



KONFERENCIAKÖTET

Conference Proceedings

**Nemzetközi tudományos konferencia
a Magyar Tudomány Ünnepe alkalmából**
International Scientific Conference
on the Occasion of the Hungarian Science Festival

Sopron, 2025. november 6.
6 November 2025, Sopron

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FENNTARTHATÓSÁGI ÁTMENET IDŐSZAKÁBAN**

DEVELOPMENT TRAJECTORIES AND NEW DIVIDES IN TIMES OF SUSTAINABILITY TRANSITIONS

Szerkesztők / Editors:

RESPERGER Richárd, SZÉLES Zsuzsanna, TÓTH Balázs István

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CONFERENCE PROCEEDINGS

LEKTORÁLT TANULMÁNYOK / PEER-REVIEWED PAPERS

Szerkesztők / Editors:
RESPERGER Richárd – SZÉLES Zsuzsanna – TÓTH Balázs István



SOPRONI EGYETEM KIADÓ

UNIVERSITY OF SOPRON PRESS

SOPRON, 2026



JUBILEUMI
TUDOMÁNYÜNNEP
2025

/



SCIENCE
JUBILEE
2025

Mottó: „200 év a tudás és a társadalom szolgálatában”

/ Motto: „200 years to knowledge and service to society”



**MAGYAR
TUDOMÁNY
ÉVE 2025/2026**

Felelős kiadó / Executive Publisher: Prof. Dr. FÁBIÁN Attila
a Soproni Egyetem rektora / Rector of the University of Sopron

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Tördelőszerkesztő / Layout Editor: Dr. RESPERGER Richárd

ISBN 978-963-334-579-5 (pdf)

DOI: <https://doi.org/10.35511/978-963-334-579-5>

A kötetben közölt tanulmányok tartalmáért kizárólag a szerzők felelősek.
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From Barriers to Action: Individual Responsibility and Solutions for Selective Waste Collection in Western Hungary

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Abstract:

Sustainable waste management appears as a sub-target in three of the UN's 17 Sustainable Development Goals (SDGs): Sustainable Cities and Communities (SDG 11), Responsible Consumption and Production (SDG 12), and Climate Action (SDG 13), highlighting the global significance of this issue. This research aimed to identify barriers to selective waste collection and to explore what individuals can and are willing to do to overcome these obstacles. Using the World Café Method (WCM), 226 participants took part in collaborative discussions in western Hungary. The results revealed that the most significant barriers were ‘*Lack of infrastructure*’, ‘*Lack of knowledge*’, and ‘*Laziness*’. The micro-level analysis identified several participant-proposed solution areas, such as ‘*Collecting and giving information*’, ‘*Motivation*’, and ‘*Creating infrastructure in the own environment*’. The study highlights that although system-level problems exist, individual-level interventions and personal responsibility can play a crucial role in improving selective waste collection practices. The findings provide practical guidance for developing targeted, individual-centred interventions in the micro-level environment.

Keywords: selective waste collection, World Café method, consumer behaviour

JEL Codes: D10, D91, Q53, Q56

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1. Introduction

Waste management is one of the main pillars of sustainability and a crucial part of the circular economy model. Its importance has been outlined by both practitioners and academia alike. One of the key elements of sustainable resource management is reducing waste generation and increasing the practical efficiency of selective waste collection. The latter, however, depends largely on public participation and the recognition of individual responsibility.

Although selective collection infrastructure is available in many parts of Hungary, public participation remains low. A recent nationally representative survey indicates a positive but slow shift in sustainability attitudes (Növekedés.hu, 2025). The reasons for this may include, besides the right attitudes, a lack of knowledge and motivation, but also the population's habitual behaviour patterns in their everyday lives.

