protecting the environment in other countries	11.74 (2.36)***	9.1 (3.05)***	20.97 (3.47)***	12.18 (3.16)***
IS4G26D All human beings should take responsibility for preserving the natural world	8.15 (1.5)***	2.49 (2.43)	28.4 (5.7)***	20.45 (5.14)***
IS4G26E Countries need to work together to preserve the world's natural resources	3.2 (1.14)**	4.4 (1.9)*	77.27 (7.49)***	62.01 (6.89)***

Source: own elaboration based on ICCS 2022 data

* p<0.05, ** p<0.01, *** p<0.001.

Note: Differences in percentages between students a) girls and boys b) SES IV–I quartile, declaring that they "strongly agree" or "agree" with the following statements; Differences in civic knowledge between students who "strongly agree" or "agree" and those who "disagree" or "strongly disagree".

4.3 Students' reports on their sustainable behaviours

Another key aspect analysed in the study was the frequency of students' engagement in sustainable behaviours. 8th graders were asked to indicate how often in the 12 months before the study have they been engaged in specific actions important for the environment and sustainability. Table 5 presents the distribution of students' responses. Among the activities listed, Polish students most frequently reported reducing electricity use—nearly half (47.3%) stated that they did this often, while an additional third (33.2%) reported doing it sometimes. The next most common activities included reducing food waste, saving water, repairing items, and reusing old items. A majority of students reported engaging in these activities "often" or "someti-

mes", although they were less common compared to electricity-saving behaviours. Less frequent behaviours included limiting the use of plastic items and avoiding products with plastic packaging. For example, only 25.8% of students reported "often" limiting their use of disposable plastic items, and 15.8% reported "often" avoiding buying products with plastic packaging. The least common behaviour was purchasing used clothing instead of new.

When compared to their peers in other European countries, Polish students reported engaging in these pro-environmental behaviours relatively frequently, placing Poland among the countries with the highest percentages of students reporting such actions. However, exceptions include limiting the use of plastic items, avoiding products in plastic packaging, and purchasing used clothing, which were less common among Polish students compared to their European peers (Wasilewska, 2023).

Table 5 *Polish 8th grade students' reports on their sustainable behaviour*

During the last twelve months, how often have you done each of the actions listed below?	**1. Often**	**2. Sometimes**	**3. Rarely**	**4. Never**
ES4G11A Purchase used instead of new clothing	15,4%	24,3%	28,2%	32,1%
ES4G11B Reduce water use (e.g. when brushing your teeth, having a shower, washing dishes)	32,8%	38,9%	21,1%	7,2%
ES4G11C Reduce the use of electricity (e.g. switching off the lights when leaving a room, turning down the heat when it is not too cold)	47,3%	33,2%	14,7%	4,8%
ES4G11D Avoid buying products with plastic packaging (e.g. school supplies, groceries)	15,8%	34,7%	34,8%	14,7%
ES4G11E Reuse old items in good condition instead of buying new ones	34,2%	39,8%	19,7%	6,3%
ES4G11F Limit the use of plastic items (e.g. disposable plastic glasses, water bottles, plastic shopping bags)	25,8%	34,7%	28,3%	11,2%
ES4G11G Reduce food waste (e.g. avoiding buying more food than necessary, eating leftovers)	38,4%	39,1%	17,0%	5,5%
ES4G11H Repair rather than replacing items you have (e.g. fix your bike instead of buying a new one, mending a backpack instead of buying a new one)	35,8%	39,6%	19,4%	5,2%

Source: own elaboration based on ICCS 2022 data

It is important to emphasize that this question does not account for the motivations behind the given actions. Many of these behaviours may not stem (either at all or predominantly) from pro-environmental considerations, but rather from economic motivations, including rules or habits introduced at home and rooted in financial issues. This makes it challenging to interpret the above results in the context of pro-environmental attitudes. The fact that the most common actions are those closely tied to financial savings supports the view that economic factors may play a significant role in the analysed behaviours of Polish students. The most frequent activities declared among Polish 8th graders: reducing electricity use, water consumption, or food waste can result in financial savings. In contrast, behaviours that are less economically motivated and may even involve additional costs, such as limiting the use of plastic items or avoiding products in plastic packaging, are much less frequent. The issue of purchasing used clothing is particularly difficult to interpret in this context. While it could reflect pro-environmental awareness in some cases, it might also be linked to economic necessity or cultural norms, or even trends in fashion, making it harder to assess its connection to sustainability-oriented attitudes.

