



Ewa JASKA • Agata BALIŃSKA • Agnieszka WERENOWSKA

## MOBILE APPLICATIONS IN THE SUSTAINABLE LIFESTYLE OF GENERATION Z

Ewa Jaska (ORCID: 0000-0002-3874-1985) – *Warsaw University of Life Sciences – SGGW*

Agata Balińska (ORCID: 0000-0002-8777-9955) – *Warsaw University of Life Sciences – SGGW*

Agnieszka Werenowska (ORCID: 0000-0002-2545-4442) – *Warsaw University of Life Sciences – SGGW*

Correspondence address:

Nowoursynowska Street 166, 02-787 Warsaw, Poland

e-mail: ewa\_jaska@sggw.edu.pl

**ABSTRACT:** The main objective of the research was to recognise the importance of apps in the implementation of sustainable lifestyles of representatives of Generation Z. The specific objectives were to identify: sustainable behaviors, the relationship between areas of behavior and the use of apps correlating with the area, and their determinants. The main stages of the research process included: critical analysis of the literature on the subject, development of research assumptions, selection of the method and research tool, and development of research results. Empirical research using a survey technique CAWI was conducted among 838 respondents in 2023. Factor analysis, Mann-Whitney U test and Spearman's rank correlation coefficient were used. Hypotheses were confirmed that behaviors in particular areas are positively correlated with the use of applications whose scope correlates with a particular area of behavior, and that economic conditions have the greatest impact on the sustainable lifestyle of representatives of generation Z. The conclusion identifies research limitations and implications, as well as directions for future research.

**KEYWORDS:** mobile applications, sustainable lifestyle, Generation Z

## Introduction

Modern consumers are primarily looking for convenience and are increasingly migrating between available channels and forms of shopping, avoiding simple classification and assignment to one category. “They are becoming conscious buyers who value their time, but also the shopping experience, moving more and more towards a profile that we could call a hybrid consumer” (Gregor et al., 2017). As Mruk and Jankowska-Kaczmarek (2017) point out, expanding knowledge about consumer behavior and attitudes can reduce waste and promote sustainable development. Ethical consumption is becoming increasingly important in reconciling global agricultural production with biodiversity conservation (Ghali, 2021). Smartphones equipped with sustainability applications („apps”) can help connect consumer decisions with their impact on the environment and biodiversity (Nghiem & Carrasco, 2016).

The development of new media makes access to this information very quick, but due to the multitude of information channels and messages, we often deal with information noise. Wang et al. (2023) point out that the potential of online news media in promoting green consumption, disseminating environmental knowledge, reporting environmental issues, and changing individual declarations of green consumption into behavior should be fully explored. The research of Gregor et al. (2017) shows that 8 out of 10 social media users not only use recommendations from friends, but also share information about purchased goods on various types of social networking sites.

Mobile applications are a response to the need to quickly obtain information in one place and within a specific scope. Grabiwoda (2019) distinguishes the following features of a useful application:

- intuitive installation,
- ease and speed of use,
- possibility of high engagement through push notifications,
- adaptation to changing technological requirements and trends thanks to updates.

Applications are increasingly playing the role of virtual assistants, providing information, entertainment, helping in planning purchases, time, etc. They are also an element of lifestyle, which was confirmed by Grabiwoda (2019) and Abuhamdeh et al. (2023) in their research. Unfavorable climate changes mean that lifestyle is increasingly analysed in a sustainable context. Research on sustainable style has become quite popular in recent years, as evidenced by the literature cited in this article. However, to the best of the authors’ knowledge, there is a significant lack of research considering mobile applications in a sustainable lifestyle. The research undertaken by the authors fits into the existing gap.

The main goal of the research was to recognise the importance of the application in implementing a sustainable lifestyle of Generation Z representatives. The specific goals are to recognise: the scope of sustainable behaviors, the relationship between the areas of behavior and the use of applications corresponding to a given area, and the conditions influencing these behaviors.

An important research task is the operationalisation of the term „sustainable lifestyle”. In this research, it was assumed that a sustainable lifestyle includes:

- giving up excess consumption,
- shopping taking into account prelogical premises,
- responsible everyday behavior at home, at work, and at university,
- management of excess food and clothes,
- applying solutions aimed at reducing water and energy consumption directly and indirectly.

## An overview of the literature

The term „lifestyle should be understood as the scope and forms of everyday behavior of individuals or groups, specific to their social situation, manifesting the social situation and perceived as characteristic of this location, and thus enabling the broadly understood social location of other people” (Ponikowska, 2016). The terms „ecological lifestyle”, „balanced lifestyle” are also used in the literature and are combined with „healthy lifestyle”. They are not synonyms, but they have many elements in common. As Geiger et al. (2018) emphasise, attitudes in this regard are individual choices that meet needs at three stages of consumption: acquisition, use and sale of goods and services, without prejudice to ecological and socio-economic conditions today and in the future.

A sustainable lifestyle may result from concern for the natural environment and economic and socio-cultural conditions. The term „sustainable lifestyle” is used interchangeably with the term „behavioral change”, to refer to pro-ecological, frugal, altruistic and equitable behaviors in all areas of life, including diet, energy consumption, mobility, etc. (Böhme et al., 2022). Although Essiz et al. (2023) believe that concern for the environment is widespread and consumers are generally favorable towards green consumption, they often have difficulty translating these values into actual behavior. Liu and McCarthy (2023) point out that a personal sense of moral obligation or responsibility is a key reason for the so-called green shopping, and the lack of strong moral standards makes ethical consumption decisions difficult. This creates the so-called „green gap” which has become the subject of interest for researchers in recent years (Gleim & Lawson, 2014; Witek & Kuźniar, 2024). „Green consumption is understood as purchasing and consumption behaviors by an individual which are related to environmental and resource problems and are motivated by not only a desire to satisfy an individual’s needs but also a concern for the welfare of society in general” (Nguyen et al., 2019). This definition is similar to that for sustainable consumption, which was declared by the United Nations Environment Programme in 1994. Similarities are also pointed out by Garbyal and Gupta (2024), who defined it as follows: „Green/sustainable consumption is a form of consumption that is attuned with the safeguard of the environment for the present and future generations. It ascribes consumers’ concern to address environmental issues through embracing environmentally friendly behavior, such as the use of renewable energy, carrying out organic activities, reduce, recycle, reuse, which leads to zero impact on climate”.

A sustainable lifestyle requires balanced consumption attitudes related to the choices of products or services that can be described as rational as opposed to irrational, i.e. impulsive, not guided by a logical calculation of profits and losses, including environmental ones (Ponikowska, 2016). Meier’s (2006) research shows that prosocial behavior is quantitatively important for economic and social outcomes. The pro-social approach includes:

- unconditional altruism (people are interested in the well-being of others regardless of who and why contributed to it and do not expect anything in return),
- conditional altruism (in addition to the benefits of the other person, your own benefits are also important, which may have a non-economic dimension, e.g. sense of self-worth, agency, feeling of pleasure, gaining prestige),
- aversion to inequality (altruistic behavior towards people who are doing worse and aversion to those who are doing better).

