Journal of Business Sectors
Volume 04 Issue 01 June 2026
ISSN 2989-3445 www.jobsjournal.eu

Key Determinants of Pro-Environmental Consumer Attitudes in the Context of Circular Economy Practices

Silvia Lorincova
Technical University in Zvolen, Slovakia
silvia.lorincova@tuzvo.sk
0000-0002-5763-5002

Maria Osvaldova
Technical University in Zvolen, Slovakia
xosvaldova@is.tuzvo.sk
0000-0003-3184-7282

Bronislav Drimal
Technical University in Zvolen, Slovakia
xdrimal@is.tuzvo.sk
0009-0000-8344-0949

Renata Stasiak-Betlejewska
Czestochowa University of Technology, Poland
renatastasiak@gmail.com
0000-0001-8713-237X

ABSTRACT

Research background: The investigation of consumer attitudes in terms of demographic characteristics represents an important and still relevant area of research. It allows the identification of key determinants of individual consumer behavior. The relevance of this research topic is strengthened by current environmental challenges, especially climate change, which emphasize the need for sustainable use of resources. As a result, there is an increasing need to study the determinants of environmentally responsible attitudes to support the optimization of resource use.

Purpose of the article: The aim of the research is to examine pro-environmental consumer attitudes in material reuse. The focus is on demographic characteristics such as gender, age, income, and place of residence. The research aims to reveal structural differences in consumer preferences and value orientations, providing a deeper understanding of the determinants of environmental attitudes.

Methods: The research was conducted in Slovakia in 2024 using an online questionnaire, with nearly 600 respondents. The main aim was to determine whether key determinants (gender, age, income, and place of residence) influence pro-environmental attitudes toward material reuse. To test hypotheses on group differences, a one-way analysis of variance (ANOVA) was applied. Statistical processing was performed using STATISTICA 12.

Findings & Value added: Research confirmed a statistically significant gender difference in attitudes toward material reuse, with women showing stronger pro-environmental tendencies. No statistically significant differences were found across age groups, income categories, or place of residence, suggesting these demographics are not decisive predictors of pro-environmental attitudes. Results align with prior work on women's stronger environmental engagement and contribute to the academic debate by supporting multidimensional research combining social and psychological determinants. For circular economy policy, this pattern implies demographic segmentation may be ineffective in many policy contexts, measures should promote sustainable consumption across the whole population. Findings highlight behavioral and psychological drivers, supporting educational programs, awareness campaigns, and policy instruments that strengthen environmental norms and individual responsibility for sustainable behavior. Although the gender effect was small, it can refine communication, especially to increase engagement among men. Overall, the study favors behavior-based interventions to advance material reuse and circular economy practices.

RECEIVED: November 6 2025 ⊙ **ACCEPTED:** January 28 ⊙ **PUBLISHED ONLINE:** June 30

KEYWORDS: circular economy, reuse of materials, pro-environmental attitudes, demographic factors, ANOVA

JEL CLASSIFICATION: D12, J10, O13

CITATION: Lorincova, S., Osvaldova, M., Drimal, B. & Stasiak-Betlejewska, R. (2026). Key Determinants of Pro-Environmental Consumer Attitudes in the Context of Circular Economy Practices. *Journal of Business Sectors, 4*(1), 29–42. https://doi.org/10.62222/10.62222/ZNQK8443

INTRODUCTION

The study of consumer attitudes in relation to demographic characteristics represents a well-established and relevant area of research that makes it possible to identify key determinants of consumer attitudes. Gender is traditionally considered an important factor shaping consumer attitudes (Exley et al., 2024; Sahi, 2023; Malghan & Swaminathan, 2021). Other relevant variables influencing consumers' value orientations and preferences include age (Reis & Rese, 2025; Manley et al., 2023; Rudolph et al., 2020), level of education completed, income (He & Tsvetkova, 2025), and place of residence (Kotler & Keller, 2016). Consumer attitudes and preferences are therefore determined by a wide range of sociodemographic and psychological factors (Tamimi et al., 2025; Kral & Janoskova, 2023; Wannemuehler et al., 2023), which highlights the need for their systematic examination also in the context of the circular economy, where consumers play a key role in the implementation of its principles (McQueen et al., 2022).

The aim of the research is to comprehensively examine pro-environmental consumer attitudes in the area of material reuse. The research focuses on identifying structural differences in consumer preferences and value orientations, providing a deeper understanding of the determinants of environmental attitudes. The research gap lies in the integration of traditional demographic variables with the concept of the circular economy, which makes it possible to study consumer attitudes in the context of material reuse. Using mathematical and statistical methods, the influence of gender and age differences, as well as the effects of income, and place of residence on environmental attitudes, is analyzed on a sample of nearly 600 respondents. By identifying these differences, it is possible to better predict consumer decision-making and its variability across different groups. The research findings will provide a basis for developing targeted policies, educational programs, and business strategies that support the implementation of circular economy principles.

The structure of the article is as follows: firstly, theoretical background is presented. Then, the research objective, methodology and data are defined. It is followed by the research results and discussion. Finally, conclusions, limitation, and future research direction are suggested.

THEORETICAL BACKGROUND

The study of consumer opinions in the context of demographic characteristics represents a long-established and still relevant field of research that helps identify the main determinants of individual consumer attitudes. Gender has traditionally been perceived as an important determinant of consumer attitudes, as confirmed by Malghan & Swaminathan (2021), who note a strong global interest in studying gender differences. Research by Exley et al. (2024) also points to differing social preferences between men and women. In a broader context, Sahi (2023) argues that gender is a crucial factor in interpreting financial choices and decisions, suggesting that gender differences play a significant role in both consumer and economic behavior. Sreen et al. (2018) state that women tend to show a more positive attitude toward purchasing environmentally friendly products than men. According to Kotler & Keller (2016), other important factors influencing consumer value orientations and preferences include age, education, income, and place of residence. Mohr & Schlich (2016) expand the range of variables to include household size, marital status, social class and wealth, occupation and type of work, as well as urban versus rural environment. The issue of generational studies and generational differences is addressed, for example, by Rudolph et al. (2020). Evidence of varying preferences across different age groups is provided by Reis & Rese (2025), who emphasize the importance of age in shaping attitudes and consumer decisions. Research by Boulianne & Shehata (2022) also focuses on differences between younger and older generations. Manley et al. (2023) prove that generation Z shows a higher willingness to pay for sustainable and ethically produced products than millennials, which indicates a shift in values towards environmental responsibility. Income appears as additional factor that plays a significant role in shaping consumer attitudes. He & Tsvetkova (2025) highlight that higher socioeconomic status (measured by income or education) is associated with greater diversity of consumption across brands and price levels. This means that consumers with higher incomes have broader options for choice and experimentation. Research by Tamimi et al. (2025), Kral & Janoskova (2023), Wannemuehler et al. (2023) also confirm that consumer attitudes and preferences are influenced by various sociodemographic factors. This underscores the need to examine consumer opinions and preferences in the context of the circular economy, as consumers represent a key element in applying its principles (McQueen et al., 2022).

Although socio-demographic factors such as age, gender, income, and place of residence have traditionally been used as basic determinants of consumer behavior, current research shows that their explanatory power for pro-environmental attitudes is limited. Newer approaches emphasize that psychological and value-based variables are stronger predictors of behavior than simple demographic characteristics (He et al., 2024). Theories such as the Theory of Planned Behavior (TPB) explain pro-environmental behavior through attitudes, subjective norms, and perceived behavioral control (Aisyah & Cahyasita, 2023). Extended models show that environmental values and ecological identity significantly strengthen these mechanisms (Du & Jiang, 2025). Similarly, the Value-Belief-Norm (VBN) theory highlights the role of personal values, beliefs, and moral norms in activating environmentally responsible behavior (Arya & Kumar, 2023). Empirical studies indicate that values such as altruism, biospheric beliefs, and awareness of consequences strongly influence willingness to act in an environmentally friendly way (Yang et al., 2024). Combined

approaches that integrate TPB and VBN provide a more comprehensive explanation of behavior, for example, in the choice of green hotels or low-carbon transport, than demographic models alone (Zhang et al., 2025; He et al., 2024). Research also points to the importance of personal identity and self-perception as an environmentally conscious consumer, which can strengthen the effects of attitudes and subjective norms (Gelibolu & Mouloudj, 2025). While socio-demographic variables such as income or age can support market segmentation, psychological determinants explain why individuals adopt environmentally friendly decisions (Potrashkova et al., 2024). Current evidence confirms that values, norms, and self-perception have a substantially greater influence on behavior than traditional socio-demographic variables (Sari et al., 2025). These findings support the conclusion that null or insignificant effects of demographic factors are not random, but reflect a shift in marketing theory toward behavioral and psychographic approaches (Alashiq & Aljuhmani, 2025).

