detritus | Multidisciplinary Journal for Circular Economy and Sustainable Management of Residues

CISA

CONSUMER BEHAVIOUR WITH REGARD TO WASTE SEPARATION IN PUBLIC AND PRIVATE SPACES

Betül Gök [1,*], Barbara Hartl [2], Sabine Dworak [1], Therese Schwarzböck [1] and Astrid Allesch [3]

[1] *Institute for Water Quality and Resource Management, Technische Universität Wien (TU Wien), Karlsplatz 13/226, 1040 Vienna, Austria*
[2] *Department for Management and Economics, University for Continuing Education Krems, Dr.-Karl-Dorrek-Straße 30, 3500 Krems, Austria*
[3] *Institute of Waste Management and Circularity, University of Natural Resources and Life Sciences (BOKU Vienna), Gregor-Mendel-Straße 33, 1180 Vienna, Austria*

Article Info:
Received:
2 December 2024
Revised:
29 January 2025
Accepted:
5 February 2025
Available online:
2 March 2025

Keywords:
Waste separation
Consumer waste behaviour
Recycling
Littering
Recycling behaviour
Public waste

ABSTRACT

Consumer behaviour plays an important part in waste separation. In contrast to private households, consumer behaviour in public spaces, like parks, pedestrian zones and on sidewalks, has hardly been analysed and waste separation in public is scarcely implemented. Recent research on the characterization of public waste indicates that waste from public spaces contains a high proportion of recyclables, which shows that considerations concerning the introduction of separate waste collection are reasonable. This study aims to understand the differences between consumer waste behaviour in private and public spaces. Waste separation behaviour in public spaces is analysed through guided interviews (n=12) and an online survey (n=238) of residents of Vienna (Austria) and is compared to waste separation behaviour in private spaces. The results show that, firstly, social norms regarding waste separation are more established in private households than in public spaces. Secondly, although the total amount of waste generated in public spaces is lower, recyclables (paper, plastic, metal, glass) are relevant waste fractions in public waste and are therefore regarded as important when high resource recovery is pursued. Thirdly, waste separation in public spaces requires more effort on the part of consumers disposing of waste than in private spaces. This is mainly due to the lack of recycling bins. Fourthly, waste separation in public spaces is seen as a lower priority by respondents compared to litter prevention. The results suggest that separation behaviour varies according to the contextual space and cannot be regarded as identical.

1. INTRODUCTION

The rise in packaging materials usages, particularly from online retail and take-out food and drinks, requires a new approach to waste management, embracing the principles of the circular economy (Bilitewski and Härdtle, 2013). To achieve a circular economy, it is crucial to promote waste prevention and reduction, as well as to prioritise separate waste collection over other waste treatments (EC, 2008). Furthermore, the European Union (EU) has mandated that its member states recycle 60% of their municipal waste and 70% of their packaging waste by 2030 (EC, 2018a, 2018b). When it comes to the plastic packaging sector in Austria, there is a significant need for improvement as the recycling rate (currently approx. 25%) needs to increase drastically to achieve a 55% target by 2030 (BMK, 2022; EC, 2008).

Human behaviour and separation habits play a crucial role in waste separation since they greatly impact waste processing and the quality of secondary materials (Kranert, 2017). When analysing waste separation, the literature focuses primarily on household waste (Timlett and Williams, 2008). However, there is a lack of information regarding separation behaviour in other locations, such as public spaces like streets, parks and squares. Research on public waste often focuses only on littering (Al-mosa et al., 2017; Bator et al., 2011; Liu and Sibley, 2004; Schultz et al., 2013) and waste separation behaviour is rarely addressed. However, public waste and household waste exhibit distinct characteristics, indicating a significant potential for recyclables in public waste, particularly packaging waste and disposable products (Kladnik et al., 2024). Public waste is of high quality and quantity for separate collection in highly frequented locations such as pedestrian zones and shopping areas, but is low in green areas and leisure centres (Gangl et al., 2022). As public waste is often collected as mixed waste, its potential has hitherto remained unexploited.

* Corresponding author:
Betül Gök
email: betul.gok@gmx.at

Detritus / Volume 30 - 2025 / pages 3-13
https://doi.org/10.31025/2611-4135/2025.19467

The aim of the study is to understand the differences in consumer waste separation behaviour in public and private spaces. The results will provide valuable insights into the perception of waste in different contextual spaces and will show how the introduction of waste separation in public should be approached. The study raised the following research questions: What are the motivations behind and obstacles to waste separation in private households and in public spaces? Are there differences in waste separation behaviour in public and private spaces? If so, what are the differences in social norms behind such behaviour, the respective resultant waste fractions, as well as the comparative waste separation difficulties encountered in the public and private spheres? Finally, how is littering as compared to waste separation in public spaces perceived?

The paper is structured as follows: Section 1 presents the factors that influence waste separation behaviour, with a focus on social norms. This is done based on the available literature. Section 2 outlines the methodology and dataset in the study presented, consisting of 12 guided interviews and a questionnaire survey with 238 respondents. Section 3 presents the results of the case study. Finally, section 4 contains the discussion and section 5 consists of the conclusion.

1.1 Factors influencing waste separation behaviour

Public spaces are accessible to everyone, implying that their use precludes the exclusion of others (Corten, 2019). These spaces bring together individuals from diverse backgrounds, often without prior acquaintance. While public spaces evoke a sense of community and togetherness, actual interaction and exchange among individuals tend to remain minimal (Belk, 2017; Jansson, 2011; Kemp, 1999). Even if direct interaction is not particularly pronounced, it still influences behaviour. Goffman (1971) argues that individuals actively adopt different roles. Their behaviour is context-dependent and shaped by norms and expectations, likened to a performance in which individuals present themselves – both verbally and non-verbally – according to the audience and setting (Goffman, 1963a).

Understanding the dynamics of behaviour in public spaces is essential for enhancing waste separation practices. Previous research has mainly focused on separation behaviour in private households. Hence, information on separation behaviour in public spaces is limited. First, the primary factors that influence waste separation in households are summarised. Subsequently, the influencing factors for waste separation in public spaces will be addressed in this section.

According to Knickmeyer (2020), the main social influencing factors in private households are socio-demographic characteristics, psychological factors, economic factors and political background. Psychological factors relate to the perceived comfort and effort of separating waste. The convenience of infrastructure is one of the most important influences to increase household waste separation behaviour and is effective if the following criteria are met (Bernstad, 2014; Knickmeyer, 2020; Miafodzyeva and Brandt, 2013; Zhou et al., 2022): short distances and a strategic location of collection points for recyclables; high frequency of collection; availability of curb-side collection; storage space in households; (smart) visual design of collection points. In simpler terms, the easier it is to use and to access the separation system, the more likely it is to be used (Knickmeyer, 2020). A lack of infrastructure (the availability of bins) presents a barrier for participating in waste separation (Jesson et al., 2014; Timlett and Williams, 2009). Thus, the provision of recycling bins can significantly increase the collection rate (Brothers et al., 1994; McCoy et al., 2018). Furthermore, collecting multiple recyclables, such as plastics and metals, in one recycling bin has been shown to simplify separate waste collection and increase participation rates (Oskamp et al., 1996).