The research, compared to previous studies on the subject, is *novel in two respects*:

Firstly, to create a more accurate picture of the drivers of public participation, an individual-level assessment of waste management behaviour is needed. To increase and sustain commitment to selective waste collection, it is essential to develop a methodology that enhances public awareness and raises the willingness to act. A prerequisite for this, however, is the need for in-depth research among local communities and smaller groups. Our fundamental goal is to provide a bottom-up approach for decision-makers by identifying areas where interventions and awareness-raising measures are needed. In this study, in addition to reviewing the literature, we identify factors that hinder selective waste collection among 226 participants in western Hungary and explore how we can strengthen their commitment to this activity.

Secondly, we apply the World Café method (WCM) in our research. Although the World Café method is widely used to examine various social and organizational topics, it is rarely applied in research focusing on selective waste management behaviour. In this respect, our research is methodologically innovative. WCM is a dialogue-based, participatory method that contributes to understanding the factors under investigation by incorporating different perspectives. It also encourages collective thinking and helps develop collective knowledge.

Our research findings can serve as a basis for developing awareness-raising educational programs and macroeconomic measures built upon the motivating factors inherent in individual responsibility and willingness to act. The study can also be considered a starting point for future research.

The paper is organised as follows. Section 2 reviews key barriers identified in prior research. Section 3 presents the World Café design and the sample. Section 4 reports the main barriers and micro-level solution themes. Section 5 concludes with recommendations.

2. Literature review

According to international literature, the main barriers of waste selection are convenience and infrastructure (Knickmeyer, 2020; Méndez-Lazarte et al., 2023; Rousta et al., 2015; Timlett & Williams, 2008), but also insufficient knowledge (Moussaoui et al., 2022; Rousta et al., 2020) and low public awareness (Babazadeh et al., 2018; Méndez-Lazarte et al., 2023).

Analyses carried out in Hungary emphasize the same factors. Németh & Mészáros (2022) surveyed 240 households in Zala county and found that the key barriers of waste management behaviour are lack of space and the conditions for selective waste collection provided by the public service provider are not adequate. The most common responses in terms of incentives are to implement door-to-door collection and to reduce public service fees.

The households of Győr-Moson-Sopron county were also analysed. A survey carried out in 2020 showed that the lack of information and the uncertainty related to the faith of selective waste, also the unsatisfactory infrastructure and the distance of selective collection points from the homes of the inhabitants are the main barriers of waste management behaviour (Németh & Mészáros, 2021).

The lack of infrastructure was also highlighted by earlier research carried out by Misik & Kárász (2006) in Debrecen. They showed that most respondents are not at all or only minimally willing to bear additional costs in the event of the full introduction of selective collection.

The lack of information seems to be the main barrier according to Monostori & Hörich (2008). The authors emphasize the importance of education and the necessity of actively involving in the strategical thinking all parts of the society (e.g., civil organizations, churches).

Many university students still do not feel that selective collection is easily accessible. Gulyás & Veres (2023) analysed the location of the collection points in the University of Miskolc and tried to propose ways to improve their distribution, thus improving the selective collection rate of university students.

It seems that Hungarian households underestimate their food waste levels (Kunszabó et al., 2023). By composting, the authors emphasize the importance of knowledge and awareness of households. In an earlier survey carried out in 2020 the lack of knowledge, but also the lack of space (Kunszabó et al., 2022) emerged as key barriers. The literature suggests that western Hungary remains under-researched, and prior Hungarian studies primarily map barriers rather than co-created, bottom-up solutions.

3. Methodology and data sources

We used the World Café method (WCM) (Brown & Isaacs, 2005), a participatory qualitative approach suitable for exploratory research and large-group knowledge elicitation (Löhr et al., 2020). It is a process that helps participants engage in constructive dialogue on issues related to a particular topic (Fouche & Light, 2010; Prewitt, 2011; Stöckigt et al., 2013).

The WCM sessions aimed to identify perceived barriers to selective waste collection and to co-create solution ideas. Data collection consisted of three steps:

1. Individual work: gathering personal experiences and opinions on a given topic.
2. Large group work (involving all participants): grouping and categorizing the data collected from individuals and naming the categories.
3. Small group work: searching for common solutions to the problems identified in each category.