In recent years, the concept of the circular economy has attracted increasing attention due to its significant potential to ensure long-term economic sustainability (Agrawal et al., 2025). The main principle of this concept is the efficient management of resources through practices such as recycling, renovation, product life extension, and material reuse (Zhou & Smulders, 2021). This concept is applied across a wide range of sectors (Mhatre et al., 2024). Research demonstrates the extensive application of circular economy principles in the construction industry (Boukherroub et al., 2024; Mhatre et al., 2024), the real estate sectors and forest industry (Ruokamo et al., 2023), as well as in the textile industry (Ferreira et al., 2025; Coscieme et al., 2022). At the same time, research of Eren et al. (2024), and Mhatre et al. (2024) highlight not only the potential of recycling, repair, maintenance, and reconstruction but particularly emphasize material reuse as a key tool for reducing environmental burdens. Material reuse has proven to be one of the most effective strategies for reducing material waste and shortening material cycles (Psarommatis et al., 2025). Within this framework, material reuse represents a central circular economy practice that connects macro-level sustainability objectives with individual consumption decisions. The circular economy, as a macro-level framework, influences consumer behavior through mechanisms that shape individual attitudes, social norms, and perceived personal responsibility. Practices such as material reuse and product life extension create new consumption norms in which environmentally responsible behavior becomes socially expected (Hojnik et al., 2023; Testa et al., 2024). At the micro level, this process is reflected in more positive attitudes toward reuse, stronger perceptions of individual effectiveness, and the development of personal environmental norms (Gu et al., 2024; Rückert et al., 2024). Research also shows that repeated exposure to circular practices supports the internalization of environmental values and increases consumers' willingness to engage in sustainable decisions (He et al., 2024; Sari et al., 2025). Thus, the circular economy functions not only as a production model but also as a behavioral stimulus linking systemic sustainability strategies with individual consumer decision-making.

It also contributes to lowering the consumption of new raw materials and reducing emissions generated by extraction and processing activities (Rückert et al., 2024; Schützenhofer et al., 2022). Furthermore, it extends product life cycles and decreases the pressure on primary natural resources (Gu et al., 2024). According to Wiedenhofer et al. (2025), material reuse represents one of the key instruments for mitigating the negative impacts of climate change. Climate change represents one of the greatest challenges of the 21st century, as it significantly affects both environmental stability and economic development (Pechdin & Bunditsakulchai, 2025; Tang et al., 2025; du Maire et al., 2024; Scholes et al., 2023). Since environmental problems are largely a consequence of human behavior, there is an increasing need to systematically analyze pro-environmental consumer practices (Nagy, 2025).

Previous research (Nagy, 2025; Konstantinidou et al., 2024; Asaad & Suleiman, 2023; De Cicco et al., 2023) have repeatedly focused on socio-demographic variables, such as gender, age, and others, as key determinants that can significantly influence attitudes toward the reuse of materials and products. For example, Leong et al. (2024) examined gender differences in the intention to purchase environmentally friendly packaging products. Zhao et al. (2021) found that women more frequently exhibit environmentally responsible behavior, including material reuse, which may be the result of stronger environmental norms and beliefs. Similarly, Gu et al. (2024) confirmed that women show a higher level of engagement in reuse practices, which may be influenced by greater environmental involvement and interest in sustainability. The issue of pro-environmental attitudes is further expanded by Agoston et al. (2024). Nagy (2025), based on a Hungarian sample, demonstrated that age is a stronger predictor of environmentally responsible behavior than income or education. Moreover, Nagy (2025) found that the number of children in a household positively affects pro-environmental behavior, while women consistently display higher levels of environmental engagement than men. In the context of sustainable consumption, Makowska et al. (2024) provide valuable insights by analyzing the behavior of different generations in terms of environmental responsibility and preferences for sustainable products. Findings from Gu et al. (2024) show that factors such as attitudes, perceived outcome effectiveness, and knowledge are most strongly associated with public behavior related to material reuse. Their research further indicates that gender, age, education, and income jointly contribute to shaping the level of engagement in reuse practices.

Although socio-demographic variables are commonly used in consumer research, recent studies emphasize the importance of psychological theories in explaining why individuals engage in pro-environmental behavior.

RESEARCH OBJECTIVE, METHODOLOGY AND DATA

Data collection was carried out using a structured online questionnaire created in Google Forms. The questionnaire was divided into two main sections. The first section focused on the socio-demographic characteristics of the respondents and included questions examining gender, age, net monthly income, and place of residence. Demografic factors such as gender (women, men), age (under 30 years, 31 - 44 years, 45 - 59 years, 60 - 79 years, 80 years and over), monthly income (less than minimum wage, €616 - € 999, €1,000 - €1,999, €2,000 - €2,999, €3,000 and more), and place of residence (small town, town, medium-sized city, larger city) were investigated. The second section of the questionnaire focused on respondents' attitudes related to the circular economy, particularly material reuse. The analysis focused on attitudes toward material reuse, which were operationalized through the statement: "Reusing materials is important to me." This item was used as the dependent variable in hypothesis testing.

Before completing the questionnaire, respondents were informed about the voluntary nature of participation, the anonymity of the survey, and that the collected data would be used exclusively for scientific and research purposes. By continuing with the questionnaire, respondents provided their informed consent. The structure of the questionnaire was designed to be clear and easy to complete. The average time required to complete the questionnaire was approximately five minutes.

A total of 595 respondents participated, of whom 57.82% were women and 42.18% were men. In terms of age, respondents younger than 30 years dominated the sample (52.61%). Regarding monthly income, the most numerous group consisted of respondents with a monthly income between €1,000 and €1,999 (39.16%). According to the size of their place of residence, the largest share of respondents lived in towns with 5,000 to 50,000 inhabitants (35.97%). A more detailed composition of the research sample is presented in Table 1.

Table 1: Composition of the research sample

Demografic		Abs. frequency	Rlt. frequency
Gender	Women	344	57.82%
	Men	251	42.18%
Age	Under 30 years	313	52.61%
	31 - 44 years	119	20.00%
	45 - 59 years	139	23.36%
	60 - 79 years	21	3.53%
	80 years and over	3	0.50%
Monthly Income	Less than minimum wage (€615)	130	21.85%
	€616 - € 999	141	23.70%
	€1,000 - €1,999	233	39.16%
	€2,000 - €2,999	66	11.09%
	€3,000 and more	25	4.20%
Place of Residence	Small town (up to 5,000 inhabitants)	196	32.94%
	Town (5,000-50,000 inhabitants)	215	35.97%
	Medium-sized city (50,000-100,000 inhabitants)	148	24.87%
	Larger city (over 100,000 inhabitants)	37	6.22%

Source: own research

A respondent was defined as a resident of the Slovak Republic who voluntarily decided to participate in the questionnaire survey. No lower age limit was specified; the main criterion for inclusion was the respondent's willingness to participate and to complete the online questionnaire. A non-probability sampling method (convenience sampling) was used. Respondents were not selected from any existing databases, and no official or commercial respondent databases were used by the authors. Data were collected online using Google Forms. The questionnaire was distributed electronically via e-mail communication and social networks, which made it possible to reach respondents from different regions of the Slovak Republic. Participation in the research was voluntary and anonymous. This entails limitations in representativeness, particularly the strong share of younger respondents (52.61% under 30) and the low proportion of older age groups (only 3.53% aged 60–79 and 0.50% aged 80+). This imbalance may reduce the precision of estimates for older categories and lower the statistical power when testing age-related differences. Therefore, results regarding the effect of age should be interpreted with caution: a lack of significant differences may partly reflect the uneven age distribution and wide confidence intervals in groups with a small number of respondents, and the generalizability of the findings to the overall population of Slovakia is limited in this respect.

