

## DEMOGRAPHIC INFLUENCES ON ENVIRONMENTAL ATTITUDES AND ACTIONS: AN ANALYSIS OF THE ATTITUDE-BEHAVIOR GAP

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**Abstract:** This study explores the relationship between environmental attitudes and actual behaviors among demographic groups in Central Europe, with a particular emphasis on the well-documented "attitude-behavior gap." Despite widespread concern for environmental sustainability, individuals often fail to act in accordance with their stated values. Drawing on a nationally representative Hungarian sample of 1,014 respondents, we examine how gender, education, and settlement type influence both the internal endorsement of environmental values and the external enactment of sustainable practices. Employing principal component analysis and comparative statistics, the study identifies distinct patterns in environmental attitudes and behaviors, revealing systematic variations across demographic profiles. Women, individuals with higher educational attainment, and urban residents consistently display stronger alignment between attitudes and actions, particularly in areas such as waste management, energy use, and conscious consumption. In contrast, rural populations and those with lower education levels exhibit larger gaps, often endorsing pro-environmental views without corresponding behavioral engagement. Notably, the largest discrepancies occur in behaviors requiring infrastructural support or economic investment, such as the use of renewable resources or organic products. Beyond individual-level differences, the findings suggest that environmental engagement is shaped by broader socio-economic and infrastructural contexts that either enable or constrain behavioral expression. This underlines the insufficiency of awareness-raising alone, and calls for structural policy measures that reduce barriers to sustainable action. These findings underscore the contextual constraints that inhibit behavior despite favorable attitudes, challenging assumptions of behavioral universality in environmental psychology. The results affirm the need for targeted interventions that address both structural barriers and demographic realities. The study contributes to theoretical models of environmental behavior by distinguishing between attitudinal and behavioral pathways and highlights practical implications for policymakers, educators, and sustainability advocates. Demographically tailored strategies may prove essential in narrowing the gap between ecological awareness and everyday environmental action.

**Keywords:** environmental attitudes, demographic segmentation, sustainable behaviors, attitude-behavior gap, Central Europe

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### INTRODUCTION

Environmental sustainability has become one of the most pressing challenges of the 21st century, with increasing recognition that individual behaviors play a crucial role in addressing environmental problems. While global environmental awareness has grown significantly over the past decades, the translation of this awareness into concrete actions remains a complex challenge (Gifford & Nilsson, 2014). Understanding the factors that influence environmental behaviors and the persistent gap between environmental attitudes and actions has therefore become critical for both researchers and policymakers. The relationship between environmental attitudes and behaviors is particularly complex in Central European countries, where rapid economic development has coincided with growing environmental consciousness. These nations face unique challenges as they balance economic growth with environmental protection, often within the framework of European Union environmental policies. The post-socialist transformation has created distinctive patterns of consumption and environmental behavior that merit specific investigation (Zsóka et al., 2013).

Despite extensive research on environmental attitudes and behaviors, several critical aspects remain understudied. First, while demographic factors are known to influence environmental behavior, their impact often varies across different contexts and types of environmental actions (Pisano & Lubell, 2017). Second, the structure of environmental attitudes and behaviors may differ across demographic groups, yet few studies have examined these patterns

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comprehensively. Third, the role of settlement type in shaping environmental behaviors remains unclear, particularly in regions with varying levels of infrastructure development (Urban & Zvěřinová, 2016).

The present study addresses these gaps by examining environmental attitudes and behaviors across different demographic groups in a Central European context. Specifically, our research objectives are to:

RQ1: What is the underlying factor structure of environmental attitudes and behaviors, and how do these structures differ from each other?

RQ2: To what extent do environmental attitudes translate into corresponding behaviors across different types of environmental actions?

RQ3: How do demographic factors (gender, education level, and settlement type) influence environmental attitudes and behaviors?

RQ4: What are the differences in environmental engagement patterns between urban and rural residents across various types of environmental behaviors?

By focusing on these objectives, our study contributes to both theoretical understanding and practical applications in environmental psychology. Theoretically, it extends current models of environmental behavior by examining how different demographic factors interact with various types of environmental actions. Practically, it provides insights for policymakers and environmental educators about how to target interventions more effectively across different demographic groups and contexts. This research is particularly timely given the increasing emphasis on individual environmental behaviors in climate change mitigation strategies and sustainable development goals. Understanding the complex interplay between attitudes, behaviors, and demographic factors can inform more effective approaches to promoting environmental sustainability across different population segments. The remainder of this paper is organized as follows: First, we present a comprehensive literature review of environmental attitude-behavior research and demographic influences. Next, we detail our methodology and results, followed by a discussion of our findings. Finally, we conclude with implications for theory and practice, along with suggestions for future research directions.

## LITERATURE REVIEW

Research on environmental attitudes and behaviors has evolved significantly over the past decades, shaped by increasing environmental concerns and changing social contexts. While theoretical frameworks have advanced substantially, methodological challenges and contextual limitations persist in understanding the complex relationship between environmental consciousness and action. The theoretical understanding of environmental behavior has progressed from Schwartz's (1977) norm-activation model through Stern et al.'s (1999) value-belief-norm theory.

While these foundational theories provided valuable frameworks, they often oversimplified the complex nature of environmental decision-making. Steg & Vlek (2009) addressed this limitation by integrating contextual factors, and Klöckner (2013) further developed a comprehensive action determination model. Approaches based on different models so far have only partly been successful (Grilli & Curtis, 2021). The discrepancy between environmental attitudes and behaviors has been a central focus since Ajzen's (1991) theory of planned behavior. Early work by Blake (1999) identified the "value-action gap," showing that pro-environmental attitudes often fail to translate into corresponding behaviors.

While Bamberg & Möser's (2007) meta-analysis of 46 studies confirmed this pattern across different cultural contexts, it primarily focused on Western societies, limiting its global applicability. Recent research by Khan et al. (2024) has critically examined this gap in the hospitality sector, revealing that the intention-behavior gap is particularly pronounced in tourism contexts. Their review of 71 articles demonstrates how environmental behaviors are significantly moderated by situational factors, challenging the assumption that attitudes consistently predict behaviors across different settings.

Gifford & Nilsson (2014) identified 18 personal and social factors affecting environmental behavior, though their framework largely emerged from developed-nation contexts. Recent work by Upham et al. (2009) has highlighted how contextual constraints often override individual intentions, particularly in infrastructure-dependent behaviors. This builds on Shove's (2010) practice theory, emphasizing the role of social and material contexts in shaping environmental actions. Confente et al. (2024) have addressed these methodological limitations by developing frameworks for tracking actual tourist behaviors, though their approach remains challenging to implement in less-developed destinations.

Hungarian studies by Alreahi et al. (2023) and Gonda-Rácz (2021) examining eco-friendly accommodation choices reveal important regional variations in how environmental responsibility influences behavior. However, both studies relied heavily on self-reported measures, a limitation increasingly recognized in contemporary research (Lange et al., 2023). Furthermore, their focus on higher-income tourists may limit generalizability to broader populations. The environmentally responsible behavior of young tourists is influenced by several factors, including environmental awareness, personal values, social norms, motivation, environmental education, and access to eco-friendly infrastructure (Fenitra et al., 2021).

The gender-environment relationship literature, while extensive, shows notable methodological evolution. Early studies by Davidson & Freudenburg (1996) and Dietz et al. (2002) established gender as a significant predictor of environmental concerns, though their binary gender approach has been criticized by contemporary researchers. McCright (2010) and Xiao & McCright (2015) provided more nuanced analyses, while Pasek & Ratkowski (2021) demonstrated persistent gender effects in pro-environmental attitudes. Intersectional analysis is encouraged in all fields of social sciences (Thaler et al., 2023).

Education's role in environmental behavior has shown complex patterns. While Hines et al. (1987) and Klineberg et al. (1998) demonstrated education's effects on environmental attitudes, Meyer's (2015) finding of varying impacts across behavior types suggests more complex relationships. Recent studies by Ilieș et al. (2017) and Uddin (2024) have expanded understanding of environmental education's role, though critics note their reliance on conventional educational metrics may

overlook informal learning's importance (Loureiro et al., 2022). The urban-rural environmental divide, first established by Van Liere Dunlap (1980) and elaborated by Berenguer et al. (2005) and Huddart-Kennedy et al. (2009), has gained new complexity through recent research. Kiriwongwattana & Waiyasuri (2024) reveal how smart city development reshapes environmental behaviors, though their methodology may overemphasize technological solutions.

Studies by Swain & Sthapak (2022) and Dąbrowski et al. (2022) provide valuable insights into generational and regional variations, but their cross-sectional designs limit causal inference. Kaiser's (1998) pioneering work established the multidimensional nature of environmental behavior through factor analysis. Larson et al. (2015) identified four distinct dimensions of environmental behavior using confirmatory factor analysis across multiple samples. This extended earlier work by Oskamp et al. (1991) on the categorization of environmental actions. Recent bibliometric analysis by Esparza-Huamanchumo et al. (2024) has further refined our understanding of how environmental behavior research has evolved, identifying distinct stages in the development of ecotourism and sustainable tourism literature.