These attitudes also have ecological consequences. In times of unfavorable climate changes, it is necessary to shape them widely among consumers. Nuutinen and Lappalainen (2022) mention in their research the need to look for new ways to support ecological and social environmental sustainability. Similarly, Wang and Chao (2019) point to severe environmental pollution, depletion of natural resources, and climate change that are driving consumers and governments towards green consumption. In turn, Khan et al. (2021) emphasise that future-oriented people are concerned about the environment, which is why they choose green and sustainable consumption. In a sustainable economy (Davidenko et al., 2024), consumers increasingly prefer environmentally friendly products and services.

The issues discussed in this article fall within the mainstream of behavioral economics. One of the researchers and ambassadors of this trend in economics is Richard H. Thaler, the winner of the Bank of Sweden A. Nobel Prize in Economics in 2017 for his contribution to behavioral economics. An important part of his research is the impact of behavior on climate change. Thaler and Sunstein (2023) claimed that „understanding the choice architecture can accelerate many reforms that will help reduce the damage resulting from a warming world”. In their opinion, the main obstacles that hinder the rational use of resources are (Thaler & Sunstein, 2023):

- heuristic of the present – people tend to focus more on what is now than on what will happen later. The realisation that climate change is happening here and now most often comes when experiencing extreme weather phenomena (typhoons, floods, extremely high temperatures) or resulting fires or drying reservoirs and watercourses. In the absence of such experiences, people associate unfavorable climate changes with an indefinite future,

- clarity – we understand what we see, we don't see greenhouse gases, so we don't worry about them. More noticeable are polluted waters (colored with sewage from factories, fabric dyeing plants, leather tanneries) or smog hovering over cities or mountain resorts,
- lack of a specific culprit – it is easier to fight an opponent who can be identified, e.g. terrorist organisations. Even though climate change is a greater threat than terrorism in terms of the expected number of victims, the fight against these changes is much weaker than the fight against terrorist organisations,
- loss aversion – people are more negative about expected losses than positive about expected gains. Promoting a responsible lifestyle may initially require incurring easily identifiable expenses, i.e. generating losses, e.g. abandoning the consumption of cheaper industrially produced food in favor of more expensive ecological products, increasing taxes or local fees in favor of, for example, more effective waste segregation or investing in zero-emission transport. Of course, unfavorable climate change also generates losses, but most of them are postponed and their scale is still difficult to estimate.

Changes towards a sustainable lifestyle also concern everyday consumption. For example, Cué Rio et al. (2022), Dute et al. (2016) emphasise that changes should go not only towards supply-oriented restrictions, but also changes in consumers' eating habits. They point out that reducing meat consumption is an obvious strategy aimed at implementing sustainable development policy. Behavior in this area was also verified in the empirical research presented in this article.

### Development of hypotheses

Mobile applications are ubiquitous and influence our everyday practices. A significant number of apps have already been developed to support people's lifestyles to make them more sustainable.

Mobile applications perform more and more tasks related to the everyday functioning of modern people. This is especially visible in the case of young consumers, including those belonging to Generation Z. Applications in the context of a sustainable lifestyle are treated as a research tool but also as a way to stimulate these behaviors. Kuo and Horna (2017) point out that despite numerous studies, we still do not know much about sustainable everyday behaviors and the role of applications in these behaviors. Barboza and Filho (2019) emphasise that „currently, mobile applications with ecological features offer society new possibilities and alternatives for green consumption”. Interesting research on the use of applications in sustainable consumption was also presented by Guillén et al. (2022). In their assessment, “there is evidence of positive, significant relationships between application use, awareness of consequences, and attribution of responsibility for “green citizenship behaviors”.

Using applications in the context of creating a sustainable lifestyle may be useful because, as Mruk and Jankowska-Kaczmarek (2017) point out, people make decisions more easily when they have limited choices, and such solutions are provided by applications (filters and personalisations). This is confirmed by the research of Thaler and Sunstein (2023) who claim that „information can be a surprisingly strong motivator” and applications can be treated as a „green default option”, as an element of education but also as impulses that they remind you about something cyclically and without any effort on the part of the user. D'Arco and Marino (2022) take a similar position, emphasising that „apps promote educational and behavioral effects, such as mobilising social influence and providing benefits and achieving goals.” The multitude of applications and their functions has a positive impact on environmental issues (Sunio & Schmöcker, 2017). As Brauer et al. (2016) emphasise, there is still a need to improve these applications, especially with regard to motivational processes and initiatives in the area of sustainable development. Guillén et. al (2022) emphasise that the use of the concept of gamification in applications related to sustainable consumption has the potential to motivate users to change their lifestyle.

The analysis of the literature was the basis for adopting the research hypothesis:

H1. Behaviors in particular areas are positively correlated with the use of applications whose scope corresponds to a given area of behavior (factor).

Zalega (2017) emphasises that changes in consumer behavior are the result of economic changes. The crisis in 2008-2011 (in Poland the situation was quite good compared to other EU countries, in 2009 it was the only country in Europe to achieve positive economic growth), and 2020-2022 (especially in Poland with inflation even above 10%) undoubtedly influenced the reduction of consumption and the search for cheaper ways to meet the needs of households. In a difficult macroeconomic

situation, consumers are usually less willing to take risks. Research by Essiz et al. (2023) shows that consumers with lower general risk aversion and higher subjective knowledge about ecology show greater consistency between the presented values and behaviors in the context of green consumption. In the case of a sustainable lifestyle, the main counter-argument appearing in the media, in the statements of consumers and politicians is that we cannot afford it. This is a kind of paradox, as described by, among others, Hickiel (2020) or Raworth (2023). Nevertheless, linking behavior with political and economic factors is, in the opinion of Thaler and Sunstein (2023), the most effective and they called it „libertarian paternalism”. On the basis of behavioral economics, Niemcewicz (2018) analyses consumer behavior involving the purchase of „fair trade” certified products. Thanks to the short information on the packaging, consumers receive confirmation of the pro-environmental and pro-social policies of producers. Consumers, often for ideological reasons, are willing to pay a higher price for a product with this certificate than for a similar one from outside the fair trade network. Thus, the consumer gains well-being resulting from participating in the fair distribution of goods and supporting the economies of poor countries. Striving to eliminate poverty, fair trade states that the main principle of operation is the recognition of the primacy of people over profits (Niemcewicz, 2018). This certificate was also verified in the research presented below. Unfortunately, many research results indicate discrepancies between the declared concern for the natural environment and shopping habits (Chatterjee et al., 2022).

