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TOWARDS ZERO WASTE: CIRCULAR BEHAVIORS IN POLISH UNIVERSITY STUDENT HOUSEHOLDS

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ABSTRACT

This article aims to provide knowledge about circular practices (behaviors) in students' households. The application of attitude theory proved useful in the considerations as an organizational theoretical framework and for research purposes (creating the structure of the research tool). The authors present the results of quantitative research – a survey method. The research material was obtained through a survey technique and an online questionnaire research tool, from 567 students from 5 Polish higher education institutions (both public and private).

Building habits related to the circular economy (CE), the so-called micro-decisions (or "droplet" decisions), which are routinely made in one's household, constitute an important step in shaping the circularity of this household and consequently support the transition of the entire economy from a linear to a circular model. Seemingly insignificant daily decisions (e.g., whether to drink tap water or buy bottled water, or whether to throw a book in the trash or give it to someone), when accumulated, have a profound meaning and lead to significant, holistic change.

The conclusions from the conducted research take the form of recommendations and identification of areas that require support in building circular households for young people. The research found that, the level of circularity of student households is highly diversified and depends on the type of activities and the infrastructural context (housing conditions), and there is a clear gap between theoretical knowledge and practical implementation of the principles of the CE, particularly visible in the area of food management and involvement in local ecological initiatives.

Keywords: circular economy (CE), attitude, circular behaviors, household, students, survey method

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INTRODUCTION

Discussions on the issues of progressive climate change, the role of humans, and strategies – on one hand for counteracting, and on the other hand for dealing with the consequences of these changes – have been an essential element of interdisciplinary scientific debates in recent decades (Hügel & Davies, 2020; Kaczan & Orgill-Meyer, 2020; Smoliński et al., 2024). Young people often join these discourses as important actors in ongoing changes (Kozłowski, 1998; O'Brien et al., 2018). According to the survey results titled "What do young people say about climate change?" (Dunne & Bijwaard, 2021), nearly half (46%) of young Europeans consider climate change and environmental degradation as one of the most serious problems affecting the entire world. They are concerned about climate change not only relatively, i.e., in comparison with other important problems facing the world but also in absolute terms. At the same time, young people's concern about climate change aligns with their considerable knowledge and awareness of this topic (Dunne & Bijwaard, 2021).

The axiological source for formulated proposals for climate protection changes is most often the concept of sustainable development, i.e., the idea that all dimensions of life on Earth – economic, social, and environmental – must be developed considering the needs and limitations of current and future generations (Jastrzębska, 2017; Rząsa & Ciski, 2021). Alongside it, there is also the concept of CE, according to which the linear cycle of material circulation transforms into a closed cycle (Adamus et al., 2024). In the closed cycle, the end of a product's life is simultaneously the beginning of a new product or service's life, where all materials are utilized, and their added value is maximized (Bianchi & Cordella, 2023; Jastrzębska, 2017).

The proposed changes should also, and perhaps primarily, concern educational issues understood as an attempt to identify and understand pro-ecological behaviours, and then reproduce and promote them. Researchers and organizations such as UNESCO and the UN emphasize the role of climate change education as an important aspect of the (quality of) life of young people who are also young consumers (Kamińska & Krakowiak-Drzewiecka, 2023).

LITERATURE REVIEW

Literature review indicates that young people respond significantly faster to new trends emerging in society, including more quickly adopting consumer behaviours from others, and are more sensitive to environmental protection issues (among others, Joubert et al., 2022; Nikodemska-Wołowik et al., 2019; Pierzchała & Pierzchała, 2020). Hence, they constitute an important and interesting research group, especially when focusing on their daily circular practices (undertaken within their household), including these consumer behaviours.

For the conducted research and considerations, it was assumed that the group of young consumers is primarily represented by individuals aged 19–24 and 25–34 years (according to various definitions called young adults) (Barszcz, 2019; Kowalska, 2012) who can be represented by students (Manczak & Sanak-Kosmowska, 2018). The analysis focused not on student (temporary) households, but on households where respondents permanently reside (usually their family households). According to the GUS definition, a household is defined as a group of related or unrelated people living together and maintaining themselves jointly. If any of the people living together maintain themselves separately, they form a separate, single-person household (Statistics Poland, 2025).

A review of global literature provides knowledge that scientific interest in students as a research group mainly concerns issues of increasing students' ecological awareness, which is to become the basis for actively promoting activities related to climate research promotion, developing climate change mitigation measures, establishing legal solutions, and promoting sustainable development ideas. It is also noted that students' attitudes and behaviours depend on their level of awareness of climate challenges and their knowledge of this topic (Nowak et al., 2023). In their research, Leal Filho et al. (2023) showed that

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students' attitudes, i.e., their perception of climate change and its causes and effects, are shaped primarily through informal education, and therefore researchers postulate that universities should expand their educational offer in this area. This is important insofar as the level of awareness and emotional attitude toward ecological issues directly express themselves in specific (circular or not) behaviours of young people. These three elements combine in the so-called theory of human attitude. However, there is a lack of comprehensive research focusing strictly on such behaviours illustrating the level of circularity in households where students are participants.