Data collection occurred between October 17, 2023, and May 12, 2025. A total of 11 WCM rounds took place. During data collection using the WCM, the sample was chosen based on different age groups and life situations:

1. university students, who were recruited from among the students of Pannon University,
2. active workers, who were recruited with the help of HR managers from employers based in the municipality, and
3. pensioners, who were reached through the Northern Neighbors Public Interest Pensioners' Cooperative (Északi Szomszédok Közérdekű Nyugdíjas Szövetkezet).

The age composition of the groups examined is as follows: university students are aged 18-24, those in active employment are aged 25-65, and pensioners are over 65. Participants volunteered for the study following an online call for participants. The World Café rounds were held at the University of Pannonia.

The participants were asked about their habits regarding selective waste collection and about the factors that prevent them or people they know (relatives, friends, neighbours, and other acquaintances) from selectively collecting waste. Participants in WCM were anonymous and could not be identified. A total of 226 people took part in the 11 WCM rounds. The data for each round is shown in *Table 1*.

Table 1: Statistics of sample collection

Rounds	Date	Number of Participants	Identified barriers (pieces)
WCM_1	2023.10.17	26	41
WCM_2	2023.11.04	30	41
WCM_3	2023.12.13	17	29
WCM_4	2025.02.19	25	89
WCM_5	2025.04.07	13	31
WCM_6	2025.04.07	15	26
WCM_7	2025.04.23	24	95
WCM_8	2025.04.23	15	48
WCM_9	2025.05.05	11	60
WCM_10	2025.05.12	26	75
WCM_11	2025.05.12	24	99
Total		226	634

Source: Authors' own research

The participants individually identified the barriers, writing down all the obstacles to selective waste collection in general on different post it notes. These papers were collected with the help of a moderator.

In the second phase of the data collection process, the participants grouped the obstacles identified by themselves and collected by the moderator and then named the resulting categories. After, in the third step of the study, small groups (including about 4-6 participants) formulated proposed solutions to the identified barriers at the micro, meso, and macro levels.

The current study refers to individuals and their closest environment (closest relatives, family members, and friends) as the micro level. The meso level means local governments, institutions operating, employers, and the municipal waste management organization in a given location. The state level (legislators, legal regulators) is the macro level. This paper focuses on and deals with the micro-level, so the individuals and their close environment. In the next chapter, the data collected with WCM and the conclusions that can be drawn from it are presented.

4. Results

Our study analyses primary data that was collected from the WCM rounds as the previous chapter presented it. First, we show the barriers that the participants noticed related to the selective waste collection and visualise it in *Figure 1*. Participants generated 634 sticky-note items. During coding, some notes were split into multiple distinct barriers while synonyms and irrelevant items were removed, resulting in 652 coded barrier instances across 28 categories.

The most significant obstacle in the selective waste collection is the '*Lack of infrastructure*' that occurred 150 times in our dataset. Factors such as lack of the bins, lack of space to store the selective waste until taking it to the collection point or inaccessibility are related to this barrier. The service deficiencies category – that includes for instance infrequent collection, full bins, problems with coin-operated machines – strongly related to it, because both could mark the dissatisfaction of the inhabitants with the infrastructure of the waste sorting.

