

# The future of waste collection in Amsterdam

Exploring the trade-offs between different water-based waste collection systems in the canal area of Amsterdam

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## Master Thesis

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Date	Friday 26 <sup>th</sup> January, 2024
To be defended in public on:	Tuesday 6 <sup>th</sup> February, 2024



## **Preface and Acknowledgements**

This thesis is the product of the graduation phase of the master's program Management of Technology to obtain the Master of Science degree at the Delft University of Technology. This thesis project was carried out in collaboration with the Municipality of Amsterdam. The primary objective was to contribute to the development of a new waste collection system for the canal area of the city of Amsterdam.

During this thesis project, I received a great deal of support. Therefore I would like to take a moment to show my gratitude.

First of all, I would like to thank my first supervisor Ir. Marcel Ludema for his support and guidance during this thesis. I appreciated our frequent meetings and the time you had available for me. Second I would like to express my gratitude to my second supervisor Prof. Neelke Doorn for her guidance during the meetings we had and the clear and constructive feedback on my work.

A special thanks to my supervisors from the municipality of Amsterdam, Marcel Stiphout and Ties van Haperen. I really appreciated the freedom I got during my research, knowing that if I needed anything you were both there to help me. Whether it was providing me with the information I needed or guiding me through the enormous organisation of the Municipality of Amsterdam to find the right person.

Not to be missed, I would like to thank all the experts and residents who participated in my research in the design workshop, by giving interviews and taking the time to complete my survey.

Additionally, I would like to express a special thanks to my girlfriend, my family, my friends, my roommates and all others who supported me while writing this thesis for supporting me, keeping me motivated and giving me some distraction when needed.

Finally, I want to express my thanks to all the colleagues from the department Afval & Grondstoffen from the municipality of Amsterdam for the nice working environment and the support I received on office days.

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*Delft; 26<sup>th</sup> January 2024*

## Summary

Heavy traffic in the city of Amsterdam has damaged the 17th-century bridges and quays over the past years. To prevent further damage and expand the lifespan of both existing and renovated structures, a maximum axle load of 7,5 tonnes is mandated in the city centre. Currently, the municipal waste collection department has a permanent exemption from this regulation due to the absence of an alternative method to collect the city's waste.

One promising solution involves re-utilising the city's waterways and employing vessels to transport waste out of the city. Two pilots involving water-based waste transport have been conducted in the city and were found to be a working proof of concept. It is, however, not known what a water-based collection system for the whole centre should look like to service the city and preserve the quays and bridges. This thesis aims to assess the trade-offs between three conceptual water-based waste collection systems (WCSs) to guide the direction for designing a suitable WCS for the city.

The three concepts examined concepts differ in the scale of the transshipment locations (the point where waste is transferred from land to water), categorised as WCSs with small- medium- and large-scale transshipment locations. The study focuses on the trade-offs between WCSs within and between the domains of social acceptance and technical feasibility.

This thesis consists of two main parts, in the first part the three water-based conceptual WCSs were defined using a design workshop. During the workshop, six employees of the municipality used different exercises to generate ideas on how waste could be collected using the waterways and to turn these ideas into conceptual designs.

In the second part of this thesis, these three conceptual WCSs were studied using a case study. The units of analysis in each of the WCSs were the social acceptance and the technical feasibility.

To evaluate the technical feasibility of each of the WCSs, expert interviews with specialists in vessels, waterways, quay walls and assets were conducted. The social acceptance of the three WCSs was studied using a survey administered to potential users of these systems. They were asked to choose between various WCSs based on walking distance, their general preferences, their preferences in specific situations and their concerns regarding these systems. Parallel to the survey, potential user interviews were conducted to gain deeper insights into respondents' reasons for preferences or aversions to specific WCSs.

The results from the expert interviews were summarised and presented in a table to provide an overview of the feasibility of the three WCSs. Survey results were depicted through graphs illustrating respondents' choices, while potential user interviews were analysed thematically, supported by quotes from the interviews.

WCS with large- and medium-scale transshipment locations were both found to be potentially feasible from a technical perspective, whereas the small-scale option was deemed unlikely to be feasible. The survey indicated that the majority of the respondents had a preference for self-disposal in containers close to their homes as opposed to having their waste collected at a self-scheduled time, requiring them to be present at home to hand over the waste to the pickup service. Additionally, respondents preferred disposal facilities not too close to their homes or within their direct line of sight. Insights from potential user interviews revealed that participants favouring self-disposal valued flexibility, while on the other hand, those preferring self-scheduled pick-up appointments believed this WCS would address the litter issue in the city.

In conclusion, a key trade-off identified was between providing residents with their most preferred waste disposal method through numerous disposal locations versus the technical challenges, if not impossibility, of realizing such a large number of locations.

Based on this, the municipality was recommended to conduct further research on WCSs with large- and medium-scale transshipment locations, alongside implementing pilot projects to test these systems in a real-world setting.

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# 1 Introduction

Our cities are growing. All over the world, there has been a trend of people moving from rural areas to cities for more than 50 years. In 1950, approximately 30% of all people lived in urban areas, which grew to 53% in 2015. For Europe, these numbers are respectively 51,7% in 1950 and 73,9% in 2015. These numbers are expected to grow in the coming years to 68,4% worldwide and 83,7% in Europe (United et al., 2018). These rising percentages combined with the growing world population (Gerland et al., 2014) leads to significant growth of cities (Kii, 2021). Besides the cities, global consumption is also growing (Kharas, 2017).

The growth of our cities and our consumption means that more transportation movements to, in and from the city (centres) are needed to fulfil all the demands of people visiting, living and working in the cities. The growing amount of transportation movements leads to congestion and nuisance, especially in the often narrow streets of city centres. One of the cities struggling with these issues is the city of Amsterdam, a historical city in the Netherlands. This city experiences an additional challenge concerning the large amount of city traffic. The city has many canals with old bridges and quay walls. Over the past years these 17th-century bridges and quays, part of the UNESCO World Heritage WHC (2010), have been damaged by the heavy city traffic. The structures were simply not designed for the weight and amount of traffic that is present in the city these days.

The damage inflicted over the past years is so large that is expected that 80 to 125 bridges and 60 kilometres of quay walls need to be restored in the next 30 years. This means partial renovation or complete replacement (Gemeente Amsterdam, 2022a). In total, the city of Amsterdam has 215 kilometres of quay walls and 850 bridges that need to be preserved to ensure the safety and functioning of the city in the coming years.

One of the ways to prevent more wear and tear on the bridges and quay walls is by limiting their usage. Usage is limited in specific situations if immediate action is needed, to prevent unsafe situations or irreparable damage (Gemeente Amsterdam, 2020). Besides that usage in general is limited by the traffic regulation 'zone heavy traffic Amsterdam' (*'zone zwaar verkeer Amsterdam'*) (Gemeente Amsterdam, 2021c). This regulation limits the axle load of traffic in the city centre to a maximum of 7.5 tonnes.

This 7.5 tonnes zone is a step forward towards the preservation of the quays and bridges but many businesses and organisations do not yet have the equipment needed to conform to these rules. And in many cases, there is no suitable equipment yet. Therefore it is possible to get an exemption from this regulation. (Gemeente Amsterdam, 2021a). Although these exemptions are currently needed for the functioning of the city they conflict with the preservation of the quays and bridges.

## 1.1 The usage of the waterways

A possible alternative for heavy, damaging trucks is the use of waterways, an ancient technique that existed long before cars were invented. Transportation of goods and people was one of the reasons for digging these canals in the first place.

In recent years, there has been a resurgence in considering the waterways for the transportation of goods. Various studies have indicated that the use of waterways can be an alternative for road traffic that is worth exploring since it enables the transport of large volumes (Lowe, 2006) and deep penetration into the city centre (Maten et al., 2003). However, not all goods are suitable for transport over water. Studies have indicated that waterways are an alternative for transportation streams with large volumes and heavy weights (Nepveu, 2020). The three most suitable streams are building materials, waste streams and non-perishable food and beverages.

This thesis focuses on the waste stream. Unlike the other two streams, the waste stream is handled for the most part by one organisation which means that adaptations in this stream can have a large impact. Besides that, this makes adapting the process easier than for the other suitable streams. All household waste in the city is handled by the municipality. To collect this waste the organisation is structurally using the heavy traffic zone exemption. The trucks used to collect the waste weigh more than 20 tonnes and there currently is no alternative available. Besides the challenges regarding the high loads on quays and bridges, there are several other challenges regarding the conventional way of waste collection that make it worthwhile looking into the waste collection system (WCS). The conventional way of waste collection and the accompanying challenges will be elaborated upon in section 1.2.

The idea of using the city's canals for waste transportation is not new, quite the opposite. Until 1993 (Smit, 1993), the waterways of Amsterdam were used to transport household waste out of the city centre. Waste was collected in several areas near the water and loaded onto a barge. These barges were then shipped to the waste incineration. After 1993 the collection method was changed and conventional garbage trucks were used. The collection areas near the water were no longer needed and the city got cleaner (Smit, 1993).

## 1.2 The conventional waste collection system and its challenges

The conventional way of waste collection in Amsterdam is as follows: Residents put their garbage bags outside on the streets, two times a week within a given time frame (for example on Monday and Thursday between 6:00 and 7:30 in the morning). The collection service then picks up these bags with a (large) garbage truck. This truck drives directly to the waste processor when full. Within this system, only residual waste is collected. Residents who want to separate waste can bring their paper and glass to containers if provided in the neighbourhood, if not separation is not possible. The conventional collection system as described above will from now on be referred to as bag-collection.

As mentioned before there are some challenges with the bag-collection system besides the heavy loads on the quays and bridges. With the bag-collection system bags are placed on the streets by residents and stay there until the collection service has picked up the bags. This enables rats and seagulls to tear open the bags which causes litter in the streets. Another challenge with the current system is that the possibilities to separate waste are limited as mentioned above. The last challenge with the current system is that this system only collects residential waste, businesses may choose their contractor to collect their waste. The freedom of choice for their contrac-

tor in itself is not a problem, but the result is a large number of transportation movements, all by heavy trucks. There are areas where up to 10 different contractors are active of which most collect more than one waste stream resulting in more than 20 trucks entering the area for an amount of waste that could have been collected using three or four trucks (T. van Haperen, personal communication, August 3, 2023). This causes not only more load on the quays and bridges than needed but also has a large impact on the traffic flows in the city.

As an alternative for bag-collection, the municipality is placing underground containers where possible. Underground containers prevent the bags on the street and allow for the separation of waste. The placement of these containers is however not possible in all areas because of the 7.5 tonnes zone and a lack of space underground. Therefore an alternative WCS is still needed.

### 1.3 Water-based waste collection pilots

Now that the WCS needs to be adapted for the preservation of the historical centre, the municipality aims to solve as many challenges as possible with the new WCS. As mentioned in section 1.1 the usage of the waterways looks promising, therefore the municipality is currently exploring and developing collection systems that utilise the waterways. Exploring the possibilities of using waterways again to collect and transport waste is done by conducting pilots. Two different pilot projects have been conducted, the first pilot project conducted was the 'Waste collection by vessel' (*'Afval ophalen per boot'*) (Gemeente Amsterdam, 2021b). In this pilot, small trucks were used to collect the garbage bags that were put outside on the streets by households. This small truck then drives to the transshipment location. A transshipment location is a location used for unloading goods from one vehicle resource and loading it onto another vehicle resource during the transportation process. In this case from a small truck to a vessel, which is done by dumping the waste in the vessel. When the vessel is full it sails away to the waste processor. In this pilot, only residual household waste is picked up and there are garbage bags on the streets two days a week similar to the conventional bag-collection method. Although this pilot contributes to the preservation of quays and bridges it does not solve the other challenges that come forward in the bag-collection method. This pilot lasted until 1 October 2023 and then was decided to continue the waste collection with the method from the pilot (Gemeente Amsterdam, 2023).

The second pilot is the 'pilot waste collection by appointment' (*'Proef afval ophalen op afspraak'*) (Gemeente Amsterdam, 2022b) in *'De Negen Straatjes'* and the *'Passeerdersgrachtbuurt'*, an area of 3x3 small streets and 4 canals in the canal ring area and a adjacent neighbourhood. In this area, residents can make an appointment with the waste collection service of the municipality of Amsterdam using an online form. In this form, residents pick a two-hour time slot in which the collection service can come by to collect their waste. Residents should store the waste inside their homes (or gardens) and hand it to the collector when they ring the doorbell; it is prohibited to put the waste outside. Small electric vehicles or cargo bikes are used to collect the waste. When the vehicle is full the vehicle or bike drives to the trans-

shipment location where the waste is transferred to a vessel by hand. In this pilot, it is possible to separate waste into five different streams: residual (which holds plastic waste, that is separated at the processor), GFTE (vegetables, fruit, garden and food scraps), paper/cardboard, glass and textile. Besides residential waste, also business waste is collected within this system. To make this possible the municipality took over the contracts businesses had with their contractors and now waste is collected using recurring appointments with these businesses. In this way, this collection method does not only solve the problems regarding the loads imposed on the quays and bridges; but also solves the other challenges from the bag-collection. The first results of this pilot indicate that storing the waste inside keeps the streets cleaner and it improves waste separation (Greven, 2023).

### 1.4 Problem statement and objective

Both pilots seem to offer a working alternative for the bag-collection that lowers the loads on the quays and bridges and one of the pilots seems to solve additional challenges from the bag-collection as well. However, the fact that a system works is of course not a guarantee that it is the most suitable solution for the challenges regarding waste collection in the city of Amsterdam. Currently, there is no knowledge of the promises and limitations of alternative water-based WCSs in the context of Amsterdam. To find a suitable solution and prevent a lock-in of technology, (a non-optimal technology or solution that becomes the standard and is very hard, and often costly, to change (Foxon, 2013)), multiple solutions should be explored.

Therefore this thesis aims to contribute to the development of a new WCS for the city of Amsterdam by guiding towards a suitable, more optimised design through exploring and comparing the promises and limitations of different waste collection systems.

### 1.5 Scale of transshipment locations

To be able to guide the municipality towards a suitable WCS, the systems compared need to be selected using a structured way. This is done by selecting one variable within the WCSs and adapting that specific variable for each WCS assessed. After comparison could then be concluded which value of the variable seems to be most promising.

In this thesis, the scale of the transshipment locations is used to generate different WCSs for comparison. This variable is used because the transshipment location is a key element of a WCS using the waterways. After all, this is the point where waste is transferred from land to water. Besides that, this variable correlates with many others such as the number of locations and the distance between locations. This correlation means that the scale of the transshipment location has a large impact on the WCS design.

### 1.6 The canal area

In figure 1 the areas where bag-collection is currently used and for which an alternative WCS is needed are displayed. The green zones are the zones where underground containers are no option because of the 7.5 tonnes zone or because of a lack of space underground. The purple zones are still under investigation, there is a possibility these zones are reach-

able without using weak quays and bridges. (M. Stiphout, personal communication, October 3, 2023) It is currently under investigation whether these zones could be serviced using underground containers. Since this is still uncertain, both the green and purple areas are included in the scope of this thesis. The grey zones are serviceable with underground containers and are therefore out of scope for this thesis. The green and purple zones together will from now on be referred to as the canal area.

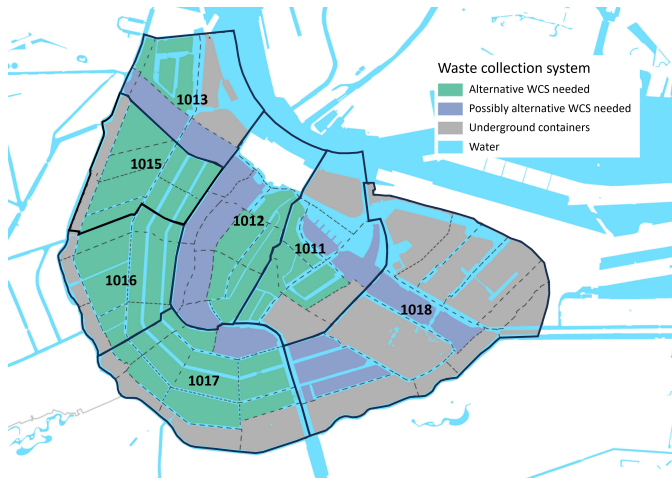


Figure 1: Canal area of Amsterdam

## 1.7 Relevance

This thesis is written as part of a graduation project for the Master's study "Management of Technology" at the Technical University Delft. This thesis fits very well in the management of technology (MOT) program since it touches on different subjects covered in the program such as business process management, inter- and intra-organisational decision making and supply chain management. Besides that, defining the trade-offs in developing a WCS can be seen as a part of managing innovation since this helps to define the direction of the innovation.

Besides the relevance specifically for the MOT master, this study also has a wider academic relevance, in the first place it adds knowledge on different WCS designs from the viewing point of technical experts and residents to the existing knowledge base. It gives insight into the trade-offs that are to be made in the city of Amsterdam, that might apply to other urban areas with similar characteristics, when developing a new WCS.

## 1.8 Research question

To explore the promises and limitations of different WCSs and contribute to the development of a new WCS the following research question has been defined:

*Which trade-offs can be identified between different water-based waste collection systems in the canal area of Amsterdam that use different scales of transshipment locations focusing on the operational viability?*

## 2 Method

To be able to answer the main research question searches in the literature were conducted on urban logistics and the success factors in urban logistics. Besides that, the scales of the transshipment locations of the different WCS were determined. Thereafter a set of sub-questions was formulated based on the theory, to help answer the main research question. Then the methods that were used to answer each of these questions are explained briefly in section 2.5.

### 2.1 Waste collection domain

The domain of waste collection has been explored by conducting exploratory searches in the literature. During the exploration of the domain of waste collection, different aspects of the domain have been identified such as the technical, social, financial, economic, juristic, environmental and political aspects. These aspects have mutual connections that influence each other which makes finding the optimal solution impossible since an optimal solution is always from a certain perspective. It is for example possible to choose the most fancy technological solution, but this can also be the most expensive one which makes it financially sub-optimal. On the other hand, the choice of the most economical option could impact the social aspect since this solution does not live up to their expectations. Therefore a balance between optimisations on different aspects needs to be found.