The use of attitude theory proves useful in the above considerations as an organizational theoretical framework and for research purposes (creating the structure of the research tool). In the literature, there are many definitions and approaches to the term attitude, but it's worth focusing on the following: a person's attitude toward an object (person, thing, event, idea) is defined as a relatively permanent tendency to positively or negatively evaluate that object by that person (Wojciszke, 2003) or "a relatively permanent structure (or disposition for such a structure to appear) of cognitive and emotional processes and behavioural tendencies, which expresses a specific relationship toward a given object" (Mika, 1981, p. 116). It's worth noting that the term attitude was first used in the 19th century by philosophers Spencer and Bain. These authors directly identified it with the psychological state of readiness to listen and learn something. This state is a condition for acquiring true knowledge (Mika, 1981).

In constructing the concept of attitude, it is important to highlight three main components that make it up. These are: the cognitive component, emotional component, and behavioural component. Each of these components can individually take different values. Thus, "attitude" becomes a three-dimensional typological construct, defining a three-dimensional space in which people's attitudes toward certain objects or phenomena can be organized (Nowak, 1973).

The cognitive component of attitude may include relevant information about the attitude object, beliefs, assumptions, or doubts, with particular emphasis on beliefs (Mądrzycki, 1977). The cognitive component is directly related to possessed knowledge about the subject that constitutes a specific object of attitude (Rogozińska-Pawełczyk, 2014). The essence of the emotional component is the emotional reaction to the attitude object (Fidelus, 2012). According to Nowak (1973), it directly concerns feelings displayed by the individual, which can include tenderness, love, admiration, compassion (positive), and their opposites, such as hatred or envy. One example might be strong reactions to certain symbols (or specific words) that may remind us of circumstances experienced in childhood. The third component of attitude is the behavioural component. It is a more or less uniform set of dispositions for specific behaviour toward the attitude object (Nowak, 1973). The behavioural component of attitude refers to the tendency to behave toward a given unit or phenomenon (Rogozińska-Pawełczyk, 2014). Action should be understood as an activity that is organized and directed toward a specific goal (Mądrzycki, 1977).

The concept of attitude presented above clearly defines it as a specific mechanism regulating human behaviour and conduct. This article discusses the behavioural component of attitude (of the student and other members of their household toward the CE).

In global literature, there are many empirical works concerning awareness, attitudes, and behaviours of various social groups and communities toward implementing a CE, including different aspects of this process. Some of them concern only selected issues, e.g., plastic packaging, fashion industry, food, electronic waste, etc. There are also review papers presenting literature analysis in this field and results of other authors' research.

One such global review paper is the work by Gonella et al. (2024). Based on an extensive literature review, these authors noted the growing importance and complexity of individual roles in implementing CE and recognized the significance of individual consumer decisions and their market behaviours. In the conclusion of this work, we read that despite the development of research on CE, there are still

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noticeable gaps in consumer awareness and behaviour, even in developed countries. Based on observations from countries such as the USA, China, UK, Germany, France, and Norway, regional differences in consumer approaches to CE were also found, resulting from cultural, political, and economic differences.

Another example is Tang's (2023) article, which shows the attitudes of various social groups toward plastic pollution, its production, consumption, and recycling, and also identifies behavioural barriers to reducing this pollution. This work cites many studies on the attitudes and beliefs of various groups (students, pupils, local community members) in China, Indonesia, and Greece, among others. These studies reveal general negative attitudes toward plastic pollution and willingness to act against it by supporting campaigns, paying for environmentally friendly alternatives, and supporting government interventions aimed at achieving this goal (see also Deng et al., 2020; Hammami et al., 2017; Tang & Hadibarata, 2022; Tyllianakis & Ferrini, 2021).

Hazen, Mollenkopf & Wang (2017) cite results of American-Chinese research on consumers' inclination to switch from purchasing new products to refurbished ones. Research conducted among students and customers of a selected company showed that such inclination exists, though it depends on the price of these products, government incentive systems promoting purchases of refurbished products, and the perception of benefits this can bring to the environment.

Almulhim & Abubakar (2021) presented results of their own survey research conducted among residents of the Dammam metropolitan area in Saudi Arabia, aimed at determining awareness and attitudes toward transitioning to CE and identifying obstacles in implementing CE and ways to overcome them. Results showed that while respondents had an optimistic attitude toward segregating used products/materials and toward the idea of selling, reusing and/or exchanging them for new ones, they had limited awareness of CE topics and little understanding of this idea.

In European research, reported by Siminelli (2017) and conducted in Sweden and Italy, the role of consumers in transitioning to CE was studied, considering four sectors: clothing, household appliances, paper, and food. Results showed that respondents express environmental concerns at the disposal stage, not during purchase or product use, indicating they lack awareness of their impact on this process.