The regression results for the students' reports on their sustainable behaviours scale (*e_susbeh*), with a national mean of 51.56 and a standard deviation of 8.40, show a notable gender gap. Girls score over 4 points higher than boys, which corresponds to nearly half a standard deviation, suggesting a meaningful difference in reported everyday actions beneficial to the environment. Differences by SES are present but modest, and become smaller when civic knowledge is included in the model. A one standard deviation increase in civic knowledge is associated with less than a 1-point increase on the scale. The model explains a moderate share of variance (R^2 increasing from 0.09 to 0.11), with gender remaining the strongest predictor of sustainable behaviours.

The results at the item level are presented in Table 6. For almost all statements, the data show that students from higher SES families (4th quartile) are significantly more likely to report "often" or "sometimes" engaging in most behaviours compared to those from lower SES families (1st quartile). However, no significant relationship with SES was observed for purchasing used clothing instead of new or repairing items. The largest SES-based differences were noted for limiting the use of plastic items (15.9 percentage points) and avoiding products with plastic packaging (15.8 percentage points), both of which are less financially motivated behaviours. This helps explain the modest overall SES effect in the regression: while some sustainable behaviours show SES-related differences, others—especially those economically motivated—do not. Gender differences were prominent, with girls significantly more likely than boys to report engaging in most of the analysed behaviours. The only exception was repairing items instead of replacing them, where no statistically significant difference was observed. The largest gender-based differences were seen in purchasing used clothing (ES4G11A—26.6 percentage points) and limiting the use of plastic items (21.7 percentage points).

Table 6 ***Students' reports on their sustainable behaviours – differences by gender, SES, and civic knowledge***

	Difference in percentages between girls and boys (percentage points), SE	**Difference in percentages between SES IV–I quartile (percentage points), SE**	**Difference in civic knowledge (ICCS 2022 Civic knowledge proficiency scale points), SE**	**Difference in civic knowledge (ICCS 2022 Civic knowledge proficiency scale points) for the mean value of SES and gender, SE**
ES4G11A Purchase used instead of new clothing	26.64 (2.54)***	-0.98 (3.75)	7.78 (3.16)**	3.66 (3.02)
ES4G11B Reduce water use (e.g. when brushing your teeth, having a shower, washing dishes)	13.33 (2.43)***	7.93 (2.85)**	27.14 (3.42)***	18.99 (3.15)***
ES4G11C Reduce the use of electricity (e.g. switching off the lights when leaving a room, turning down the heat when it is not too cold)	7.09 (2.02)***	12.89 (2.39)***	43.57 (4.13)***	30.39 (3.86)***
ES4G11D Avoid buying products with plastic packaging (e.g. school supplies, groceries)	18.1 (2.22)***	15.76 (4.02)***	12.99 (3.14)***	1.26 (2.92)
ES4G11E Reuse old items in good condition instead of buying new ones	9.52 (2.36)***	8.87 (2.78)***	34.83 (3.63)***	26.67 (3.33)***
ES4G11F Limit the use of plastic items (e.g. disposable plastic glasses, water bottles, plastic shopping bags)	21.74 (2.48)***	15.95 (3.23)***	23.23 (3.19)***	9.87 (3.03)***
ES4G11G Reduce food waste (e.g. avoiding buying more food than necessary, eating leftovers)	9.35 (2.17)***	11.3 (3.16)***	34.43 (3.66)***	23.76 (3.35)***
ES4G11H Repair rather than replacing items you have (e.g. fix your bike instead of buying a new one, mending a backpack instead of buying a new one)	0.66 (2.1)	0.31 (3.08)	15.42 (3.75)***	16.17 (3.33) ***

Source: own elaboration based on ICCS 2022 data

* p<0.05, ** p<0.01, *** p<0.001.

Note: Differences in percentages between students a) girls and boys b) SES IV–I quartile, declaring that they did something "often" or "sometimes"; Differences in civic knowledge between students declaring that they did something "often" or "sometimes" and those declaring they "never" or "rarely" did it.