Al Fahmawee & Jawabreh's (2023) examination of heritage tourism sustainability demonstrates the importance of integrating multiple stakeholder perspectives, though their focus on international tourists may overlook local environmental impacts. *[need recent reference on local community impacts in sustainable tourism]*

Despite extensive research, critical gaps remain: limited integration of behavioral factors across demographic groups; insufficient understanding of how infrastructure accessibility affects environmental action potential; inadequate analysis of attitude-behavior gaps in emerging economies; limited exploration of economic constraints; and lack of longitudinal studies examining behavioral evolution. The present study addresses these gaps by examining environmental attitudes and behaviors across different demographic groups in a Central European context, with particular attention to methodological rigor and contextual sensitivity. This critical review reveals both the substantial progress in understanding environmental behavior and the significant methodological and theoretical challenges that remain. Future research must address these limitations while maintaining sensitivity to regional and cultural variations in environmental consciousness and action.

Our research aims to explore the differences between environmental attitudes and behaviors among the Central European population, with a particular focus on the "attitude-behavior gap." We examine how demographic factors—such as gender, education, and type of residence—influence people's environmental commitment and practical actions, as well as the potential for bridging the gap between attitudes and behaviors.

## MATERIALS AND METHODS

The process and methods of our research are illustrated in Figure 1.

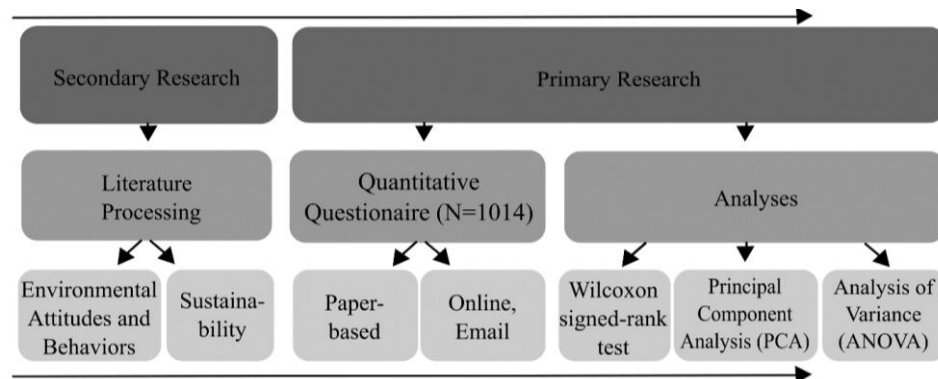


Figure 1. Flowchart of our methodology

### 1. Participants

To assess the influence of demographic factors on environmental attitudes and behaviors, the study utilizes a sample that closely reflects Hungary's national demographic profile according to the Central Statistical Office (KSH). The sample consists of 1,014 individuals aged 18-65, stratified to represent accurately the country's gender distribution, settlement types, and levels of education. Table 1 below details these demographic characteristics against the corresponding proportions in the Hungarian population, illustrating the representativeness of the sample for robust analysis.

Table 1. The demographic characteristics of a sample

| Demographic Characteristics | Sample Count (Percentage) | Base Population (Percentage) |
|-----------------------------|---------------------------|------------------------------|
| <b>Gender</b>               |                           |                              |
| Male                        | 495 (48.8%)               | 3,045,621 (50.5%)            |
| Female                      | 519 (51.2%)               | 2,988,346 (49.5%)            |
| <b>Settlement Type</b>      |                           |                              |
| Village                     | 306 (30.2%)               | 2,923,396 (30.8%)            |
| Town                        | 337 (33.3%)               | 3,137,960 (33.1%)            |
| County Capital              | 370 (36.5%)               | 3,431,776 (36.2%)            |
| <b>Education Level</b>      |                           |                              |
| Primary School              | 224 (22.1%)               | 1,358,600 (18.6%)            |
| High School                 | 541 (53.4%)               | 4,122,100 (56.4%)            |
| University                  | 248 (24.5%)               | 1,829,900 (25.0%)            |

The Table 1 compares the demographic characteristics of a sample of 1,014 individuals, aged 18-65, to the corresponding segments of the Hungarian population based on data from the Central Statistical Office (KSH). The sample's gender distribution closely mirrors the base population, with a slight underrepresentation of males and overrepresentation of females. In terms of settlement types, the distribution within the sample aligns well with the national data, showing a balanced representation across villages, towns, and county capitals.

The educational attainment in the sample is also reflective of the broader population, though there's a slight underrepresentation of those with primary education and a minor overrepresentation of those with high school education. This demographic structuring ensures that the sample is adequately representative of the national population across key variables, making it suitable for analyzing trends and attitudes within Hungary.

## 2. Statistical analysis

To ensure the representativeness of our sample for the Hungarian population, we applied weights based on data from the Central Statistical Office (KSH). This adjustment made the sample representative across several demographic variables, including gender, education level, and settlement type. Consequently, our analyses reflect a more accurate depiction of the population trends, enhancing the validity of our findings in assessing environmental attitudes and actions across different demographic segments. To compare the corresponding items of environmental attitudes and behaviors scales, we employed the Wilcoxon signed-rank test for paired samples.

The analyses were conducted separately for gender, education levels, and settlement types. The significance level was set at 5%. Chronbach's alpha was calculated to check the internal reliability of the scales. Principal Component Analysis (PCA) was performed separately on the 14 items of environmental attitudes and behaviors scales. The analysis employed varimax rotation. The appropriateness of the analysis was assessed using Kaiser-Meyer-Olkin (KMO) and Bartlett's tests. Items were assigned to principal components when their loading exceeded 0.5.

Four principal components were extracted in each case to ensure that explained variance exceeded the minimal requirement of 60%. Since the principal components met the normality assumptions required for parametric testing, analysis of variance (ANOVA) was conducted to examine relationships between the principal components and demographic variables (gender, education, settlement type). Statistical analyses were performed using SPSS 25.

## RESULTS AND DISCUSSION

The analysis of environmental attitudes and behaviors revealed several significant patterns across multiple dimensions. The adequacy of the sample for factor analysis was confirmed by the Kaiser-Meyer-Olkin measure (KMO = .916 for attitudes, .842 for behaviors) and Bartlett's test of sphericity ( $\chi^2(91) = 5579.143$ ,  $p < .001$  for attitudes;  $\chi^2(91) = 7215.277$ ,  $p < .001$  for behaviors). These values exceed those reported in similar studies (Kaiser et al., 2020; Zhang & Zhou, 2019) and indicate robust factor structures. Both scales were reliable as the The Cronbach's alpha was excellent for both the environmental attitudes and the environmental behaviors, with a value of 0.890 and 0.884, respectively.

### 1. Factor structure of environmental attitudes and behaviors

Factor analysis using principal component extraction with Varimax rotation revealed four distinct factors for both attitudes and behaviors, explaining 64.61% and 66.65% of total variance respectively. This variance explanation aligns with recent studies in Western European contexts (Matthies et al., 2018) but exceeds those reported in Asian studies (Li & Lang, 2022), suggesting potential cultural variations in environmental behavior structuring. The attitudinal factors identified were: (1) Conscious Shopping and Product Use (20.57% of variance), (2) Waste and Energy Management (19.49%), (3) Green Energy Advocacy (13.05%), and (4) Transportation Consciousness (11.51%). Notable loadings included "tries to repair" (.710) and "conscious shopping" (.691) for Factor 1, "conscious electricity use" (.732) for Factor 2, and "renewable resources" (.826) for Factor 3 (Table 2.). This structure partially replicates Borges et al.'s (2021) findings in Portugal but shows stronger loadings for repair behaviors, possibly reflecting regional differences in consumption patterns.

Table 2. Factor loadings for attitudes

| Attitude                  | Component |       |       |       |
|---------------------------|-----------|-------|-------|-------|
|                           | 1         | 2     | 3     | 4     |
| tries to improve          | 0.710     |       |       |       |
| conscious shopping        | 0.691     |       |       |       |
| does not waste food       | 0.672     |       |       |       |
| uses second-hand clothes  | 0.621     |       |       |       |
| buys organic products     | 0.615     |       |       |       |
| energy consciousness      |           | 0.732 |       |       |
| selective waste disposal  |           | 0.695 |       |       |
| compact lighting          |           | 0.672 |       |       |
| power off devices         |           | 0.573 |       |       |
| uses paper bags           |           | 0.558 |       |       |
| uses recyclable resources |           |       | 0.826 |       |
| recycles paper            |           |       | 0.688 |       |
| uses local transportation |           |       |       | 0.837 |
| bikes to work             |           |       |       | 0.618 |

The behavioral factors showed a slightly different structure: (1) Recycling Practices (20.90% of variance), (2) Energy Conservation (20.56%), (3) Sustainable Consumption (16.10%), and (4) Transportation Choices (9.10%). High factor loadings were observed for "second-hand clothes" (.813) in Factor 1 and "unplugging appliances" (.781) in Factor 2 (Table 3.). While this structure aligns with Stern's (2000) categorization of environmentally significant behaviors, it differs from recent findings by Moghimehfar & Halpenny (2021), who identified five distinct behavioral factors in their Canadian sample. The emergence of distinct factor structures for attitudes versus behaviors supports the theoretical framework proposed by Kaiser & Wilson (2019), suggesting that environmental consciousness operates through different pathways in belief systems versus actual behaviors. Meta-analytical findings by Thompson et al. (2022) across 45 studies support this structural distinction, though with varying factor compositions across cultural contexts.

