

Article

Factors Determining the Choice of Pro-Ecological Products among Generation Z

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Abstract: (1) Background: This article aims to present the factors influencing purchasing decisions by Generation Z respondents (from Poland, Slovakia, the Czech Republic, and Hungary) relating to pro-ecological products from the electrical machinery industry. Additionally, a model was created allowing us to determine whether the pro-environmental approach is associated with other purchase determinants identified in the factor analysis. (2) Methods: Verification of the objective was carried out using, i.e., a survey method, Delphi and factor analysis, econometric modeling, and the Kruskal–Wallis test. (3) Results: The most significant factors declared by respondents from Generation Z of the V4 countries influencing pro-quality and pro-environmental purchasing decisions from this industry were product price (3.959), previous personal experience with the product (3.959), expected product life (durability) (3.809), and individual customer needs (3.615). The least important determinants were the period for which the product was on the market (2.843) then, surprisingly, product packaging (2.902), and ecolabel (2.921). (4) Conclusions: Interpreting the resulting model, it can be concluded that as the assessment of knowledge and experience as well as the assessment of the brand and image increased, the assessment of the importance of pro-ecological factors also increased. Branding and image are more linked to environmental activities.

Keywords: pro-ecological product management; purchase factors; pro-ecological consumer behavior; circular economy; decision-making; brand



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1. Introduction

In recent years, there has been a significant surge in worldwide consumer engagement regarding environmentally friendly products, indicating a notable growth in the global interest in such sustainable options. Consumers are more demanding, and they are changing their behavior, with searches for sustainable goods increasing globally by 71% since 2016. Corporations are responding, particularly in the cosmetics, pharmaceutical, fashion, and food sectors. In addition, companies are often required to report on ESG (environmental, social, and governance) measures [1–5]. On the other hand, people are not conscious of how important the natural environment (especially the richness of flora and fauna) is for the proper functioning of humans (physically and mentally) [6].

It translates not only into esthetic and health aspects but also into business issues in the short and long term. For example: “In a European Union (EU) study, 16% of the 25,000+ respondents said that their lives had already been affected by biodiversity loss” [1].

Research on the environmental awareness state has been conducted worldwide since the mid-1970s. Environmental protection, the environment, and pro-environmental approaches are terms frequently used in scientific papers in the natural sciences, humanities,

technology, and economics. Almost 43,000 open-access thematic articles were found in the Web of Science database (In the research, the words “pro-environmental approach” and “environmentally” were used). These have been analyzed in a multifaceted manner. Many authors point to the importance of eco-innovation (especially process, product, and organizational innovation) in the context of building a new business model [6,7]. A significant advantage of a pro-environmental approach that occurs in combination with the provision of high-quality products to customers is, among other things, enhancing competitive edge in the market [6,8], achieving better financial performance [9–11], and managing risk [12]. An analysis of several research findings shows that eco-innovation positively influences the company’s overall operation [13–15].

The literature on the topic identifies several critical factors that influence decision-making in various spheres of life for both individual clients and business-to-business interactions. The essential foundation for effective decision-making is a thorough and detailed analysis of the problem, considering its various dimensions within a specific context [16–18]. The most important factors influencing the decision-making process in the literature include experience [19,20], cognitive errors [21], age, and individual differences [22], belief in personal relevance [23], and escalation of involvement influence people’s decisions [8,24,25], as well as cognitive abilities, personality type, emotional state, views, attitudes, context (circumstances), presence (influence of other) people or lack thereof [26–28], and intuition [29]. Decision-making processes in the presence of multiple variables can be supported by statistical methods, i.e., AHP or fuzzy AHP analysis [30,31].

It should be noted that the market of green/pro-ecological products can be reflected by the rapid growth of environmentally conscious consumers. The “green” products term is frequently employed to delineate products designed to safeguard or improve the environment throughout their life cycle. This is achieved by conserving resources and reducing the utilization of harmful substances, pollution, and waste [32].

The aim of this research determined the selection of the target group for study. Generation Z, known as Centennials or Post-Millennials too, is a group of individuals born from the mid-1990s to the early 2010s. At present (2023), the oldest individuals in this category are approaching their third decade of life, while the youngest may be only a few years old [33]. The behaviors and attitudes of this group are becoming the subject of multidimensional analyses. Many representatives of the Post-Millennial generation are characterized by the fact that they engage in social and environmental issues [34,35]. They see their role as active participants in creating positive change in society. It is worth comparing attitudes and purchasing behavior/habits, also considering the specific characteristics of individual countries. There is a research gap in this area. Generation Z [36] is a group with enormous potential to shape society and the economy in the future. Their unique characteristics and perspectives will have a significant impact on various aspects of social, cultural, and economic life. In the context of analyses of the qualitative and environmental characteristics of products, it should be emphasized that the balanced approach to life of this generation can significantly influence the need to look at the production process and the product life cycle itself differently [37,38]. For many of them, work–life balance is a priority. They strive to combine their careers with their passions and interests. Some of them are increasingly willing to implement the principles of the sharing economy, and this approach will force the production of products with better-quality environmental parameters.

Analyzing the literature [36,39–43], the following factors, which are presented in Table 1, may be indicated as relevant in the context of making purchasing decisions in the case of Generation Z.

Table 1. Factors relevant in the context of making purchasing decisions in the case of Generation Z.

Factors	Characteristics
Eco-consciousness	They show a unique sensitivity to ecological issues, which sets them apart from previous generations. This trend means that these products and brands gain favor, which promotes consistently sustainable production, responsible consumption, circular economy, and corporate social responsibility, i.e., a proactive and eco-innovative approach to environmental protection.
Digital presence	Highly competent in the area of technology: Generation Z (referred to as the digital elite) is connected closely to the internet and social media platforms. It is where they look for information on the parameters of the products they are interested in, guided by reviews, opinions, and online content when making purchasing decisions. The expression of their dissatisfaction can easily be spread by consumer ostracism.
Social values	Their interest in social issues is evident in their approach to shopping. They prefer brands that explicitly support values such as equality, inclusion, and social justice.
Authenticity	For Generation Z, the authenticity and honesty of companies are crucial. They expect transparency in communications and actions.
Shopping experience	Interactive and engaging shopping experiences, both online and in store, are of high value to Generation Z. Companies that offer unique and engaging interactions attract their attention. Young people are looking for thrills and experiences.
Peer influence	Recommendations and suggestions from peers play a significant role in the purchasing decisions of this group. This generation is more likely to trust the recommendations of their friends. On the other hand, autonomy and independence are of high importance to them. They want to make their own decisions and express their identity in this way.
Diversity and inclusion	Brands are expected to be more representative and diverse, reflecting the diversity of society. Companies that promote inclusion and diversity win their favor.
Mobility	Smartphones are an integral part of Generation Z's life, making online shopping and mobile app usage a crucial part of their purchasing process. It is significant to be aware that Generation Z has had access to a vast amount of information and communication opportunities since childhood, which has shaped their thinking and behavior in a specific way.