Respondents expressed their attitudes on the statement "Reusing materials is important to me". To evaluate the attitudes, a five-point Likert scale was applied. The scale included the following response options: 1 = Strongly disagree; 2 = Somewhat disagree; 3 = Neutral; 4 = Somewhat agree; 5 = Strongly agree. For the analyses the STATISTICA 12 program was used.

Using mathematical and statistical methods, the main research question was tested:

- Do key determinants influence pro-environmental consumer attitudes related to material reuse?

Based on this question, the following hypotheses were formulated:

- H1: It is assumed that there exists a significant difference between women and men in pro-environmental consumer attitudes related to material reuse.
- H2: It is assumed that there exists a significant difference among age groups in pro-environmental consumer attitudes related to material reuse.
- H3: It is assumed that there exists a significant difference among monthly income categories in pro-environmental consumer attitudes related to material reuse.
- H4: It is assumed that there exists a significant difference among size of the place of residence in pro-environmental consumer attitudes related to material reuse.

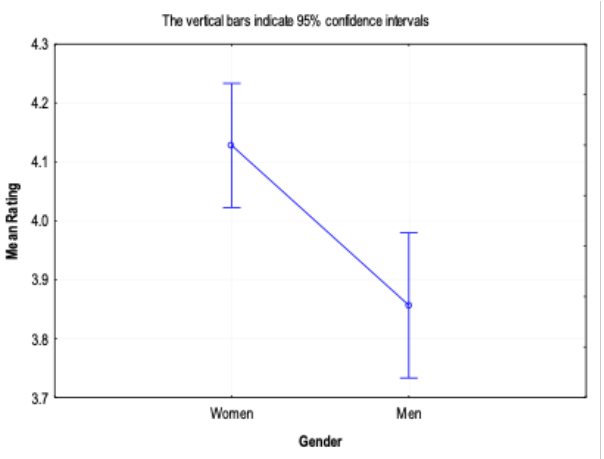
A one-way ANOVA was used to test differences in the degree of material reuse across groups defined by gender, age category, monthly income, and size of the place of residence. ANOVA is quite robust to different variances if the n's are equal and large enough. A one-way ANOVA was applied separately for each factor (gender, age, income, place of residence) to test whether there are statistically significant differences in pro-environmental attitudes, specifically in the reuse of materials. This methodology is commonly used in research on environmental attitudes to examine differences in attitudes and practices by demographic characteristics. For example, Yadav (2018) analyzed environmental attitudes among Nepali adolescents and used one-way ANOVA to test the effects of age, gender, and residential background. Similarly, Oral et al. (2021) used ANOVA to identify differences in environmental behavior among students from different fields of study and socio-demographic groups. Lu (2023) examined the visual and cultural dimension of environmental preferences and used ANOVA to compare perceptions of rural identity through visual elements by gender and age.

Before applying the one-way analysis of variance (ANOVA), the main statistical assumptions of this method were verified. The normality of data distribution was assessed using descriptive statistics and graphical inspection of the distributions. Given the large sample size (n = 595), ANOVA was considered sufficiently robust to minor deviations from normality. The assumption of homogeneity of variances among the compared groups was tested using Levene's test. In all analyzed cases, the test results were not statistically significant ($p > 0.05$), indicating that the assumption of equal variances was met. Based on the fulfillment of these assumptions, one-way ANOVA was applied separately for each demographic factor (gender, age, income, and place of residence). The level of statistical significance was set at $\alpha = 0.05$. Statistical analyses were performed using STATISTICA 12.

RESULTS AND DISCUSSION

In the first area, the research examined pro-environmental attitudes related to material reuse from a gender-based perspective. The initial results presented in Figure 1 show that women achieved higher average values than men. This indicates that women demonstrated more pronounced pro-environmental attitudes in the area of material reuse compared to men.

Figure 1: Pro-environmental attitudes in relation to the reuse of materials from a gender-based perspective.



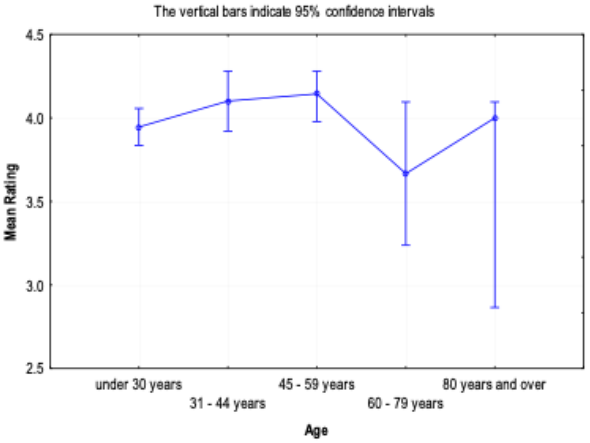
Source: own research

In the next step, the preliminary results were subjected to additional statistical testing. Levene's test supported the assumption, $F(1, 593)=0.024$, $p=0.876$. After checking homogeneity of variances, the difference between women and men was tested using a one-way ANOVA. ANOVA showed a significant main effect of gender, $F(1, 593)=10.789$, $p=0.0011$, with a small effect size ($\eta_p^2=0.0179$; $\omega^2=0.0162$). Women reported higher agreement ($M=4.128$, $SE=0.054$, 95% CI [4.023, 4.233], $n=344$) than men ($M=3.857$, $SE=0.063$, 95% CI [3.733, 3.980], $n=251$); the mean difference was $\Delta M=0.271$, Cohen's $d\approx0.27$. Because the factor had two levels, no post hoc tests were needed. H1 was accepted. The results show that the gender effect is statistically reliable but small in practical terms. A small practical effect means that gender alone is not a strong or efficient variable for market segmentation, even if the result is statistically significant.

The second area of analysis focused on pro-environmental consumer attitudes related to the reuse of materials in relation to age. The preliminary results presented in Figure 2 indicate that the age group 45–59 years attributed the greatest importance to material reuse. Slightly lower values were recorded among respondents aged under 30, 31–44, and over 80 years, with all groups reaching average scores of around 4.0 points. The lowest values were observed in the 60–79 age group, indicating the least level of pro-environmental attitudes related to mate-

rial reuse. Based on the preliminary results, it can be concluded that the middle-aged group (45–59 years) shows the strongest tendency toward material reuse, while the older population (60–79 years) appears to be the least active in this area. The remaining age groups displayed relatively balanced results.

Figure 2:Pro-environmental attitudes in relation to the reuse of materials from an age perspective



Source: own research

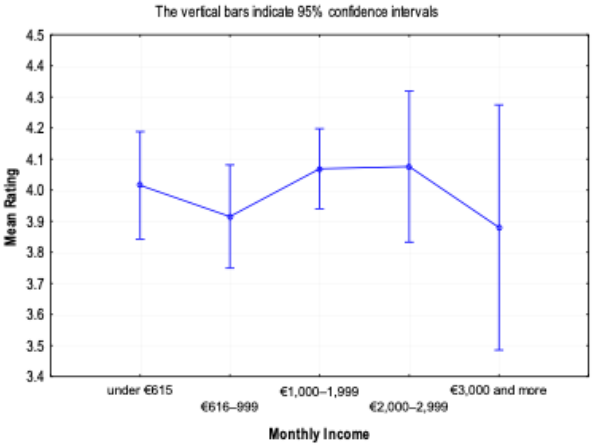
In the next step, differences in agreement levels among age groups were tested using a one-way analysis of variance (ANOVA) after verifying the homogeneity of variances. The analysis examined the assumption that there is a significant difference among age groups in pro-environmental consumer attitudes related to material reuse. Based on the results achieved, it can be stated that Levene's test indicated no violation, F(4, 590)=1.445, p=0.218. The overall effect of age was not significant, F(4, 590)=1.807, p=0.126, and effect sizes were small, η_p^2=0.012 and ω^2=0.005. Descriptive estimates with 95% confidence intervals were:

- ≤30 years M=3.946 (SE=0.057; [3.835, 4.057]; n=313),
- 31–44 years M=4.101 (SE=0.092; [3.921, 4.281]; n=119),
- 45–59 years M=4.144 (SE=0.085; [3.977, 4.311]; n=139),
- 60–79 years M=3.667 (SE=0.218; [3.238, 4.096]; n=21), and
- 80 years and more M=4.000 (SE=0.578; [2.865, 5.135]; n=3).