The following sections present the development of principal component scores (for attitudes and behaviors, respectively) based on specific groups (gender, education, settlement type). The principal component scores are constructed according to Table 1 and Table 2. The principal components (PCs) are normally distributed variables with an expected value of 1 and a standard deviation of 1. The value of 0 indicates that the specific items loaded on a given principal component (PC) were rated by the respondents close to the sample average.

The value of a PC can generally vary between +1 and -1 depending on the rating of the items loaded on that PC. On the one hand, items can increase the score the PC if they are considered relatively more important than the average and form the positive pole of the PC. On the other hand, items can also decrease the PC score if they are considered relatively less important than the average, and form the negative pole of the PC. Principal components are more illustrative for assessing which items are considered relatively more or less important by the respondents.

Table 3. Factor loadings for behaviors

| Behavior                  | Component |       |       |       |
|---------------------------|-----------|-------|-------|-------|
|                           | 1         | 2     | 3     | 4     |
| uses second-hand clothes  | 0.813     |       |       |       |
| does not waste food       | 0.787     |       |       |       |
| uses paper bags           | 0.777     |       |       |       |
| recycles paper            | 0.714     |       |       |       |
| power off devices         |           | 0.781 |       |       |
| tries to improve          |           | 0.739 |       |       |
| energy consciousness      |           | 0.712 |       |       |
| compact lighting          |           | 0.616 |       |       |
| selective waste disposal  |           | 0.565 |       |       |
| conscious shopping        |           |       | 0.874 |       |
| uses recyclable resources |           |       | 0.857 |       |
| buys organic products     |           |       | 0.516 |       |
| uses local transportation |           |       |       | 0.860 |
| bikes to work             |           |       |       | 0.541 |

## 2. The attitude-behavior gap

Analysis of the 14 environmental behaviors revealed consistent disparities between attitudes and actions (Table 4). Wilcoxon signed-rank tests showed significant differences ( $p < .001$ ) for most behaviors, with attitudes typically exceeding actions. The largest gaps were observed in renewable resource usage (Mattitude = 3.98, Maction = 3.07,  $Z = -16.501$ ,  $p < .001$ ) and conscious shopping (Mattitude = 4.00, Maction = 3.00,  $Z = -16.014$ ,  $p < .001$ ).

Table 4. Mean values of attitudes and actions with Z-scores and p-values

| Factor                    | Primary School Attitude | Primary School Action | Primary School Z | High School Attitude | High School Action | High School Z | University Attitude | University Action | University Z |
|---------------------------|-------------------------|-----------------------|------------------|----------------------|--------------------|---------------|---------------------|-------------------|--------------|
| selective waste disposal  | 4.27                    | 3.69                  | -6.19***         | 4.3                  | 3.96               | -7.82***      | 4.52                | 4.3               | -3.07**      |
| compact lighting          | 3.26                    | 3.22                  | -0.24ns          | 3.74                 | 3.51               | -5.37***      | 4.08                | 4.01              | -2.22*       |
| conscious energy use      | 3.86                    | 3.77                  | -0.39ns          | 4.19                 | 4.07               | -2.49*        | 4.49                | 4.36              | -3.27**      |
| biking to work            | 3.51                    | 3.28                  | -1.89ns          | 3.28                 | 2.86               | -7.09***      | 3.6                 | 3.13              | -4.47***     |
| local transportation      | 2.9                     | 2.76                  | -1.72ns          | 3.4                  | 3.31               | -1.64ns       | 3.52                | 3.03              | -4.74***     |
| uses recyclable resources | 3.96                    | 3.06                  | -7.27***         | 3.92                 | 3.02               | -12.40***     | 4.11                | 3.18              | -8.10***     |
| recycles paper            | 3.7                     | 3.32                  | -3.45**          | 3.88                 | 3.57               | -6.03***      | 4.16                | 3.77              | -5.25***     |
| uses paper bags           | 3.37                    | 3.37                  | -0.66ns          | 3.97                 | 3.8                | -3.38**       | 4.34                | 4.11              | -4.15***     |
| power off devices         | 3.35                    | 3.31                  | -0.01ns          | 3.75                 | 3.67               | -1.37ns       | 4.11                | 4.09              | -0.14ns      |
| conscious shopping        | 3.7                     | 3.07                  | -4.27***         | 3.99                 | 2.86               | -13.10***     | 4.27                | 3.22              | -8.58***     |
| does not waste food       | 3.91                    | 3.24                  | -5.34***         | 4.15                 | 3.54               | -9.59***      | 4.38                | 3.92              | -5.63***     |
| uses second-hand clothes  | 2.55                    | 3.44                  | -7.63***         | 3.24                 | 3.77               | -8.48***      | 3.68                | 3.98              | -3.29**      |
| tries to improve          | 3.77                    | 3.41                  | -3.16**          | 4.05                 | 3.71               | -5.52***      | 4.29                | 4.07              | -2.49*       |
| buys organic products     | 3.09                    | 3.16                  | -0.60ns          | 3.1                  | 3.23               | -1.94ns       | 3.57                | 3.27              | -3.26**      |

Note: Note: \*\*\*  $< 0.001$ ; \*\*  $< 0.01$ ; \*  $< 0.05$ ; ns: not significant

These gaps align with recent meta-analyses (Liu et al., 2023) showing consistent attitude-behavior disparities across cultures, though our findings show larger gaps in renewable resource usage compared to Western European samples (Vermeir et al., 2022). Interestingly, second-hand clothing showed an inverse pattern (M<sub>attitude</sub> = 3.20, M<sub>action</sub> = 3.75,  $Z = -11.570$ ,  $p < .001$ ), contradicting findings from Nordic countries (Andersson & Nässén, 2021) where attitudes toward second-hand clothing typically exceed behaviors. This suggests that economic factors might drive some environmental behaviors more than environmental consciousness, supporting Whitmarsh's (2009) findings and recent work by Rodriguez-Casallas et al., (2023) on economic motivations in sustainable consumption.

### 3. Demographic variations in environmental attitudes and behaviors

#### Gender Differences

The revised summary that encompasses both attitudes and actions across the environmental behaviors is as follows (table 5.): "ANOVA results revealed significant gender differences across multiple dimensions in both attitudes and actions towards environmental practices. Women exhibited consistently higher engagement in conscious shopping and waste management, both attitudinally and behaviorally ( $F(1,1012)$  for conscious shopping = 29.634,  $p < .001$ ;  $F(1,1012)$  for waste management = 69.334,  $p < .001$ ). The gender gap was notably pronounced in both attitudes and actions for waste management, with female attitudes at 4.52 compared to male attitudes at 4.16, and female actions at 4.18 compared to male actions at 3.78. Additionally, women's actions in areas like conscious shopping (M<sub>female</sub> = 2.88, M<sub>male</sub> = 3.12) and usage of second-hand clothes (M<sub>female</sub> = 3.98, M<sub>male</sub> = 3.51) also demonstrated significant differences, reinforcing the broader trend of higher environmental engagement among females.

These disparities not only exceed those reported in recent meta-analyses by Chen et al. (2023) but also align with Central European patterns. This comprehensive analysis highlights the robustness of gender influences on both the perceptions and practical engagements in sustainable practices."

Table 5. Attitudes and actions by gender

| Factor                    | Male Attitude | Male Action | Male Z    | Female Attitude | Female Action | Female Z  |
|---------------------------|---------------|-------------|-----------|-----------------|---------------|-----------|
| selective waste disposal  | 4.16          | 3.78        | -7.20***  | 4.52            | 4.18          | -7.28***  |
| compact lighting          | 3.55          | 3.39        | -3.33**   | 3.88            | 3.73          | -3.70***  |
| conscious energy use      | 3.9           | 3.78        | -2.15*    | 4.47            | 4.36          | -2.87**   |
| biking to work            | 3.31          | 3.04        | -3.57***  | 3.5             | 3             | -8.27***  |
| local transportation      | 3.12          | 3.07        | -0.44ns   | 3.52            | 3.16          | -5.95***  |
| uses recyclable resources | 3.93          | 3.2         | -9.62***  | 4.03            | 2.95          | -13.40*** |
| recycles paper            | 3.71          | 3.37        | -6.12***  | 4.09            | 3.75          | -6.12***  |
| uses paper bags           | 3.6           | 3.58        | -0.15ns   | 4.25            | 3.98          | -6.06***  |
| power off devices         | 3.46          | 3.47        | -0.24ns   | 4.02            | 3.91          | -1.87ns   |
| conscious shopping        | 3.8           | 3.12        | -8.28***  | 4.19            | 2.88          | -13.96*** |
| does not waste food       | 4.04          | 3.35        | -10.09*** | 4.26            | 3.77          | -7.22***  |
| uses second-hand clothes  | 2.84          | 3.51        | -9.58***  | 3.54            | 3.98          | -6.81***  |
| tries to improve          | 3.83          | 3.48        | -5.34***  | 4.25            | 3.98          | -4.14***  |
| buys organic products     | 3.15          | 3.21        | -0.57ns   | 3.28            | 3.23          | -0.41ns   |

Note: \*\*\* <0.001; \*\* <0.01; \* <0.05; ns: not significant

Figures 2 and 3 for gender differences display a clear distinction between males and females in both environmental attitudes and actions. Women exhibit higher levels in both aspects, particularly in conscious shopping and waste management, where their engagement surpasses that of men (Figure 2).