### 2.2 Success factors in urban logistics

Besides the domain of waste collection itself, searches have been conducted on the success factors of urban logistics. According to Kiba-Janiak (2016) six different stakeholder groups can be distinguished: local authority, residents (consumers), shippers, receivers, transport companies and public transport operators. For each stakeholder group, the success factors differ since they all have different interests.

Due to the complex social interactions that take place within urban areas, solutions in urban logistics ask for the consideration of the needs of community, governmental and corporate stakeholders (Rose et al., 2017). These needs should be taken into consideration to provide a working solution for all stakeholders.

According to Baidur & Macário (2013) the adaptation of logistical solutions to its contextual environment is essential. This adaptation should encompass considerations such as the urban landscape, the infrastructure, the skill sets of logistics company employees and the public policy. By doing so, logistical solutions become more appealing to the end customer.

Furthermore, Rose et al. (2017) claims that: "The most successful urban logistics strategy will be one that adapts to both the physical/environmental and social characteristics associated with a specific urban area type simultaneously." (p. 376)

In summary, the literature reviewed underscores that the success of urban logistics hinges on the adaptation of a logistics system to the specific nuances of the specific urban setting and to meet the diverse needs of the stakeholders involved. Adapting logistical systems to the environment ensures the development of logistics solutions that are not only

efficient but also socially and environmentally sustainable.

Adaptation to a specific urban environment could be assessed by looking at the technical feasibility of a system in a specific context. Technical feasibility provides insights into whether a proposed solution can be effectively implemented in a given urban environment. Adaption to the needs of the stakeholders in place could be assessed by looking at the acceptance of a particular solution by these stakeholders. There are however too many stakeholders to include all of them in this research. Karlsen (2002) and Mishra & Mishra (2013) state that end users are one of the most important stakeholders in the development and implementation projects. Therefore this thesis focuses on the end users. It is important to note that although Karlsen (2002) indicates that end users are most important, Karlsen (2002) also mentioned that the other stakeholder groups have an equal chance of causing challenges in the process. Therefore it is important to include other stakeholders as well later on in the development process outside of this thesis.

In this project, there are three general types of potential end users of the conceptual WCSs: residents, businesses and tourists. The tourist group is kept out of scope in this thesis since members of this group only use the system for a limited time. The other two groups are more permanent users of the system and are therefore seen as more important stakeholders in the design process of the system. According to O&S (2022b) there were approximately 26.000 registered businesses in 2022 of which 12.000 self-employed persons (O&S, 2022c). Assuming that the share of self-employed persons produces little to no waste, this means that there are approximately 14.000 registered waste-producing businesses in the city centre. In 2022 there were about 56.000 households in the city centre (O&S, 2022a), which means that there were approximately 4 times more households than businesses. Because limited time was available for this research this thesis focused on the largest group, the group of residents (households).

Therefore this thesis will focus on the trade-offs between different WCSs in the areas of technical feasibility in the specific urban environment of Amsterdam and the needs of potential residential users of the WCSs.

A trade-off is defined as: "The requirement that some of one good or one objective has to be given up to obtain more of another." (Black et al., 2012) (p. 412). In this thesis three trade-offs will be studied: the trade-offs between the WCSs present within the area of technical feasibility, the trade-offs between WCSs present within the area of social acceptance and the trade-offs between WCSs considering both the areas of technical feasibility and social acceptance.

Other aspects of the domain of waste collection are considered out of scope in this study. However, this does not mean that these aspects are unimportant. Where this thesis is limited to the abstraction level of mentioning the number of transshipment locations and the relative scale of these locations, the municipality of Amsterdam needs more detailed data to make well-informed decisions. To gain insight into the economic aspects and the resources that are needed for alternative WCSs, research is conducted by Royal Haskoning DHV, parallel to this thesis. Royal Haskoning DHV (2023) looked into the number of vessels, cargo bikes and personnel needed for a WCS similar to the WCS with large-scale

transshipment locations studied in this thesis. They aimed to compare this to the current WCS to gain insights into the differences in costs and resources needed. Besides that, they looked into WCSs with smaller-scale collection points and transfer locations. As this research was conducted parallel to this thesis, definitive results were not yet available at the time of writing.

## 2.3 The scales of the WCS compared

As mentioned in section 1.5 the scale of the transshipment locations was used as the variable over the different WCS that were compared. Because expressing the scale of transshipment locations in numbers was challenging in an early research stage the number of locations is used to express the scale. The number of locations correlates inversely proportional with the scale of the transshipment locations.

In total three WCSs were compared with different scales of transshipment locations and thus a different number of transshipment locations. By using three different amounts of transshipment locations a bisection-like search method could be used, a mathematical method for finding the minimum or maximum value of a function (Solanki et al., 2014). This means that by comparing the three WCSs on operational viability it can be determined between which two WCSs the most promising solution should lie.

The same could have been done with more than three WCS with different numbers of transshipment locations but because of time constraints, the minimum amount of points needed to narrow down the search space was used.

For this method to work three points were needed that together cover the whole spectrum of realistic options. For the WCS with the largest scale transshipment location a WCS with 5 transshipment locations was used. This is the minimum amount of locations the municipality thought was needed to service the whole canal area (T. van Haperen, personal communication, August 3, 2023). This WCS will be referred to as the WCS with the large-scale transshipment locations. For the WCS with the smallest scale transshipment location a WCS with 200 transshipment locations was used. With this number of locations, every resident has a transshipment location within 200 meters of walking distance of their house. This WCS will be referred to as the WCS with the small-scale transshipment locations. The middle scale WCS was chosen in a way that the factor between the number of transshipment locations between the small and middle, and middle and large scale locations was similar; eight and five respectively. This WCS will be referred to as the WCS with the medium-scale transshipment locations.

## 2.4 Thesis structure

This thesis is structured in two integral parts, each contributing to the overarching exploration of the trade-offs between different WCSs. This distinctive structure is designed to allow for both the development of the WCSs and an exploratory study of the trade-offs between the WCSs developed; while maintaining a chronological order which is beneficial to the readability. In the first part, the three WCS are defined using a design workshop. In the second part of this thesis, the WCSs defined in part one are studied using a case study. Within this case study both the technical feasibility and social ac-

ceptance are studied. The design of the case study itself is explained in the paragraph below.

**The case study design** In the literature, no standard case study design has been found that is suitable for studying and comparing different cases in the same contextual environment. Therefore an alternative case study design was used in this thesis, inspired by the case study designs introduced by Yin (2009). The case study design used is the single context, embedded multiple case design. See figure 2 for a visualisation of the design. In this study, three cases are studied, the three different WCSs. These three WCSs are placed within the same context, namely the city centre of Amsterdam. Within each of these WCSs, the technical feasibility and the social acceptance are analysed, as the embedded units of analysis. Because the three WCSs are placed within the same context they are comparable and this enables claims on the trade-offs between these WCSs.

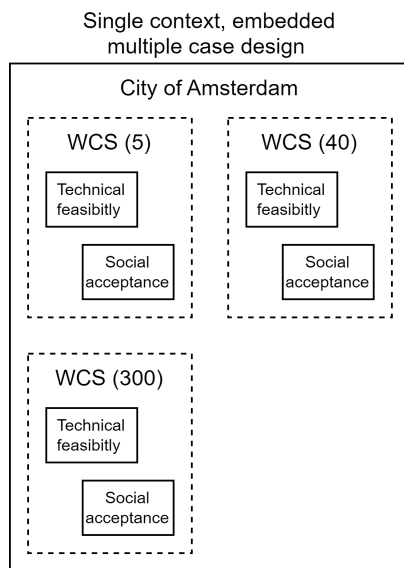


Figure 2: Single context embedded multiple case study

## 2.5 Sub-research questions

In order to answer the main research question the set of sub-research questions below has been defined, based on the theory above. The answers to these sub-research questions lead to the answer of the main research question.

1. What should the three WCSs with large-, medium- and small-scale transshipment locations look like to be compared from a technical and a social perspective?
2. How feasible are the three WCSs in terms of technical feasibility?
3. Which trade-offs can be identified between the three conceptual WCS looking from the technical perspective?
4. What is the attitude of residents towards the WCSs and the provided services by the municipality?
5. What are the underlying reasons for residents to have a certain attitude towards the different WCSs?
6. Which trade-offs can be identified between WCS looking from the user's perspective?

### 2.5.1 Defining the WCSs

To answer sub-question 1 a design workshop was used. The workshop had six participants from within the department Waste & resources, who were involved in or closely related to the pilot projects. In this design workshop, the three WCSs that are compared in this thesis were defined. A more detailed description of this workshop and the results can be found in section 3.

### 2.5.2 Study of the WCSs

To answer sub-questions 2 and 3 expert interviews were used with experts from different fields of expertise. The experts interviewed were from within or related to the municipality, but all from outside the department waste & resources. In these semi-structured interviews, the experts were shown the three conceptual WCS. They were then asked to give their opinion on technical feasibility from their point of view. A more detailed description of the expert interviews can be found in 4.1.1.

To answer sub-question 4 a survey was used under potential users of the WCSs. This survey was spread randomly and asked respondents to make choices between different ways of disposing of their waste to gain insight on their preferences. A more in-depth description of the method for this survey can be found in section 4.1.2.

To provide an answer to sub-question 5 interviews under potential users were conducted. In these semi-structured interviews residents were first asked about their preferences in waste disposal. Thereafter they were asked why they had certain preferences. The interviews with potential users are described in more detail in section 4.1.3.

The answer to sub-question 6 was provided by the combination of the survey under potential users and the interviews with potential users in sections 4.1.2 and 4.1.3.

In figure 3 an overview of this thesis' structure is provided.

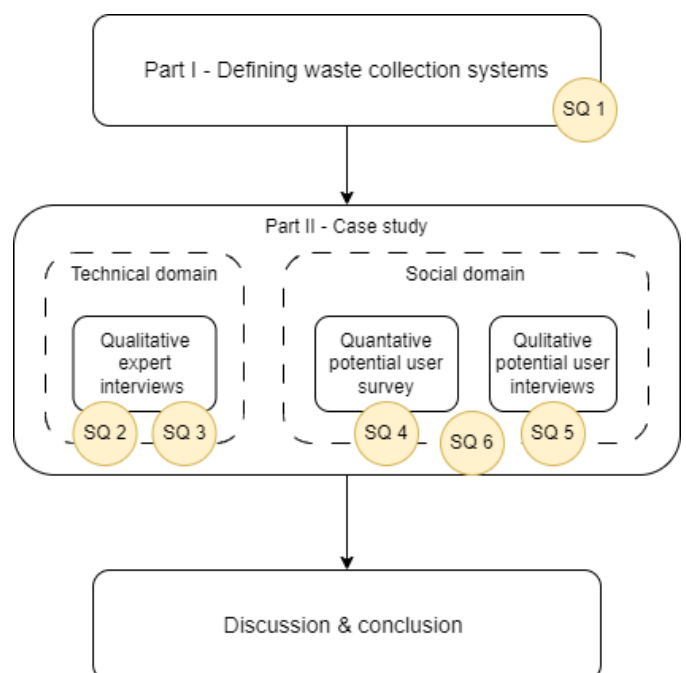


Figure 3: Overview of the thesis' structure

### 3 Part I - Defining the waste collection systems

In part I sub-research question 1 will be answered by defining the three conceptual WCSs that will be compared later on in this thesis.

#### 3.1 Method

To compare the three different WCSs, three systems were defined. This required assumptions about how the waste is collected in each of the scenarios. The main variable that was alternated between the different WCSs was the scale of the transshipment locations. Inherent in the variation in scale of the transshipment locations is a difference in the collection method that is used within the WCS. It would be for example illogical to collect waste with a light electric vehicle (LEV) and personnel when every resident has a transshipment location close by (<200m). On the other hand, it would not be accepted if residents were expected to bring their waste to one of the 5 large-scale transshipment locations at a distance of (>750m). To make informed assumptions on how the WCSs are shaped, a design workshop was used. This method was chosen because design workshops are an effective method to generate innovative ideas since this method allows different voices to be heard (Levy & Huli, 2019). By combining multiple tools and exercises in the workshop specific achievements can be reached (Chen et al., 2022). By using different exercises the aim was to generate ideas and bring these broad ideas back to a more detailed conceptual WCSs.

##### 3.1.1 Design workshop

To define the collection methods and details of the collection process a design workshop was used. All participants received a preparation document (see appendix A) 4 days in advance including a brief introduction to the research, the goal of the workshop and a preparation exercise.

The workshop was carried out with a group of six participants and the researcher himself who led the workshop. All people who contributed to the workshop were from inside the municipality or closely related. The choice was made to limit participants to people from inside the organisation to prevent the municipality from creating false expectations towards people outside the organisation before ideas were thought through thoroughly. Although the group consisted of people from within the municipality, the group invited was varied in terms of age, gender and function. Not all who were invited attended the workshop but the variety that was aimed for was there. The age of the participants varied from 20 to 55 years old, 2 of the 6 participants were women and the following functions were involved: A manager from the department Afval & Grondstoffen, a staff member within the waste collection by appointment project, Dashboard/data specialist within the waste collection by appointment project, a project manager logistics, a project advisor and former area-broker ('gebiedsmakelaar') of different neighbourhoods in the canal area and a student Technical Business Administration ('Technische bedrijfskunde') from the university of applied sciences in Amsterdam, who was doing a project for the municipality involving waste transport over water.

The two-hour workshop followed a double diamond line

structure (Council, 2007), which represents the divergence and convergence phases in the workshop. The first and third phase were diverging and the second and fourth phase were converging. During the first phase of the workshop, a workshop was used to generate ideas that could be used to shape each of the three WCSs. During this brainstorming session, all limitations that are present in the real world were kept out of consideration to stimulate creative thinking as much as possible. During the brainstorming session, a broad set of ideas on how to collect waste over the water was generated. In the second phase, three promising, broad ideas were extracted from the wide set of ideas by the participants, one for each WCS. The selection was based on the knowledge and expertise of the participants present. The ideas of which the group was convinced to have the most potential for being suitable for collecting waste in Amsterdam were chosen.

Thereafter, in the third phase, the selected ideas were further developed and expanded. The further development of the three ideas was done in two smaller groups for the sake of time and diversity. In this way, both groups could develop different versions of the ideas generated in during the brainstorming.

In the fourth phase, the set of five questions below had to be answered. These questions help to make the ideas concrete enough to be able to compare them in later stages of the study. The questions were split up into two categories that, together aim to describe the WCS in full. The first three questions, 1a, 1b and 1c, focus on the technical fleshing out and the last two questions, 2a and 2b focus on the service that is offered towards residents and businesses in each WCS.

##### 1. The technical process

- (a) What does the process look like from the front door to the transshipment location, from a technical perspective?
- (b) What does the process look like at the transshipment location, from a technical perspective?
- (c) What does the process look like from the transshipment location to outside the city, from a technical perspective?

##### 2. Service towards residents and businesses

- (a) What process does the resident or business go through to dispose their waste?
- (b) Which service does the municipality offer towards residents and businesses?

After the two groups answered the questions above they shared their ideas and clarified any ambiguities. The six possible designs were later analysed and merged by the researcher as explained in section 3.1.2.

##### 3.1.2 Data analysis

During the workshop, the questions that describe the WCSs were answered twofold by the two groups. These answers were thereafter analysed and merged by the researcher. The analysis focused on the differences between the solutions of the two groups. This was because the designs of the groups were very similar, which was logical since they were based on the same concepts defined in the brainstorming earlier. For each type of WCS, the differences between the two solutions



were mapped. This led to an overview of the differences between each pair of WCSs.

Based on the differences between the solutions developed by the two groups the researcher was able to merge each pair of designs ending up with the three WCSs that will be further researched. The ideas were merged by looking at each identified difference in the processes and selecting one of the two or more options to be part of the final WCS design. This selection was made based on the advantages and disadvantages of the concepts discussed during the workshop.

### 3.1.3 Reliability and validity

Although the design workshop could be fully repeated, using the workshop guideline and slides in appendix B, the chances of the outcomes being the same are low. This is inherent to the method chosen in this thesis. Taking into account the level of reliability possible in participative design, the method used is relatively reliable. Meaning that if the design workshop was to be repeated the results would probably not be the same but do have a large chance of being similar to the results presented here.

The validity of this part is relatively low, although the workshop could be repeated using the description of the workshop provided, the workshop guideline in appendix B, it is a single case and the results are not validated.

It is important to note that the relative reliability and relatively low validity of part I of this research may not necessarily be a problem keeping the objective of this research in mind. The results of the workshop can only differ so much since these are bounded by the scale of the transshipment locations. The type of vehicle on land or the size of the vessel could be different and this could have an impact on the trade-offs between the different concepts. However, this impact is quite small compared to the impact of the difference in scale between the concepts.

## 3.2 Results design workshop

The results of the workshop are presented in two sections, firstly the differences between the designs of the two groups are explained in section 3.2.1, in this same section is also explained which choice was made by the researcher and why. After that, the combined results for the three WCS are using text and figures in section 3.2.2.

### 3.2.1 Differences between the designs of the two groups

As said before in section 3.1.2 the two groups came up with similar designs. Since the designs were very much alike the focus in merging the designs was on the differences between them. The main differences between the two groups were found in the design of different elements and in the way of documenting the design.

The two groups had a different approach in writing down the answers to the questions and the strictness with which they answered the questions. One group used drawings on a whiteboard to visualise the three different systems and used keywords with the drawings to make sure all questions were answered. The other group mainly used keywords to describe the different systems and used an oral explanation to answer the questions

Below the differences in answers to the questions are presented per WCS.

**5 transshipment locations** One group gave two possibilities regarding the collection itself, the first one was storage behind the door and collection by ringing the bell and handing the waste to the collection service. The second one was by using a garbage chute (indoors or mounted to the facade) and collection by the collection service that emptied the chute. The other group gave only one method, collection by ringing the doorbell.

The choice was made to only include collecting by ringing the doorbell in the design of the concept since this is easier to implement and probably encounters less resistance than making adaptations to houses.