Wider intervals in the oldest groups reflect small n. Because the overall effect was not significant, no post hoc tests were conducted. H2 was rejected. Based on the results achieved, it can be stated that in this sample, age does not explain a meaningful share of variance in the attitude.

Monthly income was analyzed as the third factor that may influence pro-environmental consumer attitudes related to material reuse. The following income categories were examined: <€615 (income lower than the minimum wage); €616–999; €1,000–1,999; €2,000–2,999; and ≥€3,000. Figure 3 presents the average importance scores, which ranged approximately from 3.8 to 4.1 points. The results indicate that respondents with a monthly income between €2,000 and €2,999 showed the strongest tendency toward material reuse. Slightly lower values were observed among respondents earning €1,000 to €1,999. Both low-income groups (€616–999) and high-income groups (€3,000 and above) assigned less importance to this aspect.

Figure 3: Pro-environmental attitudes in relation to the reuse of materials from an income perspective



Source: own research

Further, after verifying homogeneity of variance, differences across income categories were tested with a one-way ANOVA. Levene's test was non-significant, F(4, 590)=2.090, p=0.081. The ANOVA indicated no income effect on agreement, F(4, 590)=0.690, p=0.599; effect sizes were negligible, η_p^2=0.0047 and ω^2≈0. Descriptive means were as follows:

- <€615 M=4.015 (n=130), - €616–999 M=3.915 (n=141), - €1,000–1,999 M=4.069 (n=233), - €2,000–2,999 M=4.076 (n=66), - ≥€3,000 M=3.880 (n=25).

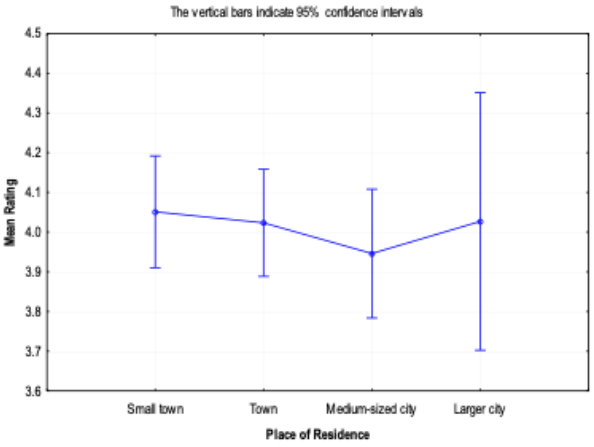
Given substantial interval overlap and the null omnibus test, no post hoc tests were conducted. The results show that income does not differentiate the attitude in this dataset. H3 was rejected.

The last determinant that may influence pro-environmental attitudes toward material reuse was the place of residence. The analysis focused on differences in respondents' views according to the size of the place of residence, categorized as small town (up to 5,000 inhabitants), town (5,000–50,000 inhabitants), medium-sized city (50,000–100,000 inhabitants), and larger city (over 100,000 inhabitants).

The initial results presented in Figure 4 suggest that respondents living in small towns (up to 5,000 inhabitants) and towns with 5,000 to 50,000 inhabitants attributed relatively high importance to material reuse. They were followed by respondents residing in larger cities with more than 100,000 inhabitants. The lowest mean value

was reported by respondents from medium-sized cities with 50,000 to 100,000 inhabitants.

Figure 4: Pro-environmental attitudes in relation to the reuse of materials from a settlement-size perspective



Source: own research

After verifying homogeneity of variances, a one-way ANOVA was used. The analysis examined whether the place of residence influences respondents' pro-environmental attitudes toward material reuse. The assumption of homogeneity of variances held, Levene's $F(3,591)=1.11$, $p=0.344$. The omnibus test was not significant, $F(3,591)=0.323$, $p=0.809$, partial $\eta^2=0.002$. Descriptive means were as follows:

- small town (up to 5,000 inhabitants) M=4.05 (n=196), - town (5,000–50,000 inhabitants) M=4.02 (n=214),

- medium-sized city (50,000–100,000 inhabitants) M=3.95 (n=148), - larger city (over 100,000 inhabitants) M=4.03 (n=37).

Reported importance of reusing materials does not differ by city of residence. Post-hoc comparisons are unwarranted. H4 was rejected.

Research found a statistically significant difference between women and men in attitudes toward the reuse of materials, with women reporting higher agreement. However, the difference had only small practical significance. By contrast, no significant differences were observed across age groups, income categories, or by the size of respondents' place of residence.

The results reached support H1 on gender differences, suggesting that gender may be a relevant factor in shaping environmental attitudes. Women report higher agreement, perhaps relating to different socialization or risk perceptions, which are important topics in marketing communication. The small effect size indicates that other variables may also play an important role. It means that a marketing strategy targeting only women would likely be inefficient and miss many interested men. A statistically significant gender difference was found, but the effect is small. Therefore, gender should not be used for strict segmentation. Instead, marketers can apply small adjustments in communication. For example, one ad version can stress responsibility and social norms, while another can stress practical benefits such as efficiency, savings, or "smart" solutions. Small changes in visuals and calls to action can also be tested. These minor adjustments may improve campaign effectiveness for material reuse programs, while the main message stays the same for all audiences. The lack of significant differences by age (H2), income (H3), and place of residence (H4) suggests that these demographic characteristics are not decisive in this area. The failure of these traditional demographic variables is a very important result for marketing theory. This finding suggests traditional demographic segmentation is not effective for promoting circular economy practices like material reuse.

The analysis showed that women attributed greater importance to the reuse of materials. This finding aligns with previous research that repeatedly show higher environmental engagement among women than men. Research by Saulick et al. (2024), Zhidebekkyzy et al. (2023), and Hansmann et al. (2020) report higher rates of waste sorting, more active environmental attitudes, and more frequent use of sustainable strategies among women. Pratama & Ristanto (2024) identified gender as a key predictor of pro-environmental behavior among students. Similar conclusions were reported by Hernández-Alemán et al. (2024), and Dąbrowski et al. (2022) who highlight interactions between gender, perceived environmental threats, and green identity. Research by Xia & Li (2023), and Yang & Wilson (2023) differentiates types of pro-environmental behavior, with women's influence more common in the private sphere. An exception is Asha & Sultana (2023), who found minimal gender differences, underscoring cultural and contextual variability in this effect.

By contrast, age did not emerge as a significant predictor of attitudes toward the reuse of materials in our research. Previous research, however, reports mixed evidence on this relationship. Some research, such as Wang et al. (2021), Hansmann et al. (2020), and Wiernik et al. (2016), identified a positive effect of age, while others, such as Yang & Wilson (2023), and Zhidebekkyzy et al. (2022), report no effect or even a negative one. Wiernik et al. (2013) found a weak and inconsistent effect of age on self-rated behavior. Research by Ágoston et al. (2024), Lin & Fung (2024), and Pratama & Ristanto (2024) suggests that age may influence behavior only in interaction with other variables, such as cultural context or value orientation. Consequently, age appears to be a variable factor whose effect depends on the type of attitudes, the cultural setting, and individual attitudes.

The third hypothesis tested the association between income level and environmental attitude. The results reached in our research again showed no significant relationship. Similar results are reported by Peterson & Tollefson (2024) and Yang & Wilson (2023), who note that higher income does not necessarily imply greater environmental engagement. Some research, such as Hernández-Alemán et al. (2024), point to a complex interaction among economic status, environmental interest, and behavior. According to Pratama & Ristanto (2024), Ber-

thold et al. (2023), Ertz et al. (2016), and Otto et al. (2016) the effect of income is often mediated by other factors, such as education, access to infrastructure, or green norms. Although Du et al. (2022) showed that income can influence decision making in some contexts, the overall picture is mixed and suggests that income alone is not a strong predictor of environmental attitude.