Source: Own study based on [36,40–43].

Due to the need to fill a research gap, it was established that the goal of the article was to present the factors influencing purchasing decisions related to environmentally friendly products from the electrical machinery industry by respondents of Generation Z from Poland, Slovakia, the Czech Republic, and Hungary. The research also aimed to create a mathematical model to determine whether the pro-environmental approach was related to the other purchasing determinants identified in the factor analysis. This research fills the research gap in identifying determinants of pro-environmental behavior relating to non-food/food products [44–46] among representatives of generation Z in the Visegrad countries.

It was assumed when implementing the project that the electrical engineering industry (EEI) is one of the branches of the electrical machinery industry, which is one of the largest industrial sectors in the world. It produces both simple consumer goods and very technologically advanced ones. The electrical and electronics industry is the fastest-growing area of the entire electrical machinery industry in Poland. It is responsible for the production of electronic devices, radios, televisions, computers, lighting equipment, transformers, cables, and electric motors [47]. In the study, the terms electrical machinery industry, electrical machinery branch, and electrical machinery sector are used interchangeably and specifically refer to the electrical and electronics industries.

2. Materials and Methods

The article is part of a series of publications in connection with the implementation of grant No. IVF 22230264 “Qualitative–environmental aspects of products improvement” [48]. The research tool was a survey questionnaire distributed to respondents in Poland, the Czech Republic, Slovakia, and Hungary in the first half of 2023. Spatial and subject

coverage included consumers (both individual and B2B, current and potential) in the Visegrad countries. A survey of the situation with regard to the importance of the quality–environmental priorities of products in Central European countries is significant in the context of deepening cooperation between these countries, exchanging experiences, and building or creating both new business models and new communication models.

The study aimed to identify and analyze the reasons/determinants that guide the surveyed young people (representatives of Generation Z) in the process of purchasing pro-environmental products. The aim of the study was also to create a model to answer whether the pro-environmental approach is related to the other identified determinants identified (during the research) in the factor analysis.

The following research hypotheses were formulated:

- The education of the surveyed representatives of Generation Z influences their choices of environmentally friendly products;
- The environmental (pro-ecological) approach of the respondents of Generation Z is associated with their knowledge and experiences, as well as brand and image perceptions.

The purpose of the research determined the selection of the target group. Many representatives of the post-millennial generation are characterized by their involvement in social and environmental issues. They see their role as active participants in creating positive changes in society. It is worth comparing attitudes and purchasing behavior/habits, also taking into account the specificity of individual countries. There is a research gap in this area. Generation Z is a group with much purchasing potential. This group will affect and shape the attitudes and behaviors of societies, economies, and economic sectors, as well as organizations, both now and in the future. Their unique features and a different perspective, taken into account in the purchasing process, will have a significant impact on various aspects of social, cultural, and economic life. In the context of analysis of the qualitative and environmental characteristics of products, it should be emphasized that the changing approach to the philosophy of life of this generation may significantly affect the need for a different look at the production process and the product life cycle itself. For this generation, work–life balance is a priority. They strive to combine their career with their passions and interests. They are against purposefully aging products and planned obsolescence. (This term refers to a business strategy in which a product is intentionally designed to have a limited lifespan or become obsolete after a certain period. The goal is to encourage consumers to replace the product with a new version, leading to repetitive purchases. This practice is often driven by economic considerations, as it can stimulate ongoing demand for products and boost sale). Generation Z indicates that issues related to environmental problems and challenges are important to them. Some of them are more and more willing not only to declare but also to implement principles of, e.g., the sharing economy, and this approach forces/will force the production of products with better-quality environmental parameters [49,50]. In this context, the topic is significant at the micro–meso and macroeconomic levels. Understanding the changes taking place in the processes related to making purchasing decisions is very important in the context of change management and ensuring the business continuity of manufacturing enterprises. According to some scientific publications, policies aimed at fostering pro-environmental attitudes should target young people from Generation Z. Younger consumers in today’s world are increasingly conscious of their surroundings and are developing new, pro-environmental values [51–53].

The verification of the research objective required the use of a diverse range of research instruments, i.e., a comprehensive literature review using inductive and deductive approaches, reasoning by analogy, a survey method, the Delphi method, and statistical methods. Factor analysis, econometric modeling, and the non-parametric Kruskal–Wallis test were used to verify the hypotheses. The non-parametric Kruskal–Wallis test was used for analysis because the quantitative data did not have a normal distribution. The study was conducted at a significance level of $\alpha = 0.05$. Statistica 13.3 and Excel 2013 were used for the analysis.

A survey questionnaire containing various types of wording was used to conduct the research, including “Specify to what extent you agree with the following statements regarding the quality and environmental aspects of the products”. Participants (consumers) were instructed to rate individual sentences for compliance according to a five-point Likert scale (where 1 meant the respondent’s lack of agreement with the proposed statement, and 5 was complete agreement). Data for the survey were collected from people interested in participating in the study. Questionnaires were distributed via email, LinkedIn, WhatsApp, and Facebook and collected through face-to-face interviews. The questionnaire was developed in English (but was also translated into national languages). A total of 812 questionnaires were obtained, and after checking the completeness and correctness of the data, 796 forms were accepted for further analysis. Pilot tests were conducted on a total of 80 respondents (20 from each of the surveyed countries) to check the correctness of the formulated questions and their proper interpretation (due to cultural and linguistic differences, reliability of answers, correctness, and completeness of data for further analysis). In the context of verifying the validity of the questionnaire, consultations were made with people specialized in marketing research and statistics from all the countries surveyed. All respondents were of legal age. Detailed characteristics of the respondents in terms of such characteristics as country of origin, marital status, gender, education, employment, and number of people in the household are presented in Table 2.