4.4 Students' reports on consumer behaviours

An additional question addressed students' consumer behaviours. Students were asked to indicate how often, over the year before the study, they had either requested their parents/guardians to buy or avoid purchasing specific products, or how often they had done so themselves. The question covered different aspects of critical consumption, with three items relating to environmental issues, which are presented in Table 7 together with the distribution of students' responses.

Overall, the data indicate that while many Polish eighth-grade students occasionally engage in pro-environmental consumer behaviours, consistent involvement remains relatively low. Buying environment-friendly products—an activity which can be understood very broadly—was the most common action, followed by—less frequently—purchasing recyclable goods. Refusing to buy products whose production had a negative environmental impact was the least common behaviour, with only a small percentage of students engaging in it regularly, and a significant share rarely or never.

In comparison to their peers from other European countries participating in the ICCS 2022 study, Polish students were relatively less likely to report refusing to buy goods with a negative environmental impact or purchasing only goods that can be recycled. Poland was among the countries with lower percentages of such responses, below the European average. However, in the case of buying environmentally friendly products, Polish 8th graders' responses were comparable to the average and slightly above the European average (see Damiani et al., 2024).

Table 7 ***Polish 8th grade students' reports on consumer behaviours***

During the last twelve months, how often have you done or have you asked your parents or guardians to do the following things?	**1. Often**	**2. Sometimes**	**3. Rarely**	**4. Never**
ES4G10B Refuse to buy goods whose production has a negative impact on the environment	13,5%	30,8%	27,8%	27,9%
ES4G10D Buy only goods that can be recycled afterwards	14,5%	30,7%	28,9%	25,9%
ES4G10E Buy environment-friendly products	26,7%	37,8%	19,1%	16,4%

Source: own elaboration based on ICCS 2022 data

Students' reports on the consumerism behaviours scale (*e_ethcon*), with a national mean of 47.99 and a standard deviation of 9.69, also show a clear gender difference. Girls report engaging in environmentally conscious consumer behaviours approximately 4.7 points more than boys, which represents about half a standard deviation, indicating a meaningful difference in reported practices. The association with SES is weaker but becomes more pronounced after accounting for civic knowledge, suggesting that higher-SES students may be more likely to engage in these behaviours when knowledge is considered. Interestingly, the relationship between civic knowledge and consumer behaviours is negative in this model, with a one standard deviation increase in knowledge corresponding to a decrease of about 1.9 points. This counterintuitive pattern may reflect the complexity of consumer decisions, which can be shaped by both values and access, and not solely by civic awareness. The model explains a moderate portion of variance (R^2 increasing from 0.06 to 0.08), with gender remaining the strongest predictor.

The item-level analysis helps contextualise and explain the regression results. Table 8 presents differences in students' reports on environment-related consumer behaviours by gender, SES, and civic knowledge. Significant differences at the item-level were noted between girls and boys, with girls significantly more likely than boys to engage in pro-environmental consumer behaviours. The particular large differences between the declarations of girls and boys were observed in relation to refusing to buy goods whose production negatively impacts the environment (20.9 percentage points), and buying environmentally friendly products (20.6 percentage points).

Interestingly, differences based on socio-economic status were smaller and generally weak or not statistically significant. Comparisons between students from the highest (4th quartile) and lowest (1st quartile) SES groups revealed minimal differences in pro-environmental consumer behaviours.

Civic knowledge differences revealed mixed associations with these behaviours. At the scale level, students with higher civic knowledge report less frequent engagement in certain consumer actions. At the item-level in the case of refusing to buy goods with negative environmental impact and buying only recyclable goods, no significant difference in civic knowledge was

observed between students who reported engaging in these actions "often" or "sometimes" and those who did so "rarely" or "never". However, buying environmentally friendly products showed a positive, though weak, association with civic knowledge. After adjusting for SES and gender, the relationship between civic knowledge and the first two behaviours became consistently negative, while for buying environmentally friendly products, the adjusted association was no longer statistically significant. These findings suggest that higher civic knowledge does not always correspond to greater engagement in pro-environmental consumer behaviours. In fact, students with higher civic knowledge levels were less likely to report participating in certain pro-environmental consumer behaviours and/or have a more critical or sceptical approach towards some actions like e.g., greenwashing or oversimplified environmental messaging, which could be associated with "environmentally friendly" products.