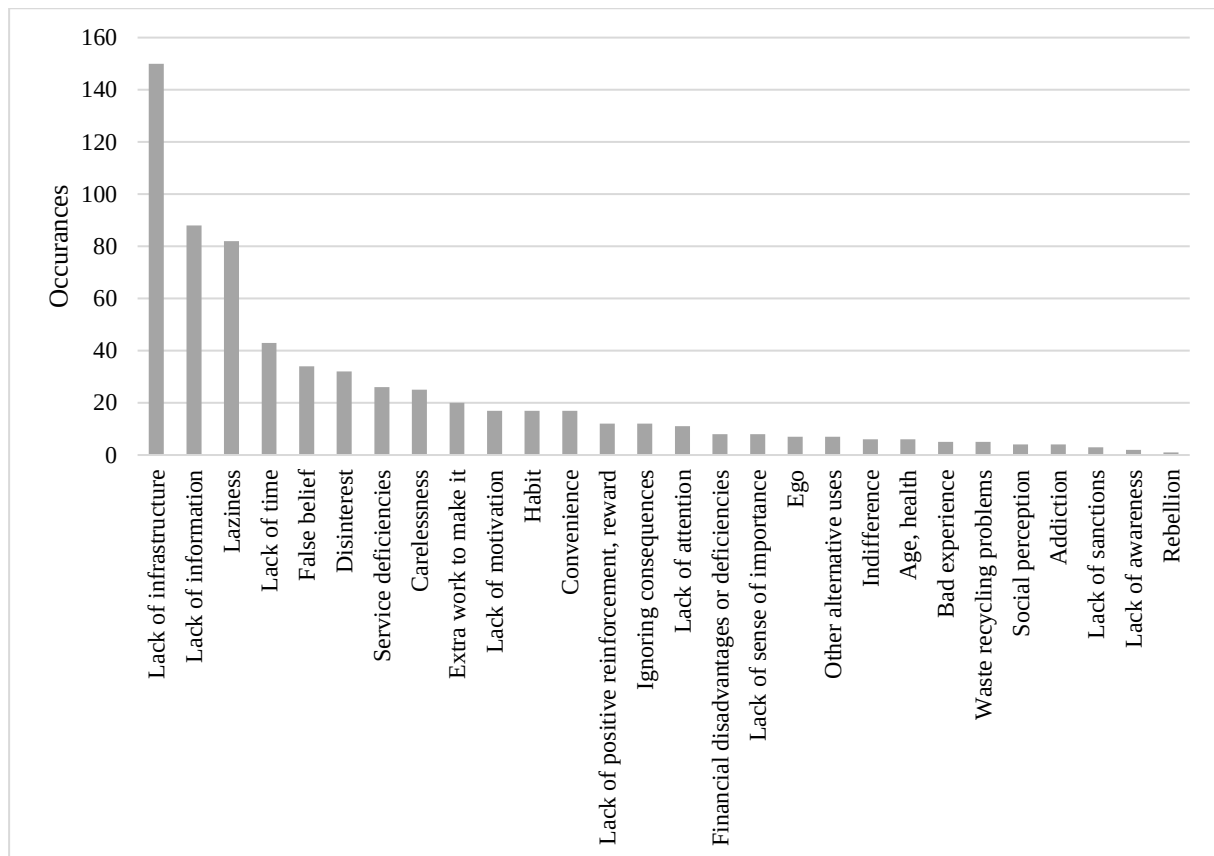


Figure 1: Barriers of the selective waste collection

Source: Authors' own research

The international literature also identified it as a main obstacle of the selective waste collection. Michael and co-authors (2024) found that the infrastructure can positively influence students' intentions toward e-waste disposal behaviour. Based on the study by Moktamin and co-authors (2023) the 78.1 percent of the 349 respondents thought that they will recycle the used batteries, if the special bins are available close to their housing areas. Other articles also proved that an adequate infrastructure could support the recycling behaviour of the individual (Bailey et al., 2015; Gilmour et al., 2013).

The second most frequent group is the '*Lack of information*' that has 88 occurrences in our database. Within this barrier the participants highlighted that the inhabitants do not have deep knowledge about this topic, they do not have enough information about which waste is involved in which selective category. Maybe the high frequency of this category also shows that a holistic and long-term education strategy is needed, because the one-time transfer of the information does not result in knowledge and practical experience.

The international literature on selective waste management also dealt with the information, knowledge as a barrier. A large body of waste management literature identified lack of knowledge as an influencing factor (Masdek et al., 2023; Cudjoe et al., 2022; Wu et al., 2022). Heidig and co-authors (2025) analysed a sample of 1065 German and South African respondents, and their results showed that perceived and actual knowledge had a significant impact on reported food waste behaviour. Pan and Liu (2024) found that the knowledge positively influenced waste separation intention. Valentin and co-authors (2024) came to a similar conclusion in the field of the reducing food waste.