Similarly, the fourth hypothesis on the effect of place of residence was not supported. Previous research report divergent conclusions. Some research (Cheng & Mao, 2024; Zhidebekkyzy et al., 2023; Dąbrowski et al., 2022) identify stronger pro-environmental behavior among urban residents, especially younger people. By contrast, Yang & Wilson (2023) describe a weak or inconsistent effect and suggest that service availability, infrastructure, and education are more decisive. Other research (Hernández-Alemán et al., 2024; Saulick et al., 2024; Hansmann et al., 2020; Berenguer et al., 2005) also indicates that the environment shapes pro-environmental behavior indirectly through norms, social networks, and conditions for action.

The research question is partially supported. Of the four determinants analyzed, only gender showed a statistically significant association with pro-environmental attitudes related to material reuse ($F(1,593)=10.789$, $p=0.0011$, $\eta_p^2=0.0179$; women > men). Future research should focuse on understanding why gender difference exists. Qualitative methods, such as in-depth interviews or focus groups could help marketers understand the different motivations and barriers for men and women. Age, income, and place of residence did not reach significance in this sample ($p=0.126$; 0.599; 0.809), indicating no meaningful differences across those groups. A comparison with previous research indicates that gender is a relatively stable predictor of environmental attitudes, whereas variables such as age, income, and place of residence show considerable variability, often mediated by other individual or social factors. These findings support the need for a comprehensive, multidimensional approach to researching pro-environmental attitudes because it is proposed that psychographic variables, such as consumer values, personal norms, or lifestyle, are more important predictors of this behavior than demographics. The Theory of Planned Behavior, often explain pro-environmental actions better than simple demographic data. Therefore, it is recommended that marketing strategies should focus on changing attitudes or highlighting social norms, not just targeting groups by age or income.

Although the research was conducted in the conditions of the Slovak Republic, the findings have broader theoretical relevance in an international context. The result showing that age, income, and place of residence are not significant determinants of attitudes toward material reuse is consistent with previous international studies that report the limited explanatory power of traditional demographic variables in pro-environmental research (Otto et al., 2016; Yang & Wilson, 2023; Hernández-Alemán et al., 2024). These findings support a theoretical shift from demographic segmentation toward behavioral and psychological approaches, which are more suitable for cross-country comparisons. International research repeatedly confirms that pro-environmental attitudes and behaviors are more strongly influenced by individual values, personal norms, and perceived behavioral effectiveness than by socio-demographic characteristics alone (Ertz et al., 2016; Gu et al., 2024). From this perspective, theoretical frameworks such as the Theory of Planned Behavior and the Value–Belief–Norm Theory represent universal models that can be applied across different cultural and national contexts (Wiernik et al., 2016; Yang & Wilson, 2023). The findings therefore contribute to the international discussion on the role of consumers in the circular economy and suggest that policies and marketing strategies aimed at promoting material reuse should focus primarily on shaping attitudes, values, and social norms rather than relying solely on demographic characteristics.

Future research could test factors from models like the Theory of Planned Behavior or the Value-Belief-Norm theory. The Theory of Planned Behavior examines attitudes, subjective norms, and perceived behavioral control, which are all important for marketing strategy (Hidayat & Sananta, 2024; Meliniasari & Mas'od, 2024; Wibowo et al., 2024). This would help explain why consumers engage in reuse, moving beyond just who they are. Another very relevant model often used in environmental research is the Value-Belief-Norm Theory which could explain how a consumer's personal values (like caring for the environment) lead to specific beliefs and a personal norm, or feeling of obligation, to engage in material reuse (Gomes et al., 2022; Wang et al., 2023; Soemantri et al., 2025). Results can be important for marketing management because it helps managers understand the core motivations, attitudes, and social norms that marketing can influence. Future research could focuses on psychographic segmentation, which studies consumer values, lifestyles, and AIOs (Activities, Interests, Opinions). Understanding consumer attitudes toward reuse is a first step for marketing more complex circular solutions, such as product-as-a-service, leasing models, or company-led repair programs.

From a theoretical perspective, this study contributes to a better understanding of the determinants of pro-environmental consumer attitudes in the context of the circular economy. The finding that traditional demographic variables such as age, income, and place of residence do not have a statistically significant effect on attitudes toward material reuse challenges classical demographic-based approaches. The results support recent theoretical views emphasizing the importance of psychological and behavioral factors, including values, personal norms, environmental beliefs, and perceived responsibility. Therefore, the study highlights the need to apply broader theoretical frameworks, such as the Theory of Planned Behavior or the Value–Belief–Norm theory, which can explain pro-environmental attitudes more effectively than demographic characteristics alone.

From a practical perspective, the findings have important implications for policymakers, marketing managers, and organizations promoting circular economy principles. Since no significant differences were found across age, income, or place of residence, strategies based solely on demographic segmentation may be ineffective. Instead, practical interventions should focus on shaping consumer attitudes, strengthening social norms, and increasing awareness of the environmental benefits of material reuse. The results also suggest the importance of universal communication campaigns that emphasize the personal and societal value of reuse practices across all consumer groups. For companies, the findings indicate opportunities to design circular business models and marketing strategies that are value-oriented and behavior-focused rather than based only on traditional demographic targeting.

The finding that most demographic groups show similar attitudes toward reusing materials is highly important for both policy makers and marketing managers. It indicates that market segmentation by age, income, or place of residence may not be effective for promoting circular activities, because environmental behavior is influenced more by values, attitudes, and the level of awareness of circular economy principles than by demographic factors. Therefore, marketing strategies should be based on shared motives and values and should use unified, inclusive campaigns that strengthen awareness of the benefits of reuse. As noted by Testa et al. (2024), consumer behavior in the circular economy is more strongly linked to value-oriented attitudes than to age or income. According to Hojnik et al. (2023), companies are increasingly adapting to changing social trends and environmental awareness across generations, which supports the need for universally oriented strategies. Other studies show that demographic differences have only a weak effect on circular behavior, while education, communication, and the availability of solutions that support reuse play a key role (Zhidebekkyzy et al., 2022). From a practical perspective, it can therefore be recommended that managers and policy makers invest in universal information campaigns and behaviorally motivating strategies that promote positive attitudes toward reuse across the whole population (Nowicki et al., 2023).

Based on these findings, several practical steps can be recommended for marketing managers. First, communication should be built on shared values such as environmental responsibility, long-term sustainability, and social benefits, rather than on targeted segmentation by age or income. Second, it is important to build trust and transparency in communication about reuse and recycling, because consumers respond positively to authentic environmental claims supported by evidence. Third, it is recommended to use digital channels and interactive communication formats that combine education with consumer engagement across generations. In addition, marketing activities should be linked to circular economy principles, for example through campaigns that promote longer product lifetimes and product reuse. Finally, collaboration with communities and non-governmental organizations can increase trust and strengthen shared awareness of the benefits of reusing resources.

CONCLUSION

The research on consumer pro-environmental attitudes regarding the reuse of materials, conducted online in Slovakia in 2024, provided valuable insights into the attitudes of different demographic groups. The findings of this research indicate that gender is a significant predictor of attitudes toward the reuse of materials, with women showing higher agreement and placing greater importance on these attitudes; however, the effect size was small. In contrast, age, income, and place of residence were not found to be significant factors, suggesting that their influence on environmental attitudes is variable and often mediated by other individual or social factors. These results align with previous research, highlighting the relative stability of gender differences and the complexity of other demographic factors in shaping pro-environmental attitudes. Overall, the results emphasize the need for a multidimensional approach to studying pro-environmental attitudes that integrate demographic, psychological, and contextual factors.

The main limitation of this research is its geographic and cultural focus, as data were collected exclusively in Slovakia, which may limit the generalizability of the findings. Additionally, small sample sizes in some categories, (e.g., adults over 60 or respondents with and monthly income higher than €3,000), may affect the reliability of the results. Future research should expand and diversify the sample, include multiple cultural contexts, and investigate the link between reported attitudes and actual consumer attitudes. Moreover, integrating psychological, social, and contextual factors that influence pro-environmental attitudes would provide a more comprehensive understanding. Such a multidimensional approach can improve insight into the mechanisms shaping environmental attitudes and support the development of effective interventions promoting sustainable behavior.