Table 2. Characteristics of the surveyed group of respondents.

Features	%(N)	Features	%(N)
Country		Marital status	
Poland	52% (415)	single	64% (508)
Czech Republic	17% (138)	married	6% (46)
Hungary	17% (133)	partner relationship	28% (229)
Slovakia	14% (110)	widow/divorced	2% (13)
Gender		Education	
male	36% (285)	elementary	17% (134)
female	61% (489)	medium	50% (397)
I do not want to answer	3% (22)	higher	33% (265)
Place of living		Number of people in the household	
rural area (e.g., village)	35% (278)	one	3% (23)
city up to 20,000 inhabitants	11% (86)	two	12% (98)
a city of 20,000 to 150,000 inhabitants	14% (111)	three or four	26% (203)
a city with more than 150,000 to 500,000 inhabitants	36% (288)	over 4	59% (472)
a city with more than 500,000 inhabitants	4% (33)		

Source: Own study based on surveys conducted in Poland, Slovakia, Hungary, and the Czech Republic, N = 796.

3. Results

When discussing the perception of product quality, several key factors and considerations should be addressed. These factors encompass both the objective attributes of the product and the subjective experiences and expectations of consumers. The literature on the subject indicates that from the perspective of the manufacturer/seller, attention should be paid to the following issues:

- Product features and specifications: description of the physical attributes, features, and technical specifications of the product;
- Durability and reliability: assessment of how long the product is expected to last and how well it functions over time. A reliable product is often associated with higher quality;
- Performance: information on how well the product performs its intended function. High-performance products are typically perceived as higher in quality;

- Materials and ingredients: detail the materials or ingredients used in the product's production. High-quality, sustainable, or natural ingredients can enhance the perceived quality;
- Craftsmanship and workmanship: highlight the skill level and attention to detail in the product's manufacturing. Fine craftsmanship often leads to higher perceived quality;
- Brand reputation: analyze the reputation of the brand or manufacturer. Established and trusted brands may automatically convey higher product quality;
- Price: consider the price point and its relation to the market. Consumers often associate higher prices with better quality, although this is not always the case;
- Warranty and customer support: evaluate the warranty and customer support provided by the manufacturer. A strong warranty and reliable customer service contribute to perceived quality;
- Design and packaging: discuss the design and packaging of the product. Attractive and well-thought-out design can positively impact perceived quality;
- Market context: examine the product's context within the market. How does it compare to similar products from competitors? This context can shape consumer perceptions;
- User experience: consider the overall experience of using the product. Factors like ease of use, convenience, and functionality play a role in perceived quality;
- Consumer expectations: recognize that consumer expectations and past experiences influence how a product's quality is perceived. Meeting or exceeding these expectations is crucial;
- Cultural and regional variations: be aware of cultural and regional differences in quality perception. What is perceived as high quality in one region may differ elsewhere according to cross-cultural differences in consumer behavior [54].
- Environmental and ethical considerations: today, many consumers value products that align with environmental and ethical principles. Highlight any eco-friendly or ethical aspects of the product [55].

In the scope of our survey, we opted for a comprehensive approach in developing questions and possible response variants. In the initial phase, based on the analysis of available literature, we incorporated findings from previous studies. It is essential to highlight a research gap related to comprehensive investigations of environmentally quality-related features of electromechanical products and their impact on purchasing decisions among Generation Z consumers. To better understand the specifics of this industry and accommodate cultural differences in individual countries, we applied the Delphi method. The design and production of electromechanical products require the involvement of various specialists from different fields. We identified and engaged experts from various areas (production engineering, automation, electrical engineering, management, sustainable development, circular economy, ecological economics, accounting and finance, marketing, statistics, political science) from four academic centers in Poland, the Czech Republic, Slovakia, and Hungary. Experts were assessed based on their knowledge and competencies, considering the criterion of the number of publications in reputable scientific databases such as Web of Science and Scopus.

Additionally, questions were designed in consultation with representatives of entrepreneurs in the electromechanical industry in V4 countries. Among the practitioner experts were, for example, electrical, mechanical, automation, and control engineers, materials engineers, software engineers, quality specialists, test and certification engineers, research and development specialists, and safety and hygiene engineers. The task of the experts was to help identify and select potential response variants' characteristics and significance for the electromechanical industry. This hybrid method allowed us not only to leverage the richness of scientific literature but also to incorporate practical insights from specialists in different regions. Furthermore, through consultations with the research team, experts assisted in considering the specifics of Generation Z respondents, enriching our study.

Ultimately, 18 factors identified by experts as influencing the choice of environmentally friendly products in the electromechanical industry were extracted for further research involving Generation Z respondents. In the subsequent stage, pilot studies were conducted among the target group in individual countries, and questions were adjusted by analyzing errors, queries, and incorporating justified suggestions. The validation methodology encompassed five categories but primarily focused on assessing appropriateness, validity, and accuracy. Consultations were conducted to ensure fidelity of translations. Cultural aspects did not play a pivotal role in this validation due to the localization and history of the V4 countries covered in the study.

Participants responded to the presented statements/purchase factors and determined their importance. The respondents' opinions are presented in Figure 1. Research showed that from 2% to 6% of people (depending on the question) had no opinion on the given topic. Therefore, people who did not express their interest were not taken into account in subsequent analyses. In the context of perception of product quality, the most significant factors in the process of making purchasing choices for the surveyed young people were product price, previous personal experience with the product, and expected product life (durability).