**40 transshipment locations** One group gave two possibilities for the service provided at the transshipment locations, one possibility was to have one vessel service multiple locations and have an opening schedule for each location. The other possibility was to have all locations open at any time serviced by one or more vessels. The other group gave only the possibility of having all locations open at any time.

The choice was made to assume a design in which all locations were always available. This was because during the workshop it came forward that the experience up until then was that if a schedule was used for a specific location garbage would also be placed at that location outside the specified hours. And this would result again in unwanted garbage bags on the streets.

**200 transshipment locations** One group assumed the transshipment locations to be all floating underground-like containers. The other group proposed a combination of floating containers, containers on the quays and containers integrated inside the quay walls.

The choice was made to assume a design in which a combination of floating containers and containers on the quays is used because this enables more flexibility. The option to integrate containers in the quay walls was left out of the conceptual design since this option would probably be significantly more challenging to realise than the other two.

### 3.2.2 Combined results

Based on the answers to the questions in the workshop and the choices made above, a description is given for each of the three WCS below.

#### 5 transshipment locations

##### 1. The technical process

- (a) From the front door to the transshipment location.  
*The waste is picked up at the door by a municipal employee and taken to the transshipment location by means of electric bicycles or light electric vehicles.*
- (b) At the transshipment location.  
*The transshipment takes place by emptying the load of the bicycles or light electric vehicles into the waste vessel into separate compartments for different waste flows. To make this possible either sepa-*

rate waste compartments will be used on the bike or LEV's or the unloading will be done manually by an employee.

- (c) From the transshipment location to outside the city/the processor.

*The vessel ships the waste in a fixed rhythm from the location in the city directly to the processor without any intermediate stops. Another vessel will be moored at the location in the centre to ensure the transshipment process of newly delivered waste can continue.*

- 2. The process of, and provided service towards, residents

- (a) The process for the resident

*Residents store the produced waste in their houses, for example in the garbage bin or in another suitable place of their choice. They make an appointment with the pick-up service at the time they would like to dispose their waste. This appointment can be made when needed or this can be a weekly recurring appointment with the pick-up service. When the pick-up service rings the doorbell the resident hands the waste to the employee.*

- (b) The provided service

*The municipality offers a waste collection service for the waste so that residents do not have to bring it away themselves. The residents can choose the moment themselves, but they are expected to stay at home to hand over the waste to the pick-up service, to prevent waste on the streets.*

#### **40 transshipment locations**

- 1. The technical process

- (a) From the front door to the transshipment location.

*The waste is either brought to the transshipment location by residents or the waste is picked up at the door by a municipal employee and taken to the transshipment location by means of electric bicycles or light electric vehicles.*

- (b) At the transshipment location.

*The transshipment takes place by an employee who takes over the waste from the resident and puts it in the right place on the vessel, or the transshipment takes place by emptying the load of the bicycles or light electric vehicles into the waste vessel into separate compartments for different waste flows. To make this possible, separate waste compartments on the bike or LEV's that can dump individually will be used or an employee will do the unloading manually.*

- (c) From the transshipment location to outside the city/the processor.

*The vessel ships the waste in a fixed rhythm from the location in the city directly to the processor without any intermediate stops. Another vessel will be moored at the location in the centre to ensure the transshipment process of newly delivered waste can continue.*

- 2. The process of, and provided service towards, residents

- (a) The process for the resident

*Residents store the produced waste in their houses, for example in the garbage bin or in another suitable place of their choice. From there there are two options, the first one being that a resident takes the waste to the transshipment location themselves. The second option is that they make an appointment with the pick-up service at the time they would like to dispose their waste. This appointment can be made when needed or this can be a weekly recurring appointment with the pick-up service. When the pick-up service rings the doorbell the resident hands the waste to the employee.*

- (b) The provided service

*The municipality offers a hybrid service in which residents can both bring the waste at a moment of their choice and besides that offer a waste collection service. For the pickup service, the residents can choose the moment themselves, but they are expected to stay at home to hand over the waste to the pick-up service, to prevent waste on the streets.*

#### **200 transshipment locations**

- 1. The technical process

- (a) From the front door to the transshipment location.

*The waste is brought to the transshipment location by the residents themselves.*

- (b) At the transshipment location.

*The resident disposes of the waste separately in the container on the quay or the water, this varies per location. These containers are then emptied from the water using a vessel with a crane.*

- (c) From the transshipment location to outside the city/the processor.

*A vessel sails from container to container to empty them until the vessel is fully loaded. Then the vessel sails to the processor to unload and then continues or restarts its route.*

- 2. The process of, and provided service towards, residents

- (a) The process for the resident

*Residents store the produced waste in their houses, for example in the garbage bin or in another suitable place of their choice. The resident takes the waste to the transshipment location themselves to put it into the right container. This location can be either on the quay or the water, with a safe place to transit from the quay to the location on the water.*

- (b) The provided service

*The municipality offers a service where residents can dispose of their waste at any time within 200 meters of their property, 24 hours a day, 7 days a week.*

## **4 Part II - Study of the waste collection systems**

As stated before, there were two units of analysis in this case study: the technical feasibility of each WCS and the social acceptance of each WCS. To examine the technical feasibility of

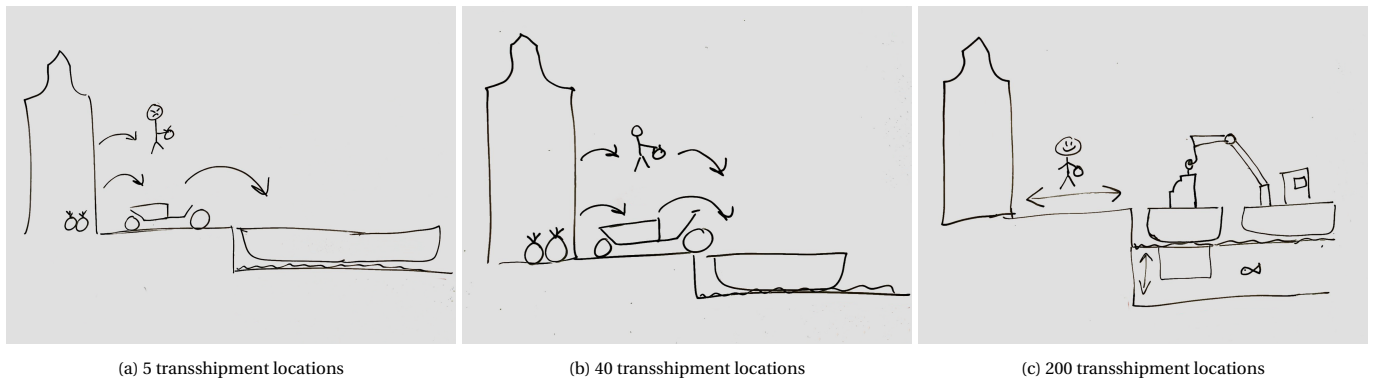


Figure 4: WCS concepts

the WCSs semi-structured expert interviews were used. For the examination of the social acceptance by users, a mixed methods approach was used. A survey was used to gain insight into the trade-offs users would make between different WCSs based on the actions they should undertake to get rid of their waste. For example, staying at home for a given period versus walking an x distance. Besides the surveys, interviews were conducted with potential future users of the system to get a more in-depth understanding of the attitude of users towards the different WCSs. This combination of methods was used to, on one hand, quantify the preferences of users and, on the other hand, gain a more qualitative understanding of users' attitudes towards the conceptual WCSs.

#### 4.1 Method

In this section, the methods used to study both units of analysis are explained in detail. The methods described in this section involve human participants. Ethical approval for this research was granted by the Human Research Ethics Committee of the TU Delft. The informed consent forms used in this research can be found in appendix D.

**Note on social acceptance research** *The survey and the interviews were conducted in the name of the student and the TU Delft and not in the name of the municipality of Amsterdam. The collaboration between the student and the municipality was mentioned in the consent forms but outside of that it was not actively advertised either. The choice to do this was made because of two reasons. In the first place to prevent the municipality from creating false expectations among citizens through the content of the survey or the interviews. In the second place for the sake of saving time, in case a survey would be held in the name of the municipality this would be conducted by a separate body in the organisation which would take a minimum of 6 to 10 weeks to realise.*

##### 4.1.1 Expert interviews

In order to gain insight into the technical feasibility of the three WCSs, semi-structured interviews were conducted with experts who have in-depth knowledge of different elements of the WCSs. This method was chosen because experts are able to assess different concepts without having all the exact numbers that would be needed in case the different WCSs were to be examined by calculating what is and what is not possible.

At least one interview was held for each technical element

that comes forward in one or more of the WCSs, with an expert on that particular element. All WCSs included in this research use space on the water, therefore an expert on the available space on the water was interviewed. The other elements on which experts were interviewed are: space in the streets, vehicles, quays, waterways, vessels, logistics on land, logistics on water, (underground)containers and transshipment techniques. For each expert, an adapted set of interview questions was used to fit the specific element of the interview.

**Sampling** For the interviews on technical feasibility, a form of purposive sampling was used, namely expert sampling (Mujere, 2016). For each technical element in the WCSs, an expert was interviewed. The experts interviewed were selected via the network of the municipality of Amsterdam and more specifically the network of the department Afval & Grondstoffen. However, all experts selected were from outside the department Afval en Grondstoffen and were not or only indirectly involved in the pilot projects. First, a list of technical elements in the WCSs was made, thereafter the researcher asked internally for people that knew of experts in that field, either internal or external of the organisation. In case multiple experts were suggested the selection depended on the availability of these experts with a preference for the most senior expert assuming these have the most extensive knowledge.

**Interview content** The interview conducted consisted of three parts, one part for each WCS. In each part, the same questions were asked to make sure the results were comparable. Concluding a few overarching questions have been asked. An interview guide can be found in appendix E.

Below an example of the questions used in the interviews can be found.

Per WCS:

- Which challenges do you see in this WCS from the perspective of your field?
- How large are these challenges from a technical view?
- What challenges do you see from other perspectives?
- What would be needed to make the WCS possible?

Overarching:

- Which solution would be the most workable from the perspective of your field?

**Data analysis** Each interview conducted with experts was distinct, with a dedicated focus on one specific technical element. Therefore a method that looks at all interviews individually was needed. The selected analysis technique was an abstractive text summarization of each interview. This way of summarization was chosen for its efficient way of summarizing text and the ability to develop new sentences that highlight the most important information, creating an overview of the relevant information from the interviews (Moratanch & Gopalan, 2016).

After summarising the interviews an overview table was created that indicates the feasibility of each WCS seen from the fields of expertise covered in this research. To validate the results presented in the table, three peer students of the researcher read the summaries and based on that filled out the table. The outcomes were similar to those of the researcher himself and can be found in appendix F. Two of the peers made a more conservative estimation of feasibility based on the summaries and one made a more progressive estimation. Based on the similarity of the results the decision was made to use the initial scores assigned to the WCSs by the researcher.

The abstractive summarization of all interviews has been carried out by one individual, the researcher himself, it is assumed that if one person does all the interpretation of all the interviews the results of these interviews are as comparable as possible. It would however have been better if this process was conducted by multiple researchers parallel so the results could be compared improving the reliability of the results. This was however not possible due to limited time and resources.

#### 4.1.2 Potential user survey

A survey among potential users was used to gain insight into the trade-offs users would make when multiple WCSs were available to them. In the first place the trade-offs between different WCS that provide different ways of waste disposal. In the second place, (possible change in) preferences when specific unfavourable conditions were added to the situations compared. In the third place, potential users were asked about the concerns residents might have regarding the WCSs.

**Focus of the survey** The survey conducted focused on two subjects, the first subject was the trade-off users make between walking an  $x$  distance versus staying home for a  $y$  period of time to dispose their waste. The second subject was the trade-off users make between the different collection methods in general.

The trade-off between walking an  $x$  distance and staying at home for a  $y$  period was done using pairwise comparisons. Each respondent was asked multiple times to choose between walking an  $x$  distance and staying at home for 2 hours at a time of their choice within a window of  $xx:xx$  and  $xx:xx$ . With each question the walking distance was extended, the distances ranged from 50m to 500m.

Other questions focused on the preferences users have regarding the WCSs beyond the service that is provided. The process that users go through to dispose their waste is not the only way users are impacted by the WCSs. They are also impacted by the changes in the streetscape and for example the

extra traffic on the road. Respondents are asked to choose between the different statements in the form of: I would rather have A with consequence X or B with consequence Y. For example, I would rather have to stay at home for two hours for a waste appointment or I would like to be able to dispose my waste in my own street with a (underground) container in the streetscape. In total 10 sets of these statements were presented in the survey to gain insight in user preferences beyond the service provided.

To give participants an idea of the distances to the container the time it would take an 'Amsterdammer' (resident of Amsterdam), on average, to walk to that container and back was used. This time was calculated using the average walking speed for both men and women worldwide, of different ages, as provided by Bohannon & Andrews (2011). The average walking speed of the Amsterdamer was then calculated using the number of men and women of different ages (O&S, 2023) living in the city centre.

**Accessibility** The aim was to make the survey as accessible as possible, therefore the whole survey, including the opening statement, was written in B1-level Dutch. This means that the large majority of the Dutch population can read and understand the text, exact numbers are unknown but estimated numbers vary between 80% and 90% (Onze Taal, n.d.). The English version was a direct translation of the Dutch version. Because of a lack of knowledge and tools, the language level of the English version has not been determined. However, since it is a direct translation of the Dutch B1-level text it was assumed that the level of English was basic enough to be accessible to a broader public.

Besides the focus on the language level of the text, the survey was extensively pretested. Feedback on the survey questions was provided by three employees from within the municipality, of which two communication specialists, three fellow students and two citizens external to the project and study area. The two citizens external to the project were also asked to complete the survey to test the estimated duration, of 5 minutes.

There was a Dutch and an English version of the survey, in the first question asked for the preferred language and branched to the questions in the language. The questions of the survey can be found in appendix G.

**Sampling** Probability sampling was used for this survey. This method was selected to give every member of the population a non-zero chance of being selected and thought that get a representative sample of the population (Sekaran & Bougie, 2016). With this sample, it was possible to make relatively strong claims about the trade-offs the population within the canal area of Amsterdam made. The survey was conducted in two different ways: online and in person. The online survey was spread to randomly selected houses in the canal area by spreading flyers with a short text, a QR code and a URL (afval020.nl) that both led to the online survey. The flyers were double-sided with one English and a Dutch side, see figure 5 for the English version.

To select the addresses that would participate a stratified sampling technique was used, the canal area was divided into strata based on the numbers in the zip code which resulted in 7 strata. Within each stratum a number of random addresses



Figure 5: Survey flyer

Area	No. of clusters
1011	9
1012	11
1013	9
1015	15
1016	8
1017	13
1018	7

Table 1: Proportional allocation

were selected, the selected address became the starting point of a cluster of 10 addresses, the address selected and the following 10 addresses on that side of the street were selected. The addresses were selected from a list of all the addresses with a residential function in the canal area. Addressed in the 'waste collection by appointment' pilot area were excluded from this list to prevent bias. The number of clusters was determined using proportional allocation, taking into account the number of addresses known as addresses with residential functions in each area. The number of addresses selected per area can be found in table 1 Using this method a proportional amount of flyers was spread in each of the seven zip code areas of the canal area. The random selection of the addresses was done using an Excel file with all the zip code and house number combinations per zip code area, filtered for addresses with a residential function. Each row was assigned a row number. The number generator was used to pick a row number in the file, and the address in that row was selected as a starting point of a cluster. In total 720 flyers with an invitation to participate in the survey were spread. The spread of the clusters was as shown in figure 6.

The choice for cluster sampling within the strata was made for the sake of time, for the representation of the population it would have been better if all addresses in the strata were randomly selected but this was not possible because of time limitations.

The in-person survey was conducted by the researcher himself with the participants of the interviews. This second way of conducting the survey was added to gain insights into the opinions of these participants in the same way as was done

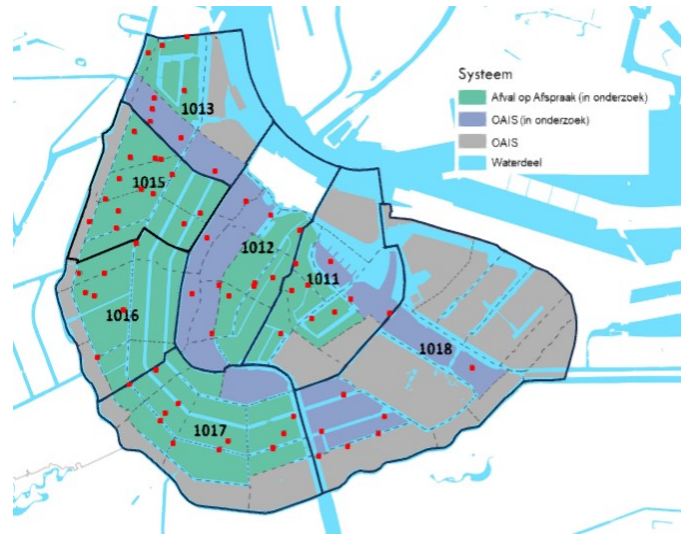


Figure 6: Cluster locations

with the rest of the respondents of the survey. This was also a way to include at least some people who might not opt-in on participating in the survey based on a flyer with a QR code or URL. Depending on the preference of the respondent the respondent filled out the online survey themselves or the questions and possible answers were read to the respondent and they could answer orally; the researcher would then fill out the online survey.

**Data analysis** The first trade-off between the distance versus the time at home was analysed by plotting the outcomes of the survey in a graph which shows the gradient transition in preference for walking to waste appointments. This was done for the whole population as well as per age group and per zip code area to identify any differences between age groups and the different areas. The data of the answers to the remaining trade-offs was presented in a table, which also indicated in favour of which collection method the preferences of respondents were.

#### 4.1.3 Potential user interviews

Although the survey made the trade-offs users would make very visible in a quantitative way, qualitative and nuanced elements users might have had were not represented by the survey. Therefore also interviews were held with potential users of the WCSs. The goal of these interviews was to gain insight into the underlying reasons potential users have a preference for or an aversion towards a WCS. The interviews were conducted using the interview guide in I.