From extensive nationwide research conducted in Romania (Lakatos et al., 2018), which aimed to study consumer behaviours and attitudes toward CE in terms of sustainable consumption and production and examine their readiness to be active participants in this process, it appears that despite awareness of benefits from reducing resource consumption, as well as their selective collection, recycling and reuse, most respondents have not adopted and do not intend to adopt consumer patterns based on CE. The research results, in the authors' intention, will help develop strategies to strengthen consumer position in this process in the Romanian market.

More recent work by Krajnc et al. (2022), which presents research results on awareness and attitudes of young people from five European countries (Austria, Slovenia, Poland, Greece, and Lithuania) toward CE and Green Deal, shows that young people deeply believe in CE principles and priorities, think a lot about the environment, and engage in limited circular activities. However, they encounter many barriers hindering their participation in CE. The most important among these are lack of knowledge and insufficient support to actively participate in implementing CE priorities. They don't see themselves as architects of change toward CE and don't show significant skills in the practical implementation of its principles, however, in everyday life they show quite responsible pro-ecological behaviours.

In Poland, interesting results are provided by qualitative research presented in the report "Young Poles Facing Climate Change" (Blachnicka-Ciacek, 2020). The studied young people often treat ecology exclusively as a consumer choice. Such positioning of "ecology" means it is seen mainly in terms of personal benefits and pragmatic choice. The basic motivations for ecological attitudes among

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"normal people" are thus individual savings, personal health, and appearance. Most respondents were not ready or did not speak about the need to give up consumption. Additionally, although respondents believed in the sense of undertaken ecological practices at the household level, they had little sense of agency extending beyond individual and family life. They didn't believe they could influence corporations whose products they consume, or politicians and policy directions. The author also identified a typology of strategies that young people developed as a reaction to threat (climate crisis): denial, confusion, individual pragmatism, new label of interspecies solidarity, and active adaptation (Blachnicka-Ciacek, 2020).

The literature and research review indicate a diversity in attitudes and behaviours of young people as consumers, which depend on many factors, including the level of knowledge, institutional support, and cultural and economic conditions. Many of the presented works emphasize the existence of gaps in awareness and practices related to recycling, waste selection, or consumption reduction. Research reveals that young people, despite declared interest in environmental protection, often perceive ecology as a consumer choice rather than as part of systemic changes. There is a visible lack of sense of agency and limited readiness to undertake more radical actions. Analyses emphasize the role of ecological education and policies supporting pro-ecological behaviours. Attention is drawn to the importance of financial incentives and government regulations that can support the transition to the CE. At the same time, behavioural barriers are indicated, such as consumption habits, lack of knowledge, and insufficient structural support.

This conclusion effectively synthesizes the key findings from the literature review, highlighting both the challenges and opportunities in promoting CE behaviours among young people. It emphasizes that while there is awareness and interest in environmental issues, there are still significant gaps between attitudes and actual behaviours, particularly in terms of taking more substantial action beyond individual consumer choices.

MATERIALS AND METHODS

The research discussed in the article aimed to determine the level of circularity in the households of polish university students from a behavioural perspective. This goal was achieved by providing knowledge about circular practices – behaviours taking place in their households daily. These practices were characterized according to the 5r division – refuse, reduce, reuse, recycling, and repair.

The consequence of the assumed research goal was the formulation of the overarching problem question: What is the level of involvement of Polish university students' households in the implementation of the circular economy?

In the research presented in this publication, CAWI (computer-assisted/aided web interviews) was used as the research method. The advantage of this method is the possibility of obtaining reliable data at the optimal time for the respondent and at an individual pace, as well as anonymity. This methodological approach represents an effective way to collect reliable data on sustainability practices while respecting respondents' time constraints and privacy concerns. The combination of the CAWI method with a carefully designed questionnaire allowed researchers to gain valuable insights into how CE principles translate from theory into everyday household practices among the student population. The study used a specially constructed questionnaire directed at students, which was meant to determine their attitudes toward CE and obtain information about whether and which CE principles are implemented in their households. The survey was titled "My circular household". The research lasted from September 2024 to January 2025. It should be added that these were not student (temporary) households, but households where respondents permanently reside (most often their family households).

The study involved 567 students from 5 Polish higher education institutions: the University of Łódź, the University of Kalisz, the University of Economics in Katowice, the University of Social Sciences, and Cracow University of Technology. The obtained

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research material allowed for characterizing both the respondents and their households. It was a highly diverse group, and their only common feature was that at least one of their members was currently a student. This assumption means that at least one person in the household is young and simultaneously is/should be (as a student) aware of basic knowledge regarding circularity issues. Moreover, it was assumed that this person knows the principles, practices, and activities of the entire household. Although such sample selection is non-probabilistic, it is effective because it allows conducting research in a relatively short time and obtaining extensive material for quantitative analysis. Furthermore, in the case of broad research covering such a diverse set of households, both in terms of structure and place of residence, it was not possible to construct a sampling frame necessary for random sample selection. Therefore, it should be noted that the studied sample, although statistically unrepresentative, due to its size and strong differentiation, allows drawing general synthetic conclusions.