As previously mentioned, there is little knowledge about separation behaviour in public spaces. It is important that the infrastructural factors are kept as low-threshold and simple as possible (Gangl et al., 2022). Leeabai et al. (2019) suggest a threshold distance between 8 and 410 m as relevant for influencing waste disposal behaviour. In the case of residual waste bins in public spaces, individuals use cognitive maps of the environment in order to identify the location of the nearest waste bin (Hartl and Hofmann, 2024). The provision of waste bins and short distances have an impact on reducing littering (Al-mosa et al., 2017; Bator et al., 2011; Schultz et al., 2013). The most frequently discarded items worldwide include cigarette butts, and the impact of takeaway packaging is on the rise (Bator et al., 2011; Castaldi et al., 2021; Schultz et al., 2013). The littering of cigarette butts can be reduced significantly by installing ashtrays and waste bins (Liu and Sibley, 2004). Overall, the studies suggest that simply providing recycling bins, without changing people's attitudes, already leads to better collection rates.

Separation knowledge is also an important factor to consider (Sorkun, 2018; Zhou et al., 2022). Varying separation systems and a lack of knowledge, on the one hand, can act as barriers to separate collection (Jesson et al., 2014). Consistently utilised waste separation systems, on the other hand, have a positive effect over time (Jenkins et al., 2003). Gangl et al. (2022) suggest presenting information in an intuitive manner in order to achieve a subconscious impact. Information should be provided in a simple form: Little text, a large font and photos have a positive effect (Rousta et al., 2015; Sussman et al., 2013). Gamification, for example through waste bins that react with sounds or smileys and reward users, can also promote intuitive behaviour (Berengueres et al., 2013).

This research focuses on social norms. Social norms (synonymously used for `subjective norms´) are the expectations of how to behave and are influenced by significant others, such as family, friends or neighbours (Ajzen, 1991; Miafodzyeva and Brandt, 2013). These norms vary depending on cultural factors (Becker, 2014). There is, as has been mentioned, a lack of research on social norms regarding waste separation in public spaces. The studies which are mentioned in the following focus on private households. It is shown that waste separation behaviour in private households is influenced by social and moral norms (Miafodzyeva and Brandt, 2013; Nguyen et al., 2015; Zhang et al., 2015). In a study by Park and Ha (2014), it can be seen

that social norms, together with attitudes, influence participation in separate collection. Past separation behaviour also has a significant influence on current behaviour, which is why habit formation can be seen as promoting separate collection (Xu et al., 2017). If separate collection is socially approved, it will motivate people to take action in that direction (Cialdini, 2003). Role models can be used to guide social norms, which, for example, led to a 42% increase in the separate collection of organic waste in a cafeteria in Canada (Sussman et al., 2013). Sussman et al. (2013) also shows that signage with important information and instructions lead to an increase in the separation behaviour of organic waste of approx. 20%.

While waste separation behaviour in private households is largely shaped by social and moral norms, as well as past behaviour and habit formation, the situation changes when we turn our attention to public spaces. In this context, a key distinction is that public spaces involve the use of common goods, such as waste management systems. The use of common goods creates a social dilemma (Belk, 2017), wherein individual and collective interests can be at odds (Kollock, 1998; Van Lange et al., 2013). As Ostrom and Ahn (2007) note, the challenge of collective action arises from the short-term appeal of free-riding, which can outweigh the incentive to contribute to common goods. Consequently, norms and values shaping behaviour related to public goods reflect a tension between social and personal identity.

The focus of this paper is on waste separation in public spaces. However, since littering is a well-explored topic in the literature, it will be addressed here in order to examine the relevance of waste separation in relation to littering. It should be noted that although littering occurs mostly unconsciously, the perpetrators are aware that it is an antisocial behaviour (Gangl et al., 2022). In clean settings, littering occurs less frequently as it sends a message to refrain from this behaviour (Bator et al., 2011). Based on the study by Sussman et al. (2013), negative role models can promote negative behaviour. With regard to littering, places where littering is already taking place are more likely to encourage further littering (Dur and Vollaard, 2015). Another study by Keizer et al. (2011) deals with the difficulties of a reversal effect with signages: According to the study, if prohibitions signs are located in places that support negative norms, e.g. places heavily affected by littering with an anti-littering sign, fewer people are likely to comply with anti-littering measures. In fact, it triggers a reversal of behaviour, resulting in more littering than in the same situation without a prohibition sign. Therefore, in this case, other measures would be more appropriate than prohibition signs.

The behaviour of consumers regarding littering and waste separation will be explored within this paper, with a focus on the latter. Participation in separate waste collection requires adequate infrastructure, knowledge, and norms. Public waste is often collected as mixed waste, showing that infrastructure is already a barrier to participation. It is worth investigating whether and how consumers perceive this barrier. Furthermore, this study aims to understand the differences in social norms between private and public spaces in order to fill the current knowledge gap.

1.2 Waste collection and infrastructure in the city of Vienna

With a population of nearly 2 million, Vienna is Austria's largest city (StatistikAustria, 2023). It covers an area of 414.87 km² (MA23, 2023) and has a population density of 4,656 inhabitants/km² (MA23, 2022). Vienna attracts over 5 million visitors annually (MA23, 2023). Concerning household waste, separate collection schemes are established. Mixed waste and paper from households are often collected through a kerbside collection system, while glass, lightweight packaging and organic waste are collected at collection points in public areas (about 4.400 public collection points for household waste) (MA48, 2017). The collection, both of private and public waste, is predominately managed by the municipal department MA48 (GEM, 2023). At the time of the study, various municipal solid waste fractions were collected and treated, including mixed waste, paper, glass, lightweight packaging (plastic, metal, beverage cartons) and organic waste. The municipality provides collection services for bulky waste and hazardous waste at disposal centres. However, since bulky and hazardous waste are not relevant to the study presented, these waste fractions will not be further discussed. In total, Viennese households produce 289 kg/cap per year of residual waste (518,500 t) annually, which is significantly higher than the Austrian average of 166 kg/cap (BMK, 2017; MA48, 2017). Examining mixed residual waste characteristics from private households, the proportion of recyclables is as high as 47% (MA48, 2017). Public waste is seldom collected separately and waste amounts are currently largely unknown (Gangl et al., 2022). About 20.800 public waste bins are installed throughout the city (MA48, 2023a), which are manually emptied/collected by street sweepers. In the course of collection, they manually sort PET bottles and drink cans from public bins for mixed waste (MA48, 2017). Public waste is documented separately from other waste streams as street sweepings. According to the city of Vienna (MA48, 2023b), 15,635 t/a of street sweepings (without gravel) were collected in 2020. Keeping the numbers mentioned in mind (relatively high per capita waste production, high share of recyclables in residual waste, high population density and tourism, limited options for separate waste collection in public spaces), the city of Vienna thus constitutes an ideal case study on the need to gain deeper insight into consumer waste separation in public spaces.

2. DATA AND METHODOLOGY

The current research employs a multi method approach to assess consumer attitudes towards waste separation in public, combining both qualitative and quantitative data. This approach helps to balance the limitations of each method (Hammond, 2005). In the following, two studies are presented: First, a qualitative approach was chosen to gain insights via interviews with consumers. Based on these results, a quantitative survey was conducted to test

hypotheses regarding the difference between waste separation in private and in public areas.