The third largest category is the '*Laziness*'. Every third participant highlighted it as an obstacle. This is a complex pattern, behind it there can be various reasons, like the individuals do not understand or feel the importance of the action, they can be unmotivated to perform it or they can find it too hard or difficult to do. Therefore, these results also mark the limitation of

the method used because it did not explore the reasons behind the laziness. In general, the literature also focuses on the analysis of the causes and not the laziness. Hence, this finding also marks a future research direction that examines the reasons of the laziness related to the selective waste collection.

Based on the results, two main types of barriers could be identified. The first is the ‘*Psychological and individual factors*’ such as ‘*Disinterest*’, ‘*Carelessness*’, ‘*Lack of motivation*’, ‘*Convenience*’ etc. These could stem from the personal internal state, the cognitive processes or behavioural patterns. The behavioural automatisms (‘*Habit*’) also could belong to this category because the routine actions could hinder the new, environmentally friendly behaviour based on maintaining the previous habitual behaviour.

This category draws attention to give information about the selective waste collection is not enough, behavioural change (if it is necessary) can only be achieved through interventions that take psychological factors into account. The question is whether the psychological factors could keep an individual away from the waste sorting, then who and how can influence them. Primarily, it seems that the behavioural change can happen with individual awareness and behavioural interventions.

The second group could consist of the ‘*External influencing factors*’ like the ‘*Lack of infrastructure*’, ‘*Service deficiencies*’, ‘*Financial disadvantages or deficiencies*’, ‘*Waste recycling problems*’, as well as ‘*Social perceptions*’. These barriers are independent of the individual. Hence, from the approach of micro level, the question is how the people should react to it or reduce its effect on themselves.

To sum up, *Figure 1* indicates that there are various impeding factors that make it hard for the western Hungarian people to sort their waste. However, to change the behavioural pattern it is not enough to see the obstacles, the next step is to collect the potential solutions to reduce them. These actions can happen on micro, meso and macro level. Our study focuses on the micro level solutions, so it deals with the individual opportunities and responsibilities in the selective waste collection.