The online survey questionnaire was prepared by the authors of the study in Polish. It consisted of 21 questions (including six questions about respondent characteristics) of varying complexity and detail, concerning issues related to the CE. Before beginning the research, the questionnaire underwent a multi-stage pilot procedure, ensuring that its final version is understandable, accessible, easy to use, and according to the authors, has adequate diagnostic value.

The questions contained in the questionnaire, as already mentioned in the introduction, are grounded in attitude theory. According to the literature, attitudes are captured and studied by breaking them down into three components: emotional, cognitive, and behavioural, therefore the questionnaire consisted of three thematic blocks corresponding to these areas. Due to the large amount of material, this article discusses selected questions focused on the behavioural aspect, showing the practices of the surveyed households.

RESULTS

Among the 567 surveyed students, women were predominant, constituting 64.9% of the studied sample. 69.8% of all respondents were people under 25 years of age. Taking into account the universities from which the respondents came, it should not be surprising that 41.1% of them were people living in large cities with over 100,000 inhabitants. The households of which they are members most often consist of 2 to 4 people (76.9% of all respondents). The buildings in which members of the surveyed households live are primarily detached single-family houses (46.0%) and apartment blocks (32.7%), with the latter being predominantly blocks built before 1990 (23.6%), that is, from the so-called "great panel" construction era (see Table 1).

Out of all 567 respondents, 502 (88.5%) indicated that their households segregate municipal waste. Among the most frequently mentioned reasons for undertaking such actions, they pointed to the conviction about the correctness and sensibility of waste segregation (309 people, which constitutes 61.5% of those segregating waste) and the belief that they are taking care of the environment this way (250 people, 49.8% of all those segregating). The motive of possible savings on waste collection expenses was indicated by 170 respondents (33.8% of those segregating), while 123 respondents (24.5% of those segregating waste) pointed to the automaticity of such actions. It seems, therefore, that the respondents try to apply the *recycling* principle in their households. Of course, one can assume that this results from the growing public awareness about the need to undertake such actions and the benefits resulting from them, but in practice, the regulations in force in Poland, which largely force Poles to practice such attitudes, are not without significance.

Among the 65 people (11.5% of all respondents) whose households do not segregate waste, the main reason was the lack of space for segregation (73.8% of those not segregating waste). The second most indicated reason should be concerning, manifesting in the lack of willingness from household members

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Table 1. Basic statistics regarding the study participants (n=567)

	Characteristic	Number	Percentage (%)
Gender	Women	368	64.9
	Men	199	35.1
Age	18–24 age	396	69.8
	25 age and more	171	30.2
Household size	1 person	39	6.9
	2 persons	144	25.4
	3 persons	130	22.9
	4 persons	162	28.6
	5 persons	54	9.5
	6 persons and more	38	6.7
Location/ Place of residence	Rural area/Village	151	26.6
	Town up to 20,000 residents	58	10.2
	Town 20–50,000 residents	50	8.8
	City 50–100,000 residents	75	13.2
	City over 100,000 residents	233	41.1
Type of housing/ Building type	Detached single-family house	261	46.0
	Terraced/row house	17	3.0
	Apartment block built before 1990	134	23.6
	Apartment block built in 1990 or later	108	19.1
	Tenement house/Historic apartment building	28	4.9
	Other	19	3.4

Source: own elaboration based on Authors (2024/2025).

to undertake such actions (33.8% of non-segregating households) (see Fig. 1).

The next analysed type of circular behaviours occurring in the surveyed students' households is related to repairing household equipment that has malfunctioned or worn out through use, as well as other items used by members of the surveyed households (Table 2). Among the respondents, "giving a second life" to sports and recreational equipment enjoys the greatest popularity. Almost half of the 567 respondents (49.2%) declared that they do this at least frequently. A slightly smaller percentage (46.9%) also points to clothing as items subjected to repair. Given the prices of new devices, interest in repairing audio and computer equipment should not be surprising. Importantly, only 5.5% of respondents declared that they never send such equipment for repair, opting immediately for purchasing new items.

Against this background, the much lower percentage of people trying to repair their mobile phones might seem surprising (31.9% of the 567 respondents at least frequently, while 14.6% never do it). A higher percentage of "never" responses is only seen in the case of shoe repairs and small household appliances (18.9% and 18% of respondents, respectively). While repairs of small household appliances are unfortunately economically unprofitable, in the case of shoes, the limited

Fig. 1. Reasons for not segregating waste in the household (n = 65)
Source: own elaboration based on Authors (2024/2025).