The research focused solely on reported attitudes without directly measuring actual behavior, representing an area for future research. Future research should explore other consumer behaviors including repairing, product sharing, leasing, and remanufacturing. Marketing managers need to understand how consumers perceive these different practices. Research should focuse on the perceived value or perceived risk of circular products as it is necessary for developing effective marketing strategies.

ACKNOWLEDGEMENT

The authors acknowledge the financial support from the Scientific grant agency of the Ministry of Education, Science, Research and Sport of the Slovak Republic and the Slovak Academy of Sciences Grant No. VEGA 1/0093/23 “Research of the potential of the circular

economy in the Slovak business environment in the production of innovative products based on recycled materials wood -rubber –plastic", Grant No. VEGA 1/0111/26 "Research on the potential of utilizing quality management approaches in industrial enterprises with a specific focus on the woodworking and furniture industry in the context of increasing their competitiveness".

AUTHOR CONTRIBUTIONS STATEMENT

Conceptualization, S. L., M. O., B. D. and R. S. B.; methodology, S. L. and M. O.; software, M. O.; validation, S. L., M. O., B. D. and R. S. B.; formal analysis, S. L., M. O., B. D. and R. S .B.; investigation, S. L., M. O., B. D. and R. S. B.; resources, S. L. and M. O.; data curation, S. L., M. O., B. D. and R. S. B.; writing-original draft preparation, S. L., M. O., B. D. and R. S. B.; writing-review and editing, S. L., M. O., B. D. and R. S. B.; visualization, S. L., M. O., B. D. and R. S. B.; supervision, S. L. and M. O. All authors have read and agreed to the published version of the manuscript.

DATA AVAILABILITY STATEMENT

The datasets used and analyzed during the current study are available from the corresponding author upon reasonable request.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

REFERENCES

1. Ágoston, C., Balázs, B., Mónus, F., & Varga, A. (2024). Age differences and profiles in pro-environmental behavior and eco-emotions. *International Journal of Behavioral Development*, 48 (2), 132-144. https://doi.org/10.1177/01650254231222436
2. Agrawal, S., Jain, V. K., & Verma, H. (2025). Circular economy! Sustainable growth and achieving zero net emissions - a way ahead for building sustainable tomorrow by optimising consumption. *International Journal of Sustainable Agricultural Management and Informatics*, 11 (1). https://doi.org/10.1504/IJSAMI.2025.143112
3. Aisyah, D., & Cahyasita, D. (2023). Investigating the factor influencing Indonesian Consumers' Intention to Purchase Green Products in Indonesia: Applying the Theory of Planned Behavior. *Buletin Penelitian Sosial Ekonomi Pertanian Fakultas Pertanian Universitas Haluoleo*, 25 (2). https://doi.org/10.37149/bpsosek.v25i2.840
4. Alashiq, S., & Aljuhmani, H. (2025). From sustainable tourism to social engagement: A value-belief-norm approach to the roles of environmental knowledge, eco-destination image, and biospheric value. *Sustainability*, 17 (10), 4353. https://doi.org/10.3390/su17104353
5. Arya, B., & Kumar, H. (2023). Value behaviour norm theory approach to predict private sphere pro-environmental behaviour among university students. *Environmental and Climate Technologies*, 27 (1), 164-176. https://doi.org/10.2478/rtuect-2023-0013
6. Asaad, S., & Suleiman, A. (2023). Socio-demographic factors and treated wastewater reuse in the MENA region: Insights and implications. *Desalination*, 565, 116830. https://doi.org/10.1016/j.desal.2023.116830
7. Asha, M. M., & Sultana, N. (2023). Does social awareness intervention increase the community's environmental attitude and behavior? Social Science Review, 38 (2), 91-104. https://doi.org/10.3329/ssr.v38i2.64462
8. Berenguer, J., Corraliza, J., & Martín, R. (2005). Rural-urban differences in environmental concern, attitudes, and actions. *European Journal of Psychological Assessment*, 21, 128-138. https://doi.org/10.1027/1015-5759.21.2.128
9. Berthold, A., Cologna, V., Hardmeier, M., & Siegrist, M. (2023). Drop some money! The influence of income and subjective financial scarcity on pro-environmental behaviour. *Journal of Environmental Psychology*, 91, 102149. https://doi.org/10.1016/j.jenvp.2023.102149
10. Boukherroub, T., Tchakoutio, A. N., & Drapeau, N. (2024). Using lean in deconstruction projects for maximising the reuse of materials: A Canadian case study, *Sustainability*, 16 (5), 1816. https://doi.org/10.3390/su16051816

11. Boulianne, S., & Shehata, A. (2022). Age differences in online news consumption and online political expression in the United States, United Kingdom, and France. *International Journal of Press-Politics*, 27 (3), 763-783. https://doi.org/10.1177/19401612211060271
12. Cheng, H., & Mao, C. (2024). Disparities in environmental behavior from urban–rural perspectives: How socioeconomic status structures influence residents' environmental actions—based on the 2021 China general social survey data. *Sustainability*, 16 (18), 7886. https://doi.org/10.3390/su16187886
13. Coscieme, L., Manshoven, S., Gillabel, J., Grossi, F., & Mortensen, L. F. (2022). A framework of circular business models for fashion and textiles: the role of business-model, technical, and social innovation. *Sustainability-Science Practice and Policy*, 18 (1), 451-462. https://doi.org/10.1080/15487733.2022.2083792
14. Dąbrowski, A., Środa-Murawska, S., & Dombrowicz, M. (2022). Rural–urban divide? Generation Z and pro-environmental behavior in Poland. *Sustainability*, 14 (23), 16111. https://doi.org/10.3390/su142316111
15. De Cicco, R., Dini, M., Curina, I., Francioni, B., & Cioppi, M. (2023). The influence of socio-demographic factors on feelings of attachment, involvement, loyalty attitudes, and environmentally responsible behavior toward a cultural destination. *Turistica - Italian Journal of Tourism*, 32 (1). https://doi.org/10.70732/tijt.v32i1.18
16. du Maire, P., Gärtner, F., Deckert, M.H., Johlitz, M., & Öchsner, A. (2024). Investigation of the ageing behaviour of multiple reused polypropylene binding twines. *Applied Research*, 3 (6), e202400090. https://doi.org/10.1002/appl.202400090
17. Du, L., & Jiang, S. (2025). Enhancing green food consumption intentions among chinese generation X: Integrating environmental values and self-identity into the theory of planned behavior. *Sustainability*, 17 (7), 2942. https://doi.org/10.3390/su17072942
18. Du, S., Cao, G., & Huang, Y. (2022). The effect of income satisfaction on the relationship between income class and pro-environment behavior. *Applied Economics Letters*, 31, 61-64. https://doi.org/10.1080/13504851.2022.2125491
19. Eren, S., Özenç, A. A., & Çeven, N. (2024). Research on sustainable textile production: Waterless dyeing of PET and recycled PET fabrics. *Tekstilec*, 67 (1), 19-32. https://doi.org/10.14502/tekstilec.67.2023079
20. Ertz, M., Karakas, F., & Sarigöllü, E. (2016). Exploring pro-environmental behaviors of consumers: An analysis of contextual factors, attitude, and behaviors. *Journal of Business Research,* 69, 3971-3980. https://doi.org/10.1016/j.jbusres.2016.06.010
21. Exley, C.L., Hauser, O.P., Moore, M., & Pezzuto, J.H. (2024). Believed gender differences in social preferences. *Quarterly Journal of Economics*, 140 (1), 403-458. https://doi.org/10.1093/qje/qjae030
22. Ferreira, J. C., Triki, E., Doutres, O., Demarquette, N. R., & Hof, L. A. (2025). Recyclable polyester textile waste-based composites for building applications in a circular economy framework. *Journal of Cleaner Production*, 515, 145759. https://doi.org/10.1016/j.jclepro.2025.145759
23. Gelibolu, M., & Mouloudj, K. (2025). Exploring the effect of minimalism on ethical consumer behavior: A value–identity–personal norm theory approach. *Administrative Sciences,* 15 (9), 330. https://doi.org/10.3390/admsci15090330
24. Gomes, G., Moreira, N., Bouman, T., Ometto, A., & Van Der Werff, E. (2022). Towards circular economy for more sustainable apparel consumption: Testing the value-belief-norm theory in Brazil and in The Netherlands. *Sustainability*, 14 (2), 618. https://doi.org/10.3390/su14020618
25. Gu, Y., Xia, Z., Tian, X., Xie, J., & Liu, Y. (2024). Factors determining reuse behavior: A meta-analysis. *Cleaner and Responsible Consumption*, 14, 100213. https://doi.org/10.1016/j.clrc.2024.100213
26. Hansmann, R., Laurenti, R., & Geisseler, B. (2020). Determinants of pro-environmental behavior: A comparison between students and employees at a Swiss university. *Journal of Cleaner Production*, 268, 121864. https://doi.org/10.1016/j.jclepro.2020.121864
27. He, Y., & Tsvetkova, M. (2025). High socioeconomic status is associated with diverse consumption across brands and price levels. *arXiv*, 2506, 13840. https://doi.org/10.48550/arXiv.2506.13840
28. He, Y., Sun, Y., Zhao, Z., Chen, M., Waygood, E., & Shu, Y. (2024). Impact of social-psychological factors on low-carbon travel intention: Merging theory of planned behavior and value-belief-norm theory. *Heliyon*, 10 (6). https://doi.org/10.1016/j.heliyon.2024.e28161
29. Hernández-Alemán, A., Cruz-Pérez, J., & Díaz-Ruiz, R. (2024). The average, direct, indirect, and total effects of environmental concern on behavior: A moderated mediation analysis. *Land*, 13 (8), 1229. https://doi.org/10.3390/land13081229
30. Hidayat, T., & Sananta, D. (2024). Theory of planned behavior on green marketing influence to green purchase decision. *Journal of Digital Marketing and Halal Industry,* 6 (1). https://doi.org/10.21580/jdmhi.2024.6.1.20694
31. Hojnik, J., Ruzzier, M., Ruzzier, M., Sučić, B., & Soltwisch, B. (2023). Challenges of demographic changes and digitalization on eco-innovation and the circular economy: Qualitative insights from companies. *Journal of Cleaner Production*, 396, 136439. https://doi.org/10.1016/j.jclepro.2023.136439
32. Konstantinidou, A., Ioannou, K., Tsantopoulos, G., & Arabatzis, G. (2024). Citizens' attitudes and practices towards waste reduction, separation, and recycling: A systematic review. *Sustainability*, 16 (22), 9969. https://doi.org/10.3390/su16229969
33. Kotler, P., & Keller, K.L. (2016). *Marketing management*. Pearson Education.