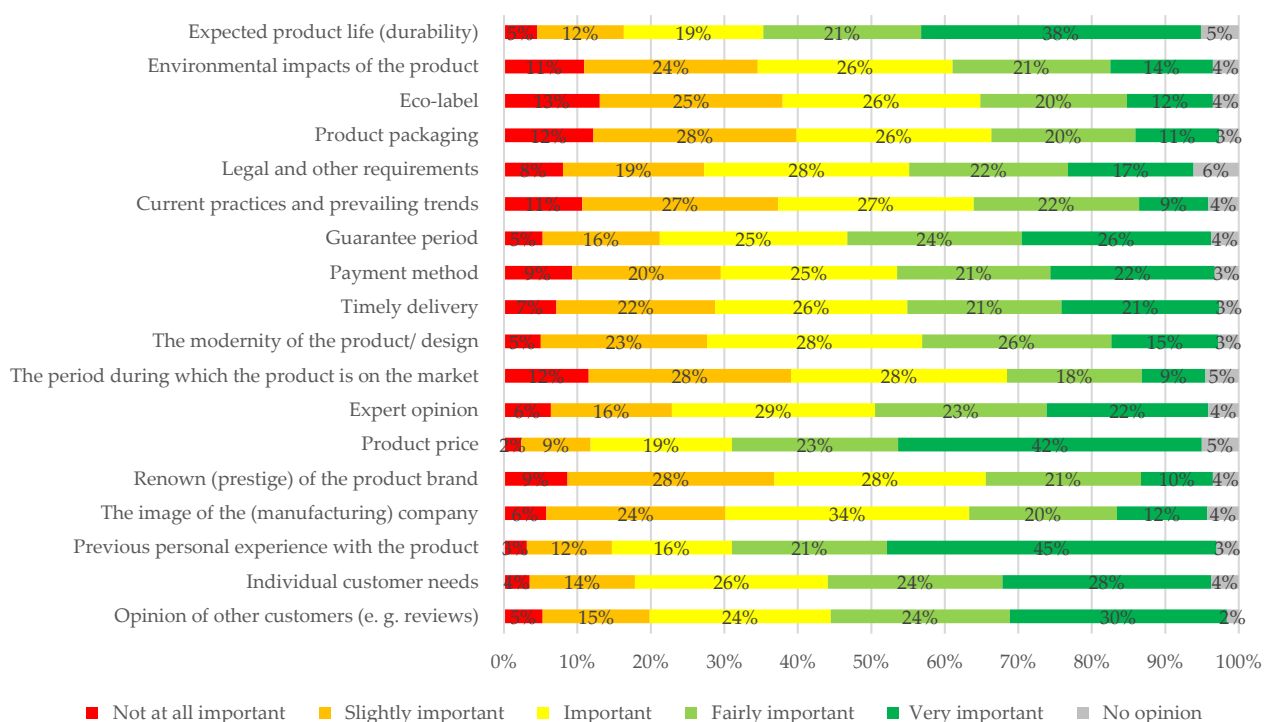


Figure 1. Perception of product quality. The question was: “How often, before buying a product, do you compare its quality with the quality of products of the same type of a competing brand? Please mark one answer with an X.” Source: Own study based on surveys conducted in Poland, Slovakia, Hungary, and the Czech Republic, N = 796.

Based on an assessment of the importance of indicators on a scale from 1 to 5, a ranking of factors determining the choice of environmentally friendly products was created using the mean. The analyses showed that the most significant factors were product price (3.959), previous personal experience with the product (3.959), expected product life (durability) (3.809), and individual customer needs (3.615). The least important factors in choosing environmentally friendly products proved to be the period during which the product was on the market (2.843) and product packaging (2.902).

Based on the evaluation of the individual determinants of young people's choice of eco-friendly products, factor analysis was performed to extract groups of characteristics that describe the preference for choosing eco-friendly products (Figure 2).



Figure 2. Average importance ratings of individual determinants of choice of environmentally friendly products by young people. Source: Own study based on surveys conducted in Poland, Slovakia, Hungary, and the Czech Republic, N = 796.

A scree plot was utilized to determine the optimal number of factors (Figure 3). Both the Kaiser–Meyer–Olkin measure of sampling adequacy and the Bartlett test of sphericity were employed to validate the appropriateness of factor analysis for the collected data. A value close to 1.0 on the Kaiser–Meyer–Olkin measure of sampling adequacy indicated the proportion of variance of variables that might be attributed to underlying factors, while a value below 0.05 on the Bartlett test of sphericity served as a threshold to confirm the suitability of factor analysis. The limit of statistical significance was set at $\alpha = 0.05$. Statistical analyses were performed with Statistica 13.3. Construct validity was assessed through exploratory factor analysis, yielding positive results. The Kaiser–Meyer–Olkin measure of sampling adequacy (KMO) was high (0.925) and the Bartlett test of sphericity was significant ($p < \alpha$, $p = 0.000$), indicating a high explanatory level for variance in the responses.

In the course of the factor analysis, three groups of factors were identified, which can be described as environmental, knowledge and experience, and brand and image-based. The results of the factor analysis are presented in Table 3.

The share of explained variance was 61%, which was calculated as a sum of all communality divided by number of variables. This means that 61% of the variability in the data is explained by factors, which suggests that factor analysis is an effective tool for understanding the structure of data.

A model that is a good fit will have fewer than 50% of the non-redundant residuals with absolute values greater than 0.05. The analysis of the residual matrix indicated that for the described data, the percentage of non-redundant residuals with absolute values greater than 0.05 was only 27%. This suggests a good fit. The regression model was applied to

uncover causal relationships between selected variables, and based on the model, it was demonstrated that such relationships exist.