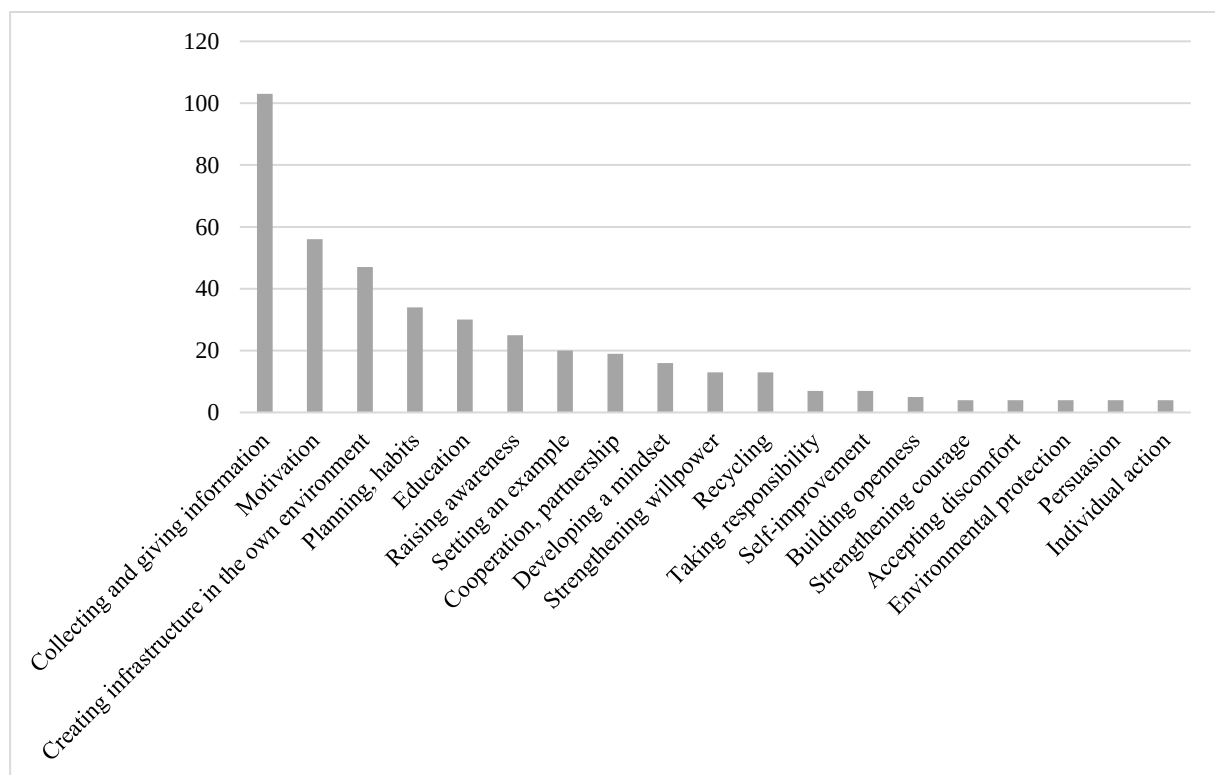


Figure 2: Potential solutions on micro level

Source: Authors' own research

The participants collected 422 potential micro-level solutions. After removing non-micro items and splitting composite notes, we coded 415 micro-level solution instances.

Interestingly, this value is lower than the number of the potential solutions related to the macro level (445 occurrences). This result could imply that the participants see more potential opportunities for interventions on the macro level than on the micro level. However, it should be emphasised that not only macro level solutions are necessary, but the individuals could also do a lot related to the selective waste collection as *Figure 2* shows it.

In the second step, the potential micro-level solutions given by the participants on the barriers of the selective waste collection are categorised into 19 groups as *Figure 2* illustrates with the occurrences. The 3 most frequently occurred categories are the '*Collecting and giving information*', '*Motivation*', and '*Creating infrastructure in the own environment*', hence, these could be the most significant tools on the micro-level to support the individual's waste sorting behaviour. Compared to the macro-level solution proposals, it can be said that the first three most frequently mentioned proposals are very similar to the micro-level proposals. At the macro level, the use of positive motivational tools (financial support, rewards, other motivational tools), education, and infrastructure development are in the top three. The content of the proposals at different levels differs – a detailed presentation of this would go beyond the scope of this study.

In the following, we present the micro-level solution proposals in detail.

In the case of the category named '*Collecting and giving information*', the participants mentioned for instance the social media, document movies, blogs, podcasts as potential sources for the information related to the selective waste collection. Interestingly, the retired attendees highlighted the significant role of the local politicians. They also preferred the face-to-face communication about the topic instead of the social media. This result could show a difference among the generations, the retired inhabitants who have more free time have greater needs for the face-to-face communication than the younger generations.

The '*Collecting and giving information*' can also represent the shared responsibility between the inhabitants and the waste management company. Because the information sharing of the given company is not enough, the inhabitants should be also open for these materials, and they have the responsibility to search, read and understand them. The WCM rounds also add plus one potential task for the inhabitants, because our data also shows the importance of the information sharing. Hence, if the inhabitants know how to sort the waste, then they can be responsible for sharing this knowledge with their close environment like friends or family members.

The second highest frequency group is the '*Motivation*', which has three subcategories: positive, negative and general motivation. The solutions related to the positive motivation (with 29 occurrences) includes tools like positive reinforcement, encouragement, praise, rewarding with money or food. The negative motivational solutions (with 14 occurrences) mark for example the punishment, self-flagellation or remorse. In 13 cases, this solution is only referred to in general terms, so the participants just wrote the motivation word on the paper. Based on these data, two conclusions can be drawn. Firstly, the comparison of the frequencies presents that the participants were more open to the positive motivational tools than the negative ones. Secondly, the self-motivation and motivating others are also important tools for supporting the waste sorting, because with them the one-off action can become regular.