Table 8 ***Students' reports on environment-related consumer behaviours – differences by gender, SES, and civic knowledge***

	Difference in percentages between girls and boys (percentage points), SE	**Difference in percentages between SES IV–I quartile (percentage points), SE**	**Difference in civic knowledge (ICCS 2022 Civic knowledge proficiency scale points), SE**	**Difference in civic knowledge (ICCS 2022 Civic knowledge proficiency scale points) for the mean value of SES and gender, SE**
ES4G10B Refuse to buy goods whose production has a negative impact on the environment	20.87 (2.16)***	7.59 (4.22)	-2.77 (3.16)	-12.02 (2.93)***
ES4G10D Buy only goods that can be recycled afterwards	15.9 (2.5)***	7.61 (3.81)*	-0.65 (3.17)	-7.71 (2.9)**
ES4G10E Buy environment-friendly products	20.61 (2.32)***	6.63 (3.67)	6.46 (3.36)*	-2.85 (3.13)

Source: own elaboration based on ICCS 2022 data

* p<0.05, ** p<0.01, *** p<0.001.

Note: Differences in percentages between students a) girls and boys b) SES IV–I quartile, declaring that they did something "often" or "sometimes"; Differences in civic knowledge between students declaring that they did something "often" or "sometimes" and those declaring they "never" or "rarely" did it.

4.5 Students' expected participation in pro-environmental activities in the future

Students were also asked about possible future participation in various civic activities, some of which were related to environmental issues. Table 9 presents the distribution of their responses. 8th graders were supposed to declare whether they think they will "certainly" or "probably" engage in those activities or not.

Polish 8th grade students differ in their willingness to engage in different types of activities. The majority (83.9%) declared that they would certainly or probably be willing to tell someone to stop damaging the environment. Lower levels of willingness were reported for encouraging others to make personal efforts and refusing to buy products harmful to the environment, although still around ¾ of students indicated that they would certainly or probably take these actions. The lowest levels of willingness was observed for participating in organised protests, with 60.6% of 8th graders considering this action. This suggests that students are less inclined toward public forms of activism.

Table 9 ***Polish 8th grade students' reports on expected participation in pro-environmental activities in the future***

There are many different ways how citizens may express their opinions about important issues in society. Would you take part in any of the following activities to express your opinion in the future?	**1. I would certainly do this**	**2. I would probably do this**	**3. I would probably not do this**	**4. I would certainly not do this**
IS4G31G Refuse to buy products that are harmful for the environment	26,5%	46,8%	20,0%	6,7%
IS4G31H Tell someone to stop causing damage to the environment	35,9%	48,0%	12,6%	3,5%
IS4G31I Participate in an organized protest to demand more action to protect our environment	19,2%	41,4%	31,6%	7,7%
IS4G31J Encourage other people to make personal efforts to help the environment (e.g. through saving water)	28,2%	49,4%	17,8%	4,6%

Source: own elaboration based on ICCS 2022 data

The scale measuring students' expected participation in pro-environmental activities (*s_envact*) has a national mean of 51.36 and a standard deviation of 8.81. The results reveal a substantial gender difference: girls score nearly 4.7 to 4.9 points higher than boys, which corresponds to just over half a standard deviation. This suggests that girls are notably more likely to anticipate engaging in civic actions for the environment in the future. SES has a small positive association with expected participation in Model 1, which diminishes after including civic knowledge. The overall effect of civic knowledge is minimal, with a slight negative interaction, suggesting that its influence may decrease among students with higher SES. The model explains a modest portion of variance (R^2 increasing from 0.08 to 0.09), reinforcing the pattern seen across outcomes—gender is the most consistent predictor, while SES and knowledge show weaker, context-dependent associations.