The following hypothesis was adopted in this research:

H2. Economic conditions have the greatest impact on the sustainable lifestyle of Generation Z representatives

## Research methods

Empirical research using a survey technique CAWI was conducted in 2023. The questionnaire was prepared on the webquestion platform. The actual research was preceded by a pilot study carried out on a sample of 722 people in 2021, and their results were assessed by the scientific community through the publication entitled *Environmentally and Socially Sustainable Behaviors of Generation Z in Poland Stimulated by Mobile Applications* (Jaska et al., 2022). The information obtained from reviewers in the publishing process and readers’ comments allowed us to improve the scope of the research and thus the research tool in the actual research. The questionnaire for the actual research consisted of 61 questions, and these were mainly questions with a scale. The research involved a convenient selection of respondents (Etikan, 2016) and every effort was made to reach the widest possible group of Generation Z respondents. The snowball method was used to provide a link to the questionnaire (Jabłońska & Sobieraj, 2013). It was available on the project’s online channels (social media accounts and profiles), and respondents were asked to share it with their friends and followers. Single respondent had the opportunity to complete the questionnaire only once. This article uses the second part of the material collected in this study, and the first part was analysed and accepted for publication in the article entitled „*Environmentally and socially responsible behavior of generation Z in the context of the economy of the common good*”.

The actual research included the following behaviors included in the concept of a sustainable lifestyle: turning off the lights in rooms, using energy-saving light bulbs, separating waste, saving water, giving up driving in favor of public transport, disconnecting devices with charged batteries from the power supply, sealing windows and insulating buildings, donating unused clothes, buying products from domestic producers, purchasing products in recycled packaging, packing fruit and vegetables in reusable bags instead of disposable ones, purchasing devices taking into account their energy efficiency class, limiting shopping activity, buying used clothes, traveling by bike, using renewable energy sources, purchasing products through the Too Good To Go, Foodsi, Vinted and others applications, purchasing organic food, purchasing products in „zero waste” departments, using ecological or biodegradable washing and cleaning agents, reducing meat consumption, using shared transport (e.g. Blablacar, city bikes), buying clothes and textiles with an ecological certificate, buying food with the FAIRTRADE mark, using foodsharing spots. In order to reduce the number of variables, a factor analysis was performed, which is presented later in the article. The obtained results were subjected to statistical analysis, using the Mann-Whitney U test and Spearman’s rank correlation

coefficient. The sample size in the actual research, after discarding incomplete questionnaires and those completed by people beyond Generation Z, includes 838 respondents.

## Results of the research

### Characteristics of respondents

The majority of respondents (61.1%) were women, 36.5% were men, 2.4% did not indicate their gender. The domination of women in survey research is typical, which is also noted by (Mulder & de Bruijne, 2019). The study involved respondents declaring their age to be 14-28. Every third respondent lived in cities with over 500,000 inhabitants (33.3%) and in the countryside (33.1%). Cities up to 50,000 inhabitants were indicated by 22.8%, and the remaining 10.9% indicated cities with 50,000 to 500,000 inhabitants. 56% of respondents lived in single-family houses, and 38.2% lived in blocks of flats. Only 5.8% mentioned boarding school. Almost half were supported by contributions from parents and other family members. Almost every fourth respondent (23.3%) indicated that they derive income from permanent employment, and 22.2% from freelance work. Academic or social scholarships were the main source of income for 5.1%, and social benefits for 1.4%. The largest group were those who spent up to PLN 1,500 on living (46.7%). Every third (33.8%) indicated the amount of PLN 1,500-3,000, and 19.6% above PLN 3,000. A common element for respondents, apart from age, was the use of applications supporting a balanced lifestyle. In the multiple-choice question, respondents marked the applications they use at least once a month. The largest group of respondents chose the OLX (62.0%) and Vinted (51.5%) applications. The next places were: Allegro lokalnie (33.5%), Too Good To Go (24.4%), Veturilo (9.8%), BlaBlaCar (8.1%), Foodsi (6.6%), Zdrowe Zakupy (6.5%), Gdzie Wyrzucić (1.9%). Respondents assessed their own behaviors that are determinants of a sustainable lifestyle (Table 1).

**Table 1.** Respondents' assessment of their own behavior

Specification	Mean	Median	Standard deviation
turning off the lights indoors	4.37	5	0.79
using energy-saving light bulbs	3.97	4	0.97
segregation of garbage	3.73	4	0.95
water saving	3.70	4	0.86
giving up driving in favor of public transport	3.69	4	1.36
disconnecting devices with charged batteries from the power supply	3.49	4	1.23
sealing windows and insulating buildings	3.45	4	1.10
Donating unused clothes	3.37	4	1.20
buying products from domestic producers	3.35	3	0.93
purchasing products in recycled packaging	3.26	3	0.93
packing fruit and vegetables in reusable bags, not disposable ones	3.20	3	1.30
purchase of devices taking into account their energy efficiency classes	3.20	3	1.05
limiting shopping activity	3.13	3	1.04
buying used clothes	3.02	3	1.36
traveling by bike	2.92	3	1.27
activities to use renewable energy sources	2.88	3	1.05



Specification	Mean	Median	Standard deviation
purchasing products through the Too Good To Go, Foodsi, Vinted and other applications	2.77	3	1.37
purchasing organic food	2.72	3	1.02
purchasing products in „zero waste“ departments	2.62	3	1.06
using ecological/biodegradable washing and cleaning detergents	2.55	3	1.03
Reducing meat consumption	2.48	2	1.30
using shared transport (e.g. Blablacar, city bikes)	2.47	2	1.29
buying clothes and textiles with an ecological certificate	2.46	2	0.99
buying food with the FAIRTRADE mark	2.39	2	1.02
using foodsharing spots	1.76	1	0.94

The respondents rated their everyday behaviors in saving energy, water and waste segregation as the highest. The lowest scores were given to behaviors related to the use of foodsharing spots. This distribution of answers may be due to the fact that people do not receive precise information about the consequences of their actions, e.g. they do not know how climate change is affected by the temperature they set in rooms, what means of transport they use, how much meat they include in their diet, whether their clothes are made of organic cotton or petroleum derivatives (Thaler & Sunstein, 2023).

A comparative analysis of the behaviors of the respondents in the age group 14- 18 and 19- 28 was also made. Behaviors characteristic of both age groups were taken into account, such as: segregation of garbage, water saving, disconnecting devices with charged batteries from the power supply, turning off the lights indoors, packing fruit and vegetables in reusable bags, not disposable ones, purchasing products through the Too Good To Go, Foodsi, Vinted and other applications, limiting shopping activity, traveling by bike and reducing meat consumption. Using the Mann-Whitney U test, it was shown that there was no statistically significant difference between the analysed age groups (p-value ranged from 0.14156 to 0.8181).