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Table 2. Repair of selected equipment and other items owned by members of the surveyed households (in %) (n = 567)

Type of equipment	Always	Very often	Often	Rarely	Very rarely	Never	I do not have/ I do not use
Audiovisual and computer equipment	11.6	13.9	19.4	25.8	21.7	5.5	1.9
Mobile phones	6.0	9.3	16.6	28.6	23.6	14.6	1.2
Small household appliances	4.9	9.0	15.9	28.0	22.4	18.0	1.8
Large household appliances	11.8	12.9	18.0	23.8	23.5	8.8	1.3
Furniture and equipment	8.1	10.9	21.0	29.6	19.4	9.0	2.0
Footwear	3.2	7.6	28.2	24.2	17.5	18.9	0.5
Clothing	4.6	12.3	30.0	24.2	15.2	12.2	1.6
Sports and recreational equipment	14.1	14.8	20.3	17.3	15.7	9.9	7.9
Children's toys and equipment	4.1	5.6	11.5	11.8	10.1	13.6	43.3

Source: own elaboration based on Authors (2024/2025).

availability of specialists (craftsmen) offering such services remains a significant factor.

The situation looks quite different when it comes to acquiring the aforementioned items as used goods by the surveyed households (Table 3). It's evident that respondents are significantly less willing to use this solution, which also bears characteristics of circular behaviours. In the case of large household appliances, the percentage of households that never use this solution was 44.3% (251 of 567 respondents). Slightly fewer people also declared that they never bought or obtained shoes (43%) and small household appliances (42.2%) for free. Interestingly, while used shoes are not in the area of interest for the surveyed households, more than half of them (51.5%) declared that they regularly acquire used clothing (from "always" to "often" options). Therefore, the growing popularity of various platforms mediating in the sale of used clothing should not be surprising. The acquisition of used books also enjoys relatively high popularity.

Generally speaking, while the surveyed households demonstrate circularity by following the *repair* principle, they perform significantly worse when it comes to following the *reuse* principle. The next type of behaviour among the surveyed households aligns with the *reduce* and *refuse* principles (Fig. 2–4). Only 74 of 567 (13.1%) of respondents declared that they never throw away food. Unfortunately, food waste occurs relatively frequently, at least once a week. This is the case for 46.4% of the surveyed households.

Among the most common reasons cited by people who throw away food are missing the product expiration date and, often as a consequence of the first cause, food spoilage. Such situations occur in 2/3 of the surveyed households (Fig. 3). It is also significant that 215 of the 493 respondents (43.6%) who happen to waste food admit that food waste is also due to poor analysis of food needs and buying too many food products. Therefore, everything indicates that in this area of circular behaviours, there is a very large potential for relatively simple correction. To a large extent, good food shopping planning should significantly reduce the scale of this unfavourable phenomenon.

Almost 84% (476 respondents) of all surveyed declared that they undertake some actions in their households aimed at reducing food waste (Fig. 4). Considering that 74 of the respondents declared no food waste in their households, this means that not everyone who wastes food tries to mitigate this

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Table 3. Acquiring equipment used in households (in %) (n = 567)

Type of equipment	Always	Very often	Often	Rarely	Very rarely	Never	I do not have/ I do not use
Audiovisual and computer equipment	2.3	4.4	11.1	28.7	16.4	33.3	3.7
Mobile phones	2.8	4.1	10.9	26.8	14.6	38.3	2.5
Small household appliances	1.4	2.3	7.6	25.6	18.0	42.2	3.0
Large household appliances	1.4	1.4	5.5	20.5	24.0	44.3	3.0
Furniture and equipment	2.1	4.4	13.6	28.2	25.0	24.0	2.6
Furniture and equipment	2.6	5.1	22.8	13.9	9.7	43.0	2.8
Footwear	4.6	18.0	28.9	16.2	11.1	18.7	2.5
Clothing	2.3	5.3	14.6	21.2	21.3	27.3	8.0
Children's toys and equipment	1.1	5.6	10.9	10.6	8.8	21.9	41.1
Books	4.9	17.6	25.7	22.0	12.5	12.9	4.2
CDs and newspapers / magazines	2.1	6.0	11.5	13.6	13.2	29.1	24.5

Source: own elaboration based on Authors (2024/2025).