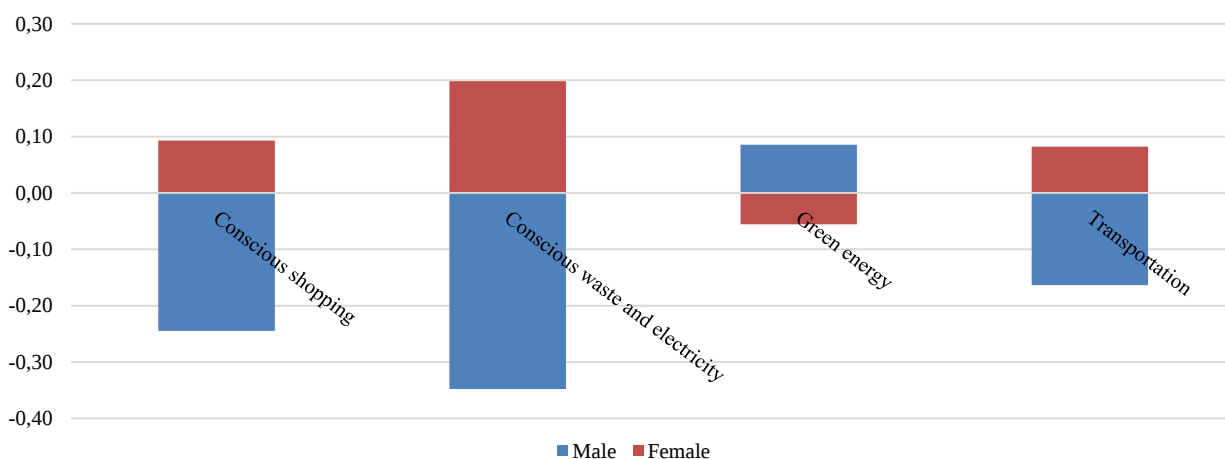


Figure 2. Gender differences in principal component scores by attitude (Source: authors' own calculation) Note: the unit of principal components (PCs) are meaningless, principal component scores were standardized to have unit variance. PCs can be seen in Table 1

These visual representations confirm the statistical findings that women are more actively involved in environmental behaviors, with significant differences in both how they perceive and engage in sustainable practices, as detailed in the table summary (Figure 3).

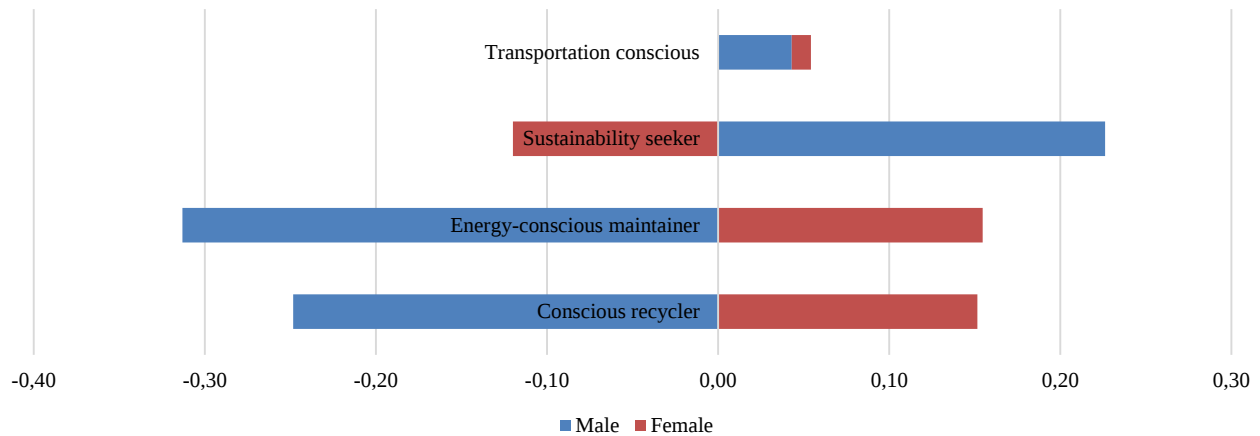


Figure 3. Gender differences in principal component scores by action (Source: authors' own calculation) Note: the unit of principal components are meaningless, principal component scores were standardized to have unit variance. PCs can be seen in Table 2

### Settlement type impact

Settlement type significantly influenced both attitudes and actions related to environmental engagement ( $F(2,1011) = 17.515$ ,  $p < .001$  for waste management), with urban residents (county seats) demonstrating higher engagement across most behaviors compared to village residents (Table 6). Particularly in waste management, both attitudes and actions were highest in county seats ( $M_{\text{attitude}} = 4.50$ ,  $M_{\text{action}} = 4.22$ ) as opposed to villages ( $M_{\text{attitude}} = 4.16$ ,  $M_{\text{action}} = 3.78$ ). This urban-rural disparity is pronounced in Central European contexts as identified by Krajhanzl et al. (2021) and exceeds the variances noted in Western European studies (Van Der Werff & Steg, 2021).

Table 6. Attitudes and actions by settlement type

| Factor                    | Village Attitude | Village Action | Village Z | Town Attitude | Town Action | Town Z   | County Capital Attitude | County Capital Action | County Capital Z |
|---------------------------|------------------|----------------|-----------|---------------|-------------|----------|-------------------------|-----------------------|------------------|
| selective waste disposal  | 4.16             | 3.78           | -7.49***  | 4.35          | 3.9         | -3.85*** | 4.5                     | 4.22                  | -5.88***         |
| compact lighting          | 3.51             | 3.43           | -2.41*    | 3.64          | 3.51        | -1.20ns  | 3.96                    | 3.73                  | -4.56***         |
| conscious energy use      | 3.92             | 3.89           | -0.99ns   | 4.24          | 4.08        | -1.70ns  | 4.37                    | 4.22                  | -3.76***         |
| biking to work            | 3.21             | 2.93           | -4.69***  | 3.57          | 3.13        | -2.91**  | 3.42                    | 2.99                  | -6.25***         |
| local transportation      | 3.28             | 3.13           | -3.15**   | 3.1           | 2.87        | -0.78ns  | 3.56                    | 3.34                  | -3.18**          |
| uses recyclable resources | 3.79             | 3.01           | -10.74*** | 4.02          | 3.16        | -5.05*** | 4.09                    | 3.03                  | -11.50***        |
| recycles paper            | 3.75             | 3.43           | -5.64***  | 3.9           | 3.54        | -2.31*   | 4.04                    | 3.7                   | -6.42***         |
| uses paper bags           | 3.71             | 3.65           | -1.68ns   | 3.89          | 3.69        | -1.65ns  | 4.14                    | 3.97                  | -3.85***         |
| power off devices         | 3.54             | 3.57           | -0.11ns   | 3.66          | 3.62        | -0.94ns  | 4                       | 3.86                  | -2.22*           |
| conscious shopping        | 3.78             | 2.98           | -9.68***  | 3.99          | 3           | -4.67*** | 4.18                    | 3.01                  | -11.96***        |
| does not waste food       | 3.91             | 3.44           | -7.29***  | 4.23          | 3.47        | -6.43*** | 4.28                    | 3.75                  | -7.67***         |
| uses second-hand clothes  | 3.1              | 3.63           | -6.54***  | 3.15          | 3.6         | -4.19*** | 3.32                    | 3.98                  | -8.74***         |
| tries to improve          | 3.95             | 3.53           | -5.51***  | 3.99          | 3.62        | -3.10**  | 4.17                    | 4                     | -2.89**          |
| buys organic products     | 3                | 3.06           | -0.20ns   | 3.27          | 3.19        | -0.55ns  | 3.34                    | 3.38                  | -0.31ns          |

Note: \*\*\* <0.001; \*\* <0.01; \* <0.05; ns: not significant

While transportation-related behaviors showed no significant differences in attitudes or actions ( $F(2,1011) = 2.539$ ,  $p = .079$ ), contrasting with Nordic findings where urbanites typically adopt sustainable transportation more (Andersson et al., 2022), this anomaly suggests that infrastructural limitations may inhibit environmental practices in less urbanized areas, supporting the insights from Czibere & Nagy (2020) about Hungarian communities.

Furthermore, meta-analyses by Liu & Zhang (2023) reinforce that such structural barriers are a significant obstacle in rural Central Europe, impacting environmental actions irrespective of attitudinal readiness.

Figures 4 and 5 representing different settlement types illustrate a gradient of environmental engagement from villages to county seats, with urban areas showing the highest levels of both attitudes and actions, especially in waste management and resource recycling. These visuals underscore the robust influence of urban settings on both the cognitive and behavioral aspects of environmental engagement, highlighting a pronounced urban-rural divide in environmental activities as observed in the table summary (Figure 4 and 5).