### Factor analysis

In order to reduce the number of variables and identify areas of sustainable behavior, factor analysis (EFA) was performed using the principal components method with Varimax rotation. Five areas of behavior have been identified and assigned the following names: 1) *Conscious everyday behavior*; 2) *Behavior in the field of limiting „energy“ losses*; 3) *Circular behaviors*; 4) *Savings attitudes*; 5) *Transport behavior*. To verify the reliability of the questionnaire, the Cronbach's Alpha test was used. The highest test value was obtained for the first factor (0.808). For the rest, it obtained values slightly lower, but above 0.600, which is considered sufficient. Table 2 presents the factor loadings.

The strongest connection with the first factor defined as „Conscious everyday behavior“ was the purchase of organic food. The second factor, defined as „Behaviors in the field of limiting „energy“ losses, is most closely related to the behavior of preventing energy losses from rooms, i.e. „sealing windows and insulating buildings“. In turn, the third area „Circular behavior“ is most closely related to the behavior of buying second-hand clothes. Behaviors related to turning off the lights in unused rooms (factor IV) are most closely related to saving attitudes. However, the last factor „Transportation behavior“ is most closely related to the behavior of traveling by bicycle.

It should be emphasised that although the factor loading of behavior involving limiting shopping activity is very low, it was included due to substantive reasons. The substantive premise also meant that this behavior was included in the fourth factor, i.e. „saving attitudes“.

To check the significance of differences between the selected areas of action for responsible behavior, Friedman's ANOVA analysis was performed (Table 3).

**Table 2.** Matrix of rotated components

Specification:	Factors				
	I	II	III	IV	V
purchasing organic food	<b>0.734</b>	0.125	-0.008	0.118	0.067
purchasing products in „zero waste” departments	0.706	0.133	0.194	0.075	0.056
reduction of meat consumption	0.606	0.348	0.219	-0.138	0.156
buying clothes and textiles with an ecological certificate	0.601	0.350	0.156	-0.055	0.149
buying food with the FAIRTRADE mark	0.578	-0.262	0.090	0.175	0.162
using ecological/biodegradable washing and cleaning agents	0.553	0.390	0.026	0.024	-0.019
purchasing products in recycled packaging	0.519	0.290	0.114	0.284	0.016
donating/obtaining items from foodsharing spots/using foodsharing spots	0.512	-0.113	0.200	-0.026	0.132
packing fruit and vegetables in reusable bags, not disposable ones	0.431	-0.072	0.381	0.262	0.079
sealing windows and building insulation	0.042	<b>0.633</b>	0.100	0.153	-0.025
purchase of devices taking into account their energy efficiency classes	-0.025	<b>0.628</b>	0.053	0.366	-0.029
using energy-saving light bulbs	0.179	<b>0.624</b>	-0.102	0.144	0.344
buying products from domestic producers	0.246	<b>0.484</b>	0.159	0.063	0.277
activities to use renewable energy sources	0.395	<b>0.435</b>	0.056	0.143	0.043
buying used clothes	0.202	-0.015	<b>0.780</b>	0.017	0.175
purchasing products through the Too Good To Go, Foodsi, Vinted and other applications	0.257	0.112	0.741	-0.092	0.101
donating unused clothes	0.063	0.167	0.706	0.240	0.026
turning off the lights indoors	-0.071	0.142	0.078	<b>0.714</b>	-0.007
water saving	0.097	0.086	0.078	<b>0.615</b>	-0.002
segregation of garbage	0.156	0.234	-0.124	<b>0.552</b>	-0.048
disconnecting devices with charged batteries from the power supply	0.048	0.064	0.080	<b>0.493</b>	0.183
limiting shopping activity	0.238	0.071	0.005	<b>0.338</b>	0.338
traveling by bike	0.086	0.141	0.055	-0.004	<b>0.735</b>
giving up driving in favor of public transport	-0.004	-0.033	0.088	0.248	0.704
using shared transport (e.g. Blablacar, city bikes)	0.264	0.061	0.248	-0.190	0.639
VARIANCE (% cumulative)	14.747	23.976	32.434	40.801	48.277

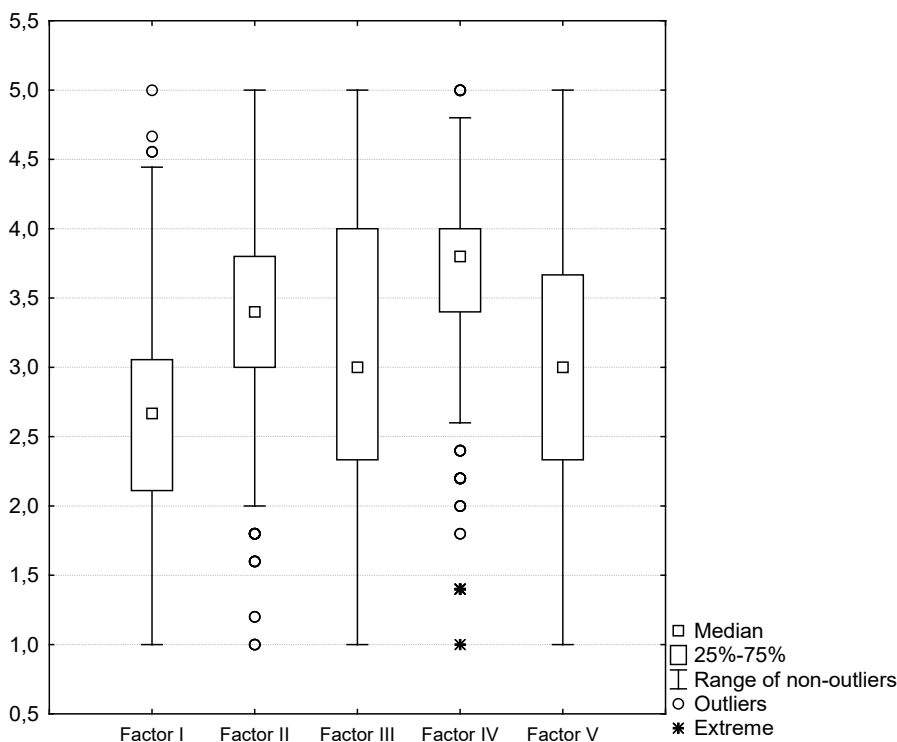
I. Conscious everyday behavior; II. Behavior in the field of limiting „energy” losses; III. Circular behaviors; IV. Savings attitudes; V. Transport behavior.