2.1 Definition of public and private space

Within this study, private spaces are defined as areas that are only accessible to a specific person or group of people, i.e. private households. Households dispose of their waste via kerbside collection and at collection points. As recyclables (paper, plastic, metal, glass) are often collected at public collection points in Austria, the nearest possible collection point for recyclables is considered within this study when private households are addressed. In this study, the term 'public (waste) bins' refers to bins for mixed waste collection, while 'recycling bins' refer to bins for separate waste collection of recyclables. The definitions of public space and public waste are based on Kladnik et al. (2024): Public space is defined as all public areas that are accessible to everyone and that can be cleaned by the local street cleaning services (e.g. pedestrian zones, streets, parks, public squares, etc.). This definition excludes semi-public spaces, such as enclosed spaces (e.g. museums, public institutions, etc.), and public spaces that require payment for use (e.g. cafes, amusement parks, etc.). In this sense, public waste is defined as waste collected from waste bins in public spaces.

2.2 Guided interviews

Semi-standardised interviews were conducted face-to-face in January 2023 with 12 participants (see details in the supplements). The sample size was selected to achieve theoretical saturation, which refers to obtaining the key insights without requiring additional interviews for further information, as recommended in the literature (Przyborski and Wohlrab-Sahr, 2021). The sampling was conducted to approximate the demographic characteristics of Vienna by interviewing people from a diverse range of districts in Vienna. The aim of the semi-structured interviews was to understand behavioural patterns regarding waste separation. The interview guideline covered four themes: personal attitudes towards waste separation, waste separation in private spaces, waste separation in public spaces, and solutions for improvement. The interviews were recorded and transcribed using the program Amberscript. The MAXQDA program was used to analyse the data using a qualitative content analysis according to Mayring (2002), with coding based on Flick (2007) and Clarke and Braun (2017).

2.3 Questionnaire survey

A total of 238 respondents participated in the online and offline questionnaire survey conducted from March to May 2023. The sample was carefully selected to represent the population of Vienna in terms of gender, age, and education level. To be eligible, participants had to have lived in Vienna for at least one year and had to be at least 18 years old. The survey was initially distributed to a wide circle of acquaintances using the snowball principle. Additionally, printouts for the survey (with a QR code) were distributed in residential areas and busy public places, with respondents in the latter areas questioned in person. This was done to ensure accessibility to all population groups, including those who may have difficulty accessing online formats such as older people and those with lower levels of education. Table 1 summarises the characteristics of the sample.

TABLE 1: Demographic information of respondents: questionnaire survey.

Variables	respondents (n=238)		Population in Vienna*
	n	%	%
Gender			
Male	109	45.8	48.9
Female	121	50.8	51.1
Divers	8	3.4	n.d.
Age (year)			
18–29	80	33.6	20.5
30–39	42	17.6	19.6
40–49	30	12.6	16.4
50–59	25	10.5	16.6
>60	61	25.6	26.8
Average age	43.3 years		41.2 years
Level of education			
Compulsory school/ no school education	15	6.3	21.2
Secondary school (no qualification for university attendance)	10	4.2	8.9
Apprenticeship	22	9.2	20.7
AHS/BHS/College (with qualification for university attendance)	53	22.3	19.7
University of Applied Sciences/University	138	58.0	29.5

** Source: MA23, 2023*

The survey consisted of four topic groups containing 30 questions in total (see details in the supplements), followed by an open question for further comments. The topic groups were: social norms, waste separation in private and public spaces, waste separation and difficulties, waste in public spaces.

In the topic group "social norms", participants were asked about their perception of waste separation in society, in private and public spaces, with respect to five items: "*My family thinks I should separate waste*", "*My friends think waste separation is a good thing*", "*My acquaintances believe I should separate my waste*", "*It is socially expected that people separate waste*", and "I *have the feeling that people in Vienna should separate their waste*" (5-point Likert scale from 1 ("I totally disagree") to 5 ("I totally agree")).

In the next group, participants were asked to report the types of waste they had produced and actively separated, in private and public spaces, during the previous week with two items: "*What waste was produced last week?*", and "*What waste did you actively separate last week?*" (Multiple-choice options included "residual waste", "paper", "glass", "metal", organic waste", "plastic" and "other").

In the topic group "waste separation and difficulties", the following five items were included, concerning private and public spaces: "*I don't have time to separate waste*", "*I don't worry about waste separation and dispose of my waste in the residual waste*", "*There are enough separation options to separate waste*", "*The available separation options cover all types of waste that I could separate*", and "*It takes a long time to find the next separation option*" (5-point Likert scale from 1 ("I totally disagree") to 5 ("I totally agree")).

In the last topic group, participants were asked with six items, concerning only public spaces: "*It bothers me when rubbish lies on the ground or in the environment*", "*It is important to me that my surroundings are tidy and clean*", "*If I can't find a rubbish bin, I take my rubbish home with me if necessary*", "*I separate my rubbish as best I can, but I don't force myself to do so*", "*I keep recyclables with me until I find a way to separate them*", and "*If I can't find a separation option in public, I take recyclables home and separate them there*" (5-point Likert scale from 1 ("I totally disagree") to 5 ("I totally agree")).

Demographic variables (sex, age, education, net income, number of household members, number of underage children) were assessed at the end. To avoid any misunderstandings, each thematic group begins with definitions of private and public space.

Based on the results of the guided interviews, the following hypotheses (H) were derived which were tested for significance:

- H1. People feel more obliged to separate their waste in private spaces than in public spaces.
- H2. In public spaces, mainly residual waste accumulates, while in private spaces, other waste fractions are also relevant.
- H3. Separating waste in public spaces requires more effort than in private spaces.
- H4. People in public spaces prioritise not leaving waste in the environment over separating waste.

The software program SPSS was used for statistical data analysis. The hypothesis tests were performed using a Wilcoxon test. Prior to this, the reliability was checked using Cronbach's alpha, which ideally should be above 0.7 (Field, 2009). The Cronbach's alpha values were satisfactory: Cronbach's alpha for social norms with 10 items = 0.827, for waste separation and difficulties with 10 items = 0.794, for waste in public spaces with 5 items = 0.750. The item "*I separate my rubbish as best I can, but I don't force myself to do so*" from the last topic group (waste in public spaces) had to be excluded due to a low Cronbach Alpha. The effect size was calculated according to Field (2009) to determine whether the effect of the results is substantial, which is the case when the effect size exceeds 0.5.

3. RESULTS: CASE STUDY IN THE CITY OF VIENNA

3.1 Guided interviews

When discussing separate waste collection, the interviewees mainly referred to waste separation in private households. The interviewees believed that separate waste collection is important for several reasons. The most commonly mentioned reason is its potential for resource reuse and recovery, which is why material recycling is generally preferred over energy recovery. Interviewees associate energy recovery, such as waste incineration, with the loss of resources and environmental pollution, while material recycling is viewed as a way to conserve resources and keep them in the cycle. Another reason mentioned to support material recycling is the prevention of harmful chemicals/hazardous waste. Most interviewees separate their household waste into four categories in private spaces: residual waste, paper, lightweight packaging (plastic and metal), and glass. However, fewer than half of the interviewees collect organic waste separately at home due to a lack of collection bins available at kerbside or at collection points. The municipality also offers disposal centres for the collection of, e.g. bulky and hazardous waste. However, as these waste streams are not relevant to this paper, they will not be addressed.