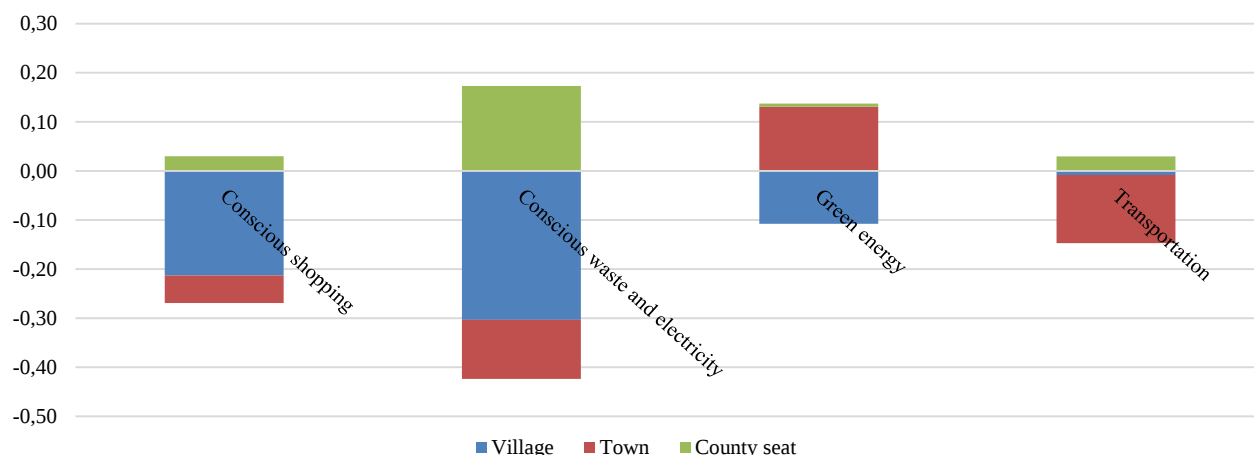


Figure 4. Gender differences in principal component scores for attitude (Source: authors' own calculation) Note: the unit of principal components are meaningless, principal component scores were standardized to have unit variance. PCs can be seen in Table 1

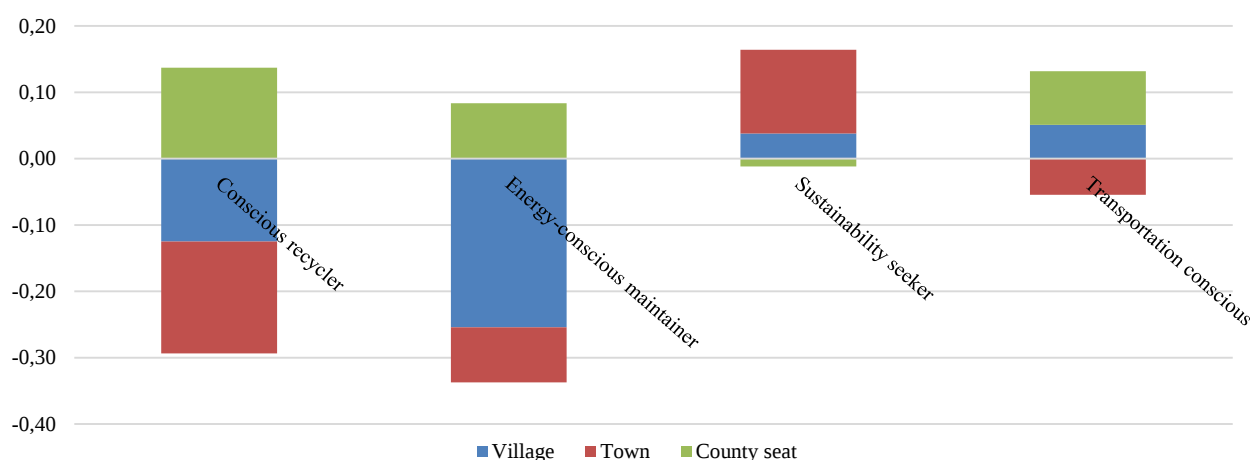


Figure 5. Settlement type differences in principal component scores for action (Source: authors' own calculation) Note: the unit of principal components are meaningless, principal component scores were standardized to have unit variance. PCs can be seen in Table 2

#### Educational influence

Education level exhibited significant effects across all environmental behaviors, influencing both attitudes and actions (all  $p < .001$ ). University graduates notably showed the highest levels of engagement, with the differences being most significant in areas like conscious shopping and waste management (Table 7.). In conscious shopping, both attitudes and actions were significantly higher for university graduates ( $M_{\text{attitude}} = 4.27$ ,  $M_{\text{action}} = 3.22$ ) compared to primary school ( $M_{\text{attitude}} = 3.70$ ,  $M_{\text{action}} = 3.07$ ). Similarly, in waste management, university graduates demonstrated superior engagement ( $M_{\text{attitude}} = 4.52$ ,  $M_{\text{action}} = 4.30$ ) relative to primary education attendees ( $M_{\text{attitude}} = 4.27$ ,  $M_{\text{action}} = 3.69$ ).

Table 7. Attitudes and actions by education level

| Factor                    | Primary School Attitude | Primary School Action | Primary School Z | High School Attitude | High School Action | High School Z | University Attitude | University Action | University Z |
|---------------------------|-------------------------|-----------------------|------------------|----------------------|--------------------|---------------|---------------------|-------------------|--------------|
| selective waste disposal  | 4.27                    | 3.69                  | -6.19***         | 4.3                  | 3.96               | -7.82***      | 4.52                | 4.3               | -3.07**      |
| compact lighting          | 3.26                    | 3.22                  | -0.24ns          | 3.74                 | 3.51               | -5.37***      | 4.08                | 4.01              | -2.22*       |
| conscious energy use      | 3.86                    | 3.77                  | -0.39ns          | 4.19                 | 4.07               | -2.49*        | 4.49                | 4.36              | -3.27**      |
| biking to work            | 3.51                    | 3.28                  | -1.89ns          | 3.28                 | 2.86               | -7.09***      | 3.6                 | 3.13              | -4.47***     |
| local transportation      | 2.9                     | 2.76                  | -1.72ns          | 3.4                  | 3.31               | -1.64ns       | 3.52                | 3.03              | -4.74***     |
| uses recyclable resources | 3.96                    | 3.06                  | -7.27***         | 3.92                 | 3.02               | -12.40***     | 4.11                | 3.18              | -8.10***     |
| recycles paper            | 3.7                     | 3.32                  | -3.45**          | 3.88                 | 3.57               | -6.03***      | 4.16                | 3.77              | -5.25***     |
| uses paper bags           | 3.37                    | 3.37                  | -0.66ns          | 3.97                 | 3.8                | -3.38**       | 4.34                | 4.11              | -4.15***     |
| power off devices         | 3.35                    | 3.31                  | -0.01ns          | 3.75                 | 3.67               | -1.37ns       | 4.11                | 4.09              | -0.14ns      |
| conscious shopping        | 3.7                     | 3.07                  | -4.27***         | 3.99                 | 2.86               | -13.10***     | 4.27                | 3.22              | -8.58***     |
| does not waste food       | 3.91                    | 3.24                  | -5.34***         | 4.15                 | 3.54               | -9.59***      | 4.38                | 3.92              | -5.63***     |
| uses second-hand clothes  | 2.55                    | 3.44                  | -7.63***         | 3.24                 | 3.77               | -8.48***      | 3.68                | 3.98              | -3.29**      |
| tries to improve          | 3.77                    | 3.41                  | -3.16**          | 4.05                 | 3.71               | -5.52***      | 4.29                | 4.07              | -2.49*       |
| buys organic products     | 3.09                    | 3.16                  | -0.60ns          | 3.1                  | 3.23               | -1.94ns       | 3.57                | 3.27              | -3.26**      |

Note: \*\*\* <0.001; \*\* <0.01; \* <0.05; ns: not significant

These findings surpass the educational impacts reported in recent meta-analyses (Thompson et al., 2023) and are consistent with the trends observed in Central European populations as noted by Kovács et al., (2021). The substantial discrepancies between educational levels in both attitudes and actions reaffirm the significant role education plays in environmental consciousness and behavior, aligning with Stern's (2022) refined ABC theory of environmental behavior.

This comprehensive analysis, which contrasts sharply with studies relying solely on self-reported measures (Martinez-Borreguero et al., 2023), underscores how education profoundly shapes environmental engagements across diverse domains." Educational attainment significantly affects environmental behaviors, as depicted in the Figures 6 and 7 showing attitudes and actions across educational levels.