After a short introduction from the researcher, the participants were asked to fill in the survey as mentioned in section 4.1.2. After that, the participants were asked to explain why they preferred a certain collection system. As well as whether they separate their waste and if they would prefer to separate more. Participants were asked to indicate which aspects of a new collection system they found most important, ease of use, the streetscape, minimisation of litter, sustainability or efficiency, and why. They were also asked to explain their main concerns when thinking about both ways of waste disposal, their opinion on disposal facilities in sight and their opinion on the use of a vessel instead of garbage trucks.

**Sampling** In total 7 interviews were held, one with a respondent in one of the 7 zip code areas. The respondents were selected via the area-broker (*'gebiedsmakelaars'*), an employee from the municipality that is, among others, responsible for the connection with residents and businesses in that area. These area-brokers brought the researcher in contact with residents that were willing to participate in an interview.

**Data analysis** The interviews held with possible future users are analysed using a thematic content analysis. This analysis was used to extract the general themes and ideas potential users had about the different WCSs.

## 4.2 Results case study

Below the results of the three elements of the case study are presented. First the results of the expert interviews are presented. These results give an impression of the feasibility of the different WCSs based on assessment by the experts interviewed. Then the qualitative results of the analysis of the survey for residents are presented. These results give an idea of the standing of residents of the city. At last, the qualitative results of the analysis of the potential user interviews are presented. These results give more insight into the underlying reason residents have to prefer one solution over the other or averse to one of the solutions.

### 4.2.1 Expert interview results

The results of the abstractive text summarization are presented below. The results of the expert interviews are presented in two formats. First, the abstraction summaries are presented per area of expertise in text form. Each summary presents the core concepts discussed per interview. Besides the summaries, a table is presented with an interpretation of the outcomes of the interviews. This table shows how feasible each WCS is from a certain area of expertise. The five different feasibility categories used can be found in table 5. The scores of each WCS can be found in table 6. The scores of the WCS were validated by peers of the researcher, the outcomes can be found in appendix F.

As the colour shifts from green to red the concept becomes less feasible when seen from a certain field of expertise. Green stands for feasible with currently existing assets/procedures. This does not mean that the municipality already has to own these assets but that they do exist and can be bought by the municipality. Probably feasible, means that assets or procedures need to be developed but that experts think the development should be possible. In the case of possibly feasible assets or procedures need to be developed and the expert can not indicate whether this development is possible. Unlikely feasible means that assets or procedures need to be developed and the expert has doubts on whether this development is possible. Unfeasible means that the expert indicates that the concept is unfeasible.

**Vessels** When focusing on the vessels both 5 and 40 locations are possible, the only difference between the two is that you simply need more barges with 40 containers. 200 locations could be possible when looking at the vessels, however, there will be some challenges. The largest challenge is lifting and emptying a container from a vessel, this gives prob-

lems regarding stability. This could be solved partially by using poles that touch the ground under the vessel to stabilise it, spud poles, but a permit will be needed to use those. Besides that, it will be hard to find locations throughout the city to dock, which applies to all concepts but of course, the more locations needed the larger the challenge will be. But overall, when comparing the concepts, the first two options are definitely feasible when looking at the vessels, the third option with 200 locations is challenging because of a limitation on the possible lifting weight when using a vessel.

**Waterways** Looking from the perspective of the sailing programme, the department of the municipality that divides the capacity of the waterways, the more locations needed the more challenging it will be. Public room in the city centre is scarce, both on water and on land. The fixed docking places that were assumed in the concepts presented are in all cases a challenge since this is not in line with the current policies. In the long term, these policies might change but that will always be a decision that politics has to make in the form of (adapted) policy. When trying to obtain fixed locations there will be competition from the initiatives to supply supermarkets and bars using the waterways, unless you are open to intensive space usage by multiple parties, sharing the space available. Overall, there is enough logistical capacity on the water to transport waste using the waterways, but there are limitations in terms of time of the day and the possible routes. During the day a lot of the capacity is used by recreational and passenger vessels. And there are busy points in the water network that could prevent obtaining permission to take a particular route. When comparing the concepts, fewer locations will be easier to realise, the more locations the harder it will be to obtain a fixed docking location in the centre. Therefore 5 locations will be easier to realise than 40. 200 locations is nearly impossible with the current policies. In general sharing spaces opens up possibilities, the more flexible you can be the more space there is.

**Quay walls** From the viewpoint of the quay walls, both 5 and 40 locations should be possible, with the side note that places need to be identified where the quays are strong enough to dock a vessel. Many quays are weak and are therefore unsuitable to dock a vessel. There are no standard rules that prevent docking on weak quays but frequent docking would weaken the quays even further and is therefore undesirable. Besides that, some walls have a temporary wall placed at a meter distance in front of the original which makes docking impossible. There are also many quays that are okay for now but have to be renovated in the future, which could cause problems in the long term. Overall, the fewer places on quays you need the easier it is to realise a certain solution. On the condition that you can find places where the quay walls are strong enough. Searching for space in general will be challenging, especially if you look for a place that is strong enough, without or with additional safety measures.

**Assets** Both 5 and 40 locations are possible from the viewpoint of assets, 5 locations is easier to maintain than 40, which gives more logistical challenges but should be possible. 200 locations becomes similar to regular container maintenance of underground containers. This is challenging since this is probably not possible on location which means that at least once a year, containers from all locations should be



<b>Feasible</b>	<b>Probably feasible</b>	<b>Possibly feasible</b>	<b>Unlikely feasible</b>	<b>Unfeasible</b>
The concept is feasible with currently existing assets/ procedures.	The concept is probably feasible but needs development of assets/procedures.	The concept might be feasible but there is a lot of doubt and unknowns.	The concept is unlikely to be feasible, it would cost a lot of time, money and/or effort to make it work.	The concept is unfeasible from a field of expertise.

Table 2: Feasibility categories

Area of expertise \ WCS	5 transshipment locations	40 transshipment locations	200 transshipment locations
Vessels	Feasible	Feasible	Possibly feasible
Waterways	Probably feasible	Possibly feasible	Unlikely feasible
Quay walls	Probably feasible	Probably feasible	Possibly feasible
Assets	Feasible	Probably feasible	Probably feasible

Table 3: Feasibility table

transported out of the city. Another challenge would be the power supply for press containers, the more locations you have the harder it is to find a sufficient power supply, especially with the challenges of the full electricity network. Besides that there are challenges at the processor, there are no facilities to empty press containers from a vessel there, which should be arranged. When comparing the concepts the concept with the least locations is the most favourable from the assets point of view and the one with the most locations is the most challenging but seems still possible.

#### 4.2.2 Potential user survey results

Below the results of the survey are presented. The responses to each question to the survey are explained in the text and plotted in a graph. First, the results for all respondents are presented, after that a few results are presented from certain sub-groups of respondents that differed from the total group of respondents.

**Results total group of respondents** The survey got 77 responses from a total of 720 flyers spread, which resulted in a response rate of 11%. Two respondents were from outside the canal area, according to their postal code, therefore these two respondents have been excluded from the results. The results of the 75 included responses are presented below. Using Cochran's 1977 formula was calculated that a sample size of 69 was enough for a confidence level of 90% with a margin of error of 10% for the population size of 90000 residents in the city centre of Amsterdam. The 75 responses should thus be enough for at least a 90% confidence level with a 10% error margin.

The survey was answered in Dutch by 71 respondents and in English by 4 respondents (Q1).

Based on question 2, the Response rate differed per postal code area, in areas 1011, 1012, 1013 and 1017 the response rate was lower than average, in areas 1015, 1016 and 1018 the response rate was higher than average and one respondent chose not to share the postal code. The response rate per postal code area and the number of spread flyers can be found in figure 7.

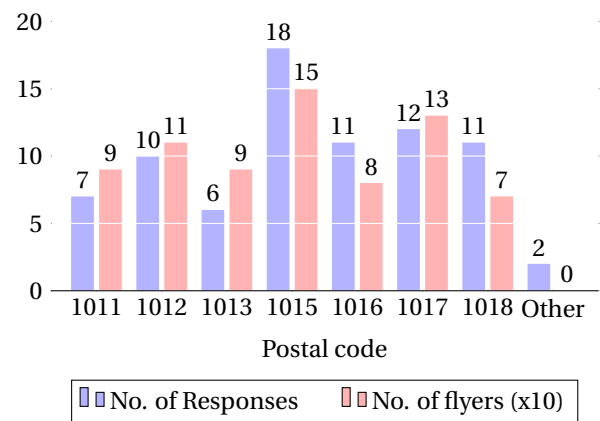


Figure 7: Responses and flyers per postal code

Based on question 3, the response rate differed per age group, respondents were on average above the age of 50. In figure 8 the spread of responses over the different age groups can be found together with the expected response if every age group was represented as present in the population of residents in the centre.

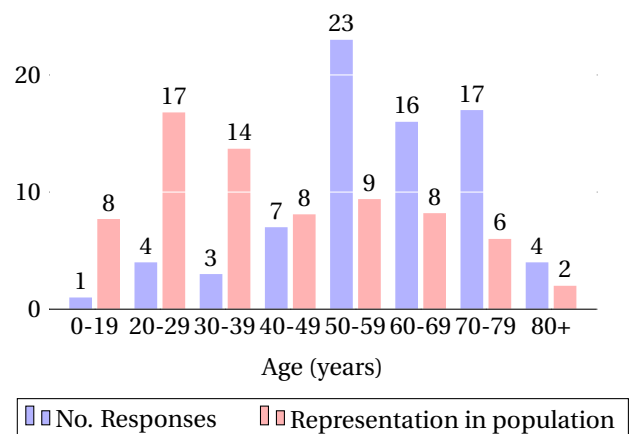


Figure 8: Age respondents

Respondents were asked to choose between self-disposal (SD) or waste on appointment (WoA) depending on the walking distance needed for self-disposal, question 4. When look-

ing only at the respondents who answered the questions, it seems that the majority of the respondents prefer to self-dispose when the walking distance is minimal. However, when the walking distance grows a growing number of respondents make the switch to Waste appointments. At a distance of 300m, only about 50% of the respondents, who answered the question, were willing to walk as opposed to staying at home for 2 hours for the waste appointment. When looking at the largest distance, 500m, only about 26% of the respondents who answered the question were willing to walk. The shifting from self-disposal to waste appointments can be seen in figure 9.

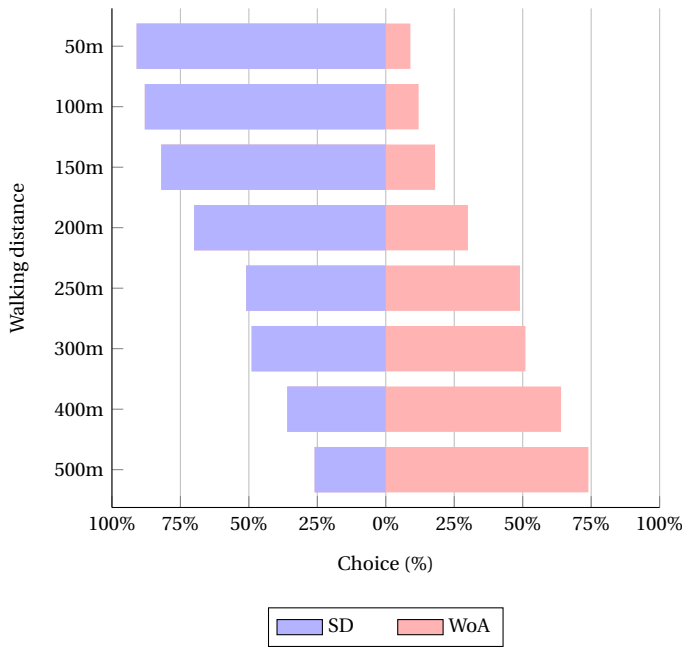


Figure 9: Self disposal vs waste on appointment

It should be noted that as the walking distance grew, a growing number of respondents chose not to answer the question. About 9% of the respondents chose not to answer the question when asked to choose between walking 50m versus staying at home for 2 hours for a waste appointment. This number gradually grows to 37% for the distances 300m, 400m and 500m. The number of respondents per distance that did not answer the question can be found in figure 10.

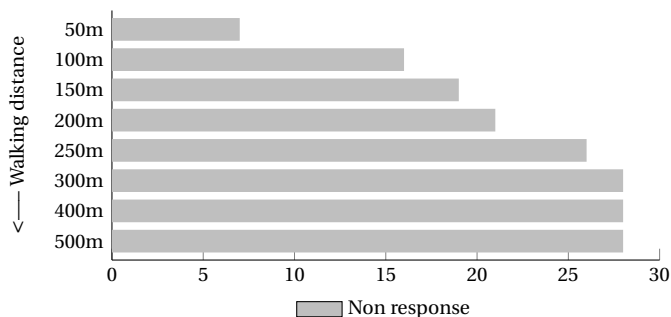


Figure 10: Non-responses

When asked for their preference between self-disposal or waste appointments without mentioning the distance to the container (Q5), 88% of the respondents preferred self-disposal, 11% preferred waste appointments and 1% did not answer the question. See figure 11.

When asked for preference between self-disposal, the current

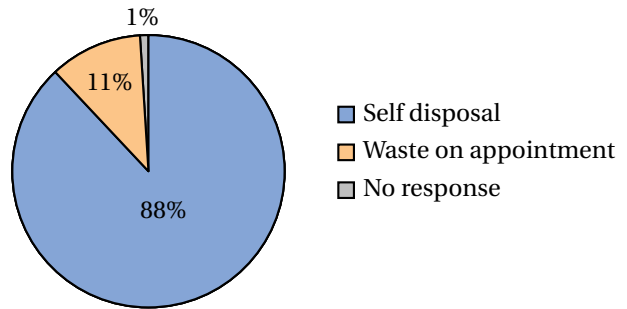


Figure 11: SD vs WoA

system (bags collection from the streets) or no preference (Q6), 63% of all respondents said they preferred self-disposal, 27% had a preference for the current system and 11% were indifferent. All respondents answered this question. See figure 12

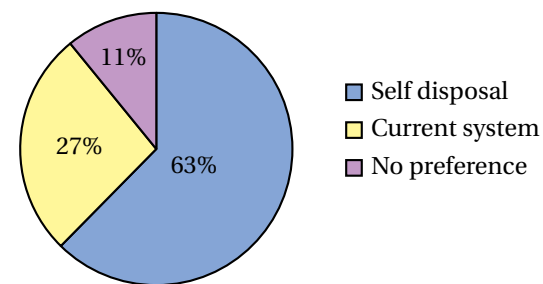


Figure 12: SD vs current system

When asked for preferences between waste on appointment, the current system (bag collection from the streets) or no preference (Q7), 75% of all respondents said to have a preference for the current system, 19% preferred waste appointments, 3% were indifferent and 3% did not answer the question. See figure 13.

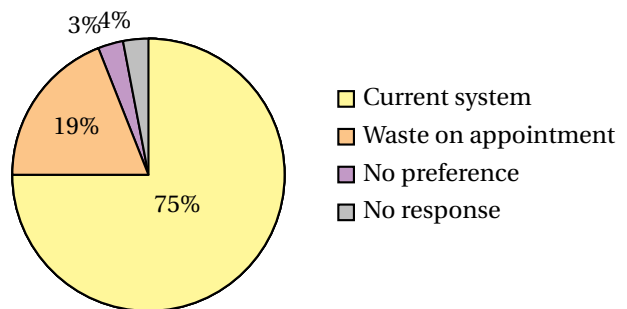


Figure 13: WoA vs current system

When respondents were asked again to choose between waste on appointment or self-disposal, but with the condition that the (underground)container for self-disposal was visible from their window (Q8), 75% of the respondents still preferred self-disposal, 23% preferred waste on appointment and 3% did not answer the question. See figure 14.

To the question of whether respondents preferred containers on the outskirts of the city centre less in sight or spread throughout the city centre but visible in the streets (Q9), 81% of all respondents preferred containers spread throughout the centre, 15% preferred containers on the outskirts of the city centre and 4% did not answer this question. See figure 15.



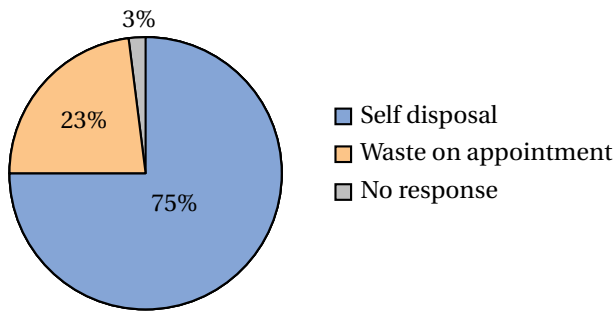


Figure 14: WoA vs SD with container visible through window

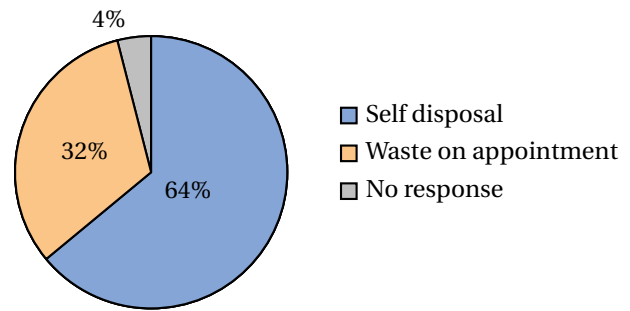


Figure 17: Self disposal with container visible through window vs waste on appointment (2)

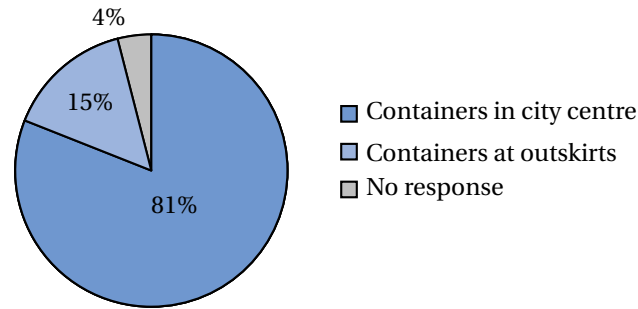


Figure 15: Preferred container location  
Containers spread throughout the city centre, more in sight vs containers at the outskirts of the city centre, less in sight

When asked if they preferred a container within a half-minute walking distance (50m) but visible from the house or a container that is at a six-minute walking distance (250m) and not visible from their house (Q10), 52% of all respondents preferred a half-minute walk, 43% of the respondents preferred a six-minute walk and 5% did not respond to the question. See figure 16.