**Table 3.** Descriptive statistics of the results of the analysed factors

Factor	Rank mean	Mean	SD	ANOVA Friedman
I. Conscious everyday behavior	1.88	2.61	0.67	Chi <sup>2</sup> = 1022.629 p = 0,000
II. Behavior in the field of limiting „energy” losses	3.4	3.37	0.66	
III. Circular behavior	2.85	3.05	1.04	
IV. Savings attitudes	4.07	3.68	0.58	
V. Transport behavior	2.79	2.99	0.99	

There are statistically significant differences between individual factors (i.e. the respondents obtained different results in assessing their activities in particular areas), which was verified by the Friedman ANOVA test and Kendall's consistency coefficient ( $p = 0.00000$ ). Additionally, in the next stage it was determined which of these factors differ from each other. For this purpose, the Wilcoxon pairwise order test was used (due to multiple comparisons, the Bonferroni correction had to be used, but the result without the correction led to the same conclusions as with the correction). The analysis showed that only between factors III and V there is no statistically significant difference (i.e. the assessment of these two areas of activities in the study group was similar), as shown in Figure 1.

**Figure 1.** Comparison of individual pairs of activities in the area of factors (Wilcoxon pairwise order test)

Each area was different from the others. The respondents rated the first factor, i.e. „conscious everyday behaviour”, the lowest.

### The importance of the application in the sustainable behavior of respondents

In accordance with the adopted issues, the relationship between sustainable behaviors, which were organised into five areas (factors) thanks to factor analysis, and the use of applications whose scope is related to these areas was verified. The assignment of applications to factors is presented in Figure 2.

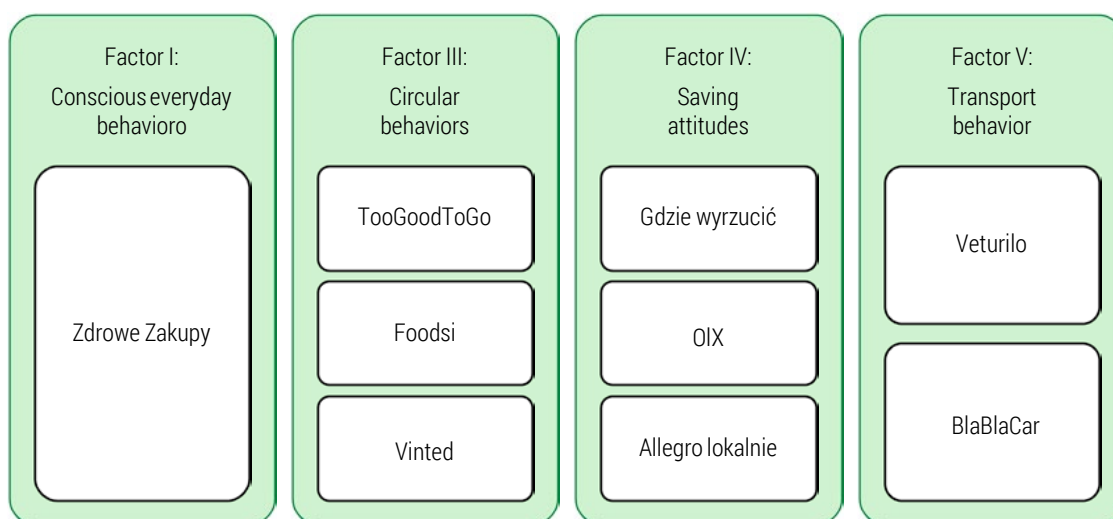


Figure 2. Behavior areas and dedicated applications

The second factor, i.e. „behaviors in the field of limiting ‚energy’ losses”, was not taken into account because none of the analysed applications corresponded to the scope of this factor.

Verification with the Mann-Whitney U test showed that for people using the application:

- „Zdrowe zakupy” behaviors in terms of factor I were significantly more important than for those who did not use this application ( $p=0.00008$ ),
- Too Good To Go, Foodsi, and Vinted behaviors in terms of factor III are significantly more important than for those who do not use these applications (in each case  $p<0.01$ ),
- Gdzie wyrzucić, OIX, Allegro lokalnie, there was no statistically significant difference in the area of saving attitudes (factor IV),
- Veturilo i BlaBlaCar behaviors in terms of factor V were significantly more important than for those who did not use this application (for BlaBlaCar  $p=0.000007$ ; for Veturilo  $p=0.01$ ).

The first hypothesis was positively verified in the case of conscious everyday behaviors (factor I), circular behaviors (factor III) and transport behaviors (factor V). In the case of saving attitudes (factor IV), it was not verified positively.

### Determinants of a balanced lifestyle

The subject of research interests were also the determinants of a sustainable lifestyle (Table 4) and their correlation with factors (Table 5).

Table 4. The importance of the determinants of a balanced lifestyle of respondents

Specification	mean	median	deviation
Reduction of expenses	3.96	4	1.09
Caring for the natural environment	3.84	4	1.04
Helping others/ Willingness to support other people	3.75	4	1.11
Saving time	3.66	4	1.14
Preserving the natural environment for future generations	3.65	4	1.18
Behavior patterns learned at home	3.14	3	1.21
Applicable law	3.09	3	1.12
Example of friends/ modeling the behavior of friends	2.97	3	1.16
Using behavior-dedicated mobile applications	2.76	3	1.36

Economic conditions had the greatest impact on the respondents' sustainable lifestyle. Thaler and Sunstein (2023) explain the relatively low position of the factor defined as „willingness to support other people” by „conditionality in cooperation”. The factor referred to as „applicable law” had an even lower position. Research by Jaska et al. (2022) shows that the impact of legal aspects may be significant. Thaler and Sunstein (2023) also emphasise that „despite all the arguments in favor of economic incentives, developing economic and psychological research, rooted in behavioral discoveries, suggest that regulatory mandates may also be a good way to solve environmental problems, much better than economists once thought.” In turn, Liu et al. (2023) draw attention to the importance of government environmental regulations in creating pro-environmental behavior.

**Table 5.** The relationship between the determinants of a sustainable lifestyle and the identified factors (Spearman's rank correlation, R)

Conditions/determinants	Factor I	Factor II	Factor III	Factor IV	Factor V
Reduction of expenses	-0.0152	0.0670	0.0940*	0.0985*	0.0754*
Saving time	0.0102	0.0535	0.0931*	0.0940*	0.0773*
Applicable law	0.1329*	0.1273*	0.0435	0.0811*	0.0441
Behavior patterns learned at home	0.0730*	0.1474*	0.0661	0.0891*	-0.0082
Example of friends/ modeling the behavior of friends	0.1275*	0.0647	0.1424*	-0.0182	0.0293
Using behavior-dedicated mobile applications	0.2319*	0.0921*	0.3390*	0.0099	0.1546*
Caring for the natural environment	0.2690*	0.2108*	0.1969*	0.2887*	0.1847*
Helping others/The willingness to support other people	0.2878*	0.1967*	0.2713*	0.1851*	0.1881*
Preserving the natural environment for future generations	0.3351*	0.2130*	0.1858*	0.2048*	0.1831*

The \* mark corresponds to the information that these are statistically significant values because the value was  $p < 0.05$ .