These results are reflected in the item-level analyses. Table 10 presents differences in students' reports on expected participation in pro-environmental activities in the future by gender, SES, and civic knowledge. Similar patterns to those observed in other areas emerge in the differences between girls and boys, with girls consistently more likely than boys to express a willingness to participate in all four forms of action. The largest difference—23.2 percentage points—is connected to participation in organised protests, indicating that girls are far more likely than boys to express interest in collective activism. However, other behaviours also showed substantial differences. Gender is a strong predictor of pro-environmental engagement, with girls consistently demonstrating greater proactivity than boys across all types of behaviours. Interestingly, when it comes to predictions about future engagement, no significant differences were noted between students based on their socio-economic status. The differences between students from the highest and lowest SES quartiles are very small and not statistically significant.

A comparison of civic knowledge between students who indicated they would "certainly" or "probably" take part in specific actions and those who declared they would "certainly not" or "probably not" participate suggests a relationship between civic knowledge and the willingness to engage, but this relationship is not consistent across all types of activities.

The strongest positive associations with civic knowledge were observed in refusing to buy harmful products (18.9 scale points) and encouraging others to make personal efforts (18.5 scale points). These associations remained significant even after controlling for SES and gender. However, no significant differences were observed for participating in organised protests and telling someone to stop damaging the environment. Interestingly, after adjusting for SES and gender, a weak negative association between civic knowledge and the willingness to participate in protests was noted, although it was not statistically significant. The findings may indicate that higher civic knowledge is more strongly linked to individual, less confrontational behaviours, but not necessarily with collective, more demanding actions like protests.

Table 10 ***Students' reports on expected participation in pro-environmental activities in the future—differences by gender, SES, and civic knowledge***

	Difference in percentages between girls and boys (percentage points), SE	**Difference in percentages between SES IV–I quartile (percentage points), SE**	**Difference in civic knowledge (ICCS 2022 Civic knowledge proficiency scale points), SE**	**Difference in civic knowledge (ICCS 2022 Civic knowledge proficiency scale points) for the mean value of SES and gender, SE**
IS4G31G Refuse to buy products that are harmful for the environment	19.5 (2.35)***	4.38 (3.34)	18.91 (3.52)***	11.15 (3.32)***
IS4G31H Tell someone to stop causing damage to the environment	11.29 (1.75)***	0.1 (1.96)	6.66 (4.53)	1.2 (4.07)
IS4G31I Participate in an organized protest to demand more action to protect our environment	23.16 (2.48)***	2.3 (3.12)	1.35 (3.2)	-5.31 (2.98)
IS4G31J Encourage other people to make personal efforts to help the environment (e.g. through saving water)	18.55 (2.07)***	3.52 (3.02)	18.5 (3.86)***	10.91 (3.63)***

Source: own elaboration based on ICCS 2022 data

* p<0.05, ** p<0.01, *** p<0.001.

Note: Differences in percentages between students a) girls and boys b) SES IV–I quartile, declaring that they would "certainly" or "probably" take part in particular activities; Differences in civic knowledge between students declaring that they would "certainly" or "probably" take part and those declaring they would "certainly" or "probably" not do this.

4.6 Relationships between attitudes and behaviours

One of the key questions among researchers studying pro-environmental behaviours and attitudes is the relationship between these two domains, particularly in the context of identifying the determinants of pro-environmental behaviours. In this analysis, relationships between specific analysed aspects were examined, including: a) students' concerns about environmental threats b) students' views regarding environmental protection, c) reports on students' sustainable behaviours and d) consumer behaviours as well as d) students' expected participation in environment-related activities in the future.

Five scales were used for the analysis, four of which consist exclusively of items relating to the analysed aspects, while one (*e_ethcon*) also includes other consumer behaviours relevant to sustainable development, extending beyond environmental issues (see Table A1 in the Annex). The results of the correlation analyses are presented in Table 11. They revealed positive relationships between all scales. However, the strength of these relationships varies.

Table 11 ***Correlations between students' concerns about environmental threats, students' views regarding environmental protection, reports on students' sustainable behaviours and consumer behaviours as well as students' expected participation in environment--related activities in the future***

	s_envcon – students' concern about threats to the global environment	**s_attenv** – positive attitudes toward environmental protection	**e_susbeh** students' reports on their sustainable behaviours	**e_ethcon** – students' reports on political consumerism behaviours	**s_envact** – students' expected participation in activities to protect the environment
s_envcon	1.00	0.35 (0.02)	0.25 (0.03)	0.17 (0.02)	0.32 (0.02)
s_attenv		1.00	0.33 (0.03)	0.29 (0.02)	0.47 (0.03)
e_susbeh			1.00	0.49 (0.02)	0.43 (0.02)
e_ethcon				1.00	0.45 (0.02)
s_envact					1.00

Source: own elaboration based on ICCS 2022 data

Note: Standard errors in parentheses. All correlations are significant at the 0.001 level. Correlations were estimated using a structural equation model and accounting for the complex sampling design. The model's standardised covariances correspond to the Pearson correlation coefficients.