Based on the interviews, the waste separation behaviour of consumers can be grouped according to the following four attitudes and practices concerning household waste: First, separate waste collection is often integrated into daily life. People combine the journey to public collection points with their errands, such as the journey to work for saving time. Therefore, the location and distance from households to public collection points for recyclables are important. This leads to the second factor, the time aspect. The interviews reveal an ambivalent attitude towards the time required for separate waste collection in private households. While most interviewees consider the time required to be low, it is also speculated that it may be the reason why some people do not participate in separate collection. Third, separate waste collection in private households can be challenging due to overfilled common household containers, especially for waste paper, and a lack of bins for organic waste collection. Fourth, interviewees report collecting waste fractions that can be disposed

of through kerbside collection or at nearby public collection points for recyclables. Thus, consumer understanding of the separate collection system relies heavily on both the presence of different waste collection bins and the corresponding labelling on the bins. This is consistent among interviewees who have changed residence or come from other countries. Kerbside collection is the preferred collection method for organic waste. The collection method for organic waste depends on the respective district, that is, on whether waste can be disposed of at a kerbside or must be brought to collection points. According to some interviewees, they stopped collecting organic waste separately when kerbside collection was no longer available, e.g. after moving. This emphasises how appealing kerbside collection is to consumers. In general, the majority of interviewees expressed satisfaction with their waste separation practices at home. However, they recommended increasing the number of paper collection bins in private households and providing kerbside collection for organic waste.

These findings on waste separation in private households differ strongly from waste separation in public spaces. While the interviewees take separate collection in private households for a given, they seem to be surprised to be asked about their waste separation behaviour in public spaces as they do not practise separate collection there. This is also depicted in the number of codes used for the qualitative content analysis: A total of 410 segments of the interviews were coded for separate waste collection in private spaces. In comparison, only 196 coded segments related to public spaces. Additionally, interviewees were not aware of the differences in their separation behaviour in private and public spaces. Overall, interviewees reported generating minimal waste in public spaces, which they typically disposed of as residual waste, regardless of how meticulously individuals may separate it at home. If at all, waste is typically only separated in public areas where nearby recycling bins are available.

There are several reasons why people fail to separate waste in public. Firstly, interviewees attribute their failure to a lack of recycling bins as well as to time constraints. Consumers find it inconvenient to separate waste in public and they expressed reluctance to expend additional effort in searching for recycling bins to separate their waste due to time limitations. Information about the location or distance to recycling bins is not easily accessible, while mixed waste bins are more visible to consumers. Therefore, the use of mixed waste bins appears more convenient, and interviewees report that these are satisfactory in terms of both quantity and distance. Secondly, preventing littering in public by disposing of waste in (mixed waste) bins is conceived as crucial to interviewees, indicating that separate waste collection is not seriously considered in public areas. Interviewees emphasised that they never leave their waste on the ground or in the environment. They always use public waste bins that are usually for mixed waste. In general, interviewees expressed a wish for more recycling bins in public spaces to facilitate separate waste collection. The idea of signs indicating the location of separate waste collection facilities was viewed positively.

Figure 1 visualises the key findings from the guided interviews. The findings from the guided interviews raise questions and indicate distinctions made between private and public spaces. These differences were further investigated in a quantitative survey that focused on social norms, efforts required to separate waste, and the perception of waste in public, using the hypotheses outlined earlier (see chapter 2.3.).

3.2 Questionnaire survey

The four hypotheses (H) defined were statistically tested for their significance. In order to test H1, whether people feel more obliged to separate their waste in private spaces than in public spaces, a statistical summary of data gathered from the survey was compiled to assess that claim (Table 2). As the data are not normally distributed, a Wilcoxon test was used. Social norms, favouring separate waste collection as a socially accepted behaviour, are significantly higher in private spaces (median = 4.40) than in public spaces (median = 4.00; asymptotic Wilcoxon test: $z = -9.138$, $p < 0.001$, $n = 238$ - T-test: $t(237) = 9.499$, $p < 0.05$). The effect size is 0.592, indicating a strong effect (Field, 2009). Therefore, this research shows that there is a significant difference in social norms regarding waste separation in private and public spaces. The findings suggest that people feel a greater responsibility to separate their waste in private settings than in public ones. Public waste separation norms seem less established than those in private households.

To test H2, respondents had to select the waste fractions they generate and actively separate. This was to test

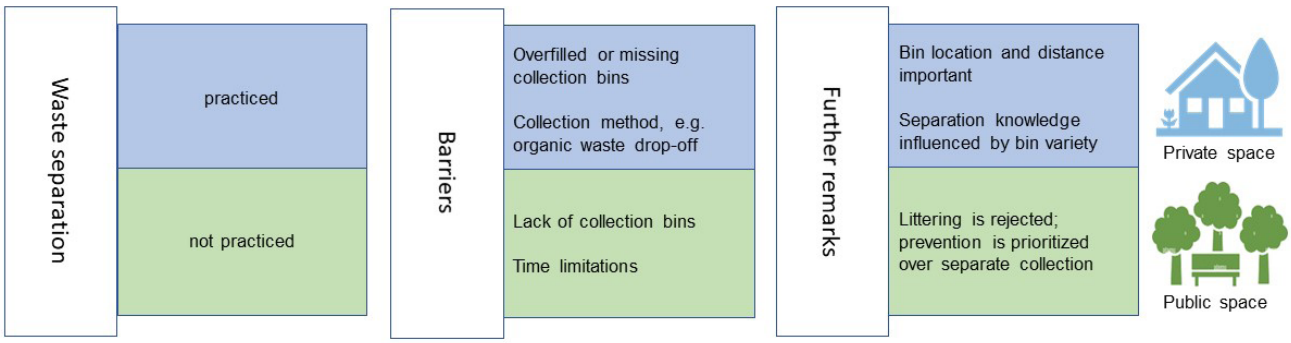

FIGURE 1: Key results from guided interviews for private (blue) and public (green) spaces.

TABLE 2: Descriptive statistics for respondents' ratings for hypothesis H1, H3 and H4. Respondents' ratings are based on a 5-point Likert scale from 1 ("I totally disagree") to 5 ("I totally agree").