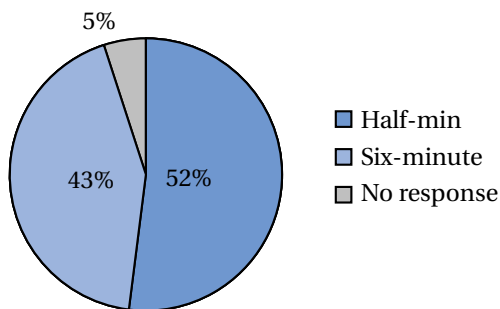


Figure 16: Preferred container location  
half-minute walk container in sight vs six-minute walk container out of sight

When respondents were asked again, in a different formulation, if they preferred to stay at home for 2 hours for a waste appointment, or if they preferred self-disposal with a container visible through their window (Q11), 64% preferred self-disposal, 32% preferred a waste appointment and 4% did not answer the question. The differences between question 8 and question 11 are the wording and a difference in explicitness (i.e. in question 11 the container in sight was specifically mentioned in both the answer and in the question, while in question 8 it was only mentioned in the question.) See figure 17.

Respondents could choose which types of nuisance they were (most) concerned about in case an (underground) container were to be placed near their house (Q12). They could choose two options from the following list: Litter around the

container, noise pollution, disrupted view, bad smell, pests or other, in case of the last option they could write an answer themselves. 65 respondents chose litter around the container, 26 chose pests, 15 for disrupted view, 12 bad smell, 12 noise pollution and 3 respondents filled out their own concerns. In figure 18 the residents' concerns are plotted.

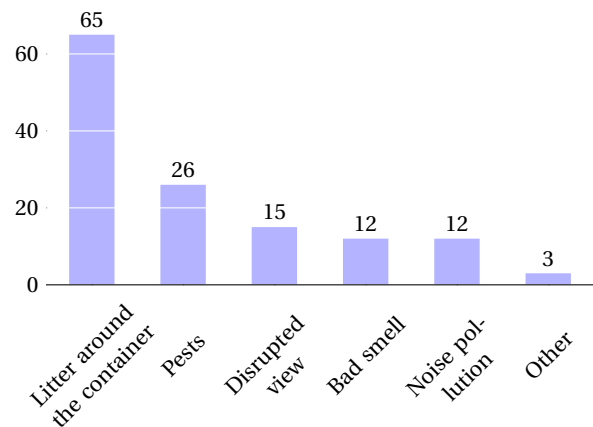


Figure 18: Concerns containers

The results of question 13, (open field for elaboration on previous answers) were so diverse they are not displayed here. For the most part, the elaborations were not specifically related to the questions or answers in the survey but were comments or complaints on the current situation regarding waste in the city. And therefore not relevant enough or the objective of this study. The answers to question 13 can be found in the raw data in appendix H.

**Deviating results sub-groups** The results as presented above are the results for the whole group of respondents, below the results presented are filtered for specific groups of respondents. For example their age, postal code or answers to other questions. When comparing the responses of different age groups a split is made at the age of 60 since this results in two almost equal groups, a group of 60- of 38 respondents and a group of 60+ with 37 respondents.

In figure 19 the choices of the 60- and 60+ groups are presented side by side. Respondents of the group younger than 60 are in general willing to walk further to self-dispose than the respondents of the older group.

A larger part of the respondents under 60 prefer self-disposal as opposed to the current system, 79% whereas only 46% of the respondents over 60 prefer self-disposal. See figure 20.

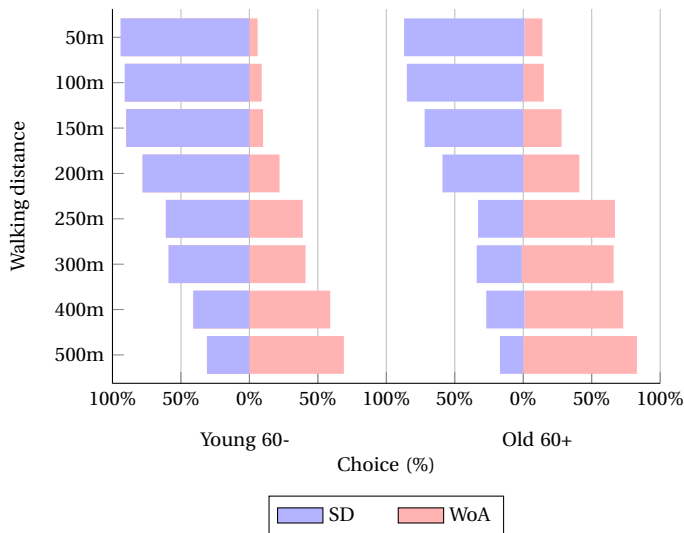


Figure 19: Difference young/old

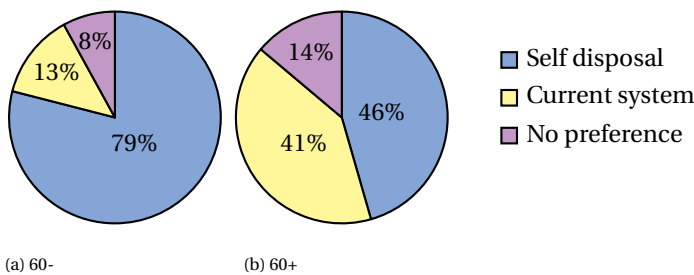


Figure 20: Difference young/old on preferred waste collection system, self-disposal vs the current system vs no preference

Of the 63 respondents that had a preference for self-disposal, 8 (13%) shifted to a preference for waste appointments and 2 (3%) did not answer when the condition was added that the container could be seen through their window.

A larger part of the younger respondents answering question 10 had a preference for walking half a minute with a container in sight than the group of older respondents as can be seen in figure 21.

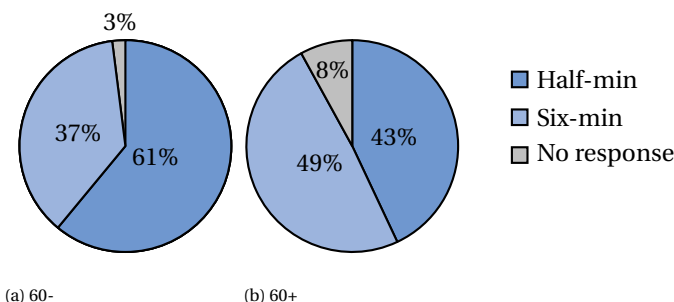


Figure 21: Difference young/old on preferred container location half-minute walk container in sight vs six-minute walk container out of sight

#### 4.2.3 Potential user interviews

After transcription, the interviews were coded using a combination of pre-defined labels and labels that were added along the way. A total of 8 themes were identified, with a total of 20 sub-themes, all 46 different labels used during coding can be classified in one of the (sub-)themes.

The results of the coding are presented in two tables. In the

first table, table 4, can be found which themes were mentioned by the respondents in each interview. In the second table, table 11, which can be found in appendix K, is shown how many times each theme/sub-theme was mentioned by the respondent during each interview.

Below is stated for each theme: in how many interviews the theme came up, what this theme means, and an example by using a quote from the interviews. All quotes from the interviews can be found in appendix L For the themes that express a preference or an aversion towards a certain collection method, the sub-themes within that theme provide the underlying reason why the respondent has a preference or an aversion. These underlying reasons are mentioned as well.

**Preference for waste on appointment** This theme came up a total of 19 times in 4 interviews, of which 16 times in 2 interviews. This theme means that the respondent expressed a preference for waste on appointment.

Q16.3: Bewoner: Nou, kijk, uiteindelijk wil ik naar een situatie toe dat we geen zwerfafval meer hebben. En dat gebeurt eigenlijk alleen maar door op te laten halen

The reasons that respondents mentioned to have a preference for waste on appointment (represented in the sub-themes) are:

- Less litter
- Ability to easily separate
- Limited storage
- Plannable pick-up moment

**Aversion to self-disposal** This theme came up a total of 13 times in 2 interviews. These were the same interviews as those that expressed a preference for waste on appointment multiple times. This theme means that the respondent expressed an aversion to self-disposal. The reasons that respondents mentioned to have an aversion towards self-disposal (represented in the sub-themes) are:

- Worried about additional waste placements/litter
- Container does not prevent waste on streets

**Preference for self-disposal** This theme came up a total of 47 times in 5 interviews. This theme means that the respondent expressed a preference for self-disposal The reasons that respondents mentioned for having a preference for waste on appointment (represented in the sub-themes) are:

- Less litter
- Flexibility
- Ability to easily separate

Within this theme, there was one other sub-theme that is worth pointing out separately, which is not a reason but a condition to prefer self-disposal. 4 of the respondents mentioned that they prefer self-disposal under the condition that the surroundings of the container were maintained well. This means that they are kept clean and free of additional placements.

Theme	Sub-theme	No. of interviews with theme	No. of interviews with sub-theme	1011	1012	1013	1015	1016	1017	1018
Preference for waste on appointment	Prefers WoA	4	3	1	1	0	0	0	1	0
	Prefers WoA Less litter		3	1	1	0	0	1	0	0
	Prefers WoA ability to easily separate		2	1	1	0	0	0	0	0
	Pref WoA, Limited storage		1	0	1	0	0	0	0	0
	Pref WoA, Likes to plan pickup at moment of choice		1	0	1	0	0	0	0	0
Aversion to self disposal	Averse SD worried about additional waste placements/litter	2	2	1	1	0	0	0	0	0
	Averse SD container does not prevent waste on streets		2	1	1	0	0	0	0	
Preference for self disposal	Prefers SD	5	5	0	0	1	1	1	1	1
	Prefers SD Less litter		5	0	0	1	1	1	1	1
	Prefers SD Flexibility		5	0	0	1	1	1	1	1
	Prefers SD ability to easily separate		3	0	0	1	1	0	0	1
	Prefers SD, if maintained well		4	0	0	1	0	1	1	1
Aversion to waste on appointment	Averse WoA, No flexibility	2	1	0	0	1	0	0	0	0
	Averse WoA, Efficiency		1	0	0	0	0	0	1	0
Not in my backyard	Worried about extra traffic	5	2	1	0	0	0	1	0	0
	Container not in (my) sight		4	1	0	0	1	1	1	0
	Boat not in (my) sight		5	1	1	0	1	1	1	0
Willing to accept a boat/container in view	Willing to accept a container in view	5	4	0	1	1	0	0	1	1
	Willing to accept a boat in view		1	0	0	0	0	1	0	0
Sees potential in using waterways	Prefers solution using the waterways	7	5	1	1	1	0	0	1	1
	Willing to accept use of waterways		6	1	1	0	1	1	1	1
Too little law enforcement	Too little law enforcement	3	3	1	0	1	0	0	0	1
	Having to call for law enforcement		1	1	0	0	0	0	0	0

Table 4: Code frequencies  
no. of interviews that include a theme

**Aversion to waste on appointment** This theme came up a total of 4 times in 2 interviews. This means that the respondent expressed an aversion towards waste on appointment. The reasons that respondents mentioned for having an aversion towards waste on appointment (represented in the sub-themes) are:

- No flexibility
- Not efficient

**Not in my backyard** This theme came up a total of 17 times in 5 interviews. This theme means that the respondent indicated that they would not like to have the collection facilities in their sight/too close to their house.

Q17.07 "Then more in sight. Not my sight."

**Willing to accept a vessel/container in view** This theme came up a total of 6 times in 5 interviews. This theme means that the respondent indicated to be willing to accept either a vessel or a container in their view.

**Sees potential in using waterways** This theme came up a total of 12 times in 7 interviews. This theme means that the respondent thinks the waterways could be used to transport waste out of the city.

**Too little law enforcement** This theme came up a total of 4 times in 3 interviews. This theme means that respondents expressed that they think there is too little law enforcement when it comes to waste.

**Types of themes** Looking at the themes, three types of themes can be identified: themes that express a preference for waste appointments, themes that express a preference for self disposal and themes that do not express a preference for one of the two. Looking at the code book in figure 4 it can be seen that respondents 1011, 1012, 1016 and 1017 expressed a preference for WoA and that respondents 1013, 1015, 1016, 1017 and 1018 expressed a preference for SD.

That means that there is an overlap there for respondents 1016 and 1017. Both respondents expressed a preference for SD multiple times, a preference for WoA once for respondent 1016 (Q16.3) and twice for respondent 1017 (Q17.10, Q17.18). Since both respondents expressed a preference for SD more frequently and this was also what they indicated during the survey they are considered part of the group that has a preference for SD. It is however important to keep in mind that these respondents have cases in which they prefer another way of disposing. For example when looking at cleanliness rather than convenience or when they think their preference would differ from day to day, see the examples below.

Q16.03: "Well, you see, ultimately, I want to move towards a situation where we no longer have litter. And that actually only happens by having it picked up."

Q17.10: "Preferably, at certain times, you'd rather take the waste away yourself, and at other times, you'd prefer it to be picked up. Resident: Yes, it's really unpredictable."

Q17.18 "Yes, then make an appointment, and I'll save it up for a week."

Looking at the underlying reasons the respondents provided to have a preference for either SD or WoA, there were two overlapping reasons. The first reason is that it would lead to less litter, all respondents preferred one or the other solution with the idea that this would lead to less litter in the streets. The second reason that overlapped was the ability to easily separate waste which was mentioned in 5 interviews.

Looking at the codebook, figure 4 it can be seen that respondents expressed a preference for a solution more frequently than they expressed aversion towards another solution.

Although all respondents do see the waterways as potential to transport waste out of the city, 5 of them indicate that they would prefer not to see the facilities to do this in their direct surroundings.

## 5 Discussion

### 5.1 Interpretation of the results

The interpretation of the results of this study is split into five parts. First the results of Part I - Defining the waste collection systems, section 3.2 are interpreted. Then the results of the three elements of Part II - Study of the waste collection systems, section 4.2.1, 4.2.2 and 4.2.3 are discussed and interpreted. After that, all results together are discussed and interpreted.

#### 5.1.1 Concept definition

In Part I - Defining the waste collection systems the different concepts were defined based on a design workshop held with employees of the department waste and resources within the municipality of Amsterdam. In this workshop, two groups developed both three concepts, these 2 x 3 concepts were brought back to the three concepts used in this research. The results of the workshop and the analysis of this workshop are three conceptual WCSs, the description of these concepts is quite broad which means that they could cover a wide range of more detailed concepts. This prevents concepts from being demised as impossible or unfeasible due to an unfortunate assumption in the details, but this also leaves quite some room for open interpretation by anyone who reads or hears the description of these concepts. This means that every expert and reader could have a slightly different idea of what each concept exactly entails. In the context of this exploratory research, the downsides of the difference in interpretation are outweighed by the benefits of giving a broad description and with that being able to compare a wider range of ideas in less detail. Therefore the exact interpretation of the concepts is left to the reader just as it was left to the experts during the research, with the note that one should be aware that others might have a different interpretation of the same concept.

#### 5.1.2 Expert interviews

It should be noted that the summaries as presented in section 4.2.1 are already an interpretation of the interviews and that table 6 is based on an interpretation of the summaries of the interviews and the interviews themselves.

As the colour shifts from green to red the concept becomes less feasible from a certain perspective. A WCS is only as feasible as its least feasible element. This means that looking at table 6 the WCS with five transshipment locations would be probably feasible, WCS with forty transshipment locations would possibly be feasible and the WCS with 200 transshipment locations would be unlikely to be feasible.

When looking at the tables in appendix F it can be seen that, although there are some differences in perception of which feasibility level a WCS gets based on the summary, the consensus is that a solution with 5 transshipment locations is more feasible than one with 40 and that both are more feasible than one with 200 transshipment locations.

#### 5.1.3 Potential user survey

In the survey, there was a growing number of non-responses in Q4, in which respondents were asked for their preference

for WCS based on the walking distance to the disposal location. At the first choice, question 4.1, the non-response was 9%, and at questions 4.6 to 4.8 the non-response was 37%. The non-response seen in the results can mean several things, it could for example indicate that one does not have a preference. It could be that it indicates a preference for another system, for example, the current system. Another option would be that one sees a repeating question formulation and does not bother to answer any further. Or it could be that one is indicating how far they are willing to walk and stop filling out the question when that limit is reached. In hindsight, it is impossible to determine what the reason was for not completing these questions.

However, by looking at the raw data there are two groups of respondents that can be identified with an answering pattern that could indicate one of the reasons mentioned above. First, a group of 15 respondents was found that started answering the questions with SD and stopping after an X number of questions, differing per respondent, ranging from 1 to 4 questions. This could indicate a respondent stops answering when their preference switches from SD to WoA. Second, a group of 7 respondents was found that only answered one question with SD, ranging from questions 2 to 6. This could indicate that these respondents only filled in the maximum distance they were willing to walk.

If it is assumed that the first group shifted their preferences to WoA upon discontinuing their responses, and the second group favoured SD at distances shorter than their response and WoA at distances longer than their response, the outcomes for Q4 alter, as depicted in figure 22.

There is no proof that this is the case but taking into account the patterns in the data it might be worth mentioning.