34. Kral, P., & Janoskova, K. (2023). Interdependence of selected socio-demographic characteristics of consumers and consumer preferences toward brands. *Innovative Marketing*, 19 (1), 197-207. https://doi.org/10.21511/im.19(1).2023.17
35. Leong, C. M., She, L., Lim, T. Y., & Wong, N. M. (2024). To buy or not to buy? Green packaging, gender differences and the intention to purchase. *International Journal of Social Economics*, 51 (11), 1353-1369. https://doi.org/10.1108/IJSE-04-2023-0249
36. Lin, Z., & Fung, H. (2024). Age differences in pro-environmental behaviors: Is it about me or the next generation? *Innovation in Aging*, 8, 1372-1372. https://doi.org/10.1093/geroni/igae098.4373
37. Lu, J. (2023). Estimating perceptual priority of rural IP visual elements by one-way ANOVA. Proceedings of Second International Conference on Statistics, Applied Mathematics, and Computing Science (CSAMCS 2022). 2022, Nanjing, China. https://doi.org/10.1117/12.2672200
38. Makowska, M., Boguszewski, R., & Hrehorowicz, A. (2024). Generational differences in food choices and consumer behaviors in the context of sustainable development. *Foods*, 13 (4), 521. https://doi.org/10.3390/foods13040521
39. Malghan, D., & Swaminathan, H. (2021). Global trends in intra-household gender inequality. *Journal of Economic Behavior & Organization*, 189, 515-546. https://doi.org/10.1016/j.jebo.2021.07.022
40. Manley, A., Seock, Y. K., & Shin, J. (2023). Exploring the perceptions and motivations of Gen Z and Millennials toward sustainable clothing. *Family and Consumer Sciences Research Journal*, 51 (4), 313-327. https://doi.org/10.1111/fcsr.12475
41. McQueen, R. H., McNeill, L. S., Huang, Q., & Potdar, B. (2022). Unpicking the gender gap: Examining socio-demographic factors and repair resources in clothing repair practice. *Recycling*, 7 (4), 53. https://doi.org/10.3390/recycling7040053
42. Meliniasari, A., & Mas'od, A. (2024). Understanding factors shaping green cosmetic purchase intentions: Insights from attitudes, norms, and perceived behavioral control. *International Journal of Academic Research in Business and Social Sciences*, 14 (1), 1487-1496. https://doi.org/10.6007/ijarbss/v14-i1/20573
43. Mhatre, P., Gedam, V. V., & Unnikrishnan, S. (2024). Management insights for reuse of materials in a circular built environment. *Waste Management & Research*, 42 (5), 396-405. https://doi.org/10.1177/0734242X231187570
44. Mohr, M., & Schlich, M. (2016). Socio-demographic basic factors of German customers as predictors for sustainable consumerism regarding foodstuffs and meat products. *International Journal of Consumer Studies*, 40 (2), 158-167. https://doi.org/10.1111/ijcs.12239
45. Nagy, S. (2025). The impact of socio-demographic variables on pro-environmental behaviour. *Periodica Polytechnica Social and Management Sciences*, 33 (2). https://doi.org/10.3311/PPso.23128
46. Nowicki, P., Ćwiklicki, M., Kafel, P., Niezgoda, J., & Wojnarowska, M. (2023). The circular economy and its benefits for pro-environmental companies. *Business Strategy and the Environment*. 32 (7), 4584-4599. https://doi.org/10.1002/bse.3382
47. Oral, H., Eren, Ö., Yay, A., & Saygin, H. (2021). Environmental citizenship perception and behavior among university engineering students in the Marmara Region of Turkey. *Environment, Development and Sustainability*, 23, 3638-3652. https://doi.org/10.1007/s10668-020-00736-8
48. Otto, S., Neaman, A., Richards, B., & Marió, A. (2016). Explaining the ambiguous relations between income, environmental knowledge, and environmentally significant behavior. *Society & Natural Resources*, 29 (5), 628-632. https://doi.org/10.1080/08941920.2015.1037410
49. Pechdin, W., & Bunditsakulchai, P. (2025). Economic stress from climate change on agriculture: A SAM-based assessment. *Environmental Research Communications*, 7 (5). https://doi.org/10.1088/2515-7620/add9ec
50. Peterson, R., & Tollefson, K. (2024). The impact of higher income on environmental interest. *Energy Sources, Part B: Economics, Planning, and Policy,* 19 (1), 2356098. https://doi.org/10.1080/15567249.2024.2356098
51. Potrashkova, L., Zaruba, V., Raiko, D., & Yevsyeyev, O. (2024). Identifying the system of value factors of green consumer choice. *Innovative Marketing*, 20 (1), 199-211. https://doi.org/10.21511/im.20(1).2024.17
52. Pratama, R. S., & Ristanto, R. H. (2024). Factors influencing students' pro-environmental behavior: A systematic literature review. *Biosfer: Journal Tadris Biologi*, 15 (1), 135-151. https://doi.org/10.24042/biosfer.v15i1.20376
53. Psarommatis, F., May, G., & Azamfirei, V. (2025). Product reuse and repurpose in circular manufacturing: A critical review of key challenges, shortcomings and future directions. *Journal of Remanufacturing*, 15, 273-310. https://doi.org/10.1007/s13243-025-00153-y
54. Reis, T., & Rese, A. (2025). Can information help bridge the attitude-behavior gap in sustainable clothing consumption? *Cleaner and Responsible Consumption*, 17. https://doi.org/10.1016/j.clrc.2025.100278
55. Rückert, A., Balkute, G., & Dornack, C. (2024). Calculating the environmental benefit of reuse platforms. *Circular Economy and Sustainability*, 4, 1913-1936. https://doi.org/10.1007/s43615-024-00360-y
56. Rudolph, C. W., Rauvola, R. S., Costanza, D. P., & Zacher, H. (2020). Generations and generational differences: Debunking myths in organizational science and practice and paving new paths forward. *Journal of Business and Psychology*, 36 (6), 945-967. https://doi.org/10.1007/s10869-020-09715-2