It should be emphasised that in most cases the correlation coefficient is positive, i.e. a higher value of the condition corresponds to a higher value of the factors (behaviors in a specific area). The coefficient values are mostly low. Noteworthy are situations in which the coefficient value is above 0.300, i.e. concern for future generations as a determinant of behavior is correlated with the area of conscious everyday behavior (factor I). This attitude is contrary to the free-rider effect described by Thaler and Sunstein (2023) who linked it to Garrett Hardin's concept of the „tragedy of the commons”. The greater importance of using applications is accompanied by a greater importance of circular behaviors (factor III), which is confirmed by the results presented earlier.

## Discussion and conclusions

The potential of mobile applications in the field of environmental protection is large and untapped. The presented research addresses the issue of the importance of mobile applications in promoting a sustainable lifestyle among representatives of Generation Z. In the literature, more analyses concern social media and it is noted that sharing information in social media has a positive impact on the intention to purchase ecological products (Sun & Xing, 2022; Panopoulos et al., 2023; Cattapan et al., 2023; De Jesus et al., 2024), and the most important are economic factors (Bełch et al., 2024). The authors emphasise that in the digital era, applications are becoming a key tool supporting young people in making more conscious choices regarding the environment and social environment. Applications can be helpful in operationalising the sustainable behaviors of Generation Z. The necessity to operationalise their eating behaviors is indicated by, among others, Ruzgys and Pickering (2024), and they emphasise the need for fuller involvement of Generation Z through educational and political initiatives. The necessity to switch to a more sustainable system of behavior is also emphasised by

Wijaya and Kokchang (2023) in their research. They emphasise that Generation Z plays a key role in taking responsibility for environmental issues, and without rigorous action and support measures, they will be the group most affected by climate change. The article presents applications covering areas from ecology to a healthy lifestyle and consumer minimalism.

The hypothesis was confirmed that behaviors in particular areas are positively correlated with the use of applications whose scope corresponds to a given area of behavior (factor):

- for respondents using the „Zdrowe Zakupy” application, behaviors in the area of factor 1 (conscious everyday behaviors) are more important than for those who do not use it,
- for respondents using the Too Good To Go, Foodsi, Vinted applications, behaviors in the area of factor 3 (circular behaviors) are significantly more important than for those who do not use these applications,
- for respondents using the Gdzie wyrzucić, OIX, allegro lokalnie applications, behaviors classified as factor 4 (saving attitudes) are significantly more important than for those who do not use these applications,
- for respondents using the Veturilo and BlaBlaCar applications, transport behaviors are significantly more important than for those who do not use these applications (factor area 5).

The H2 hypothesis that economic conditions have the greatest impact on the sustainable lifestyle of Generation Z representatives was also positively verified. Reduction of expenses on a scale of 1-5 was rated highest (3.96). Alders and Böttcher (2023) also point to economic factors, noting that Generation Z is more focused on sustainable development than previous generations, but a “green gap” has been observed – a discrepancy between consumers’ purchasing intentions and actual behavior. Factors contributing to this include price as a key barrier to purchases and perceived quality.

#### Limitations:

- the research was conducted only among Polish representatives of Generation Z,
- there is difficulty in identifying actual patterns because the analysis was based on respondents’ declarations,
- habits related to a sustainable lifestyle may be culturally and regionally diverse,
- analysis of behaviors related to a sustainable lifestyle implied by mobile applications that are poorly recognised.

#### Implications:

- research results affect both individuals and social groups. They can be useful in the areas of science, environmental policy and business,
- learning about the preferences and behavioral patterns of Generation Z related to a sustainable lifestyle may contribute to a better understanding of the needs and expectations towards mobile applications,
- research can help identify areas where there is a need to increase awareness among Generation Z about a sustainable lifestyle,
- mobile applications can be an effective tool for transmitting information and promoting sustainable behavior,
- understanding the preferences and needs of Generation Z in terms of a sustainable lifestyle may be useful for public decision-makers when developing policies promoting conscious and responsible behavior.

#### Directions for future research:

- it is advisable to systematically assess the effectiveness of various types of mobile applications in promoting a sustainable lifestyle among Generation Z,
- examining the motivational factors and barriers that influence the use of mobile applications related to a sustainable lifestyle and correspond to user preferences,
- recognising the impact of mobile applications and other factors such as education, economic status and personal values on shaping sustainable lifestyle behaviors.

## Acknowledgements

This research has been supported by the Minister of Education and Science within the framework of project Nds/545437/2022/2022 ‘Environmentally and socially sustainable behavior of Generation Z, stimulated by mobile applications’.

## The contribution of the authors

Conceptualisation, A.B., E.J. and A.W.; literature review, A.B., E.J. and A.W.; methodology, A.B., E.J. and A.W.; formal analysis, A.B., E.J. and A.W.; writing, A.B., E.J. and A.W.; conclusions and discussion, A.B., E.J. and A.W.