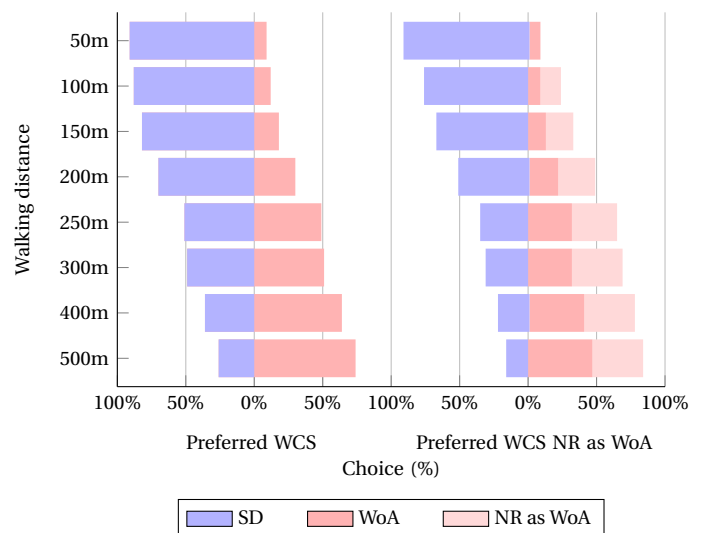


Figure 22: SD vs WoA with Non response as WoA

88% of all respondents preferred to self-disposal over WoA. When the condition was added that the container would be in their sight 13% of the respondents that previously said to prefer SD then made the switch to a preference for WoA. 42% of all respondents preferred to walk 6 minutes as opposed to half a minute to dispose their waste if this means that the container is out of their sight. These results side by side indicate that respondents like to self-dispose but would rather not see the facilities to do so. When the results of question 4 are taken into account it could be argued that the respon-

dents of this survey prefer to self-dispose their waste as close to their homes as possible but without seeing the disposal facilities.

There is a difference between the answers of the younger and older respondents of the survey. Looking at figure 19 it can be argued that younger respondents are willing to walk further than the elderly which seems logical taking into account that walking large distances becomes more challenging when a person gets older.

Looking at figure 20 it can be argued that younger respondents have a stronger preference for SD than the older group of respondents, when compared to the current system. But looking at the results of question 10, compared between young and older respondents in figure 21, it can be seen that a larger number of younger respondents prefer to walk a shorter distance and accept that they have a container in sight. Taking the results of both of these questions (Q4 and Q10) into account this could be interpreted as, that younger people have fewer problems with having collection facilities in sight than the elderly.

#### 5.1.4 Potential user interviews survey

The results of the potential user interviews indicate that less litter is a motivation for all respondents to choose the WCS of their preference. Also, the ability to separate is mentioned by proponents of both systems. On other topics, the opinions seem to differ more.

The proponents of self-disposal seem to value their flexibility in waste disposal very much. The ability to be able to choose the pick-up moment themselves does not compensate for the obligation to stay at home for two hours. This is in this instance not enough flexibility for them.

Proponents of WoA mainly think the litter problem they experience will not be solved by placing containers. The proponents of self-disposal however do think that the use of containers would solve, or at least reduce, the litter problem experienced if the containers are emptied on time and additional placements are prevented.

So although you could argue that in theory the problem of litter could also be solved using self-disposal with containers, residents remain sceptical. Whether this scepticism is justified is hard to say.

#### 5.1.5 Combined results

The results of the survey indicate that younger respondents have a preference for self-disposal as opposed to both WoA and the current system, they are willing to walk further than older respondents to self-dispose and seem to have fewer issues with having collection facilities in sight. The interviews indicated that respondents who prefer SD have this preference mainly because this gives them flexibility. With this knowledge, one might argue that younger respondents value their flexibility more than the elderly when it comes to waste disposal.

The results of the survey showed that having a container in sight caused some respondents to switch from having a preference for SD to WoA and 42% of the respondents indicated that they would rather walk further if this prevents them from having a container in their sight. The interviews also indi-

cated that respondents in general would rather not have collection facilities in their sight or too close to their homes. The survey results indicated that the underlying reasons seem to be concerns regarding litter and pests around these collection facilities and less about the facilities themselves. Respondents would like to have the pleasure of being able to self-dispose (relatively) close to their homes, but not the burden of seeing the disposal facilities and the possible disturbances that come with them. This could be described as a case of 'not in my back Yard' or NIMBY. "NIMBY is a widely used acronym for 'Not in My Back Yard', a term originating in the US to describe the arguments of those opposing development in their vicinity while not necessarily against similar development elsewhere." Kitchin & Thrift (2009).

The results of the survey showed that the majority of respondents had a preference for SD and the potential user interviews supported this. On the other hand, the expert interviews indicated that it is very challenging, if not impossible, to provide self-disposal facilities for all residents using the concept WCS with 200 transshipment locations as described in this thesis. This means that a trade-off needs to be made between what is feasible on hand and the systems desired by residents on the other hand.

## 5.2 Strengths and limitations

In this section, the strengths and limitations of this study are discussed. First, the strengths are discussed for the concept definition, the expert interviews, the potential user survey, the potential user interviews and the study in general. Thereafter the limitations are discussed, divided into the same categories.

### 5.2.1 Strengths

**Concept definition** The fact that the concepts studied in this thesis were defined by people with experience in the field of alternative ways of waste collection in the canal area of Amsterdam is a strength of this study. Because of this experience, the participants were able to foresee and tackle possible challenges already in the design workshop, improving the quality of the designs.

**Expert interviews** Looking at the expert interview it is a strength that the experts interviewed were different from the participants of the workshop. All the experts who were interviewed were not or not directly involved in the pilot projects, this allowed them to look at the WCSs presented objectively.

Besides that, the interpretation of the summaries of the expert interviews was validated by three other individuals, peer students of the researcher, and the results were similar as can be seen in appendix F.

**Potential user survey** The sample of the population was taken randomly which increased the chances of getting an outcome representative for the whole population. All postal code areas were represented in proportion to the number of residents in that area. This indicates that there is a high chance this study is generalisable for the whole area included in the research.

The survey conducted had a response rate of over 10% with its 75 responses, which resulted in a confidence level of >90%

with a margin of error of <10% for the total population of 90.000 residents in the city centre when following the formula of Cochran (1977).

**Potential user interviews** All the participants of the potential user interviews were engaged residents who knew what was going on in the neighbourhood and were aware of the ideas alive among other residents. This engagement allowed them to express not only their ideas but also represent the ideas of other residents in the neighbourhood.

**General strengths** One general strength of this study is that the research was based on the success factors in urban logistics found in the theory. Through this grounding, the usefulness of the results was strengthened.

Another strength is the mixed methods approach, which consisted of a qualitative part to explore the technical feasibility of the three concepts, a quantitative part to gain insight into the preferences of potential users and a qualitative part to gain insight into the underlying reasons. This combination of methods provided in-depth insight into the preferences of the potential users and the underlying ideas. The broad definition of the conceptual WCSs ensured that these represented a large number of more detailed WCSs which is very appropriate for an exploratory study like this.

This study can be used as a stepping stone for conducting deepening and broadening research on the future WCSs in the city of Amsterdam in order to further contribute to the preservation of this historical city.

### 5.2.2 Limitations

**Concept definition** One of the limitations of this study lies in the fundament of this study: the concept definition. The concepts generated during the workshop were limited by the knowledge and creativity of the participants. This means that there is a possibility that, if there were other participants in the workshop, the outcomes of the workshop would have been different and through that, the results of the study as a whole could have been different.

Another limitation is that, as stated in section 5.1.1, the description of the concepts is quite broad, which means that they could cover a wide range of more detailed concepts. This on the other hand limited the experts in assessing the concepts and giving detailed answers due to missing details.

**Expert interviews** A limitation lies in the number of experts consulted, this was limited due to time constraints and this caused not all fields of expertise to be represented. For example, an expert on city logistics would have been of great value to gain insight into the implications of each WCS on the situation on the road. Besides that, the majority of the experts came from within the municipality and they were all related to the municipality, which could have inflicted bias in their answers. However, most of the scope of this study has been covered by the expert interviews conducted.

The summarisation of the expert interviews was done by only one individual, the researcher himself, which could have inflicted bias in the results. Although the summaries could have been validated by letting a second individual do the summarisation of the transcript and comparing this to the

summaries of the researcher, this has not been done due to a lack of resources.

**Potential user survey** Within the results of the survey a few limitations have been identified, younger members of the population are under-represented in the survey results as can be seen in figure 8. This in combination with the fact that differences have been identified in the preferences of older and younger groups of respondents indicates that the opinion of the population as a whole probably differs from the results presented in this study. Due to a limited number of respondents, especially the younger age groups, it is not possible to correct the results for age while maintaining reliable results. Therefore the results presented are uncorrected.

**Potential user interviews** The participants of the potential user interviews were selected through the area-brokers from the municipality. This means that these participants are in one way or another more involved in the area than an average resident and often have a particular focus on waste since the area brokers were aware of the fact that the interview was regarding waste collection.

**General limitations** A limitation of the study in general is that it focused on residents as its group of users to gain insight into the trade-offs between different WCSs. Other user groups such as businesses and tourists that stay in the area were excluded from this study. Although residents might be the largest group of (potential) users in the area, the other groups of users might have a different attitude towards the WCSs studied and therefore influence the overall acceptance of a WCS.

Besides that, this study was limited to exploring the trade-offs of the WCSs in the technical and social domains. Other domains such as financials, safety, jurisdiction, economics, and sustainability were considered out of scope. But also more specific/specialist domains such as the domain of UNESCO World Heritage which preserves the Seventeenth-Century Canal Ring Area of the city and the regional water authorities, who will most certainly have an opinion regarding transporting waste over the Amsterdam canals.

The generalisability of this study to other cities is limited since the situation in the city centre of Amsterdam is unique and the structure of the city has a large influence on the WCSs included in this research. It is however not said that the trade-offs identified in this study are not present in other cities, but the presence of these trade-offs can not be assumed based on this study.

## 5.3 Future research

For future research, recommendations are made in two separate sections, in section 5.3.1 recommendations are made to improve the research conducted in this thesis. In section 5.3.2 recommendations are made for the further development of a WCS in the city of Amsterdam.

### 5.3.1 Research recommendations

To address the limitations mentioned in the previous section, future research is needed. First of all, the conceptual WCSs should be further developed for experts to be able to assess



the feasibility better and preferably in a more quantitative way. These more detailed WCSs should be assessed by experts from other domains to gain insight into the trade-offs in each of the other domains.

The number of survey respondents should be enlarged, trying to get a better representation of the younger residents in the area and make the results more generalisable for the whole population. Besides that, the group of users included in the study in general should be expanded with a focus on businesses since this user group is using the WCS permanently, as opposed to tourists, and this group produces a relatively large amount of waste.

### 5.3.2 Recommendations for further development of waste collection systems

Future research is not only needed to overcome the limitations of this study but also to further develop the new WCS in the city of Amsterdam. Therefore it is recommended to perform more pilots in the coming years testing alternative WCSs in a real-life setting. Looking at the current pilots and the possible short-term adaptations it is recommended to conduct pilots with medium-scale transshipment locations. This would be useful since medium-scale transshipment locations seem to be feasible from a technical perspective. And at the same time enlarging the number of transshipment locations seems to meet the desire of residents to self-dispose their waste relatively close to their houses.

For example, multiple transshipment locations could be used to service a neighbourhood to simulate a system with medium-sized transshipment locations. The results of this pilot could then be compared with the results of the existing pilot which could be seen as a representation of a system with large-scale transshipment locations. This comparison could be used to test whether the claim that more medium-scale transshipment locations would lead to more satisfaction of residents holds in a real-life setting.

Alternatively, smaller scale locations could be tested by for example using cargo bikes or LEVs as bringing points. These vehicles could be placed in neighbourhoods at scheduled times, residents could then dispose their waste at these points. When full the vehicle could bring the waste to a large-scale transshipment location.

When looking at the medium term, 5 to 10 years, it is recommended to look into the possibilities of sharing transshipment locations with other users and conduct pilots to test such a system. Such a pilot would be a very challenging one but looking at the results of this research, also a very promising one.

An example of such a pilot would be a pilot in which medium-sized transshipment locations are shared with other users of the waterways such as suppliers for bars and restaurants, supermarkets and other businesses. Based on the results of the research in this thesis such a pilot would be promising since it combines the preferences of residential users with a scale of transshipment locations that is technically feasible and a way of obtaining and using these locations that is the most promising according to experts.

In order to be able to conduct such a pilot preliminary research will be needed on the possibilities of sharing transshipment locations, the available partners, the available lo-

cations and the development of a WCS that is suitable for the sharing of transshipment locations.

The Department of Waste and Resources could consider taking a leading role in this research and pilot since this enables them to steer this innovation and at the same time include other departments in this innovation of the city.

Although a solution with close to 200 transshipment locations is very unlikely in the near future, due to technical limitations, this idea should be kept in mind for the long term. Future innovations in engineering could for example take away the limitations currently present.

## 6 Conclusion

This research aimed to identify the trade-offs between different waste collection systems based on transport via water in the canal area of Amsterdam that use either large, medium or small-scale transfer locations to transfer waste streams from road transport to waterborne transport, looking at the technical feasibility and the social acceptance of the solutions by stakeholders. In this thesis, several trade-offs have been identified.

Within the technical domain, a trade-off has been identified between working with a limited amount of very hard-to-obtain permanent transfer locations solely for transferring waste versus working with a larger number of easier-to-obtain transfer locations shared with other parties. Obtaining a large number of permanent 24/7 available locations was found to be impossible. When permanent locations are obtained that are available for the transshipment of waste 24/7, which is perceived as positive, only a limited amount of locations can be obtained which is perceived as negative. When more transshipment locations are obtained, which is perceived as positive, these locations need to be shared with other services, this, however, brings additional challenges which is perceived as negative.

Within the domain of social acceptance, a trade-off has been identified between giving residents a self-disposal location close to their homes versus keeping these collecting facilities out of sight. When more residents get a disposal location close to their homes, which is perceived as positive, this also means that more residents will have these facilities in sight which is perceived as negative.

Between the technical domain and the domain of social acceptance, a trade-off has been identified between residents who desire disposal locations close to their homes which means a large number of locations is needed and the technical experts that indicate that the realisation of such a large number of locations is very challenging if not impossible. When more containers are placed, which is perceived as positive by residents, this also means that finding and obtaining these locations becomes more challenging which is perceived as negative.

By identifying these trade-offs this research contributed to guiding the direction to a solution for the waste collection challenges in the city of Amsterdam. Further research is needed to gain insight into the feasibility of the different WCS in other domains.

Based on these conclusions the municipality of Amsterdam should consider carrying out further research focusing on

WCSs with medium-scale transshipment locations in the short term, looking at the feasibility of these systems seen from other domains and including a larger group of users. At the same time, pilots could be conducted to test medium-scale systems in a real-life setting. Besides that smaller scale locations could be tested by using bringing points in the form of a cargo bike or LEV.

Additionally, in the medium term, the municipality should consider conducting pilots in which transshipment locations are shared with other services since this is one of the most promising solutions according to the research conducted in this thesis because it meets the demands of residents and at the same time seems to be technically one of the more feasible solutions.

## **Abbreviations**

LEV	Light Electric Vehicle
SD	Self disposal
WCS	Waste Collection System
WoA	Wastes on Appointment
Q	Question (in the survey)
Qxx.xx	Quote (from interviews)



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# Appendices

## A Workshop preparation

### Vorbereiding workshop 06-10-23

Ter voorbereiding op de workshop zou ik jullie willen vragen onderstaande tekst door te lezen en de opdracht gedurende deze week uit te voeren.

### Mijn onderzoek

Ik doe onderzoek naar de trade-offs die er zijn tussen verschillende inzamelconcepten. Dit is van belang om er voor te zorgen dat de gemeente goed geïnformeerde keuzes kan maken mbt de richting die zij op willen met de afvalinzameling in de toekomst.

Momenteel wordt er een mogelijke invulling getest in de 9 straatjes, het is echter niet gezegd dat deze invulling van afval over water ook de meest optimale is om in de toekomst uit te rollen naar de rest van het centrum. Vandaar dat ik met mijn onderzoek wil verkennen welke voor en nadelen andere concepten met zich meebrengen. Zo heb ik het plan een concept uit te werken dat lijkt op de invulling van de 9 straatjes, met 5 overslaglocaties verdeeld over het centrum. Maar daarnaast ook te kijken wat er gebeurt wanneer er met 300 locaties wordt gewerkt waar elke bewoner zelf afval heen kan brengen en een tussenvorm met 40 overslaglocaties.

Om deze concepten met elkaar te kunnen vergelijken moet voor elk van deze concepten een invulling worden bedacht. Omdat mijn onderzoek mogelijk invloed kan hebben op de toekomst van het project afval over water wil ik graag zo veel mogelijk input van de betrokken mensen en wil ik jullie dan ook vragen mee te denken over deze invulling.

### Het doel van de workshop

Het doel van de workshop is om invulling te geven aan de 3 concepten die ik ga vergelijken. Met de invulling van concepten wordt het process bedoeld wat het afval doorloopt vanaf de voordeur van bewoners tot en met het transport over water.

Het is van belang dat we hier samen goed over nadenken want hoe beter de uitgewerkte ideeën zijn, hoe meer waarde mijn onderzoek kan toevoegen voor de gemeente. Ik wil tijdens de workshop eerst een set aan creatieve ideeën genereren voor de invulling van de verschillende concepten, om deze vervolgens te stroomlijnen naar realistische, werkbare oplossingen. De kaders waarbinnen we gaan denken zijn tijdens de brainstorm onbeperkt, alles kan en mag, Tijdens het stroomlijnen van de concepten zijn de kaders als volgt: De technische oplossingen die we gebruiken moet bewezen technologie zijn, dit wil zeggen dat de technologie bewezen moet werken maar nog niet perse op de markt hoeft te zijn.

### Opdracht voor deze week

Als voorbereiding op de workshop wil ik jullie vragen om na te denken over oplossingen gerelateerd aan afval die jij in het buitenland hebt gezien, die mogelijk nuttig kunnen zijn voor Amsterdam.