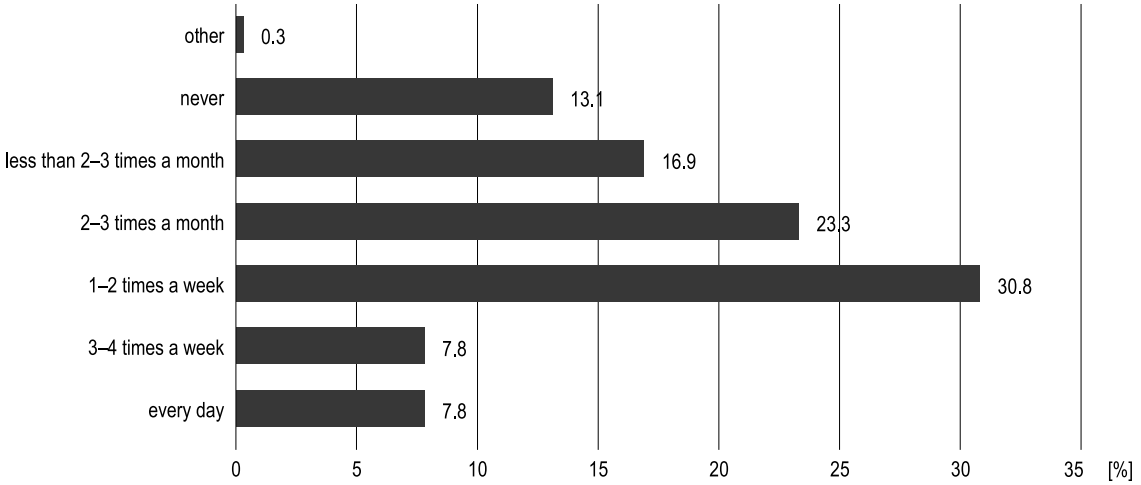

Fig. 2. Frequency of throwing away food in households (n=567)
Source: own elaboration based on Authors (2024/2025).

practice in some way. Although this group constitutes only 3.4% of those who waste food, it shows that for some part of society, this is neither a problem nor a reason for reflection and action. Among those who try to reduce the negative effects of excessive purchases or forgetfulness, actions involving feeding animals predominate (50.8%). Given that almost half of the surveyed households live in single-family housing, and the phenomenon of feeding animals is also a kind of tradition among residents of multi-family buildings, such a high percentage of responses should not be surprising. The next most common

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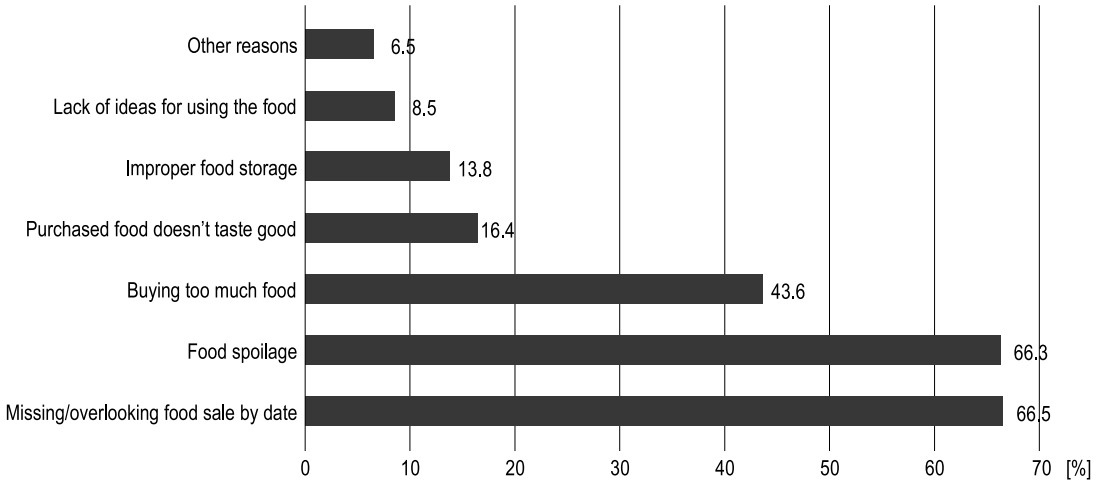

Fig. 3. Reasons for throwing away food in the surveyed households (n=493)
Source: own elaboration based on Authors (2024/2025).