The strongest correlation, though still moderate, was observed between two scales for pro-environmental behaviours: *e_ethcon* (consumer behaviours) and *e_susbeh* (sustainable behaviours), with $r = 0.49$. This indicates that students who engage in one form of pro-environmental behaviour are more likely to engage in others, highlighting the interconnectedness of environmentally conscious actions. A similarly strong, moderate correlation ($r = 0.47$) was found between support for environmental protection (*s_attenv*) and future expected participation in environment-related activities (*s_envact*). This relationship suggests that students with more positive attitudes toward environmental protection—those who, in this scale, are more likely to view environmental protection as the responsibility of both governments and individuals—are also more likely to declare their intention to take this responsibility and engage in pro-environmental activities in the future.

Slightly weaker but still moderate correlations were observed between future expected participation in pro-environmental activities (*s_envact*) and current behaviours: sustainable behaviours (*e_susbeh*, $r = 0.43$) and consumer behaviours (*e_ethcon*, $r = 0.45$). These findings suggest that present pro-environmental behaviours are moderately related to students' expectations of future engagement.

Notably, weak but statistically significant correlations were recorded between concerns about environmental threats (*s_envcon*) and both consumer behaviours (*e_ethcon*, $r = 0.17$) and sustainable behaviours (*e_susbeh*, $r = 0.25$). Additionally, the correlation between environmental concerns (*s_envcon*) and future expected participation (*s_envact*) was also weak ($r = 0.32$). This implies that concerns about environmental threats do not directly translate into either current or planned pro-environmental behaviours. These relatively weak correlations highlight that strategies relying solely on fear or concern about environmental threats may not effectively drive pro-environmental actions. Instead, fostering a sense of responsibility—both at the individual and national levels—may play a more significant role. Of course, it is important to remember that these analyses reflect associations, not causal relationships.

5. DISCUSSION AND CONCLUSIONS

This analysis highlights the complex interplay between environmental attitudes, behaviours, and factors such as gender, socio-economic status (SES), and civic knowledge among Polish 8th-grade students. The complementary use of scale-level regression and item-level analyses offers distinct insights into students' environmental attitudes and behaviours. By combining aggregate and disaggregated analyses, this study not only confirms known predictors of pro-environmental behaviours: such as gender and SES, but also identifies counterintuitive and context-specific patterns, particularly regarding civic knowledge and economic priorities. While regression models based on aggregated scales reveal broad patterns relating to gender, socio-economic status (SES), and civic knowledge, item-level analyses uncover nuanced variations that composite measures may obscure. The findings underscore that pro-environmental behaviours are heterogeneous and shaped by distinct

psychological, economic, and social mechanisms. The dual analytical approach is therefore essential: regressions provide generalizable insights, while item-level analyses illuminate exceptions and subtleties, enabling more precise interpretation and better-targeted recommendations.

The examination of specific items within the scales and the relationships between scales reveals a number of general patterns connecting pro-environmental attitudes and behaviours with gender, socio-economic status, and cognitive factors—level of civic knowledge. The findings confirm that, in Poland, girls exhibit significantly more pro-environmental attitudes than boys. Girls are also more frequently engaged in pro-environmental activities and are more likely to report that they expect they will participate in civic activities on behalf of the environment in the future. Gender differences are consistent across both analytical approaches, and are observed across all scales, and almost all items, with only two items showing no statistically significant differences. However, item-level analyses highlight larger gender disparities in specific behaviours (e.g., limiting the use of plastic items, purchasing second-hand items) than are visible in the aggregated scores. This highlights the importance of promoting pro-environmental engagement among boys during primary education. Similar patterns have been seen across many studies and countries showing that in general, females are often more engaged in environmental issues, and this is usually explained by differences in socialisation (Zelezny et al. 2000).