### Agenda

- Introductie (10 min)
  - o Het doel van de workshop
  - o Agenda
  - o Regels
- Ice-breaker (15 min)
- Brainstorm (35 min)
  - o Individueel ideeën opschrijven
  - o Ideeën delen en samenvoegen
- Ideeën uitwerken/stroomlijnen (45 min)
- Afsluiting (5 min)

## B Workshop guideline

### Workshop Guide: Defining water based waste collection systems

*Chiel van Baars | October 2023*

#### Objective

Defining three waste collection systems (WCSs) that can be assessed on different aspects later on in order to identify the trade-offs between the different systems. The aim is to define three water based WCSs systems, based on large, medium and small scale transshipment locations based on the prior knowledge of the participants.

#### Participants

The participants were mainly municipal employees from within or closely related to the pilot projects that use boats to transfer waste and one student that was doing a project on the same subject.

- Program manager
- Data/dashboard specialist
- Logistical... Henk
- Student from HvA
- Project manager/area broker
- Project member

#### Procedure

At least 5 days in advance all participants receive the preparation document (see below), which prepares them for the workshop by explaining the objective of the workshop, and giving them an assignment as preparation for the brainstorm.

On the day of the workshop prepare the room by putting post-its and pens on the table, provide at least two whiteboards or large pieces of paper to write on and start the PowerPoint presentation.

When every participant is in the room or it is time to start, by shortly repeating the goal of the workshop, showing the agenda and explaining the rules of the brainstorm. Then the workshop starts with an icebreaker which is the warmup round for the brainstorm as well.

During the brainstorm it is not allowed to assess ideas and to mention impossibilities of these ideas, it is however allowed and even promoted to build on ideas mentioned. During the brainstorm all participants write ideas on post-its, three ideas per system, a total of 9 ideas per person. Then every individual can tell which ideas they wrote down, if participants wrote down the same idea these can be skipped. Participants are encouraged to build on the ideas they hear and write down more ideas if these come to mind.

Then the group selects 1 or 2 ideas per system, of which they think have the most potential from the ideas on the table.

After the brainstorm split the group in two, and each group needs to elaborate on the ideas picked by describing the technical elements of the systems and the service that is provided towards residents. This is done for each of the three systems.

At the end of the workshop there should be 6 descriptions of conceptual WCS, two with small, two with medium and two with large scale transshipment locations.



**Gemeente Amsterdam**

# Workshop aval over water

06/10/23

06-10-2023

1

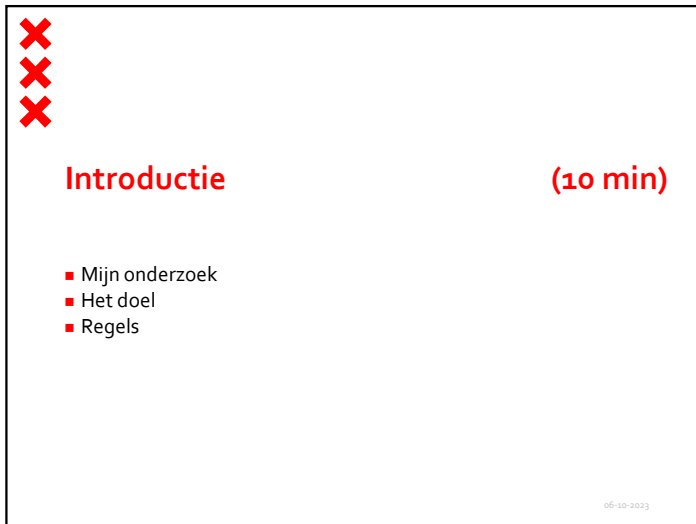


## Agenda

- Intro (10 min)
- Ice-breaker (15 min)
- Brainstrom (35 min)
- Uitwerken (45 min)
- Afsluiting (5 min)

06-10-2023

2

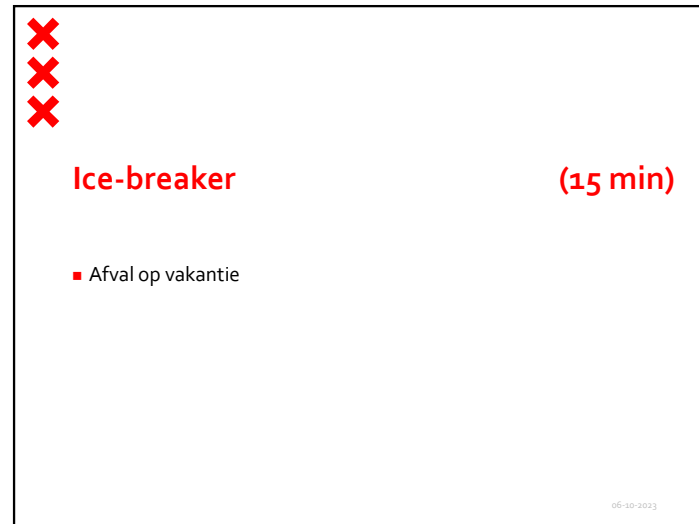


## Introductie (10 min)

- Mijn onderzoek
- Het doel
- Regels

06-10-2023

3

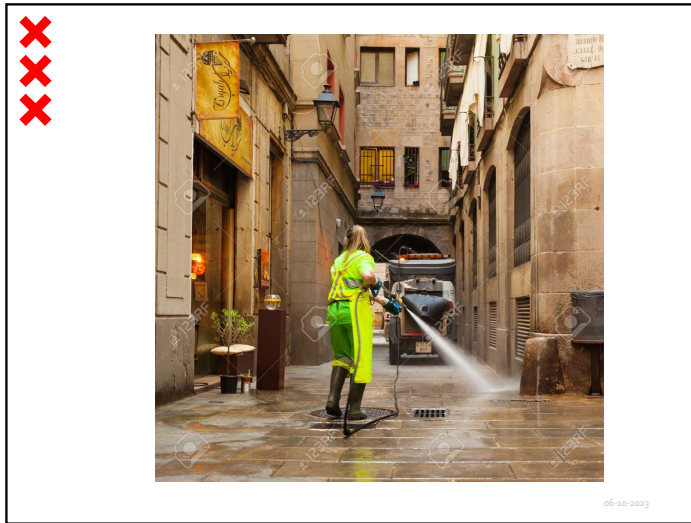


## Ice-breaker (15 min)

- Afval op vakantie

06-10-2023

4



5



6

❌  
 ❌  
 ❌

**Ice-breaker** (15 min)


- Worst idea

7

❌ Met een kano of zwemmend  
 ❌  
 ❌

 A collage of three images showing a canal scene. The top image shows a yellow kayak on the water. The middle image shows a blue kayak with a person in an orange jacket on the water. The bottom image shows a person swimming in the canal. The banks of the canal are lined with many black trash bags.

8




**Brainstorm individueel (5 min)**

- 5 locaties
- 40 locaties
- 300 locaties

Per concept, 3 ideeën op een post-it

06-10-2023

9



**Brainstorm (15 min)**

- Licht kort je ideeën toe aan de rest
- Voel je vrij om nieuwe ideeën opgedaan aan de hand van wat je hoort op te schrijven

06-10-2023

10




**Selectie van ideeën met potentie (15 min)**

- We gaan per concept minimaal 1 en maximaal 2 ideeën selecteren
- Ideeën hoeven niet perfect te zijn maar moeten veelbelovend zijn

06-10-2023

11



**Uitwerken (3x 15 min)**

- Op papier tekenen of beschrijven hoe het process er uit kan zien
- Proven technology (binnen 5 jaar)

06-10-2023

12




## Uitwerken, 5 locaties (15 min)

- Op papier tekenen of beschrijven hoe het process er uit kan zien
- Proven technology (binnen 5 jaar)
- De technische invulling van de oplossingen
  - Van de deur tot overslag
  - Overslag
  - Van overslag naar buiten de stad
- De dienstverlening richting bewoners en ondernemers
  - Wat is het process wat de bewoner of ondernemer doorloopt
  - Welke dienst biedt de gemeente aan?

06-10-2023

13



## Uitwerken, 40 locaties (15 min)

- Op papier tekenen of beschrijven hoe het process er uit kan zien
- Proven technology (binnen 5 jaar)
- De technische invulling van de oplossingen
  - Van de deur tot overslag
  - Overslag
  - Van overslag naar buiten de stad
- De dienstverlening richting bewoners en ondernemers
  - Wat is het process wat de bewoner of ondernemer doorloopt
  - Welke dienst biedt de gemeente aan?

06-10-2023

14



## Uitwerken, 300 locaties (15 min)

- Op papier tekenen of beschrijven hoe het process er uit kan zien
- Proven technology (binnen 5 jaar)
- De technische invulling van de oplossingen
  - Van de deur tot overslag
  - Overslag
  - Van overslag naar buiten de stad
- De dienstverlening richting bewoners en ondernemers
  - Wat is het process wat de bewoner of ondernemer doorloopt
  - Welke dienst biedt de gemeente aan?

06-10-2023

15



Gemeente  
Amsterdam

# Bedankt!

06-10-2023

16



## C Letter of Ethical approval

Date 07-Jan-2024  
Contact person Grace van Arkel, Policy Advisor  
Academic Integrity  
E-mail E.G.vanArkel@tudelft.nl



Human Research Ethics  
Committee TU Delft  
(<http://hrec.tudelft.nl>)

Visiting address  
Jaffalaan 5 (building 31)  
2628 BX Delft

Postal address  
P.O. Box 5015 2600 GA Delft  
The Netherlands

*Ethics Approval Application: The future of waste collection in Amsterdam*  
*Applicant: Baars, Chiel van*

Dear Chiel van Baars,

It is a pleasure to inform you that your application mentioned above has been approved.

Thanks very much for your submission to the HREC which has been approved.

In addition to any specific conditions or notes, the HREC provides the following standard advice to all applicants:

- In light of recent tax changes, we advise that you confirm any proposed remuneration of research subjects with your faculty contract manager before going ahead.
- Please make sure when you carry out your research that you confirm contemporary covid protocols with your faculty HSE advisor, and that ongoing covid risks and precautions are flagged in the informed consent - with particular attention to this where there are physically vulnerable (eg: elderly or with underlying conditions) participants involved.
- Our default advice is not to publish transcripts or transcript summaries, but to retain these privately for specific purposes/checking; and if they are to be made public then only if fully anonymised and the transcript/summary itself approved by participants for specific purpose.
- Where there are collaborating (including funding) partners, appropriate formal agreements including clarity on responsibilities, including data ownership, responsibilities and access, should be in place and that relevant aspects of such agreements (such as access to raw or other data) are clear in the Informed Consent.

Good luck with your research!

Sincerely,

Dr. Ir. U. Pesch  
Chair HREC  
Faculty of Technology, Policy and Management

## D Informed consent forms

### Opening statement Survey (EN)

Dear resident,

Thank you for participating in this study. This research is a collaboration between the Delft University of Technology and the municipality of Amsterdam.

As you may know, we aim to minimize the presence of large trucks in the city center. Therefore, we are exploring alternative methods for waste collection that impose a lower burden on the city. We are interested in your preferences when choosing between different waste collection methods. The results will be used for my graduation research and to provide recommendations to the municipality of Amsterdam.

Completing the survey will take approximately 5 minutes. Participation is voluntary, and you may skip questions if you prefer. The questionnaire is anonymous and will only be saved upon submission. Withdrawal of answers after submission is not possible due to the anonymity of the survey.

For any questions, feel free to email me at [C.vanbaars@student.tudelft.nl](mailto:C.vanbaars@student.tudelft.nl)

Chiel van Baars, Masters student, TU Delft

By continuing, you agree to this statement.

## Opening statement Survey (NL)

Beste bewoner,

Bedankt dat u mee wilt doen aan dit onderzoek. Dit onderzoek is een samenwerking tussen de TU Delft en de gemeente Amsterdam.

Zoals uw weet willen we geen grote vrachtwagens door de binnenstad hebben rijden. Daarom onderzoeken we andere manieren van afval ophalen. Deze manieren geven een lagere belasting van de stad. We vragen u naar uw voorkeuren als u moet kiezen tussen verschillende manieren van afval ophalen. De resultaten worden gebruikt voor mijn afstudeeronderzoek en voor een advies aan de gemeente Amsterdam.

Het invullen kost u 5 minuten. Meedoen is vrijwillig. U mag vragen overslaan als u dat wilt. De vragenlijst is anoniem en wordt pas opgeslagen als u hem verstuurd. Het terugtrekken van antwoorden na het versturen kan niet omdat de vragenlijst anoniem is.

Voor vragen mag u mij mailen op [C.vanbaars@student.tudelft.nl](mailto:C.vanbaars@student.tudelft.nl)

Chiel van Baars, Master student, TU Delft

Door verder te gaan, gaat u akkoord met deze verklaring.

### Written consent expert interview (NL)

U bent uitgenodigd om deel te nemen in een onderzoek genaamd 'De toekomst van afval in Amsterdam'. Dit onderzoek wordt gedaan door Chiel van Baars van de TU Delft en de resultaten worden gedeeld met de gemeente Amsterdam.

Het doel van dit onderzoek is om inzicht te krijgen in de technische mogelijkheden en beperkingen die verschillende afval ophaal systemen in de gemeente Amsterdam met zich meebrengen. Dit interview zal ongeveer 60 minuten duren. De verzamelde data zal gebruikt worden voor mijn master thesis onderzoek, een advies richting de gemeente Amsterdam en mogelijk een wetenschappelijke publicatie. Voor publicatie, zowel openbaar als intern binnen gemeente Amsterdam, worden de delen van deze publicatie die voortkomen uit dit interview met u overlegd. U wordt gevraagd om verschillende afval ophaal systemen te bekijken om te achterhalen welke uitdagingen er vanuit uw vakgebied zijn mbt tot elk systeem. Daarnaast zult u de vraag krijgen de systemen te vergelijken vanuit het oogpunt van uw vakgebied.

Zoals met elke (online) activiteit is een data-lek altijd een risico. Wij doen alles binnen onze macht om er voor te zorgen dat uw persoonlijke data vertrouwelijk blijft. Eventuele risico's worden geminimaliseerd door dit interview tijdens het transcriberen te anonimiseren. U wordt gevraagd toestemming te geven om het interview op te nemen, deze opname is uitsluitend bedoeld voor het transcriberen en deze opname zal hierna worden verwijderd. Enkel het gebied waarop u expert bent zal samen met uw inhoudelijke antwoorden worden verwerkt.

Uw deelname aan dit onderzoek is vrijwillig en u kunt op elk moment stoppen met het interview, ook kunt u het verzoek doen de ongeanonimiseerde data te verwijderen. U bent vrij bepaalde vragen over te slaan of niet te beantwoorden.

Indien u vragen heeft over het onderzoek voel u vrij de onderzoeker te contacteren: Chiel van Baars, via [c.vanbaars@student.tudelft.nl](mailto:c.vanbaars@student.tudelft.nl).

Met het tekenen van dit document gaat u akkoord met bovenstaande verklaring.

Handtekening onderzoeker:



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Handtekening Expert:

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### Opening statement potential user interview (NL)

U bent uitgenodigd om deel te nemen in een onderzoek genaamd 'De toekomst van afval in Amsterdam'. Dit onderzoek wordt gedaan door Chiel van Baars van de TU Delft en de resultaten worden gedeeld met de gemeente Amsterdam.

Het doel van dit onderzoek is om inzicht te krijgen in de mening van Amsterdammers ten opzichte van mogelijke nieuwe afval ophaalsystemen. Dit interview zal ongeveer 30 minuten duren. De verzamelde data zal gebruikt worden voor mijn master thesis onderzoek, een advies richting de gemeente Amsterdam en mogelijk een wetenschappelijke publicatie. U wordt om uw mening gevraagd met betrekking tot verschillende afval inzamel systemen. Daarnaast zult u gevraagd worden toe te lichten waarom u bepaalde systemen wel of niet ziet zitten.

Zoals met elke (online) activiteit is een data-lek altijd een risico. Wij doen alles binnen onze macht om er voor te zorgen dat uw persoonlijke data vertrouwelijk blijft. Eventuele risico's worden geminimaliseerd door dit interview tijdens het transcriberen te anonimiseren mocht u uw naam of andere persoonlijke data hebben genoemd tijdens het interview. U wordt gevraagd toestemming te geven om het interview op te nemen, deze opname is uitsluitend bedoeld voor het transcriberen en deze opname zal hierna worden verwijderd.

Uw deelname aan dit onderzoek is vrijwillig en u kunt op elk moment stoppen met het interview, ook kunt u het verzoek doen de on-geanonimiseerde data te verwijderen. U bent vrij bepaalde vragen over te slaan of niet te beantwoorden.

Indien u vragen heeft over het onderzoek voel u vrij de onderzoeker te contacteren: Chiel van Baars, via [c.vanbaars@student.tudelft.nl](mailto:c.vanbaars@student.tudelft.nl).

Met het tekenen van dit document gaat u akkoord met bovenstaande verklaring.

Handtekening onderzoeker:



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Handtekening bewoner:

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## E Expert interview guide

### Korte introductie van mijn onderzoek

Gemeente wil bruggen en kades ontlasten, daarom aan het kijken naar alternatieve manieren van afval inzamelen. Een van die manieren is afval afvoeren over het water. Daar zijn zware lasten en grote voertuigen namelijk een minder groot probleem.

Ik doe onderzoek naar verschillende manieren van afval ophalen over het water en de afwegingen die de gemeente hierin moet maken. Ik kijk daarbij specifiek naar twee aspecten, het technische aspect en het sociale aspect. Technische haalbaarheid en sociaaldraagvlak zijn namelijk de twee dingen die per definitie nodig zijn voor een haalbare oplossing. De overige aspecten zoals wetgeving en financiën zijn ook van belang maar hierin kan bemiddeld worden wanneer er draagvlak is en de oplossingen technisch haalbaar zijn.

### Focus interview

In dit interview ligt de focus op de technische haalbaarheid van de verschillende systemen. Ik wil graag per concept inzamelsysteem kijken naar de uitdagingen die er liggen, in kaart brengen hoe groot de uitdagingen zijn en of u denkt dat die uitdagingen te overkomen zijn.

### Vragen

- Wie ben je, wat doe je en wat is je achtergrond?
- Je werkt in het '... vakgebied', kan je kort toelichten wat dat ongeveer inhoud?