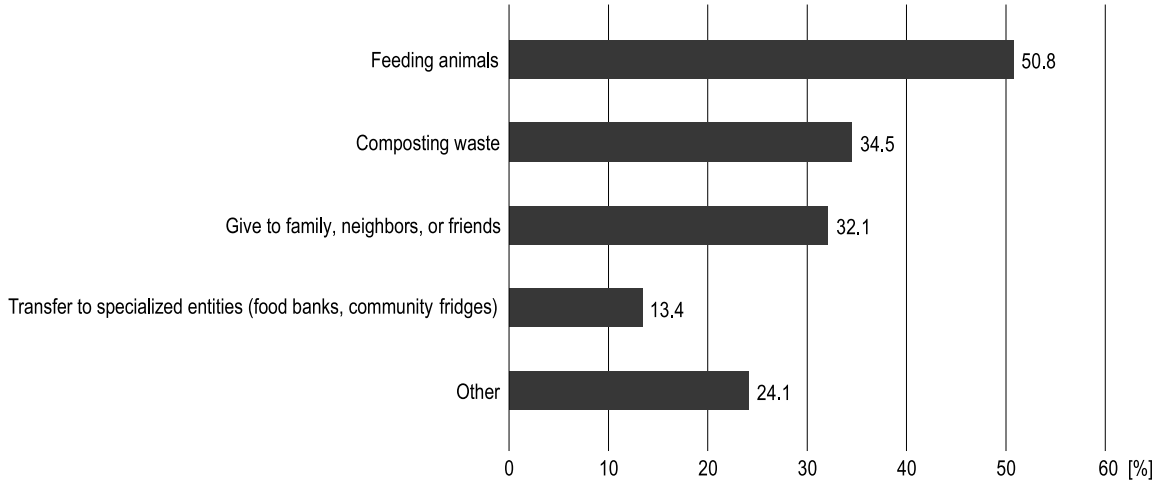

Fig. 4. Activities of the surveyed households in the field of reducing food waste (n=476)
Source: own elaboration based on Authors (2024/2025).

method of reducing waste (composting waste – 34.5% of responses) also finds its justification in the type of housing inhabited by the surveyed households. Especially since independent composting of bio-waste also translates into mandatory lower fees associated with waste collection. Although these are sometimes symbolic (from 1 PLN per household member), more and more municipalities in Poland are beginning to appreciate the benefits resulting from savings in transport and recycling levels, which translates into discounts reaching up to 10 PLN per person in some municipalities (Toborek, 2024), and this is already a significant argument for residents to undertake such actions.

As part of the conducted study, its participants were also asked to indicate what other routine activities constituting examples of micro-decisions favourable to implementing the already mentioned principles of CE are carried out in their households (Fig. 5). Online shopping is by far the most popular, which in principle should, among other things, shorten the supply chain. Almost all surveyed households (552 out

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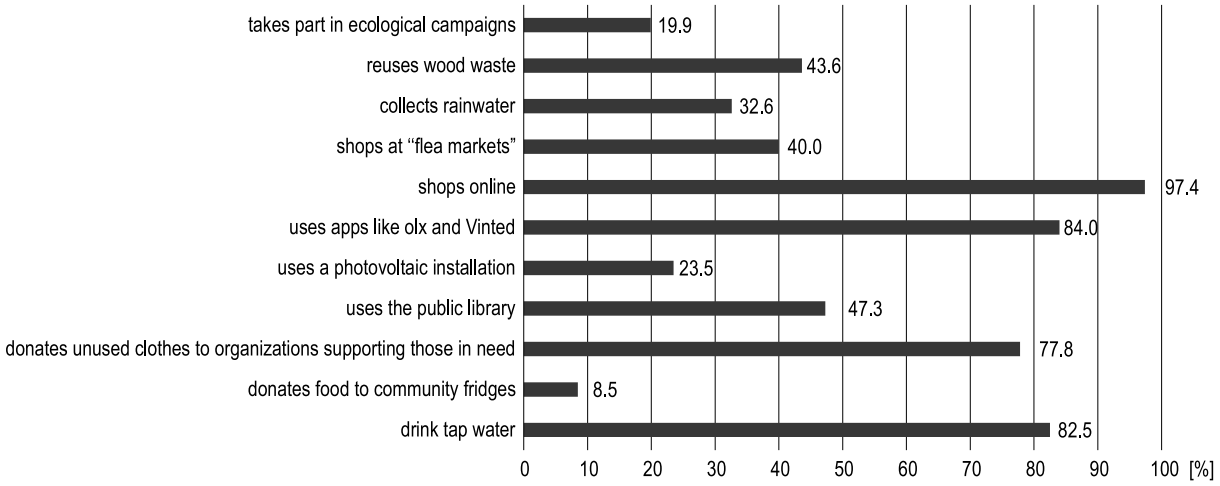

Fig. 5. Other household activity in selected circular activity areas (n=567)
Source: own elaboration based on Authors (2024/2025).

of 567, which is 97.4%) use this consumer-friendly solution. A significant percentage of respondents also use applications supporting the exchange and sale of used products, which thus find another owner and a second life (84%). Donating unused clothing to organizations supporting people in need is certainly also a beneficial habit. Unfortunately, it's difficult to determine to what extent such a high percentage is the result of delivering clothing directly to the mentioned organizations and passing it on to people using them, and to what extent it results from the popularity and easy accessibility of used clothing containers. The situation may certainly undergo some change due to the entry into force from January 1, 2025, of regulations imposing on residents the obligation to selectively collect textile waste (Article 3 point 2 paragraph 6 UUCPG). This change may increase the recycling level of such materials, but unfortunately will not increase their reuse level. Taking into account the great importance of circular challenges awareness on the part of society, which should be reflected also in the behavioural dimension/component and society's engagement in actions promoting the development of the CE idea, the level of engagement of members of the surveyed households in ecological actions carried out in their environment is not encouraging. Among all surveyed households, members of only one in five engage in such initiatives.