57. Ruokamo, E., Savolainen, H., Seppa, J., Sironen, S., Ra, M., & Auvinen, A.P. (2023). Exploring the potential of circular economy to mitigate pressures on biodiversity. *Global Environmental Change-Human and Policy Dimensions*, 78, 102625. https://doi.org/10.1016/j.gloenvcha.2022.102625
58. Sahi, S. K. (2023). Understanding gender differences in money attitudes: Biological and psychological gender perspective. *International Journal of Bank Marketing*, 41 (3), 619-640. https://doi.org/10.1108/IJBM-08-2022-0352
59. Sari, D., Wicaksono, P., Rahmadi, N., Perdhana, M., & Nareswari, O. (2025). Understanding consumer fashion circular behavior regarding second hand clothings in Indonesia: An extended theory of planned behavior and value belief norm theory perspective. *Journal of Industrial Engineering and Management*, 18 (3). https://doi.org/10.3926/jiem.6412
60. Saulick, D., Bekaroo, G., & Bokhoree, C. (2024). Investigating pro-environmental behaviour among students: A stages of change approach. *Environment, Development and Sustainability*, 26, 6751-6780. https://doi.org/10.1007/s10668-023-02985-9
61. Scholes, R. J., Coetzer, K. L., Matsika, R., Coetzee, B. W. T., Ernst, Y., Etale, A., Kubanza, N. S., Moyo, K., Nkrumah, B., Engelbrecht, F. A., Simatele, M. D., & Vogel, C. H. (2023). A Delphi assessment of climate change risks in southern Africa in the 21st century. *Climate Risk Management*, 42. https://doi.org/10.1016/j.crm.2023.100566
62. Schützenhofer, S., Kovacic, I., Rechberger, H., & Mack, S. (2022). Improvement of environmental sustainability and circular economy through construction waste management for material reuse. *Sustainability*, 14, 11087. https://doi.org/10.3390/su141711087
63. Soemantri, T., Anzhari, K., Kosasih, O., & Murwani, I. (2025). Value-belief-norm theory and pro-environmental behavior: A study on blue collar workers in Jakarta. *Journal Research of Social Science, Economics, and Management,* 5 (2), 3323-3330. https://doi.org/10.59141/jrssem.v5i2.1090
64. Sreen, N., Purbey, S., & Sadarangani, P. (2018). Impact of culture, behavior and gender on green purchase intention. *Journal of Retailing and Consumer Services*, 41, 177-189. https://doi.org/10.1016/j.jretconser.2017.12.002
65. Tamimi, M.H., Pratam, Y., & Arpah, M. (2025). Evaluation of food quality attributes influencing Generation Z's consumer preferences for packaged beverages. *Economia Agro-Alimentare*, 2, 71-100. https://doi.org/10.3280/ecag2025oa1945
66. Tang, W. R., Fang, K. Y., Mei, Z. P., Wu, H., Zhou, F. F., Chen, Y., & Li, W. L. (2025). The influence of climate change on social evolution in Eurasia over the past millennium. *Chinese Science Bulletin-Chinese*, 70 (10), 1342-1353. https://doi.org/10.1360/TB-2023-1231
67. Testa, F., Marullo, C., Gusmerotti, N., & Di Iorio, V. (2024). Exploring circular consumption: Circular attitudes and their influence on consumer behavior across the product lifecycle. *Business Strategy and the Environment,* 33 (7), 6961-6983. https://doi.org/10.1002/bse.3849
68. Wang, C., Zhang, Q., Wong, P., & Wang, L. (2023). Consumers' green purchase intention to visit green hotels: A value-belief-norm theory perspective. *Frontiers in Psychology*, 14, 1139116. https://doi.org/10.3389/fpsyg.2023.1139116
69. Wang, Y., Hao, F., & Liu, Y. (2021). Pro-environmental behavior in an aging world: Evidence from 31 countries. *International Journal of Environmental Research and Public Health*, 18 (4), 1748. https://doi.org/10.3390/ijerph18041748
70. Wannemuehler, S. D., Luby, J. J., & Yue, C. Y. (2023). Consumer preferences for kiwiberries: Implications of experimental auctions. *Hortscience*, 58 (7), 739-746. https://doi.org/10.21273/HORTSCI17133-23
71. Wibowo, N., Widiastuti, T., & Junijanto, H. (2024). The influence of theory of planned behavior, brand consciousness, and perceived risk on purchase intention. *Petra International Journal of Business Studies*, 7 (2). https://doi.org/10.9744/petraijbs.7.2.113-124
72. Wiedenhofer, D., Wieland, H., Leipold, S., Aoki-Suzuki, C., Watari, T., Aguilar-Hernandez, G. A., Graf, S., Edelenbosch, O. Y., Zanon-Zotin, M., Kaufmann, L., Fortes, P., Haas, W., & Streeck, J. (2025). The circular economy and climate change: The state of national and global evidence on mitigation potential. *Annual Review of Environment and Resources*, 50, 563-592. https://doi.org/10.1146/annurev-environ-111523-102441
73. Wiernik, B., Dilchert, S., & Ones, D. (2016). Age and employee green behaviors: A meta-analysis. *Frontiers in Psychology*, 7. https://doi.org/10.3389/fpsyg.2016.00194
74. Wiernik, B., Ones, D., & Dilchert, S. (2013). Age and environmental sustainability: A meta-analysis. *Journal of Managerial Psychology*, 28, 826-856. https://doi.org/10.1108/jmp-07-2013-0221
75. Xia, W., & Li, L. (2023). Societal gender role beliefs moderate the pattern of gender differences in public- and private-sphere pro-environmental behaviors. *Journal of Environmental Psychology*, 92, 102158. https://doi.org/10.1016/j.jenvp.2023.102158
76. Yadav, S. (2018). Nepalese adolescent's environmental discourses. *Italian Sociological Review*, 8, 217. https://doi.org/10.13136/isr.v8i2.187
77. Yang, Q., Mamun, A., Reza, M., Naznen, F., & Masud, M. (2024). Modeling the intention and usage of organic pesticide control using value-belief-norm model. *Environmental Research Communications*, 6. https://doi.org/10.1088/2515-7620/ad294a

78. Yang, Y., & Wilson, M. (2023). Explaining personal and public pro-environmental behavior. *Sci*, 5 (1), 6. https://doi.org/10.3390/sci5010006
79. Zhang, Q., Wong, P., & Wang, L. (2025). The efficacy of the theory of planned behaviour and value-belief-norm theory for predicting young Chinese intention to choose green hotels. *Scientific Reports*, 15. https://doi.org/10.1038/s41598-025-99447-1
80. Zhao, Z., Gong, Y., Li, Y., Zhang, L., & Sun, Y. (2021). Gender-related beliefs, norms, and the link with green consumption. *Frontiers in Psychology*, 12, 710239. https://doi.org/10.3389/fpsyg.2021.710239
81. Zhidebekkyzy, A., Moldabekova, A., Amangeldiyeva, B., & Štreimikis, J. (2022). Assessment of factors influencing pro-circular behavior of a population. *Economics & Sociology,* 15 (3) https://doi.org/10.14254/2071-789x.2022/15-3/12
82. Zhidebekkyzy, A., Moldabekova, M., & Abishev, T. (2023). Pro-environmental behavior and household waste sorting in Kazakhstan: An empirical analysis. *Eurasian Journal of Economic & Business Studies*, 67 (1), 39-51. https://doi.org/10.47703/ejebs.v1i67.186
83. Zhou, S., & Smulders, S. (2021). Closing the loop in a circular economy: Saving resources or suffocating innovations? *European Economic Review*, 139, 103857. https://doi.org/10.1016/j.euroecorev.2021.103857