Option	Mean	Median	Standard error	Standard deviation
H1: People feel more obliged to separate their waste in private spaces than in public spaces				
Private space	4.32	4.40	0.039	0.601
Public space	3.84	4.00	0.051	0.786
H3: Separating waste in public spaces requires more effort than in private spaces				
Time				
Private space	1.36	1.00	0.036	0.551
Public space	2.37	2.50	0.060	0.920
Waste separation options				
Private space	2.39	2.33	0.061	0.946
Public space	3.41	3.67	0.058	0.901
H4: People in public spaces prioritise not leaving waste in the environment over separating waste				
Littering	4.31	4.47	0.036	0.556
Separation	3.06	3.00	0.070	1.078

whether there was a difference in waste fractions between private and public space. This hypothesis was chosen because many interviewees reported that residual waste was their main waste fraction in public, while in private household's other waste fractions were also relevant. Table 3 indicates that all waste fractions were selected by the respondents. The difference is that fewer respondents chose waste fractions relevant for separate waste collection in public than in private spaces. Figure 2 summarises the self-reported collection rate, reflecting the ratio of waste generated to waste collected. It becomes evident that the collection rate for all waste fractions is higher in private spaces.

The descriptive statistics disprove hypothesis H2. As anticipated, apart from mixed waste, also other waste fractions, such as paper, plastic, organic waste, glass and metal are as relevant in public spaces as they are in private spaces. Therefore, separate waste collection in public spaces can be regarded as potentially reasonable. The difference between private and public spaces also lies in the collection rate (which was here defined as the ratio between reported waste separated and reported waste generated). For household waste, the collection rate was found to be higher than for public waste, meaning that more respondents claimed to separate their waste. In terms of waste generation in private spaces, the order (from highest to lowest) is paper, plastic, organic waste, glass, and metal. The order of separation in private spaces (from highest to lowest) is paper, plastic, glass, metal, and organic waste, which is similar for the generation and separation of waste in public spaces. Organic waste has the lowest collection rate for both private and public space. It is important to note that the collection rates cannot be directly compared to the waste management municipality's data: the survey refers to the number of respondents that selected waste fractions they generated and actively separated, while the other refers to the quantity collected by the municipality.

In order to test H3, whether separating waste in public spaces requires more effort than in private spaces, the items of this construct are categorised into two groups based on the underlying concept: the items "*I don't have time to separate waste*", "*I don't worry about waste separation and dispose of my waste in the residual waste*", "*If I can't find a rubbish bin, I take my rubbish home with me if necessary*" pertain to time, and the items "*The available separation options cover all types of waste that I could sep-*

TABLE 3: Descriptive statistics for respondents' answers for hypothesis H2, presenting the number of answers per waste fraction generated and per waste fraction separated in both private and public spaces.

Option	Paper	Plastic	Organic waste	Glass	Metal
	n*	n	n	n	n
H2: In public spaces, mainly residual waste accumulates, while in private spaces, other waste fractions are relevant.					
Waste fraction generated					
Private space	231	224	207	196	171
Public space	124	125	67	44	42
Waste fraction separated					
Private space	228	195	88	184	153
Public space	68	73	10	31	27

** Number (n) of total respondents = 238*

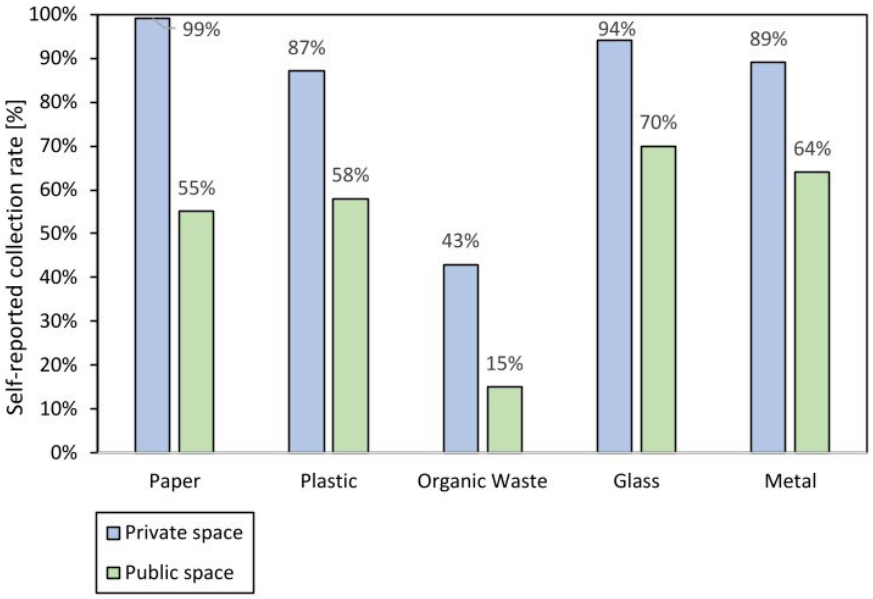

FIGURE 2: Self-reported collection rates in private and public spaces based on the questionnaire survey (n=238). The collection rate reflects the ration of separated waste fractions to the total collected waste fractions.

arate", "*It takes a long time to find the next separation option*" assess the perception of waste separation options. The statistical data is summarised in Table 2.

The items concerning time are significantly lower in private spaces (median = 1.00) than in public spaces (median = 2.50; asymptotic Wilcoxon test: $z = -11.357$, $p < 0.001$, $n = 238$ - T-test: $t(237) = -17.657$, $p < 0.05$) indicating that consumers have more time to separate their waste in private households. Using recycling bins for separate waste collection is associated with more effort in public spaces (median = 3.67) than in private spaces (median = 2.33; asymptotic Wilcoxon test: $z = -10.972$, $p < 0.001$, $n = 238$ - T-test: $t(237) = -14.930$, $p < 0.05$). The effect sizes indicate a strong impact for both time (0.736) and separation options (0.711) (Field, 2009). This supports the hypothesis that waste separation requires more effort in public areas than in private households. More effort is required in public areas as time is a limiting factor and fewer recycling options are available, both in terms of bin quantity and accessibility.

To test H4, whether people in public spaces prioritise not leaving waste in the environment over separating waste, the items were categorised into two groups: the items "It bothers me when rubbish lies on the ground or in the environment", "It is important to me that my surroundings are tidy and clean", "If I can't find a rubbish bin, I take my rubbish home with me if necessary" deal with littering, while the items "I keep recyclables with me until I find a way to separate them", "If I can't find a separation option in public, I take recyclables home and separate them there" pertain to separation facilities. As mentioned before, one item was excluded to ensure reliability. The statistical data is summarised in Table 2.

The relative importance of preventing littering is significantly higher (median = 4.47) than the separation of waste in public places (median = 3.00; asymptotic Wilcoxon test: $z = -12.356$, $p < 0.001$, $n = 238$ - T-test: $t(237) = 19.374$, $p < 0.05$). The effect size indicates a strong effect, with 0.801 (Field, 2009). Individuals consider it more important to avoid leaving their waste in the environment than to separate it. Respondents emphasise that littering is not appreciated and can be disruptive. In public spaces, the main objective is to prevent littering.