DISCUSSION

In addition to their cognitive purpose, the presented studies also had an application purpose, as they allow for formulating recommendations on what and in which areas can be improved. This applies both to the students themselves (through changes in the education program at each level of education) and other stakeholders involved in changes towards implementing CE principles, such as local and regional authorities, non-governmental organizations, and other entities. From these entities' perspective, aggregated knowledge about households' attitudes toward circularity allows for shaping collective actions supporting various attitude spheres, such as: developing CE infrastructure that improves or induces specific behaviours; educational activities; or providing positive incentives and arousing positive emotions about CE. This is especially important since Poland is a country where there is still room for further actions in this area. According to Eurostat data presented by Lewandowska et al. (2022), in 2020, the circularity indicator (calculated as the ratio of recycled materials to domestic material consumption) in Poland was 9.9%, while in the best-performing Netherlands it was 30.9%, Belgium – 23%, and France – 22.2%. The presented research results allow for formulating several important

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observations regarding the circularity of Polish students' households. Firstly, there is a clear disproportion between the implementation levels of various circular practices. The highest implementation level concerns activities that are somewhat forced by legal regulations (waste segregation) or facilitated by technological solutions (online shopping, apps for exchanging used items). This is consistent with the research results of Lakatos et al. (2018), who point to the crucial role of systemic solutions in shaping circular behaviours.

Particularly concerning is the high percentage of households regularly throwing away food (46.4% of respondents at least once a week), which indicates a significant gap in the area of shopping planning and food management. This is even more significant as it concerns households where at least one member is a student, theoretically a better-educated person more aware of contemporary environmental challenges.

It's worth noting the role of infrastructural factors in shaping circular behaviours. The research showed that households in single-family housing more often undertake activities such as composting or using food leftovers to feed animals. This confirms Krajnc et al.'s (2022) observations about the importance of appropriate infrastructure in developing a CE.

An interesting aspect is also the relatively low level of involvement in ecological actions (20% of respondents), which may suggest some dissonance between declared attitudes and actual actions. This aligns with Blachnicka-Ciacek's (2020) research results, which indicate young people's limited sense of agency in pro-environmental actions.

CONCLUSIONS

The conducted research allows us to formulate several key conclusions. Firstly, the level of circularity of student households is highly diversified and depends on the type of activities and the infrastructural context. The highest level of implementation is observed in the case of practices forced by legal regulations or supported by technological solutions.

Secondly, there is a clear gap between theoretical knowledge and practical implementation of the principles of the CE, particularly visible in the area of food management and involvement in local ecological initiatives. This is an area that requires special attention in the context of planning educational and support activities.

Thirdly, the research confirmed the significant role of infrastructure and housing conditions in shaping circular behaviours. This suggests the need to differentiate strategies for supporting the CE depending on the type of development and local context.

Based on these conclusions, recommendations can be formulated in three main areas:

1. Educational/awareness – it is recommended to focus primarily on the practical aspects of implementing the principles of the CE. As the awareness of bearing consequences and taking responsibility for consumer choices is noticeable, modern consumers, including young ones, are increasingly making decisions based on their potential social, political and ecological consequences (Chojnacka, 2019). In connection with this, it could be useful to, among others: introduce comprehensive educational programs including practical workshops, information campaigns and digital tools supporting circular habits; integrate CE issues into school and university curricula, which will allow for systematic building of ecological awareness; support academic initiatives, student organizations and local associations in promoting practical CE solutions through research projects and experimental models of resource sharing.

2. Infrastructural – it is recommended to adapt solutions supporting circular behaviour to the specifics of different types of development (including multi-family housing and student dormitories), additionally, an attractive solution could be, for example: creating recycling zones and reuse of items that will be easily accessible to residents, as well as implementing intelligent technologies supporting waste management, e.g. intelligent waste sorting bins or systems monitoring the level of raw material consumption and their reuse.

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3. Systemic – it is recommended primarily to develop regulations and incentives supporting more advanced forms of circular behaviour, going beyond basic waste sorting, such as, for example, returnable deposit systems and supporting models of economy based on renting and sharing resources, but it would also seem useful to introduce financial incentives for households actively implementing circular practices, e.g. tax relief or subsidies for ecological technologies. The level of proposed systemic solutions could also include building partnerships between the public and private sectors and non-governmental organisations in order to coordinate and scale CE initiatives.

Further research in this area should focus on in-depth analysis of the barriers to the implementation of circular practices and on developing effective support mechanisms adapted to the specificity of different types of households and their users. The authors are already in the process of implementing a study based on the same research tool, which will allow comparing the level of circular behavior in the households of Polish and Turkish university students. The online survey questionnaire for Turkish students was translated into Turkish by a native speaker in cooperation with the authors of the article. It also seems advisable to realize a comparative study among different social and age groups in Poland. This would make it possible to propose targeted (tailored to the peculiarities and needs of each group) solutions to increase their awareness and circular behavior, and, consequently, influence the intensification of circular economy development in Poland.

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