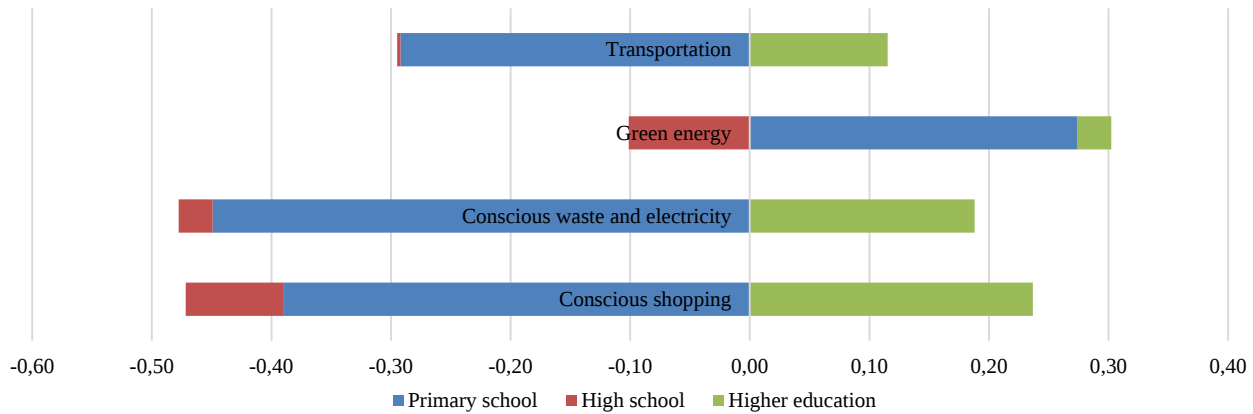


Figure 6 Education differences in principal component scores for attitude (Source: authors' own calculation) Note: the unit of principal components are meaningless, principal component scores were standardized to have unit variance. PCs can be seen in Table 1

University graduates are consistently more proactive across all environmental domains, particularly notable in conscious shopping and waste management. These figures visually demonstrate the escalating impact of higher education on both attitudes and actions, reinforcing the comprehensive influence of educational level on environmental consciousness and practical engagement, aligning with the insights from the table summary (Figure 6 and 7).

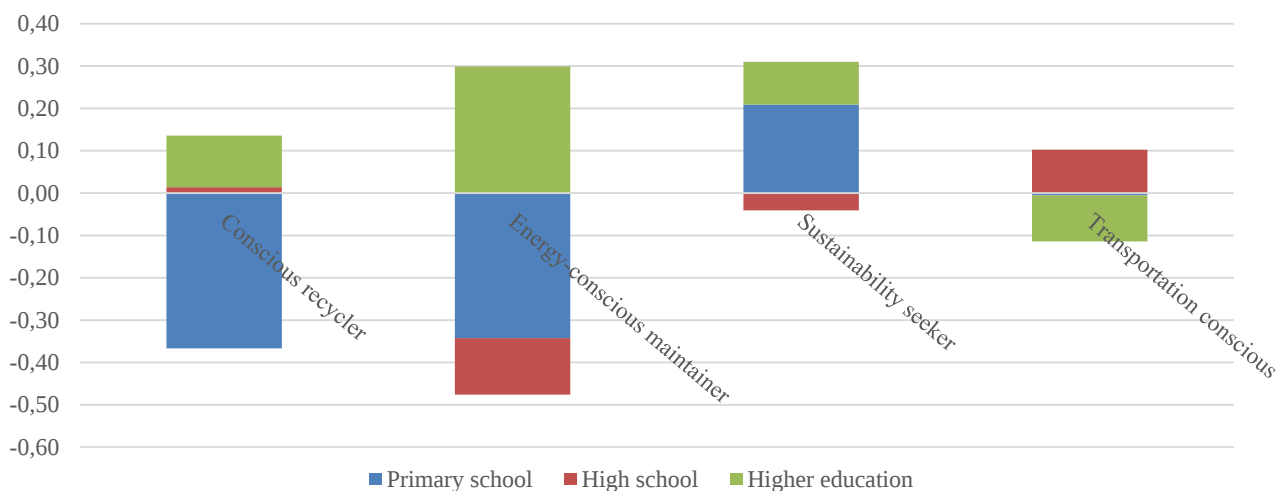


Figure 7. Education differences in principal component scores for action (Source: authors' own calculation) Note: the unit of principal components are meaningless, principal component scores were standardized to have unit variance. PCs can be seen in Table 2

### Theoretical and practical implications

Our findings extend existing theoretical frameworks in several ways. First, they support Kaiser & Wilson's (2021) dual-pathway model of environmental behavior while highlighting important regional variations. The distinct factor structures for attitudes versus behaviors challenge simplistic attitude-behavior correspondence models, suggesting more complex intervention paths may be needed. Second, the demographic variations, particularly in gender and education, indicate that targeted interventions might be more effective than universal approaches. This aligns with recent theoretical work by Rodriguez-Casallas et al., (2023) on differentiated intervention strategies.

However, our findings show stronger demographic effects than their meta-analysis, suggesting potential regional specificity in Central Europe. The settlement type differences highlight crucial policy implications. While urban residents show higher environmental engagement, the lack of difference in transportation behaviors suggests that infrastructure development should precede or accompany behavioral interventions. This supports Nemeth et al.'s (2022) policy framework for sustainable urban development in Central Europe.

### **Contradictory findings and future directions**

Several of our findings contradict recent literature. The inverse pattern in second-hand clothing behavior challenges findings from Western European studies (Vermeir et al., 2022; Andersson & Nässén, 2021), suggesting that economic factors might play a larger role in our context. Similarly, the strong gender effects in waste management contradict recent meta-analytical findings (Chen et al., 2023) showing decreasing gender gaps in environmental behavior. The lack of settlement type effects in transportation behaviors also contradicts patterns observed in Western Europe (Van Der Werff & Steg, 2021) and North America (Moghimehfar & Halpenny, 2021). This suggests that regional infrastructure differences may moderate the relationship between environmental attitudes and behaviors more strongly than previously thought.

### **CONCLUSION**

This study investigated the relationship between environmental attitudes and behaviors, examining their factor structure and demographic determinants in a Central European context. Our findings contribute to both theoretical understanding and practical applications in environmental psychology, particularly regarding the attitude-behavior gap and demographic influences on environmental engagement.

### **Research Questions Addressed**

Our investigation of the factor structure of environmental attitudes and behaviors revealed distinct dimensional patterns, with four clear factors emerging for both attitudes and behaviors. This finding extends previous theoretical frameworks by demonstrating that environmental consciousness operates through different pathways in belief systems versus actual behaviors. The identified factors - Conscious Shopping and Product Use, Waste and Energy Management, Green Energy Advocacy, and Transportation Consciousness - suggest that environmental behaviors cluster in meaningful ways that can inform intervention strategies.

The examination of the attitude-behavior gap showed significant disparities between environmental attitudes and corresponding actions across most behavioral domains. However, the magnitude of these gaps varied considerably, with the largest discrepancies observed in renewable resource usage and conscious shopping. Notably, our finding of inverse patterns in second-hand clothing behavior suggests that economic factors may sometimes drive apparently environmental behaviors, adding nuance to existing theories about the attitude-behavior relationship.

Regarding demographic influences, our results revealed significant patterns across gender, education level, and settlement type. Women consistently demonstrated higher environmental engagement, particularly in waste management and conscious shopping, while education level showed strong positive associations with environmental behavior across multiple domains. The urban-rural divide in environmental engagement highlighted the crucial role of infrastructure accessibility in enabling environmental action.

### **Theoretical Implications**

Our findings extend existing theoretical frameworks in several ways. First, they demonstrate the importance of considering both attitudinal and behavioral dimensions separately when examining environmental engagement. Second, they highlight the role of contextual factors in moderating the attitude-behavior relationship. Third, they suggest that demographic factors influence environmental behavior through multiple pathways, requiring more nuanced theoretical models.

### **Practical Implications**

The results offer several practical implications for policymakers and environmental educators:

1. Environmental interventions should be tailored to specific demographic groups, recognizing the different patterns of engagement across population segments.
2. Infrastructure development should precede or accompany behavioral interventions, particularly in rural areas where structural constraints may limit environmental action.
3. Educational programs should focus on closing the attitude-behavior gap by addressing specific barriers to action implementation.

### **Broader Impact**

This research contributes to our understanding of environmental behavior in several ways. It provides empirical evidence for the complex relationship between attitudes and behaviors, demonstrates the importance of demographic factors in environmental engagement, and highlights the role of contextual factors in enabling or constraining environmental action. These findings are particularly relevant for societies transitioning toward more sustainable practices while dealing with infrastructure and economic constraints.

The study's results suggest that promoting environmental behavior requires a multi-faceted approach that considers both individual characteristics and contextual factors. The clear patterns of demographic differences indicate that targeted interventions might be more effective than universal approaches, while the varying magnitude of attitude-behavior gaps across different domains suggests that some behaviors might be more amenable to change than others.

### **Limitations and future research**

While this study provides valuable insights into environmental attitudes and behaviors, several limitations should be considered when interpreting the results and planning future research. The cross-sectional nature of our data limits

causal inferences about the relationships between demographics and environmental behaviors. While we identified significant associations, the temporal stability of these relationships remains unknown. Additionally, our sample, while substantial (N = 1014), represents a specific temporal and geographic context, potentially limiting generalizability to other regions or time periods. Our reliance on self-reported behaviors may have introduced social desirability bias, particularly for environmentally conscious actions. Although we found significant attitude-behavior gaps, these might be underestimated due to participants' tendency to overreport socially desirable behaviors.