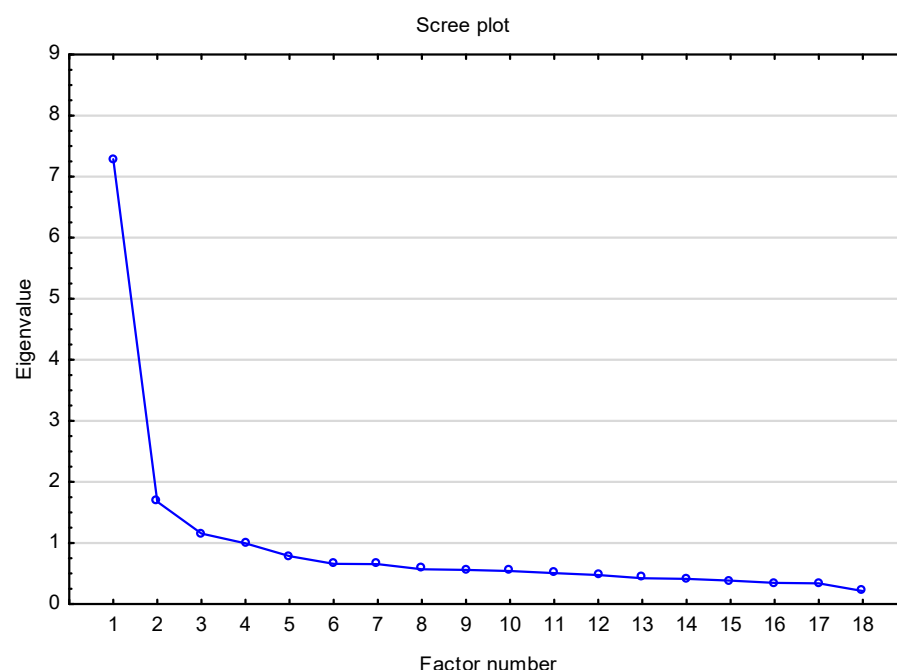


Figure 3. Scree plot. Source: Own study based on surveys conducted in Poland, Slovakia, Hungary and the Czech Republic, N = 796.

Table 3. Factor analysis results.

	Factors			Communalities
	Environmental	Knowledge and Experience	Brand and Image	
Legal and other requirements	0.6322	0.3153	0.2241	0.5493
Product packaging	0.7129	0.0559	0.3668	0.6459
Eco-label	0.8384	0.0760	0.2321	0.7626
Environmental impacts of the product	0.8327	0.1784	0.1913	0.7618
Opinion of other customers (e.g., reviews)	0.0755	0.7164	0.3103	0.6152
Individual customer needs	0.1004	0.7337	0.1852	0.5827
Previous personal experience with the product	0.1271	0.8117	0.1530	0.6984
Product price	0.1021	0.7355	0.3043	0.6440
Expected product life (durability)	0.3783	0.7224	0.0829	0.6718
The image of the (manufacturing) company	0.1439	0.3162	0.6927	0.6005
Renown (prestige) of the product brand	0.1621	0.2004	0.7537	0.6345
The modernity of the product/design	0.3123	0.2767	0.6648	0.6161
Current practices and prevailing trends	0.3629	0.1904	0.6929	0.6481
Expert opinion	0.4195	0.4346	0.2810	0.4438
The period during which the product is on the market	0.3747	0.1399	0.5793	0.4956
Timely delivery	0.3961	0.3621	0.4443	0.4854

Table 3. Cont.

	Factors			Communalities
	Environmental	Knowledge and Experience	Brand and Image	
Payment method	0.4383	0.3934	0.3858	0.4957
Guarantee period	0.5105	0.5567	0.2488	0.6324
Variance	3.69	3.97	3.32	10.98
% Var.	0.21	0.22	0.18	

Source: Own study based on surveys conducted in Poland, Slovakia, Hungary, and the Czech Republic, N = 796.

Based on factor analysis, three factors were identified and subjected to regression analysis.

The environmental approach (Y) was taken as the dependent variable. It was checked whether the pro-environmental approach was associated with the other determinants extracted in the factor analysis. The results of the regression analysis are presented in Table 4. The determination coefficient of the estimated model was $R^2 = 0.37$, which means that the model had a 37% fit to the data. For this type of data, the fit coefficient is satisfactory. The multiple correlation coefficient was 61%, and the standard error of the estimation was only 0.76.

Table 4. Regression results.

	b *	Std. Error (b *)	b	Std. Error (b)	t (603)	p-Value
Constant			0.741	0.134	5.544	0.0000 ***
Brand and image	0.448	0.040	0.481	0.043	11.092	0.0000 ***
Knowledge and experience	0.216	0.041	0.223	0.042	5.353	0.0000 ***

Source: Own study based on surveys conducted in Poland, Slovakia, Hungary, and the Czech Republic, N = 796.

* standardized coefficient, *** $p < 0.001$.

Interpreting the resulting model, it can be concluded that both knowledge and experience, as well as the brand and image, affected the assessment of environmental factors. The relationships were positive, so as the assessment of knowledge and experience and the assessment of the brand and image increased, the evaluation of the importance of pro-ecological factors also increased. Brand and image were more closely related to pro-ecological activities. If the brand and image score increased by 1 point, the environmental factors score increased by 0.481 points, while if the knowledge and experience score increased by a point, the environmental factors score increased by 0.223 points.

The regression equation can be written as follows:

$$Y = 0.741 + 0.481X_1 + 0.223X_2$$

(0.134) (0.043) (0.042)

A correctly estimated model should be characterized by a normal distribution of the model's residuals. It was therefore checked whether the residues were characterized by a normal distribution. The analyses show that $p > \alpha$ ($p = 0.1236$). Hence, the residuals were normally distributed, and it can be concluded the model was correct (Figure 4).

It was also checked whether socioeconomic characteristics (country of origin, gender, education, place of residence, financial status, and the number of people living in the household) had an impact on the assessment of the importance of individual factors when choosing pro-ecological products. The research showed that respondents' country of origin, place of residence, and the number of people in the household did not influence the assessment of selected factors determining pro-ecological purchases.

Table 5 presents the results of the non-parametric Kruskal–Wallis test, which was used to identify differences and relationships [56–58].