4. DISCUSSION

Several implications can be derived from the study presented: First, waste separation is typically associated with private households rather than public spaces. Questions about waste separation behaviour in public may even cause surprise. Although individuals are aware of the importance of waste separation and practice it meticulously at home, this behaviour is not always transferable to public spaces. The reason for this difference may be related to the lack of recycling bins. The availability of recycling bins clearly suggests which types of waste should be separated (Knickmeyer, 2020). The absence of public recycling bins thus suggests that separate collection is not a priority. Therefore, a shift in social norms together with improved bin availability is necessary to demonstrate the equal value of separate collection in both areas. Second, to promote separate waste collection in public, it is important to provide user-friendly waste separation facilities and to increase convenience. The biggest obstacle is the lack of recycling bins in public spaces. Another hindrance is the lack of knowledge about the locations of recycling bins. Offering the necessary infrastructure to participate in waste separation is a key factor in encouraging consumer waste separation behaviour (Bernstad, 2014; Knickmeyer, 2020; Miafodzyeva and Brandt, 2013; Zhou et al., 2022). Thirdly, consumers are often unaware of the waste they generate in public spaces. This study observed that people struggle to consciously recognise and name the different types of

waste they accumulate in public. The contributing factors to this lack of awareness are unclear, but one suggestion is that the relatively low amount of waste generated in public spaces may distort the perception of waste types. Fourthly, waste separation is not a priority in public areas. To prevent littering, consumers use the available waste bins, which are often for the collection of mixed waste. Consumers see public waste bins as collection possibilities for any type of waste and not only for residual waste.

Noticeable linguistic anomalies suggest a distinct view on waste in public spaces: The interviewees distinguished between separate collection for recyclables and the collection of residual waste when talking about household waste. For public spaces, they referred to 'normal' waste bins, which are actually waste bins to collect mixed waste/residual waste. This suggests that throwing waste into residual waste bins is considered the norm in public and that separate collection may not be practiced. Regarding public waste, some respondents stated that they 'simply' dispose of their waste in public waste bins, indicating that this is an intuitive behaviour and that separate collection is perceived as difficult and unusual.

This study focuses solely on the city of Vienna. Therefore, the results are geographically limited and cannot be generalised to other areas, as waste management systems and social norms may differ. However, the city of Vienna encompasses different relevant factors, which make the city an ideal location for such an analysis: There are differences in municipal solid waste generation between urban and rural areas. For instance, Vienna's annual residual waste generation is 74% higher (289 kg/capita) than the Austrian average (166 kg/capita) and household waste is separated less frequently in Vienna compared to other regions in Austria (BMK, 2017; StatistikAustria, 2017). Urban residents generate more waste due to their distinct consumption habits (Secondi et al., 2015). Further, the willingness to engage in pro-environmental behaviour depends on the context, such as living spaces, leisure and recreational activities, and work-related activities (Barr et al., 2011; Miao and Wei, 2013). Within the city a vast number of contextual spaces and activities are present and practiced.

Another limitation of the study is the methodology used to analyse consumer behaviour which relies heavily on self-reported data. For instance, the questionnaire survey may be subject to recall bias. Given the low level of waste generation in public spaces, respondents might find it challenging to accurately remember their waste separation activities from the previous week as it is asked in the questionnaire survey. This can lead to uncertainties in the results. Respondents may as well have difficulty identifying the correct waste fractions and their contribution due to a lack of awareness regarding the waste generated, especially in public spaces.

Moreover, the reliance on guided interviews and questionnaire surveys means that the accuracy of the results is dependent on the honesty of the respondents, without any means of checking the reliability of their answers. The results from self-reported data may be idealised for several reasons. Respondents may select their answers in favour of waste separation due to social desirability or to avoid the potential effects of stigma (Goffman, 1963b). Although, there is no evidence of systematic bias in self-reporting (Kormos and Gifford, 2014), and research has shown that the correlation between social desirability and self-reported pro-environmental attributes is low or non-existent (Kaiser et al., 1999; Milfont, 2009), the validity of self-reported data can vary (Kormos and Gifford, 2014). Despite efforts to minimise bias within this study, such as employing self-administered questionnaires and ensuring participant anonymity to reduce social pressure and social desirability bias (Kormos and Gifford, 2014), self-reported data without triangulation should be interpreted with caution and critically considered within the context. Incorporating observational studies to validate the results would further enhance the robustness of the study. However, due to time and cost constraints, such methods were not feasible for this research.

Additionally, both methods involved using a sample group consisting of individuals with a high level of education, which may introduce a sampling bias as it does not represent the diversity of Vienna`s population. The study would benefit from a larger and more representative sample to ensure comprehensive insights. Considering that the interviews predominantly included individuals who separate their household waste, it would also be beneficial for further studies to incorporate a focus group comprising individuals who do not engage in waste separation at all. Conducting interviews with this group could provide valuable insights into differing attitudes and behaviours, thereby enriching the findings. However, reaching out to this focus group may prove challenging, as their behaviour contrasts with socially desirable norms.

5. CONCLUSIONS

The literature commonly describes waste separation behaviour as uniform. However, this study shows that separation behaviour can vary across locations. The current study analysed consumers' waste separation in private and public spaces using guided interviews and an online survey. The findings indicate significant differences in separation behaviour:

a. Participation in separate waste collection is more established as a social norm in private households than in public areas.
b. Although less waste is generated in public areas, recyclables from such areas are still relevant waste fractions. Therefore, it is reasonable that recyclables in public spaces are collected separately and not as mixed waste.
c. Participating in public separate waste collection can be more complex for consumers in public areas than when in their respective private households, which clearly constitutes an obstacle to separate waste collection.
d. Respondents prioritise preventing littering over separate waste collection in public spaces.

Recovering recyclables is preferable to incineration and can contribute to increasing recycling rates in line with the Circular Economy Package. Recycling bins should not be

randomly placed, but strategically placed in public areas where it can be economically and ecologically justified. Although requiring appropriate infrastructure, public squares and areas with high foot traffic are regarded as ideal for introducing separate collection in public, as these areas have a high potential for recyclable materials (Gangl et al., 2022). Besides offering appropriate recycling bins it is clear from the study that initiatives to foster the social norm for waste separation in public spaces are necessary. This could be achieved, e.g., through informational campaigns on the bins themselves. For purposes of future research and public policy, it should be noted that respondents in this study indicated that they were not aware of the location of recycling bins in public spaces, which prevents them from participating in separate collection. It would be worthwhile to investigate whether this also applies to public spaces in the respondents' neighbourhoods. In addition to the lack of information about the location of public recycling bins, it would be worthwhile to investigate the effectiveness of signage and other means of indicating separate collection facilities in public areas. Furthermore, it remains unclear whether consumers are aware that public waste bins are intended merely for residual waste collection. It is unknown whether their separation behaviour in public would change if they possessed such knowledge.

ACKNOWLEDGEMENTS

This research has been funded by the Vienna Science and Technology Fund (WWTF) and by the State of Lower Austria [10.47379/ESR20019].