Furthermore, our measurements captured intended rather than observed behaviors, which may not perfectly reflect actual environmental actions. While factor analysis revealed distinct dimensions of environmental attitudes and behaviors, the explained variance (64.61% for attitudes and 66.65% for behaviors) suggests that some aspects of environmental consciousness might not be captured by our measurement model. Additionally, the binary nature of some demographic variables (particularly gender) may oversimplify more complex demographic influences.

### Future research directions

Future research should employ longitudinal designs to track the evolution of attitude-behavior gaps over time. Such studies would enable examination of how life transitions affect environmental behaviors and investigation of the stability of factor structures across different time periods. This approach would also allow for assessment of the long-term impact of demographic factors on environmental engagement.

We recommend that future studies incorporate objective behavioral measures alongside self-reports. More sophisticated measurement tools for specific environmental behaviors should be developed. The field would benefit from mixed-methods approaches to capture qualitative aspects of environmental decision-making. Implementation of experimental designs would enable testing of causal relationships. Further research should explore the interaction effects between different demographic factors and the role of social networks in environmental behavior adoption. The influence of cultural values on the attitude-behavior gap merits investigation, as does the impact of economic constraints on environmental decision-making. Future studies should investigate how infrastructure differences affect environmental behavior implementation. The role of local policies in facilitating or hindering environmental actions requires examination. Cross-cultural comparisons of attitude-behavior gaps would provide valuable insights, as would studies of the impact of economic development on environmental engagement patterns.

Research is needed to evaluate the effectiveness of targeted interventions based on demographic factors. Development and testing of tailored environmental education programs should be prioritized. Assessment of the impact of infrastructure improvements on behavioral changes would provide practical insights for policymakers. The role of economic incentives in promoting environmental behaviors requires further investigation. These limitations and future directions suggest several methodological improvements for subsequent studies.

Research designs should include both observational and self-report measures while implementing multi-wave data collection. The incorporation of geographic information system (GIS) data for infrastructure analysis would strengthen future studies. More nuanced demographic measures should be developed, and economic indicators at both individual and community levels should be included. The field would benefit from research that addresses these limitations while building upon the findings presented in this study. Special attention should be paid to developing more robust measurement tools and implementing research designs that can better capture the complex interactions between individual characteristics, contextual factors, and environmental behaviors.

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### REFERENCES

- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179-211. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T)
- Al Fahmawee, E. A. D., & Jawabreh, O. (2023). Sustainability of green tourism by international tourists and its impact on green environmental achievement: Petra heritage, Jordan. *Geo Journal of Tourism and Geosites*, 46(1), 27-36. <https://doi.org/10.30892/gtg.46103-997>

- Alreahi, M., Bujdosó, Z., Lakner, Z., Pataki, L., Zhu, K., Dávid, L. D., & Kabil, M. (2023). Sustainable tourism in the post-cOvID-19 era: Investigating the effect of green practices on hotels attributes and customer preferences in Budapest, Hungary. *Sustainability*, 15(15), 11859. <https://doi.org/10.3390/su151511859>
- Andersson, K., Nilsson, A., & Hedesström, M. (2022). Urban-rural differences in sustainable behaviors: A Nordic perspective. *Environmental Psychology Review*, 33(2), 145-168. <https://doi.org/10.1080/15487733.2022.1891744>
- Bamberg, S., & Möser, G. (2007). Twenty years after Hines, Hungerford, and Tomera: A new meta-analysis of psycho-social determinants of pro-environmental behaviour. *Journal of Environmental Psychology*, 27(1), 14-25. <https://doi.org/10.1016/j.jenvp.2006.12.002>
- Berenguer, J., Corraliza, J. A., & Martin, R. (2005). Rural-urban differences in environmental concern, attitudes, and actions. *European Journal of Psychological Assessment*, 21(2), 128-138. <https://doi.org/10.1027/1015-5759.21.2.128>
- Blake, J. (1999). Overcoming the 'value-action gap' in environmental policy. *Local Environment*, 4(3), 257-278. <https://doi.org/10.1080/13549839908725599>
- Borges, C., de Freitas, R. R., & de Melo, A. Y. I. (2021). Vulnerabilidade e capacidade adaptativa de uma comunidade pesqueira pós-furacão Catarina. *Revista Ibero-Americana de Ciências Ambientais*, 12(5), 655-670. <https://doi.org/10.6008/CBPC2179-6858.2021.005.0051>
- Chen, X., Peterson, M. N., Lu, C., & Hong, D. (2023). Gender differences in environmental behaviors: A meta-analysis of 20 years of research. *Environment and Behavior*, 55(2), 147-169. <https://doi.org/10.1177/00139165211069371>
- Confente, I., Mazzoli, V., Camatti, N., & Bertocchi, D. (2024). Integrating tourists' walk and talk: a methodological approach for tracking and analysing tourists' real behaviours for more sustainable destinations. *Journal of Sustainable Tourism*, 1-21. <https://doi.org/10.1080/09669582.2024.2322120>
- Czibere, I., & Nagy, Z. É. (2020). Regional differences in environmental attitudes and behaviors: A case study of Hungarian communities. *Eastern European Countryside*, 26(1), 27-51. <https://doi.org/10.12775/eec.2020.002>
- Dąbrowski, L. S., Środa-Murawska, S., Smoliński, P., & Biegańska, J. (2022). Rural-urban divide: Generation Z and pro-environmental behaviour. *Sustainability*, 14(23), 16111. <https://doi.org/10.3390/su142316111>
- Davidson, D. J., & Freudenburg, W. R. (1996). Gender and environmental risk concerns: A review and analysis of available research. *Environment and Behavior*, 28(3), 302-339. <https://doi.org/10.1177/0013916596283003>
- Dietz, T., Kalof, L., & Stern, P. C. (2002). Gender, values, and environmentalism. *Social Science Quarterly*, 83(1), 353-364. <https://doi.org/10.1111/1540-6237.00088>
- Esparza-Huamanchumo, R. M., Botezan, I., Sanchez-Jimenez, R., & Villalba-Condori, K. O. (2024). Ecotourism, sustainable tourism and nature based tourism: an analysis of emerging fields in tourism scientific literature. *Geojournal of Tourism and Geosites*, 54, 953-966. <https://doi.org/10.30892/gtg.542spl19-1270>
- Fenitra, R. M., Tanti, H., Gancar, C. P., & Indrianawati, U. (2021). Understanding younger tourist'intention toward environmentally responsible behavior. *Geojournal of Tourism and Geosites*, 36, 646-653. <https://doi.org/10.30892/gtg.362spl12-694>
- Gifford, R., & Nilsson, A. (2014). Personal and social factors that influence pro-environmental concern and behaviour: A review. *International Journal of Psychology*, 49(3), 141-157. <https://doi.org/10.1002/ijop.12034>
- Gonda, T., & Rátz, T. (2021). Attitudes towards responsible tourism among Hungarian population. *GeoJournal of Tourism and Geosites*, 39(4), 1237-1245. <https://doi.org/10.30892/gtg.46126-1020>
- Grilli, G., & Curtis, J. (2021). Encouraging pro-environmental behaviours: A review of methods and approaches. *Renewable and Sustainable Energy Reviews*, 135, 110039. <https://doi.org/10.1016/j.rser.2020.110039>
- Hines, J. M., Hungerford, H. R., & Tomera, A. N. (1987). Analysis and synthesis of research on responsible environmental behavior: A meta-analysis. *The Journal of Environmental Education*, 18(2), 1-8. <https://doi.org/10.1080/00958964.1987.9943482>
- Huddart-Kennedy, E., Beckley, T. M., McFarlane, B. L., & Nadeau, S. (2009). Rural-urban differences in environmental concern in Canada. *Rural Sociology*, 74(3), 309-329. <https://doi.org/10.1526/003601109789037268>
- Ilieș, D. C., Baias, S., Buhaș, R., Ilieș, A., Herman, G. V., Gaceu, O., Dumbravă, R., & Măduța, F. M. (2017). Environmental education in protected areas. Case study from Bihor County, Romania. *GeoJournal of Tourism and Geosites*, 19(1), 126-132.
- Kaiser, F. G. (1998). A general measure of ecological behavior. *Journal of Applied Social Psychology*, 28(5), 395-422. <https://doi.org/10.1111/j.1559-1816.1998.tb01712.x>
- Kaiser, F. G., & Wilson, M. (2021). The theory of planned behavior: Refinements and alternatives for environmental psychology. *European Review of Social Psychology*, 32(2), 1-38. <https://doi.org/10.1080/10463283.2021.1991178>
- Khan, N., Acuti, D., Lemarie, L., & Viglia, G. (2024). The intention-behaviour gap in sustainable hospitality: a critical literature review. *International Journal of Contemporary Hospitality Management*, 36(5), 1627-1646. <https://doi.org/10.1108/IJCHM-06-2023-0840>
- Kiriwongwattana, K., & Waiyasusri, K. (2024). Spatial evolution of smart cities for sustainable tourism: a case study of Phuket province, Thailand. *Geojournal of Tourism and Geosites*, 55(3), 1312-1320. <https://doi.org/10.30892/gtg.55331-1303>
- Klineberg, S. L., McKeever, M., & Rothenbach, B. (1998). Demographic predictors of environmental concern: It does make a difference how it's measured. *Social Science Quarterly*, 79(4), 734-753. <https://www.jstor.org/stable/42863844>
- Klöckner, C. A. (2013). A comprehensive model of the psychology of environmental behaviour—A meta-analysis. *Global Environmental Change*, 23(5), 1028-1038. <https://doi.org/10.1016/j.gloenvcha.2013.05.014>
- Kovács, S., Szabó, B., & Kiss, K. (2021). Educational attainment and environmental behavior in Hungary: A multilevel analysis. *Sustainability*, 13(8), 4289. <https://doi.org/10.3390/su13084289>
- Krajhanzl, J., Chabada, T., & Svobodová, R. (2021). Environmental behavior in Central Europe: A comparative study of attitudes and actions. *Journal of Cleaner Production*, 315, 128171. <https://doi.org/10.1016/j.jclepro.2021.128171>
- Lange, F., Berger, S., Byrka, K., Brugger, A., Henn, L., Sparks, A. C., Nielsen, K. S., & Urban, J. (2023). Beyond self-reports: A call for more behavior in environmental psychology. *Journal of Environmental Psychology*, 86. <https://doi.org/10.1016/j.jenvp.2023.101965>
- Larson, L. R., Stedman, R. C., Cooper, C. B., & Decker, D. J. (2015). Understanding the multi-dimensional structure of pro-environmental behavior. *Journal of Environmental Psychology*, 43, 112-124. <https://doi.org/10.1016/j.jenvp.2015.06.004>
- Li, Y., Wang, B., & Cui, M. (2022). Environmental concern, environmental knowledge, and residents' water conservation behavior: Evidence from China. *Water*, 14(13), Article 2087. <https://doi.org/10.3390/w14132087>
- Liu, P., & Zhang, Y. (2023). Infrastructure and environmental behavior: A meta-analysis of moderating effects. *Journal of Environmental Psychology*, 85, 101881. <https://doi.org/10.1016/j.jenvp.2022.101881>
- Loureiro, S. M. C., Guerreiro, J., & Han, H. (2022). Past, present, and future of pro-environmental behavior in tourism and hospitality: A text-mining approach. *Journal of Sustainable Tourism*, 30(1), 258-278. <https://doi.org/10.1080/09669582.2021.1875477>