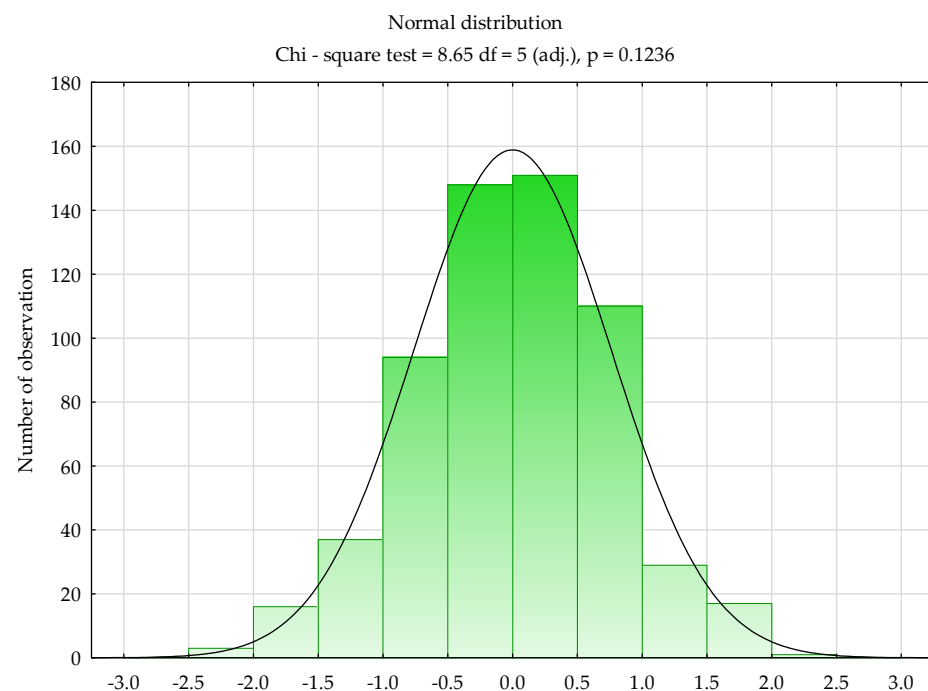


Figure 4. Distribution of residuals of the regression model. Source: Own study based on surveys conducted in Poland, Slovakia, Hungary, and the Czech Republic, N = 796.

Table 5. Results of the Kruskal–Wallis test.

	Environmental	Knowledge and Experience	Brand and Image
Gender	0.0000 ***	0.0223 *	0.0008 ***
Education	0.7645	0.0007 ***	0.0027 **
Marital status	0.4137	0.0121 *	0.1121

Source: Own study based on surveys conducted in Poland, Slovakia, Hungary, and the Czech Republic, N = 796.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

On the other hand, the characteristics that influenced the evaluation of the individual factors determining the purchase of environmental goods were gender, education, and marital status.

In the case of gender (Figure 5), it was related to both the assessment of environmental factors $p < \alpha$ ($p = 0.0000$) and based on knowledge and experience $p < \alpha$ ($p = 0.0223$) as well as brand and image $p < \alpha$ ($p = 0.0008$).

Knowledge and experience were rated highest for women (mean score of 3.70) and least important for those who did not wish to specify their gender (mean score of 3.09). Environmental factors were most important for women (mean score of 3.24) and least important for men (3.74). Brand and image were also most important for women (mean score of 3.71) and least important for those who did not specify their gender. In addition, for women, environmental factors were second most important, and for men, brand and image were second most important.

The respondents' education (Figure 6) was related to their rating of knowledge and experience factors $p < \alpha$ ($p = 0.0007$) and brand and image-related factors $p < \alpha$ ($p = 0.0027$). They rated attributes related to knowledge and experience significantly higher. It was most important for people with higher education (3.85) and least important for people with secondary education (3.55). Brand and image were most important for those with higher education (3.17) and least important for those with primary education (2.82).

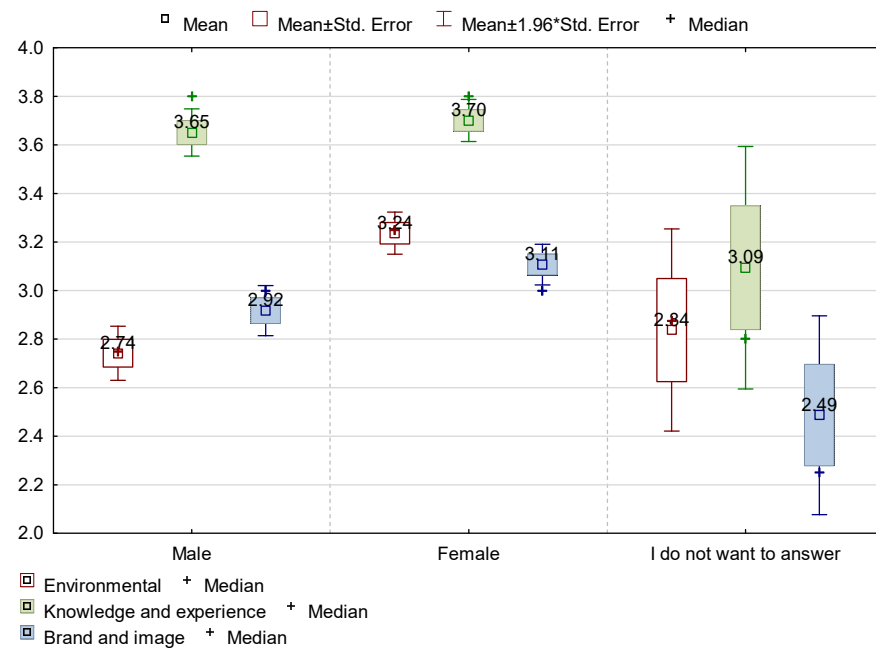


Figure 5. Gender vs. evaluation of individual factors influencing purchase decisions of pro-environmental goods. Source: Own study based on surveys conducted in Poland, Slovakia, Hungary, and the Czech Republic, N = 796.

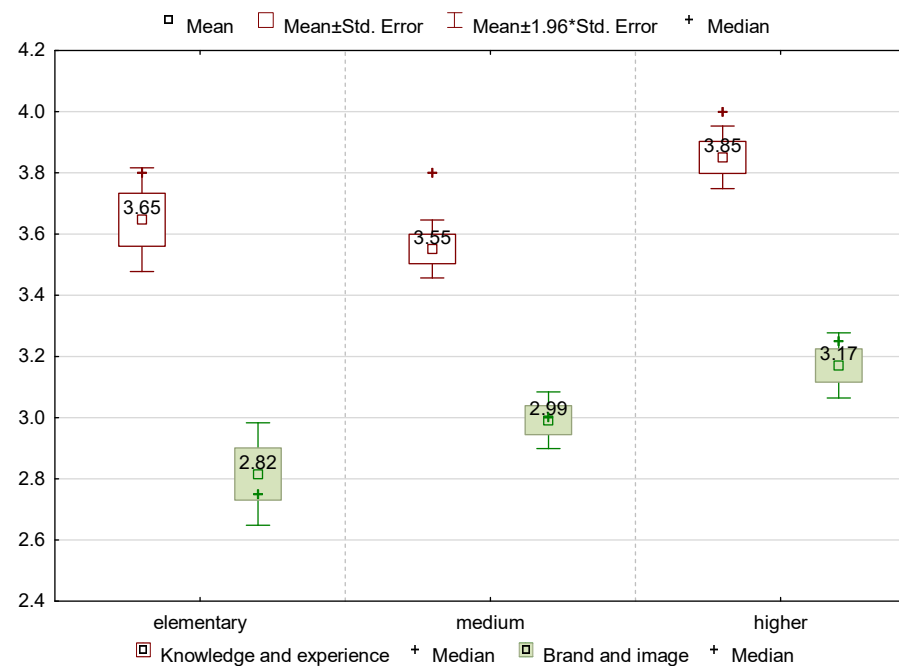


Figure 6. Education vs. the assessment of the importance of factors related to knowledge and experience, as well as brand and image. Source: Own study based on surveys conducted in Poland, Slovakia, Hungary, and the Czech Republic, N = 796.