## References

- Abuhamdeh, M., Qtaish, O., Kanaker, H., Alshanty, A., Yousef, N., & Abdulla, M. A. (2023). Leveraging big data and AI in mobile shopping: A study in the context of Jordan. *International Journal of Advanced Compute Science and Applications*, 14(7), 226-232. <https://doi.org/10.14569/IJACSA.2023.0140725>
- Alders, K.-M., & Böttcher, T. A. (2023). *Green Generation: Sustainable Purchase Intention and Marketing Impact on Gen Z*. <https://doi.org/10.13140/RG.2.2.30627.02088>
- Barboza, M. N. L., & Filho, E. J. M. A. (2019). Green Consumption Values in Mobile Apps. *Journal of International Consumer Marketing*, 31(1), 66-83. <https://doi.org/10.1080/08961530.2018.1490052>
- Bełch, P., Hajduk-Stelmachowicz, M., Chudy-Laskowska, K., Vozňáková, I., & Gavurová, B. (2024). Factors determining the choice of pro-ecological products among generation Z. *Sustainability*, 16(4), 1560. <https://doi.org/10.3390/su16041560>
- Böhme, J., Walsh, Z., & Wamsler, C. (2022). Sustainable lifestyles: towards a relational approach. *Sustainability Science*, 17, 2063-2076. <https://doi.org/10.1007/s11625-022-01117-y>
- Brauer, B., Ebermann, C., Hildebrandt, B., Remane, G., & Kolbe, L. (2016). Green by app: the contribution of mobile applications to environmental sustainability. *Proceedings of 20th Pacific Asia Conference on Information Systems*, Chiayi, Taiwan. <https://aisel.aisnet.org/pacis2016/220>
- Cattapan, T., Vilaisri, S., & Chinchanchokchai, S. (2023). The influence of social media influencers (SMI) on the pro-environmental behavior of Thai generation Y regarding the purchase of electric vehicles. *ABAC Journal*, 43(2), 77-91. <https://doi.org/10.14456/abacj.2023.16>
- Chatterjee, S., Sreen, N., Sadarangani, P. H., & Gogoi, B. J. (2022). Impact of Green Consumption Value, and Context-Specific Reasons on Green Purchase Intentions: A Behavioral Reasoning Theory Perspective. *Journal of Global Marketing*, 35(4), 285-305. <https://doi.org/10.1080/08911762.2021.1996670>
- Cué Rio, M., Bovenkerk, B., Castella, J. C., Fischer, D., Fuchs, R., Kanerva, M., Rounsevell, M. D. A., Salliou, N., Verger, E. O., & Röös, E. (2022). The elephant in the room is really a cow: using consumption corridors to define sustainable meat consumption in the European Union. *Sustainability Science*, 1-19. <https://doi.org/10.1007/s11625-022-01235-7>
- D'Arco, M., & Marino, V. (2022). Environmental citizenship behavior and sustainability apps: an empirical investigation. *Transforming Government: People, Process and Policy*, 16(2), 185-202. <http://dx.doi.org/10.1108/TG-07-2021-0118>
- Davidenko, L., Sherimova, N., Kunyazova, S., Amirova, M., & Beisembina, A. (2024). Sustainable economy: The eco-branding of an industrial region in Kazakhstan. *Sustainability*, 16(1), 413. <https://doi.org/10.3390/su16010413>
- De Jesus, J. Y. B., Merle, P. N. B., Monedera, E. U., Nicdao, R. A. F., & Etrata, A. E. Jr. (2024). Generation Z's purchase intention towards green apparel: The mediating role of apparel sustainability knowledge and green perceived value. *Review of Integrative Business and Economics Research*, 13(2), 107-122. [http://buscompress.com/uploads/3/4/9/8/34980536/riber\\_13-2\\_07\\_k23-014\\_107-122.pdf](http://buscompress.com/uploads/3/4/9/8/34980536/riber_13-2_07_k23-014_107-122.pdf)
- Douglas, B. D., & Brauer, M. (2021). Gamification to prevent climate change: a review of games and apps for sustainability. *Current Opinion in Psychology*, 42, 89-94. <https://doi.org/10.1016/j.copsyc.2021.04.008>
- Dute, D., Bemelmans, W., & Breda, J. (2016). Using Mobile Apps to Promote a Healthy Lifestyle Among Adolescents and Students: A Review of the Theoretical Basis and Lessons Learned. *JMIR mHealth and uHealth*, 4(2), e39. <https://doi.org/10.2196/mhealth.3559>
- Essiz, O., Yurteri, S., Mandrik, C., & Senyuz, A. (2023). Exploring the Value-Action Gap in Green Consumption: Roles of Risk Aversion, Subjective Knowledge, and Gender Differences. *Journal of Global Marketing*, 36(1), 67-92. <https://doi.org/10.1080/08911762.2022.2116376>
- Etikan, I. (2016). Comparison of Convenience Sampling and Purposive Sampling. *American Journal of Theoretical and Applied Statistics*, 5(1), 1-4. <https://doi.org/10.11648/j.ajtas.20160501.11>
- Garbyal, S., & Gupta, R. M. (2024). Green Consumption Behaviour for Sustainable Development. In S. Sheraz Mahdi, R. Singh & B. Dhekale (Eds.), *Adapting to Climate Change in Agriculture-Theories and Practices* (pp. 321-339). Cham: Springer. [https://doi.org/10.1007/978-3-031-28142-6\\_15](https://doi.org/10.1007/978-3-031-28142-6_15)
- Geiger, S. M., Fischer, D., & Schrader, U. (2018). Measuring what matters in Sustainable consumption: An integrative framework for the selection of relevant behaviors. *Sustainable Development*, 26(1), 18-33. <https://doi.org/10.1002/sd.1688>
- Ghali, Z. Z. (2021). Motives of ethical consumption: A study of ethical products' consumption in Tunisia. *Environment, Development and Sustainability*, 23(9), 12883-12903. <https://doi.org/10.1007/s10668-020-01191-1>