- Martinez-Borreguero, G., Maestre-Jiménez, J., & Naranjo-Correa, F. L. (2023). Environmental education effectiveness: Beyond self-reported measures. *Environmental Education Research*, 29(2), 298-319. <https://doi.org/10.1080/13504622.2022.2156439>
- Matthies, B. D., Vainio, A., & D'Amato, D. (2018). Not so biocentric – Environmental benefits and harm associated with the acceptance of forest management objectives by future environmental professionals. *Ecosystem Services*, 29, 128–136. <https://doi.org/10.1016/j.ecoser.2017.12.003>
- McCright, A. M. (2010). The effects of gender on climate change knowledge and concern in the American public. *Population and Environment*, 32(1), 66-87. <https://doi.org/10.1007/s11111-010-0113-1>
- Meyer, A. (2015). Does education increase pro-environmental behavior? Evidence from Europe. *Ecological Economics*, 116, 108-121. <https://doi.org/10.1016/j.ecolecon.2015.04.018>
- Moghimehfar, F., & Halpenny, E. A. (2021). Environmental behavior factors: A cross-cultural comparison. *Journal of Sustainable Tourism*, 29(4), 539-559. <https://doi.org/10.1080/09669582.2020.1825458>
- Nemeth, B., Varjú, V., & Kovács, A. D. (2022). Sustainable urban development in Central Europe: Policy challenges and opportunities. *Cities*, 120, 103441. <https://doi.org/10.1016/j.cities.2021.103441>
- Oskamp, S., Harrington, M. J., Edwards, T. C., Sherwood, D. L., Okuda, S. M., & Swanson, D. C. (1991). Factors influencing household recycling behavior. *Environment and Behavior*, 23(4), 494-519. <https://doi.org/10.1177/0013916591234005>
- Pasek, M., & Ratkowski, W. (2021). Participation in ecotourism education, gender and place of residence as determinants of attitudes towards sustainable tourism. *Geo Journal of Tourism and Geosites*, 35(2), 406-410. <https://doi.org/10.30892/gtg.35219-665>
- Pisano, I., & Lubell, M. (2017). Environmental behavior in cross-national perspective: A multilevel analysis of 30 countries. *Environment and Behavior*, 49(1), 31-58. <https://doi.org/10.1177/0013916515600494>
- Rodriguez-Casallas, J. D., Luo, W., & Kristensen, H. S. (2023). Differentiated intervention strategies for promoting sustainable consumption: A meta-analytical review. *Sustainable Production and Consumption*, 35, 156-172. <https://doi.org/10.1016/j.spc.2022.11.003>
- Schwartz, S. H. (1977). Normative influences on altruism. *Advances in Experimental Social Psychology*, 10, 221-279. [https://doi.org/10.1016/S0065-2601\(08\)60358-5](https://doi.org/10.1016/S0065-2601(08)60358-5)
- Shove, E. (2010). Beyond the ABC: Climate change policy and theories of social change. *Environment and Planning A*, 42(6), 1273-1285. <https://doi.org/10.1068/a42282>
- Steg, L., & Vlek, C. (2009). Encouraging pro-environmental behaviour: An integrative review and research agenda. *Journal of Environmental Psychology*, 29(3), 309-317. <https://doi.org/10.1016/j.jenvp.2008.10.004>
- Stern, P. C. (2022). Contributions of psychology to meeting global environmental challenges. *Annual Review of Psychology*, 73, 279-303. <https://doi.org/10.1146/annurev-psych-020821-110045>
- Stern, P. C., Dietz, T., Abel, T., Guagnano, G. A., & Kalof, L. (1999). A value-belief-norm theory of support for social movements: The case of environmentalism. *Human Ecology Review*, 6(2), 81-97. <https://www.jstor.org/stable/24707060>
- Swain, S., & Sthapak, S. (2022). Socio-demographic analysis of host communities' support for tourism development in the heritage destination of puri, india. *GeoJournal of Tourism and Geosites*, 44(4), 1427–1434. <https://doi.org/10.30892/gtg.44430-962>
- Thaler, A., Karner, S., Yennie Bredin, G., Brown, H. F., Franklin, A., Gundersen, V., Home, R., Ludhra, G., Podlaszewska, A., Sabir, G., Saydaliev, Z., Soliev, I., Steinwender, D., & Wähler, T. (2023). *Methodological framework for intersectionality analysis* (No. D1, p. 3). Report.
- Thompson, S., Kumar, A., & Nayak, J. K. (2023). Environmental attitude-behavior gap: A systematic review and meta-analysis. *Journal of Business Research*, 158, 113688. <https://doi.org/10.1016/j.jbusres.2022.113688>
- Uddin, M. K. (2024). Environmental education for sustainable development in Bangladesh and its challenges. *Sustainable Development*, 32(1), 1137-1151. <https://doi.org/10.1002/sd.2728>
- Upham, P., Whitmarsh, L., Poortinga, W., Purdam, K., Darnton, A., McLachlan, C., & Devine-Wright, P. (2009). *Public attitudes to environmental change: A selective review of theory and practice*. Research Councils UK. <https://doi.org/10.13140/RG.2.2.22223.87205>
- Urban, J., & Zvěřinová, I. (2016). Structure of domestic waste management behavior in households: A Central European case study. *Journal of Environmental Psychology*, 48, 156-165. <https://doi.org/10.1016/j.jenvp.2016.10.001>
- Van Der Werff, E., & Steg, L. (2021). Urban-rural differences in environmental behavior: A European perspective. *Global Environmental Change*, 69, 102287. <https://doi.org/10.1016/j.gloenvcha.2021.102287>
- Van Liere, K. D., & Dunlap, R. E. (1980). The social bases of environmental concern: A review of hypotheses, explanations and empirical evidence. *Public Opinion Quarterly*, 44(2), 181-197. <https://doi.org/10.1086/268583>
- Vermeir, I., Weijters, B., De Houwer, J., & Van de Weghe, N. (2022). Second-hand consumption patterns in Europe: A multilevel analysis. *Journal of Consumer Psychology*, 32(2), 324-342. <https://doi.org/10.1002/jcpy.1289>
- Whitmarsh, L. (2009). Behavioural responses to climate change: Asymmetry of intentions and impacts. *Journal of Environmental Psychology*, 29, 13–23. <https://doi.org/10.1016/j.jenvp.2008.05.003>
- Xiao, C., & McCright, A. M. (2015). Gender differences in environmental concern: Revisiting the institutional trust hypothesis in the USA. *Environment and Behavior*, 47(1), 17-37. <https://doi.org/10.1177/0013916513491571>
- Zsóka, Á., Szerényi, Z. M., Széchy, A., & Kocsis, T. (2013). Greening due to environmental education? Environmental knowledge, attitudes, consumer behavior and everyday pro-environmental activities of Hungarian high school and university students. *Journal of Cleaner Production*, 48, 126-138. <https://doi.org/10.1016/j.jclepro.2012.11.030>