The last characteristic examined related to the evaluation of determinants influencing the purchase of environmentally friendly products was marital status (Figure 7). It related to the assessment of knowledge and experience, $p < \alpha$ ($p = 0.0121$). This parameter was rated highest by people in civil partnerships (3.81) and among widows, lowest (2.40).

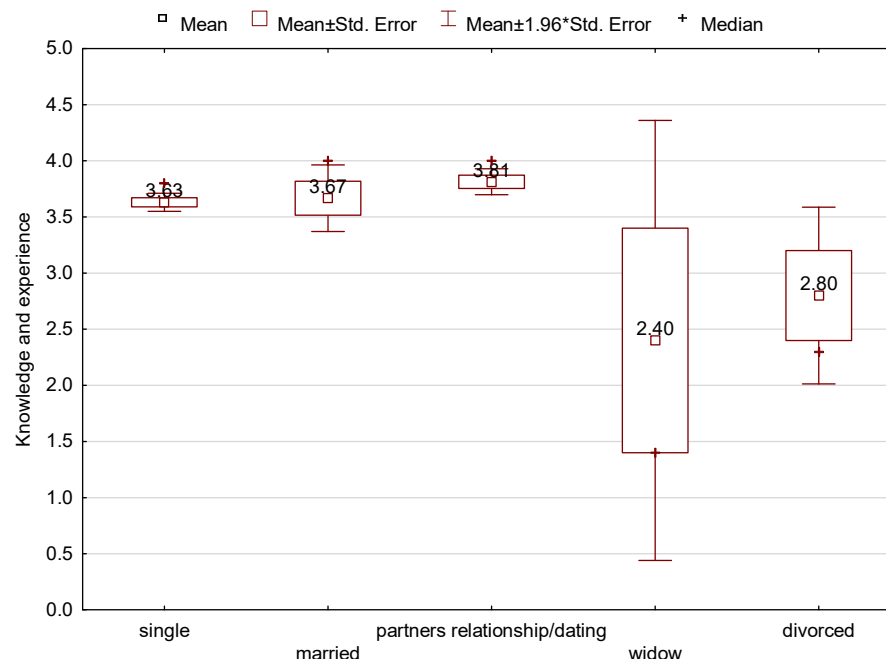


Figure 7. Marital status vs. the assessment of the importance of factors related to knowledge and experience. Source: Own study based on surveys conducted in Poland, Slovakia, Hungary, and the Czech Republic, N = 796.

4. Discussion

Because the sample used in this study, as described in the article, was not representative, we are not justified in making overarching conclusions. Nevertheless, the research findings align with those of other authors, as presented in the text, allowing us to draw the following observations. To meet the expectations of customers of enterprises from the electromechanical sector and to increase the market share of good-quality environmentally friendly products, it is significant to consider the following strategies:

- Consumer education: increasing awareness and educate consumers about the benefits of environmentally friendly products. This includes highlighting the positive impact on the environment, health benefits, and long-term cost savings [59,60];
- Product innovation: investing in research and development to create innovative, sustainable products that meet or exceed consumer expectations in terms of quality, performance, and price. This can involve using eco-friendly materials, reducing energy consumption, or implementing green manufacturing processes [61];
- Marketing and branding: developing effective marketing campaigns that emphasize the eco-friendly features and advantages of the products. Focus on building a good brand image that aligns with sustainability values to attract environmentally conscious consumers. At this point, the impact of another factor, which is the fashion for ecological behavior, is revealed. This problem is pointed out, among others, by A. Brisman. The author points out that some organic products are purchased by consumers in order to demonstrate a certain attitude and also because of the prevailing fashion for such behavior. As an example, he analyzes the reasons for the purchase of hybrid cars by Americans [62].
- Partnerships and collaborations: collaborating with relevant stakeholders such as environmental organizations, government agencies, and industry associations to promote sustainable practices and gain support for eco-friendly products. Joint initiatives can increase visibility and credibility [63];
- Accessibility and availability: ensuring that environmentally friendly products are readily available and easily accessible to consumers. This includes expanding distribution channels, partnering with retailers, addressing, transporting, and other logistical

challenges. Distribution channels and supply chains should also be geared towards pro-ecological activities.

The results of our research indicate that in the ranking of factors determining the choice of pro-ecological products from the electromechanical industry, the most important factors were product price (3.959), previous personal experience with the product (3.959), expected product life (durability) (3.809), and individual customer needs (3.615). Among the least significant determinants, respondents included the period during which the product was on the market (2.843) and, surprising the researchers, product packaging (2.902) and ecolabels (2.921). The literature indicates that the price of ecologic or pro-ecologic products is often higher than that of conventional products [45]. Many studies reveal that price is the biggest obstacle to purchasing ecologic products [64].

Based on the research findings from Southern Indian states, there were observed behavioral differences in the purchase of green products associated with environmental knowledge, environmental concern, attitude, and green purchase intention. This suggests that variations in these factors contribute to distinctions in consumer behavior when purchasing environmentally friendly products [65].