REFERENCES

Ajzen, I., 1991. The theory of planned behavior. Organ Behav Hum Decis Process 50, 179–211. https://doi.org/10.1016/0749-5978(91)90020-T

Al-mosa, Y., Parkinson, J., Rundle-Thiele, S., 2017. A Socioecological Examination of Observing Littering Behavior. Journal of Nonprofit and Public Sector Marketing 29, 235–253. https://doi.org/10.1080/10495142.2017.1326354

Barr, S., Shaw, G., Coles, T., 2011. Sustainable lifestyles: Sites, practices, and policy. Environ Plan A 43, 3011–3029. https://doi.org/10.1068/a43529

Bator, R.J., Bryan, A.D., Wesley Schultz, P., 2011. Who Gives a Hoot?: Intercept Surveys of Litterers and Disposers. Environ Behav 43, 295–315. https://doi.org/10.1177/0013916509356884

Becker, N., 2014. Increasing High Recycling Rates. Sociodemographics as an additional layer of information to improve waste management. Lunds universitet Internationella miljöinstitutet (IIIEE). https://doi.org/10.13140/RG.2.2.29133.33769

Belk, R., 2017. Sharing without caring. Cambridge Journal of Regions, Economy and Society 10, 249–261. https://doi.org/10.1093/cjres/rsw045

Berengueres, J., Alsuwairi, F., Zaki, N., Ng, T., 2013. Gamification of recycle bin with emoticons. Tokyo, Japan, pp. 83–84. https://doi.org/10.1109/HRI.2013.6483512

Bernstad, A., 2014. Household food waste separation behavior and the importance of convenience. Waste Management 34, 1317–1323. https://doi.org/10.1016/j.wasman.2014.03.013

Bilitewski, B., Härdtle, G., 2013. Abfallwirtschaft. Handbuch für Praxis und Lehre (Waste management. Handbook for practice and teaching), 4th ed. Springer Vieweg.

BMK, 2022. Kreislaufwirtschaft: Ab 2023 österreichweit einheitliche Sammlung von Kunststoffverpackung (Circular economy: Standardised collection of plastic packaging throughout Austria from 2023) [WWW Document]. URL https://infothek.bmk.gv.at/verpackungsverordnung-ab-2023-oesterreichweit-einheitliche-sammlung-von-kunststoffverpackung/ (accessed 4.25.23).

BMK, 2017. Bundesabfallwirtschaftsplan 2017 – Teil 1 (Federal Waste Management Plan 2023 – Part 1). Vienna.

Brothers, K.J., Krantz, P.J., Mcclannahan, L.E., 1994. Office paper recycling: A function of container proximity. J Appl Behav Anal 27, 153–160.

Castaldi, G., Cecere, G., Zoli, M., 2021. "Smoke on the beach": on the use of economic vs behavioral policies to reduce environmental pollution by cigarette littering. Economia Politica 38, 1025–1048. https://doi.org/10.1007/s40888-020-00205-5

Cialdini, R.B., 2003. Crafting Normative Messages to Protect the Environment. Current Directions in Psychological Science: A Journal of the American Psychological Society 12, 105–109. https://doi.org/10.1111/1467-8721.01242

Clarke, V., Braun, V., 2017. Thematic analysis. Journal of Positive Psychology. https://doi.org/10.1080/17439760.2016.1262613

Corten, R., 2019. Social dilemmas in the sharing economy. Edward Elgar Publishing.

Dur, R., Vollaard, B., 2015. The Power of a Bad Example-A Field Experiment in Household Garbage Disposal. Environ Behav 47, 970–1000. https://doi.org/10.1177/0013916514535085

EC, 2018a. Directive (EU) 2018/852 of the European Parliament and of the Council of 30 May 2018 amending Directive 94/62/EC on packaging and packaging waste.

EC, 2018b. Directive (EU) 2018/851 of the European Parliament and of the council of 30 May 2018 amending Directive 2008/98/EC on waste (Text with EEA relevance).

EC, 2008. Directive 2008/98/EC of the European Parliament and of the council of 19 November 2008 on waste and repealing certain Directives.

Field, A., 2009. Discovering Statistics Using SPSS. SAGE Publications.

Flick, U., 2007. Qualitative Sozialforschung: Eine Einführung (Qualitative Social Research: An Introduction)., 10th ed. Rowohlt Taschenbuch, Hamburg.

Gangl, K., Spitzer, F., Walter, A., Gottweis, R., Hübel, T., Keinprecht, M., 2022. Abfalltrennung und Littering im öffentlichen Raum. Ein verhaltensökonomisches Feldexperiment (Waste separation and littering in public spaces. A field experiment in behavioural economics).

GEM, 2023. Geschäftseinteilung Magistrat Wien - V001-260 (Vienna City Administration - V001-260).

Goffman, E., 1971. Relations in public. Microstudies of the public order. Routledge, New York.

Goffman, E., 1963a. Behavior in Public Spaces: Notes on the social organization of gatherings. Free Press, New York.

Goffman, E., 1963b. Stigma: Notes on Management of Spoiled Identity. Penguin, London.

Hammond, C., 2005. The wider benefits of adult learning: An illustration of the advantages of multi-method research. International Journal of Social Research Methodology: Theory and Practice 8, 239–255. https://doi.org/10.1080/13645570500155037

Hartl, B., Hofmann, E., 2024. To sort or not to sort? – Consumers' waste behavior in public. https://doi.org/10.47379/ESR20019

Jansson, J.O., 2011. Goods and service consumption in the affluent welfare state—issues for the future, in: Beyond the Consumption Bubble. Routledge, London, pp. 53–69.

Jenkins, R.R., Martinez, S.A., Palmer, K., Podolsky, M.J., 2003. The determinants of household recycling: A material-specific analysis of recycling program features and unit pricing. J Environ Econ Manage 45, 294–318. https://doi.org/10.1016/S0095-0696(02)00054-2

Jesson, J.K., Pocock, R.L., Stone, I., 2014. Barriers to recycling: A review of evidence since 2008. Birmingham.

Kaiser, F.G., Ranney, Michael., Hartig, T., Bowler, P.A., 1999. Ecological Behavior, Environmental Attitude, and Feelings of Responsibilty for the Environment. Eur Psychol 4.

Keizer, K., Lindenberg, S., Steg, L., 2011. The reversal effect of prohibition signs. Group Processes and Intergroup Relations 14, 681–688. https://doi.org/10.1177/1368430211398505

Kemp, S., 1999. Utility of public goods, in: The Elgar Companion to Consumer Research and Economic Psychology. Edward Elgar, Cheltenham, pp. 595–599.

Kladnik, V., Dworak, S., Schwarzböck, T., 2024. Composition of public waste - a case study from Austria. Waste Management 178, 210–220. https://doi.org/10.1016/j.wasman.2024.02.031

Knickmeyer, D., 2020. Social factors influencing household waste separation: A literature review on good practices to improve the recycling performance of urban areas. J Clean Prod. https://doi.org/10.1016/j.jclepro.2019.118605