The third biggest category is the '*Creating infrastructure in the own environment*' which includes actions like purchasing practical storage equipment (e.g., compartmentalized trash cans which need a small space), requesting composting bins, emptying the own selective waste bins frequently, and even using selective waste collection bins at own events such as a house party. Although the waste management company is responsible for the infrastructure, our results shows that the individuals also can take actions to improve the situation.

Based on our dataset, six other conclusions could be drawn. Firstly, being open-minded and working on ourselves are important factors in the case of waste sorting, because selective

waste collection is not a habit that we learnt or have been socialized. This is also supported by the fact that willpower occurred thirteen times in our dataset. The individual's time and effort are necessary to change behavioural patterns and create a new habit.

Secondly, the participants also used the courage concept in such cases as speaking up for waste sorting, and supporting it, even against other generations or their closer environment. It can show that selective waste collection is not mainstream or a norm in society. Therefore, as the first point sums up, the inhabitants need extra time, effort or courage to do that.

Thirdly, performing the behaviour analysed requires extra work from the people, however, not everyone has the option to do that. Hence, the main question that should be asked by those who want to start sorting the waste is: 'How can I selectively collect waste with as little effort as possible?' as one of the participants formulates it. In other words, participants should look for options that allow selective waste collection to be achieved with minimal effort. Decision-makers should also focus on this idea when deciding on infrastructure development.

Fourthly, the '*Planning, habits*' was the fourth most frequent category preceding '*Education*' or '*Raising awareness*'. Its prominent position can be a surprise, because although the habit also appeared in the case of barriers related to selective waste collection, it was not a dominant obstacle. However, in the case of the solutions of the challenges, the participants offered it 34 times. Planning can be a significant tool for waste sorting, because it supports the people to build this behaviour in their everyday life and be an automatic action.

Our fifth point is related to the family. It can be also surprising finding in the micro-level environment the participants highlighted the family as influencing and educational force and they did not mention the given generation or the friends. This result highlights the role of the family in selective waste collection, which is powerful because it could significantly increase the acceptance of selective waste collection and its integration into everyday practice. Its two directions (children educate their parents / grandparents or the parents teach their children this behaviour) could not just be an effective tool for the individual to increase commitment in waste sorting but it could also be a valid strategic instrument on the meso and macro level. The actions, campaigns based on family cooperation and joint development of the household routine may be more effective than the approaches using the generational differences.

Finally, the attitude is also an important tool in waste sorting. An interesting approach within the proposed solutions is that selective waste collection should be viewed not as an obligation but as a game, so that inhabitants can tackle it with greater enthusiasm and more easily find the most effective solution for them. Gamification could be more emotionally positive, less burdensome, and elicits less psychological resistance than the obligations.

The suggested solutions by the participants draw attention to that there could be effective tools in the case of the '*External barriers*' (like '*Lack of infrastructure or knowledge*') too that are independent of the individual. These actions such as '*Collecting and giving information*' or '*Creating infrastructure in the own environment*' could support the acquisition of behaviours related to selective waste collection and their establishment as routine.

Next to the external barriers, the other main category was the '*Psychological and individual obstacles*'. The participants also recommend potential solutions for this factor for example '*Motivation*' or '*Planning, habit*'. The individuals might need to use the self-improvement too, because they should be open for this action and should understand what the environmental and health consequences are.

Finally, our results also demonstrate that the selective waste collection probably is not a norm in the circles of the participants, therefore extra time and effort could be needed to learn this action. In addition, our closest environment could also influence our behaviour related to the waste sorting. Therefore, the micro level or the other level tools too should pay attention to those, and it is advisable for both individuals and decision-makers to develop strategies that require the least effort to collect the waste selectively.

To the best of our knowledge, it is the first time this method has been used in the area of selective waste management. Although our sample is not representative of the Western Hungarian region, it could provide a suitable starting point to increase the commitment related to the selective waste collection. Since the questions during the World Café rounds were asked in general (like *What can hinder the people to collect the waste selectively?*), therefore our method not only collect information from the participants but also from their circle of acquaintances.