The low level of consumer knowledge exacerbates the scepticism level toward pro-ecological products and hinders the process of accepting higher prices [66,67]. Nevertheless, for some consumers, this is a significant factor, and other environmental benefits outweigh the price. It is not the case for surveyed respondents from V4 countries representing Generation Z. This is probably due to the specifics of the sector and the products offered. Representatives of the scientific community emphasize that customers pay more and more attention to pro-ecological packaging and the possibility of recycling products [68]. Referring to certificates confirming the credibility of the manufacturer's declarations (issued by the so-called independent third party) can increase young consumers' trust in the product and influence the competitive advantage of enterprises [69]. In light of the results of the authors' study, it can be assumed that those interviewed declare that they take certain determinants into account in their purchasing choices because they know that this is socially desirable. Such a fashionable and socially desirable factor, which should be taken into account in the decision-making process, is the widely understood issue of concern for the environment. An in-depth analysis of the study results leads to the conclusion that respondents in the V4 countries do not fully understand how this concern manifests itself/should manifest itself in practice. The implementation of environmental activities should undoubtedly be supported by pro-ecological labels relating not only to processes but also to the product. It should be recognized and interpreted appropriately, helping to implement activities aimed at implementing the assumptions of the circular economy throughout the life cycle of both the product and its accompanying components, e.g., packaging [70].

Building awareness and knowledge in this area is very important, and, as can be seen, there is still a lot to do in this area. Using the theory of reasoned action reveals that both general environmental knowledge and eco-label knowledge have a positive impact on consumer attitudes toward the environment, driving ecologically conscious consumer behavior.

The above emphasizes the importance of communication strategies in marketing, specifically the need to educate consumers about specific environmental knowledge, including eco-label information, in addition to general environmental knowledge [71,72].

In some contradiction to the results of this study are the results of the European Social Survey. The main finding of the Polish diagnosis is that contrary to popular belief, older people are more concerned about environmental degradation issues than 15 to 24-year-olds. The popular opinion that this issue is particularly significant for the younger generation "may be due to the expressiveness and media appeal of young activists" [73]. In this context, research that also takes into account differences and cultural specificities should be developed and analyzed [74,75]. It is particularly significant in the context of planned and ongoing activities and strategies of companies related to the development

of quality and environmental parameters of a product throughout its life cycle. New solutions, for example, in the area of ESG reporting, should also take into account the specific characteristics and requirements of new generations of customers.

The analyses carried out made it possible to formulate conclusions and address the research hypotheses. Based on factor analysis, three groups of factors were identified, which guide the surveyed representatives of Generation Z when choosing pro-environmental products in the electrical machinery industry. These turned out to be environmental factors, determinants relating to knowledge and experience, and those based on brand and image.

Representatives of Generation Z from the Visegrad countries surveyed declared that they were guided by environmental concerns, i.e., environmental reasons, when choosing environmentally friendly products. Young consumers stated that they appreciated products that are sustainably sourced and produced with reduced environmental impact. More environmentally conscious consumers cared about products that are harmless to health and free of toxic substances. Nevertheless, in the case of products manufactured in the electrical machinery industry, it can be assumed that a young consumer is very likely not to give up quality for the sake of ecology. This thesis also seems to be confirmed by research by other authors. Based on the research, 65% expressed a desire to purchase purpose-driven brands that support sustainability, while only approximately 26% followed through with their intention [76].

The research hypothesis stating that the education of the surveyed representatives of Generation Z influences their choices of environmentally friendly products was confirmed. The second research hypothesis, positing that the environmental (pro-ecological) approach of the respondents of Generation Z is associated with their knowledge and experiences, as well as brand and image perceptions, was also confirmed in the present study. The young people surveyed by the authors were guided by their knowledge and previous experience when choosing environmentally friendly products. Environmental education is essential and can enhance young people's environmental behaviors. The findings indicate a positive relationship: environmental knowledge influences environmental attitudes, which, in turn, impacts environmental intentions and pro-environmental behaviors [77]. Furthermore, the electronic learning of environmental knowledge directly influences the environmental behavior of individuals [78]. The econometric analysis showed that the environmental aspects of the choice of pro-ecological products were associated, for the respondents, with both knowledge and experience and brand and image.

During our research, it was found that the reasons for purchasing environmentally friendly products were to some extent related. A consumer more aware of environmental issues is more likely to choose environmentally friendly products. Pro-ecological products must be effective and meet the consumer's quality expectations. Green marketing has a clear and substantial impact on purchase choices [79]. The brand image exerts a direct and notable influence on purchase decisions. On the other hand, "green brand knowledge portrays a positive but insignificant relationship with attitude and subjective norm" [80]. The empirical findings showed a positive impact of green marketing and green customer value on brand awareness, environmental concern, and eco-conscious customer behavior [81]. Enterprises ought to harness the environmental attributes of their products as a branding asset [82–84].

The reasons cited by young consumers when choosing pro-ecological products from the electromechanical industry were influenced by several demographic factors, including gender, place of residence, and education. This implies that individuals' decisions to opt for environmentally friendly products are shaped, to a significant extent, by their gender identity, the geographical context of their residence, and their educational background.

5. Conclusions

Undoubtedly, the limitations of this publication result from the fact that the research results are not representative of the entire population. Due to financial and organizational reasons, such a study was not possible to perform. It does not change the fact that until

now, this type of research has not been conducted in the Visegrad countries. It is, therefore, the first step of the process of better understanding the analyzed research problem. There is a need to conduct further research relating to the qualitative and environmental determinants of product selection in sectors other than food/grocery beyond the Visegrad countries. It should be borne in mind that the rankings of factors determining the choice of environmentally friendly products may vary depending on, among other things, the type of product, location, and demographics of consumers. Hence, further research to better understand the issues described, which are not static phenomena, is desirable. Furthermore, it should be borne in mind that the declarations made by the respondents in this study were not verified in any way. Broader research confronting the actual choices made about products chosen with pro-environmental and pro-quality features should be carried out considering information from companies, too: this will undoubtedly enrich the scientific discussion and, to some extent, verify the credibility of the declarations.

The research conducted can provide a basis for further research related to people's pro-ecological behavior. An important direction for further research could be to analyze the factors influencing decision-making among generations X, Y, and Alpha, as well as to indicate the perception of different factors determining the choice of pro-ecological products by comparing the results of research among various generations.

Limitations

The research was conducted in 2023. Unfortunately, achieving similar numbers in the compared groups of respondents was not possible. Nevertheless, through the use of non-parametric statistics, a comparative analysis was conducted between the studied countries of the Visegrad Group, albeit to a limited extent. In future studies, efforts will be made to ensure a more balanced number of surveyed respondents.

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