The relationships involving students' socio-economic background are more complex. Overall, students with higher SES demonstrate more pro-environmental attitudes and behaviours. SES effects vary by analytical level. Regression models suggest a modest SES influence, particularly once civic knowledge is accounted for. However, for some items within both the attitudes and behaviours scales, the differences between students from the highest (4th quartile) and lowest (1st quartile) SES groups are not statistically significant. Furthermore, while students from higher SES groups more frequently report engaging in most actions in the case of sustainable behaviours, significant differences are observed for only one consumer behaviours item, and even then it is rather small. Similarly, no significant SES-based differences were found in students' declarations regarding their expected participation in pro-environmental civic activities in the future. These findings suggest that the relationships between socio-economic status and pro-environmental attitudes and behaviours, particularly those relating to consumption patterns, are highly complex and shaped by financial motivations and financial capabilities. Other studies also highlight the complexity of the relationship between pro-environmental attitudes, behaviours, and socio-economic status, revealing variations across different social classes. Some research suggests that individuals from middle-class backgrounds tend to exhibit higher levels of pro-environmental behaviour compared to those from lower or upper classes (Chen et al., 2023). Additionally, subjective perceptions of social status play a crucial role in shaping environmental engagement (Kirsten et al., 2024).

Civic knowledge adds another layer of complexity. Generally, higher civic knowledge among students is associated with more pro-environmental attitudes and more frequent engagement in pro-environmental behaviours, both current and anticipated. However, this relationship is not consistent across all items. The role of civic knowledge diverges most notably between analyses at the scale and item level. While scale-level regressions depict civic knowledge as a weak-to-moderate positive predictor—except for consumer behaviours (*e_ethcon*), where a negative association appears—item-level analyses offers additional insight. For some items, the correlations are not statistically significant, and for others, a negative relationship emerges.

Given the associations described above, it is particularly interesting to take a closer look at the items that diverge somewhat from the primary patterns and are particularly distinctive.

One notable area is concern about climate change. As previously mentioned, Polish 8th grade students are relatively less likely than their peers in other countries to view climate change as a significant threat to the world's future, in contrast to other environmental threats where Polish students rank among the most concerned. Climate change also shows the largest differences in perception based on SES and civic knowledge, with these relationships persisting even after controlling for SES. This highlights that awareness about climate change is a field where educational efforts are especially required to address these disparities.

Another noteworthy item is one from the positive attitudes toward environmental protection scale: "Governments should focus more on protecting the environment than on supporting economic growth". This item has one of the lowest levels of agreement among Polish students, and for this statement, Poland ranks lowest among all countries participating in the study. Furthermore, this item shows a negative correlation with civic knowledge, which becomes even stronger after controlling for SES and gender. This finding suggests that many Polish 14-year-olds, including those with higher civic knowledge, prioritize economic growth over environmental measures.

Negative relationships with civic knowledge were also observed for certain pro-environmental consumer behaviours, such as refusing to buy goods whose production harms the environment or buying only goods that can be recycled. Furthermore, the analysis of items connected with expected participation in pro-environmental civic activities showed that civic knowledge is linked to preferences for certain forms of civic engagement, while not being associated with others. These results contradict the common assumption that knowledge drives pro-environmental behaviours. However, in the case of these items, the relationships are difficult to interpret, and various other factors may play a role, such as economic or cultural considerations.

Among the different scales, students' expected participation in pro-environmental activities (*s_envact*) had the strongest correlation with support for environmental protection (s_attenv). This indicates that students with more positive attitudes toward environmental protection—those who view it as a responsibility of governments and individuals—are also more likely

to express intentions to take this responsibility and engage in pro-environmental activities in the future. This finding is consistent with previous studies that highlight perceived personal responsibility as a strong predictor of pro-environmental behaviour among youth (Thielking & Moore, 2001).

At the same time, the relatively weaker correlation of expected participation in pro-environmental activities (*s_envact*) and concerns about environmental threats (*s_envcon*) emphasise that strategies relying solely on fear or concern are unlikely to be effective. Instead, fostering a sense of responsibility at both the individual and national levels appears to play a more significant role.

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