5. Conclusions, recommendations

This section presents the key conclusions of the study and outlines recommendations for improving selective waste collection through multi-level interventions. Based on the results of our research, conclusions can be drawn that have both theoretical and practical implications for improving selective waste collection practices. The findings provide actionable insights for individuals, communities, and policymakers, demonstrating pathways from recognizing barriers to implementing effective solutions.

The method itself, WCM proved to be an effective approach in selective waste collection research; an area where this method has rarely been applied. It successfully engaged participants with diverse mindsets and life situations, encouraging constructive dialogue and collective knowledge creation. Its dialogic nature enabled the participants to move beyond passive problem identification toward active engagement, bridging the gap between identifying obstacles and enabling action. We recommend that participatory methods should be utilized to foster dialogue, community engagement, and co-creation of solutions.

Our research identified 652 barrier items, categorized into 28 distinct groups. The three most prominent barriers are ‘*Lack of infrastructure*’ (150 occurrences), ‘*Lack of information*’ (88 occurrences), and ‘*Laziness*’ (82 occurrences), with psychological barriers playing a significant role. These findings suggest that system-level limitations continue to shape individual waste collection behaviour. Our analysis revealed two main types of barriers: psychological and individual factors (like disinterest, carelessness, lack of motivation) and external influencing factors (like lack of infrastructure, service deficiencies). This highlights that providing information, awareness raising or education on their own are insufficient, since behavioural change requires interventions that address both psychological factors and structural constraints at the same time. Individuals are aware of their role and can take micro-level actions to facilitate change.

The identification of 415 micro-level solution items across 19 categories demonstrates that individuals have opportunities for action. The most frequently mentioned solutions include collecting and providing information as well as creating infrastructure within their own environment. While structural constraints are evident, citizens recognize opportunities to take responsibility within their environment.

Based on these findings, we should address infrastructure gaps at not only at macro or meso level but also at micro level (individual households and communities) as well, recognizing that individuals can create solutions within their own surrounding through simple at-home infrastructure, such as compartmentalized trash cans, reusable containers, or compact storage solutions. In shared buildings, residents co-designing local sorting points increases ownership and compliance.

We suggest developing targeted educational programs for different demographic groups to address the identified information gaps (keeping in mind that on their own they would not be enough). Moving beyond one-off campaigns; accessible, long-term knowledge support should utilize several communication channels, also recognising the generational differences: while younger participants favour digital platforms, retired participants prefer face-to-face communication. Specific strategies should be implemented to overcome barriers, bridging the attitude-behaviour gap in waste separation practices. Interventions should promote small, achievable actions that reinforce positive habits and reduce perceived effort. Participants showed

greater openness to positive motivational tools than negative ones, suggesting that behaviourally informed strategies may be more effective. Framing selective waste collection better could reduce psychological resistance and sustain long-term engagement. We would like to emphasise the powerful role of family as an influencing and educational force in waste sorting behaviour. This two-directional influence, where children educate parents just as much as parents teach children, represents an effective tool that transcends generational divides.

While individual responsibility is crucial, it cannot operate in isolation. Micro-level actions at the end must be connected to meso- and macro-level systems. Participants frequently identified systemic issues, with more macro-level solutions (445) than micro-level ones (415) proposed. Supporting two-way communication between individuals and institutions ensures that personal agency meets supportive infrastructure.

This study demonstrates that improving selective waste collection requires interventions that simultaneously address psychological factors, habitual behaviour, and external circumstances. The transition from barriers to action requires both individual responsibility and collective effort, showing that sustainable waste management is achievable when personal agency meets supportive infrastructure. While macro- and meso-level actions remain important, individual responsibility forms a foundation that can accelerate behavioural change and contribute to broader sustainability goals.

Acknowledgements

Project no. 2022-1.1.1-KK-2022-00002 has been implemented with the support provided by the Ministry of Culture and Innovation of Hungary from the National Research, Development and Innovation Fund, financed under the 2022-1.1.1-KK funding scheme.

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