- Gleim, M., & Lawson, S. J. (2014). Spanning the gap: An examination of the factors leading to the green gap. *The Journal of Consumer Marketing*, 31(6), 503-514. <https://doi.org/10.1108/JCM-05-2014-0988>
- Grabowoda, B. (2019). *E-konsumenci jutro. Pokolenie Z i technologie mobilne*. Warszawa: Wydawnictwo Nieoczywiste. (in Polish).
- Gregor, B., Gotwald-Feja, B., & Łaskiewicz, A. (2017). E-commerce a zachowania konsumentów. In M. Bartosik-Purgat (Ed.), *Zachowania konsumentów. Globalizacja, nowe technologie, aktualne trendy, otoczenie społeczno-kulturowe* (pp. 119). Warszawa: PWN. (in Polish).
- Guillén, G. M., Galeote, D. F., Sicevic, N., Hamari, J., & Quist, J. (2022). Gamified apps for sustainable consumption: A systematic review. *Proceedings of the GamiFIN Conference, Tampere, Finland*, 3147, 135-145. <http://ceur-ws.org/Vol-3147/>
- Hickiel, J. (2020). *Mniej znaczy lepiej. O tym jak odejście od wzrostu gospodarczego ocali świat*. Kraków: Wydawnictwo Karakter. (in Polish).
- Jabłońska, K., & Sobieraj, A. (2013). Dobór próby badawczej czynnikiem sukcesu w prowadzonych badaniach empirycznych. *Obronność – Zeszyty Naukowe Wydziału Zarządzania i Dowodzenia Akademii, Obrony Narodowej*, 2(6), 40-48. (in Polish).
- Jaska, E., Werenowska, A., & Balińska, A. (2022). Environmentally and Socially Sustainable Behaviors of Generation Z in Poland Stimulated by Mobile Applications. *Energies*, 15(21), 7904. <https://doi.org/10.3390/en15217904>
- Khan, R., Awan, T. M., Fatima, T., & Javed, M. (2021). Driving forces of green consumption in sharing economy. *Management of Environmental Quality*, 32(1), 41-63. <https://doi.org/10.1108/MEQ-03-2020-0052>
- Kuo, P.-Y. (Patricia), & Horna, M. S. (2017). Daily challenges for sustainable lifestyles: design implications from a mobile intervention study. *Proceedings of the 2017 ACM International Joint Conference on Pervasive and Ubiquitous Computing and Proceedings of the 2017 ACM International Symposium on Wearable Computers*, New York, USA, 635-641. <https://doi.org/10.1145/3123024.3124425>
- Liu, H., & McCarthy, B. (2023). Sustainable lifestyles, eating out habits and the green gap: A study of food waste segments. *Asia Pacific Journal of Marketing and Logistics*, 35(4), 920-943. <https://doi.org/10.1108/APJML-07-2021-0538>
- Liu, N., Liu, Y., & Yu, X. (2023). The impact of public environmental concern on environmental pollution: The moderating effect of government environmental regulation. *PLoS One*, 18(8), e0290255. <https://doi.org/10.1371/journal.pone.0290255>
- Meier, S. (2006). A Survey of Economic Theories and Field Evidence on Pro-Social Behavior. FRB of Boston Working Paper, 6(6), 1-41. <http://dx.doi.org/10.2139/ssrn.917187>
- Mruk, H., & Jankowska-Kaczmarek, A. (2017). Wiedza o konsumentach z perspektywy ekonomii behawioralnej. In M. Bartosik-Purgat (Ed.), *Zachowania konsumentów. Globalizacja, nowe technologie, aktualne trendy, otoczenie społeczno-kulturowe* (pp. 92). Warszawa: PWN. (in Polish).
- Mulder, J., & de Bruijne, M. (2019). Willingness of Online Respondents to Participate in Alternative Modes of Data Collection. *Survey Practice*, 12(1). <https://doi.org/10.29115/SP-2019-0001>
- Nghiem, T. P. L., & Carrasco, L. R. (2016). Mobile Applications to Link Sustainable Consumption with Impacts on the Environment and Biodiversity. *BioScience*, 66(5), 384-392. <https://doi.org/10.1093/biosci/biw016>
- Nguyen, H. V., Nguyen, C. H., & Hoang, T. T. B. (2019). Green consumption: Closing the intention-behavior gap. *Sustainable Development*, 27(1), 118-129. <https://doi.org/10.1002/sd.1875>
- Niemcewicz, P. (2018). Ekonomia Behawioralna – Hybryda Teorii i Eksperymentu. *Studia i Prace WNEiZ US*, 51(1), 9-19. <https://doi.org/10.18276/sip.2018.51/1-01> (in Polish).
- Nuutinen, M., & Lappalainen, I. (2022). Services for sustainable future lifestyle in smart blocks – empowering people to make a difference. *IOP Conference Series: Earth and Environmental Science*, 1122(1), 012013. <https://doi.org/10.1088/1755-1315/1122/1/012013>
- Panopoulos, A., Poulis, A., Theodoridis, P., & Kalampakas, A. (2023). Influencing Green Purchase Intention through Eco Labels and User-Generated Content. *Sustainability*, 15(1), 764. <https://doi.org/10.3390/su15010764>
- Ponikowska, K. (2016). Zrównoważone style życia – ujęcie teoretyczne. In J. Klimczak & K. Ponikowska (Eds.), *Style życia w perspektywie zrównoważonego rozwoju* (pp. 17-26). Katowice: Wydawnictwo Uniwersytetu Śląskiego. (in Polish).
- Raworth, K. (2023). *Ekonomia obwarzanka. Siedem sposobów myślenia o ekonomii XXI wieku*. Warszawa: Wydawnictwo Krytyki Politycznej. (in Polish).
- Ruzgys, S., & Pickering, G. J. (2024). Gen Z and sustainable diets: Application of The Transtheoretical Model and the theory of planned behaviour. *Journal of Cleaner Production*, 434, 140300. <https://doi.org/10.1016/j.jclepro.2023.140300>
- Sun, Y., & Xing, J. (2022). The Impact of Social Media Information Sharing on the Green Purchase Intention among Generation Z. *Sustainability*, 14(11), 6879. <https://doi.org/10.3390/su14116879>
- Sunio, V., & Schmöcker, J. D. (2017). Can we promote sustainable travel behavior through mobile apps? Evaluation and review of evidence. *International Journal of Sustainable Transportation*, 11(8), 553-566. <https://doi.org/10.1080/15568318.2017.1300716>



- Thaler, R. H., & Sunstein, C. R. (2023). *Impuls. Wydanie finalne. Jak podejmować właściwe decyzje dotyczące zdrowia, dobrobytu i szczęścia*. Poznań: Wydawnictwo Zysk i S-ka. (in Polish).
- Wang, X., & Chao, C.-H. (2019). Nostalgia decreases green consumption: the mediating role of past orientation. *Business Research Quarterly*, 23(4), 270-284. <https://doi.org/10.1177/2340944420966867>
- Wang, X., Wang, Z., & Li, Y. (2023). Internet use on closing Intention–Behavior gap in green Consumption – A mediation and moderation theoretical model. *International Journal of Environmental Research and Public Health*, 20(1), 365. <https://doi.org/10.3390/ijerph20010365>
- Wijaya, D. I., & Kokchang, P. (2023). Factors Influencing Generation Z's Pro-Environmental Behavior towards Indonesia's Energy Transition. *Sustainability*, 15(18), 13485. <https://doi.org/10.3390/su151813485>
- Witek, L., & Kuźniar, W. (2024). Green purchase behaviour gap: The effect of past behaviour on green food product purchase intentions among individual consumers. *Foods*, 13(1), 136. <https://doi.org/10.3390/foods13010136>
- Zalega, T. (2017). Zachowania konsumentów w obliczu kryzysu. In M. Bartosik-Purgat (Ed.), *Zachowania konsumentów. Globalizacja, nowe technologie, aktualne trendy, otoczenie społeczno-kulturowe* (pp. 147-169). Warszawa: PWN. (in Polish).

---

Ewa JASKA • Agata BALIŃSKA • Agnieszka WERENOWSKA

## APLIKACJE MOBILNE W ZRÓWNOWAŻONYM STYLU ŻYCIA GENERACJI Z

**STRESZCZENIE:** Głównym celem badania było rozpoznanie znaczenia aplikacji w realizacji zrównoważonego stylu życia przedstawicieli Pokolenia Z. Celami szczegółowymi były identyfikacja: zrównoważonych zachowań, zależności pomiędzy obszarami zachowań a wykorzystaniem aplikacji korelujących z danym obszarem oraz ich determinant. Główne etapy procesu badawczego obejmowały: krytyczną analizę literatury przedmiotu, opracowanie założeń badawczych, wybór metody i narzędzia badawczego, opracowanie wyników badań. Badania empiryczne z wykorzystaniem techniki ankiety CAWI zostały zrealizowane w 2023 roku wśród 838 respondentów. Zastosowano analizę czynnikową, test U Manna-Whitneya oraz współczynnik korelacji rang Spearmana. Potwierdzono hipotezy, że zachowania w poszczególnych obszarach są dodatnio skorelowane z korzystaniem z aplikacji, których zakres koreluje z danym obszarem zachowań, a także, że największy wpływ na zrównoważony styl życia przedstawicieli pokolenia Z mają uwarunkowania ekonomiczne. W podsumowaniu wskazano ograniczenia i implikacje badawcze oraz kierunki przyszłych badań.

**SŁOWA KLUCZOWE:** aplikacje mobilne, zrównoważony styl życia, Generacja Z