Kollock, P., 1998. Social dilemmas: The Anatomy of Cooperation, Annu. Rev. Sociol.
Kormos, C., Gifford, R., 2014. The validity of self-report measures of proenvironmental behavior: Ameta-analytic review. J Environ Psychol. https://doi.org/10.1016/j.jenvp.2014.09.003
Kranert, M., 2017. Einführung in die Kreislaufwirtschaft. Planung – Recht – Verfahren (Introduction to the circular economy. Planning - Law - Procedure)., 5th ed, Einführung in die Kreislaufwirtschaft. Springer Fachmedien Wiesbaden. https://doi.org/10.1007/978-3-8348-2257-4
Leeabai, N., Suzuki, S., Jiang, Q., Dilixiati, D., Takahashi, F., 2019. The effects of setting conditions of trash bins on waste collection performance and waste separation behaviors; distance from walking path, separated setting, and arrangements. Waste Management 94, 58–67. https://doi.org/10.1016/j.wasman.2019.05.039
Liu, J.H., Sibley, C.G., 2004. Attitudes and behavior in social space: Public good interventions based on shared representations and environmental influences. J Environ Psychol 24, 373–384. https://doi.org/10.1016/j.jenvp.2003.12.003
MA23, 2023. Statistisches Jahresbuch der Stadt Wien 2023. Wien in Zahlen (Statistical Yearbook of the City of Vienna 2023. Vienna in figures). Vienna.
MA23, 2022. Wien in Zahlen 2022 (Vienna in Numbers 2022). Vienna.
MA48, 2023a. Jahresbericht 2022 (annual report 2022).
MA48, 2023b. Nicht gefährlicher Abfall – Abfallmengen Wien. Straßenkehricht (Non-hazardous waste - waste volumes Vienna. Street sweepings) [WWW Document]. URL https://www.wien.gv.at/umweltschutz/abfall/nicht-gefaehrliche-abfallmenge.html#strassenkehricht (accessed 1.3.23).
MA48, 2017. Strategische Umweltprüfung zum Wiener Abfallwirtschaftsplan (Wr. AWP) 2019-2024 und zum Wiener Abfallvermeidungsprogramm (Wr. AVP) 2019-2024. Anhang I – Ist-Zustand der Wiener Abfallwirtschaft 2017 (Langfassung). Strategic environmental assessment of the Vienna Waste Management Plan (Wiener Abfallwirtschaftsplan, Wr. AWP) 2019-2024 and the Vienna Waste Prevention Programme (Wr. AVP) 2019-2024. Annex I - Current state of Vienna's waste management 2017 (long version). Vienna.
Mayring, P., 2002. Einführung in die qualitative Sozialforschung: Eine Anleitung zu qualitativem Denken (Introduction to qualitative social research: A guide to qualitative thinking), 6th ed.
McCoy, K., Oliver, J.J., Borden, D.S., Cohn, S.I., 2018. Nudging waste diversion at Western State Colorado University: application of behavioral insights. International Journal of Sustainability in Higher Education 19, 608–621. https://doi.org/10.1108/IJSHE-05-2017-0063
Miafodzyeva, S., Brandt, N., 2013. Recycling behaviour among householders: Synthesizing determinants via a meta-analysis. Waste Biomass Valorization 4, 221–235. https://doi.org/10.1007/s12649-012-9144-4
Miao, L., Wei, W., 2013. Consumers' pro-environmental behavior and the underlying motivations: A comparison between household and hotel settings. Int J Hosp Manag 32, 102–112. https://doi.org/10.1016/j.ijhm.2012.04.008
Milfont, T.L., 2009. The effects of social desirability on self-reported environmental attitudes and ecological behaviour. Environmentalist 29, 263–269. https://doi.org/10.1007/s10669-008-9192-2
Nguyen, T.T.P., Zhu, D., Le, N.P., 2015. Factors influencing waste separation intention of residential households in a developing country: Evidence from Hanoi, Vietnam. Habitat Int 48, 169–176. https://doi.org/10.1016/j.habitatint.2015.03.013
Oskamp, S., Zelezny, L., Schultz, P.W., Hurin, S., Burkhardt, R., 1996. Commingled versus separated curbside recycling. Does sorting matter? Environ Behav 28, 73–91. https://doi.org/10.1177/0013916596281004
Ostrom, E., Ahn, T.K., 2007. The meaning of social capital and its link to collective action. Edgar Elgar, Northhampton.
Park, J., Ha, S., 2014. Understanding Consumer Recycling Behavior: Combining the Theory of Planned Behavior and the Norm Activation Model. Fam Consum Sci Res J 42, 278–291. https://doi.org/10.1111/fcsr.12061
Przyborski, A., Wohlrab-Sahr, M., 2021. Qualitative Sozialforschung (Qualitative social research). De Gruyter. https://doi.org/10.1515/9783110710663
Rousta, K., Bolton, K., Lundin, M., Dahlén, L., 2015. Quantitative assessment of distance to collection point and improved sorting information on source separation of household waste. Waste Management 40, 22–30. https://doi.org/10.1016/j.wasman.2015.03.005
Schultz, P.W., Bator, R.J., Large, L.B., Bruni, C.M., Tabanico, J.J., 2013. Littering in Context. Environ Behav 45, 35–59. https://doi.org/10.1177/0013916511412179
Secondi, L., Principato, L., Laureti, T., 2015. Household food waste behaviour in EU-27 countries: A multilevel analysis. Food Policy 56, 25–40. https://doi.org/10.1016/j.foodpol.2015.07.007
Sorkun, M.F., 2018. How do social norms influence recycling behavior in a collectivistic society? A case study from Turkey. Waste Management 80, 359–370. https://doi.org/10.1016/j.wasman.2018.09.026
StatistikAustria, 2023. Bevölkerung zu Jahresbeginn nach Bundesland, Alter, Geschlecht sowie österreichischer/ausländischer Staatsangehörigkeit seit 2002 (Population at the beginning of the year by federal state, age, gender and Austrian/foreign nationality since 2002).
StatistikAustria, 2017. Umweltbedingungen, Umweltverhalten 2015 (environmental conditions, environmental behaviour 2015).
Sussman, R., Greeno, M., Gifford, R., Scannell, L., 2013. The Effectiveness of Models and Prompts on Waste Diversion: A Field Experiment on Composting by Cafeteria Patrons. J Appl Soc Psychol 43, 24–34. https://doi.org/10.1111/j.1559-1816.2012.00978.x
Timlett, R.E., Williams, I.D., 2009. The impact of transient populations on recycling behaviour in a densely populated urban environment. Resour Conserv Recycl 53, 498–506. https://doi.org/10.1016/j.resconrec.2009.03.010
Timlett, R.E., Williams, I.D., 2008. Public participation and recycling performance in England: A comparison of tools for behaviour change. Resour Conserv Recycl 52, 622–634. https://doi.org/10.1016/j.resconrec.2007.08.003
Van Lange, P.A.M., Joireman, J., Parks, C.D., Van Dijk, E., 2013. The psychology of social dilemmas: A review. Organ Behav Hum Decis Process 120, 125–141. https://doi.org/10.1016/j.obhdp.2012.11.003
Xu, L., Ling, M., Lu, Y., Shen, M., 2017. Understanding household waste separation behaviour: Testing the roles of moral, past experience, and perceived policy effectiveness within the theory of planned behaviour. Sustainability (Switzerland) 9. https://doi.org/10.3390/su9040625
Zhang, D., Huang, G., Yin, X., Gong, Q., 2015. Residents' waste separation behaviors at the source: Using SEM with the theory of planned behavior in Guangzhou, China. Int J Environ Res Public Health 12, 9475–9491. https://doi.org/10.3390/ijerph120809475
Zhou, C., Fang, X. juan, Wang, Y. jie, Zhang, Q., 2022. The influence mechanism of household waste separation behavior among college students in the post COVID-19 pandemic period. J Mater Cycles Waste Manag 24, 784–800. https://doi.org/10.1007/s10163-022-01363-3