Per afval inzamel systeem: (3x) *Laat hierbij de afbeeldingen van de inzamel systemen zien en de kaart van het centrum met de zones.*

- Welke uitdagingen zie je bij het inzamelen met X locaties met bakfietsen, gekeken vanuit '... zijn of haar expertise'?
- Hoe groot zijn die uitdagingen/problemen?
- Wat moet er worden gedaan om het wel mogelijk te maken?
- Welke andere uitdagingen zie je buiten de technische uitdagingen vanuit varen?

### Overkoepelend

- Welke van deze systemen zouden op termijn haalbaar zijn vanuit het oogpunt programma varen?
- Hoe verhoud de haalbaarheid van verschillende systemen zich tot elkaar vanuit het oogpunt programma varen?

## F Results validation expert interviews

Feasible	Probably feasible	Possibly feasible	Unlikely feasible	Unfeasible
The concept is feasible with currently existing assets/ procedures.	The concept is probably feasible but needs development of assets/procedures.	The concept might be feasible but there is a lot of doubt and unknowns.	The concept is unlikely to be feasible, it would cost a lot of time, money and/or effort to make it work.	The concept is definitely unfeasible from a particular perspective.

Table 5: Feasibility categories

Area of expertise \ WCS	5 transshipment locations	40 transshipment locations	200 transshipment locations
Vessels	Feasible	Feasible	Possibly feasible
Waterways	Probably feasible	Possibly feasible	Unlikely feasible
Quay walls	Probably feasible	Probably feasible	Possibly feasible
Assets	Feasible	Probably feasible	Probably feasible

Table 6: Feasibility according to researcher

Area of expertise \ WCS	5 transshipment locations	40 transshipment locations	200 transshipment locations
Vessels	Feasible	Feasible	Possibly feasible
Waterways	Feasible	Probably feasible	Unlikely feasible
Quay walls	Probably feasible	Possibly feasible	Unlikely feasible
Assets	Feasible	Probably feasible	Possibly feasible

Table 7: Feasibility validation 1

Area of expertise \ WCS	5 transshipment locations	40 transshipment locations	200 transshipment locations
Vessels	Probably feasible	Probably feasible	Possibly feasible
Waterways	Probably feasible	Possibly feasible	Unlikely feasible
Quay walls	Probably feasible	Possibly feasible	Unlikely feasible
Assets	Feasible	Probably feasible	Possibly feasible

Table 8: Feasibility validation 2

Area of expertise \ WCS	5 transshipment locations	40 transshipment locations	200 transshipment locations
Vessels	Feasible	Feasible	Unlikely feasible
Waterways	Feasible	Probably feasible	Unfeasible
Quay walls	Feasible	Feasible	Possibly feasible
Assets	Feasible	Feasible	Possibly feasible

Table 9: Feasibility validation 3



## G Survey questions

Below the questions are presented side by side both in Dutch and English, numbered from 1 to 13:

1. Wilt u deze vragenlijst in het nederlands of in het engels beantwoorden? / Do you want to take this survey in Dutch or English?
2. Wat zijn de vier cijfers van uw postcode? / What are the four digits from your postal code?
3. In welke leeftijdscategorie valt u? / Which age category do you belong to?
4. Stel u heeft twee manieren om uw afval aan te bieden:

- U kunt uw afval zelf wegbrengen naar een container op loopafstand van uw huis. Deze container is altijd beschikbaar, dag en nacht, 7 dagen per week.
- U maakt een afspraak met de ophaaldienst, u kiest hierbij een dag en een blok van twee uur waarin een ophaaldienst het afval komt ophalen. Tijdens het gekozen tijdsblok moet u thuis blijven om het afval aan de ophaaldienst te geven. Zij bellen hiervoor bij u aan; u mag het afval niet zomaar buiten zetten. Het ophalen is elke dag tussen 08:00 en 14:00, en twee dagen in de week is het tussen 08:00 en 21:00.

Welke optie kiest u op basis van de afstand van uw huis tot de container?

Op en neer naar de container kost u  $\pm 1$  min, (50m) etc. /

Imagine you have two ways to dispose of your waste:

- You can personally take your waste to a container within walking distance of your home. This container is always available, day and night, seven days a week.
- You schedule a pickup with the waste collection service, selecting a day and a two-hour time block during which the collection service will pick up the waste. You must remain at home during the chosen time block to hand over the waste to the collection service. They will ring your doorbell for this purpose, and you are not allowed to place the waste outside without being prompted. The collection is available every day between 08:00 and 14:00, with extended hours until 21:00 on two days per week.

Now, depending on the distance of the container from your home, which of these two options would you prefer?

Roundtrip to the container takes you  $\pm 1$  min (50m) etc.

5. Heeft u liever de mogelijkheid uw afval op elk moment zelf weg te kunnen gooien of maakt u liever een afspraak met de gemeente om uw afval op te laten halen? / Would you prefer the option to dispose of your waste at any time on your own or would you prefer to schedule a pickup with the pick-up service?
6. Wilt u liever een systeem waarbij u op elk moment zelf uw afval kunt weggooien op loopafstand of wilt u liever de inzameling zoals u die nu heeft? / Would you rather have a system where you can dispose of your waste at any time within walking distance, or do you prefer the current collection system you have in place?
7. Wilt u liever een systeem waarbij u een afspraak maakt om uw afval te laten ophalen of wilt u liever de inzameling zoals u die nu heeft? / Would you prefer a system where you schedule a waste pickup or do you prefer the current collection system you have in place?
8. Heeft u liever dat de ophaaldienst uw afval ophaalt met een afspraak waarvoor u moet thuis blijven? Of heeft u liever dat u zelf uw afval kunt wegbrengen maar u de (ondergrondse) containers door uw raam kunt zien staan? / Do you prefer the waste collection service to pick up your waste with a scheduled appointment that requires you to stay at home? Or do you prefer being able to take your waste to (underground) containers yourself, even if you can see them from your window?
9. Heeft u liever containers aan de rand van het centrum zo veel mogelijk buiten het zicht? Of heeft u liever containers op meer plekken in het centrum maar in het zicht? / Would you prefer containers at the edge of the city centre, mostly out of sight? Or would you prefer containers in more locations within the centre, but visible?
10. Heeft u liever een afvalcontainer op een halve minuut lopen die u kunt zien vanuit uw huis? Of heeft u liever een afvalcontainer op 6 minuten lopen, die u niet kunt zien vanuit uw huis? / Would you rather have a waste container a half-minute walk away that you can see from your house? Or would you prefer a waste container 6 minutes away that you cannot see from your house?
11. Blijft u liever 2 uur thuis om uw afval op te laten halen? Of heeft u liever dat u op elk moment uw afval zelf kan weg gooien waarbij u een (ondergrondse) container kunt zien door uw raam? / Would you prefer to stay home for 2 hours to have your waste picked up? Or would you prefer to dispose of your waste at any time yourself, with a (underground) container visible from your window?
12. Waar bent u het meest bang voor wanneer er een container vlakbij uw huis geplaatst zou worden? / What are you most concerned about if a container were to be placed near your house?
13. Wilt u uw antwoorden nog toelichten? Zo ja, vul hieronder in. / Do you want to elaborate on your answers? If so, please

fill in below.

## H Survey results

In table 10 the abbreviations used in this appendix to display the raw data can be found.

<b>Abbreviations</b>	
PA	Pick-up appointment
SD	24/7 self-disposal
CS	Current system
NP	No preference
CSCC	Containers spread throughout the city centre
COCC	Containers at the outskirts of the city centre
HM	Half-minute walk, container in sight
SM	Six-minute walk, container out of sight
L	Litter around the container
P	Pests
D	Disrupted view
B	Bad smell
N	Noise pollution
O	Other
SD	SD CiS

Table 10: Feasibility categories

ID	Start time	Completion time	Duration	Email	Name	Language	Language (website)	Do you want to take this survey in dutch or english?	What are the four digits from your postal code?	Which age category do you belong to? (Years)	1 Roundtrip to the container takes you ±1min (50m)	2 Roundtrip to the container takes you ±2min, (100m)	3 Roundtrip to the container takes you ±4min, (150m)	4 Roundtrip to the container takes you ±5min, (200m)	5 Roundtrip to the container takes you ±6min, (250m)	6 Roundtrip to the container takes you ±7min, (300m)	7 Roundtrip to the container takes you ±10min, (400m)	8 Roundtrip to the container takes you ±12min, (500m)	Would you prefer the option to dispose of your waste at any time on your own or would you prefer to schedule a pickup with the pick-up service?	Would you rather have a system where you can dispose of your waste at any time within walking distance, or do you prefer the current collection system you have in place?	Would you prefer a system where you schedule a waste pickup or do you prefer the current collection system you have in place?	Do you prefer the waste collection service to pick up your waste with a scheduled appointment that requires you to stay at home? Or do you prefer being able to take your waste to (underground) con...	Would you prefer containers at the edge of the city center, mostly out of sight? Or would you prefer containers in more locations within the center, but visible?	Would you rather have a waste container a half-minute walk away that you can see from your house? Or would you prefer a waste container 6 minutes away that you cannot see from your house?	Would you prefer to stay home for 2 hours to have your waste picked up? Or would you prefer to dispose of your waste at any time yourself, with a (underground) container visible from your window?	What are you most concerned about if a container were to be placed near your house? 1	What are you most concerned about if a container were to be placed near your house? 2
19	19:18:20	19:23:38	0:05	anonymous		Nederlands	Dutch	1017	70 - 79	SD	SD	PA	PA	PA	PA	PA	PA	SD	CS	CS	SD	CSCC	HM	SD CiS	L	B	
20	10:44:35	10:50:36	0:06	anonymous		Nederlands	Dutch	1018	60 - 69	SD	SD	0	0	0	0	0	0	SD	CS	CS	SD	CSCC	HM	SD CiS	L	B	
21	10:39:35	10:51:32	0:11	anonymous		Nederlands	Dutch	1018	40 - 49	SD	SD	SD	PA	PA	PA	PA	SD	SD	SD	PA	SD	CSCC	HM	SD CiS	L	B	
22	11:28:53	11:41:27	0:12	anonymous		Nederlands	Dutch	1012	50 - 59	SD	SD	SD	SD	SD	SD	PA	PA	SD	SD	SD	PA	PA	CSCC	SM	PA	L	
23	12:08:55	12:19:49	0:10	anonymous		Nederlands	Dutch	1018	60 - 69	SD	SD	SD	SD	SD	SD	SD	SD	SD	SD	SD	CS	SD	CSCC	HM	SD CiS	L	D
24	12:00:50	12:43:42	0:42	anonymous		Nederlands	Dutch	1011	50 - 59	SD	0	0	0	0	0	0	0	SD	SD	PA	PA	CSCC	SM	SD CiS	L	B	
25	12:38:35	12:44:05	0:05	anonymous		Nederlands	Dutch	1018	80+	SD	0	0	0	0	0	0	SD	CS	CS	SD	CSCC	SM	SD CiS	L	O		
26	13:31:20	13:34:32	0:03	anonymous		Nederlands	English	1015	30 - 39	SD	SD	SD	SD	SD	SD	SD	SD	PA	SD	SD	CS	SD	CSCC	HM	SD CiS	L	B
27	14:30:32	14:32:50	0:02	anonymous		Nederlands	Dutch	1018	20 - 29	SD	SD	SD	SD	SD	SD	SD	SD	SD	NP	CS	SD	CSCC	SM	SD CiS	L	B	
28	15:41:37	15:46:25	0:04	anonymous		Nederlands	Dutch	1017	50 - 59	SD	SD	SD	SD	SD	SD	PA	PA	SD	SD	SD	CS	SD	COCC	SM	SD CiS	L	N
29	15:57:38	16:00:01	0:02	anonymous		Nederlands	Dutch	1015	50 - 59	SD	SD	SD	SD	SD	SD	SD	SD	SD	SD	SD	CS	SD	CSCC	HM	SD CiS	L	P

30	16:37:29	16:47:30	0:10	anonymous		Nederlands	Dutch	1017	80+	PA	PA	PA	PA	PA	PA	PA	PA	PA	CS	PA	PA	COCC	SM	PA	L	P	
31	17:06:42	17:13:04	0:06	anonymous		Nederlands	Dutch	1015	70 - 79	SD	SD	PA	PA	PA	PA	PA	PA		CS	CS	PA				L		
32	17:25:49	17:28:44	0:02	anonymous		Nederlands	Dutch	1016	30 - 39	SD	SD	SD	SD	PA	PA	PA	PA	SD	NP	CS	SD	CSCC	HM	SD CiS	B	P	
33	17:20:33	17:29:29	0:08	anonymous		Nederlands	Dutch	1017	70 - 79	SD	SD	PA	PA	PA	PA	PA	PA	SD	CS	CS	PA	CSCC	HM	PA	L	O	
34	18:00:53	18:06:25	0:05	anonymous		Nederlands	Dutch	1012	50 - 59	SD	SD	SD	SD	SD	SD	SD	PA	SD	SD	CS	SD	CSCC	HM	SD CiS	P	L	
35	18:23:00	18:26:33	0:03	anonymous		Nederlands	Dutch	1015	60 - 69	PA	PA	PA	PA	PA	PA	PA	PA	PA	CS	CS	PA	COCC	SM	PA	L	N	
36	18:37:12	18:40:51	0:03	anonymous		Nederlands	Dutch	1015	60 - 69	SD	SD	SD	SD	SD	SD	SD	SD	SD	SD	CS	CS	SD	CSCC	SM	SD CiS	L	P
37	18:46:45	18:52:34	0:05	anonymous		Nederlands	Dutch	1017	60 - 69	0	0	0	SD	0	0	0	0	SD	CS	CS	SD	CSCC	SM	PA	L	D	
38	19:53:53	19:57:05	0:03	anonymous		Nederlands	Dutch	1016	50 - 59	SD	SD	SD	SD	SD	0	0	0	SD	CS	CS		CSCC	HM	SD CiS	L	D	
39	19:03:19	19:57:24	0:54	anonymous		English (UK)	English	1018	40 - 49	SD	SD	SD	SD	PA	0	0	0	SD	SD	CS	PA	COCC	SM	PA	L	P	
40	22:57:07	22:59:50	0:02	anonymous		Nederlands	Dutch	1015	50 - 59	SD	SD	SD	SD	SD	SD	SD	SD	SD	SD	CS	SD	CSCC	SM	SD CiS	L	D	
41	23:18:53	23:22:01	0:03	anonymous		Nederlands	Dutch	1016	50 - 59	SD	0	0	0	0	0	0	0	SD	SD	CS	SD	CSCC	HM	SD CiS	B	P	
42	23:22:48	23:26:07	0:03	anonymous		Nederlands	English	1013	20 - 29	0	0	0	SD	0	0	0	0	SD	SD	CS	SD	COCC	HM	SD CiS	L	B	
43	23:33:20	23:39:46	0:06	anonymous		Nederlands	Dutch	1015	70 - 79	SD	0	SD	0	0	0	0	0	SD	SD	PA	SD	CSCC	SM	PA	L	P	
44	05:35:53	05:38:33	0:02	anonymous		Nederlands	Dutch	1015	60 - 69	SD	SD	0	0	0	0	0	0	SD	NP	CS	SD	CSCC	SM	SD CiS	L	N	
45	09:23:03	09:30:19	0:07	anonymous		Nederlands	Dutch	1017	80+	SD	SD	0	0	0	0	0	0	SD	CS	CS	SD	CSCC	SM	PA	L	P	
46	10:34:43	10:45:49	0:11	anonymous		English (UK)	Dutch	1015	50 - 59	SD	SD	PA	PA	PA	PA	PA	PA	SD	SD	PA	PA	CSCC	SM	PA	L	N	
47	13:42:09	13:46:00	0:03	anonymous		Nederlands	Dutch	1012	70 - 79	0	0	0	0	0	SD	0	0	SD	NP	CS	SD	CSCC	SM	PA	L	D	
48	14:41:58	14:50:41	0:08	anonymous		Nederlands	Dutch	1016	70 - 79	SD	0	0	0	0	0	0	0	SD	CS	CS	SD	CSCC	HM	SD CiS	L	P	
49	15:52:59	15:58:57	0:05	anonymous		Nederlands	Dutch	1012	60 - 69	SD	0	0	0	0	0	0	0	SD	CS	CS	SD	CSCC	HM	SD CiS	N		
50	14:55:13	16:06:37	1:11	anonymous		Nederlands	Dutch	1017	0 - 19	SD	SD	SD	PA	PA	PA	PA	PA	SD	SD	CS	SD	CSCC	HM	SD CiS	L	P	
51	19:07:47	19:09:28	0:01	anonymous		Nederlands	Dutch	1016	50 - 59	SD	0	0	0	0	0	0	0	SD	CS	CS	SD	CSCC	SM	SD CiS	L	P	
52	20:27:24	20:38:48	0:11	anonymous		Nederlands	Dutch			SD	SD	SD	SD	0	0	0	0	SD	NP	CS	SD	COCC		SD CiS	L	D	
53	21:21:17	21:30:54	0:09	anonymous		Nederlands	Dutch	1016	50 - 59	0	SD	0	0	0	0	0	0	SD	SD	CS		CSCC			L	D	
54	23:09:03	23:48:44	0:39	anonymous		Nederlands	Dutch	1015	60 - 69	SD	SD	SD	SD	PA	PA	PA	PA	SD	NP	CS	SD	CSCC	SM	PA	L	N	
55	10:55:59	11:00:58	0:04	anonymous		English (UK)	Dutch	1017	70 - 79	0	0	SD	0	0	0	0	0	SD	SD	CS	SD	CSCC	HM	SD CiS	L	P	
56	12:12:42	12:15:49	0:03	anonymous		Nederlands	Dutch	1016	50 - 59	SD	SD	SD	SD	SD	SD	SD	SD	SD	SD	CS	SD	COCC	SM	SD CiS	N	L	
57	12:21:45	12:25:36	0:03	anonymous		Nederlands	Dutch	1012	50 - 59	SD	SD	SD	PA	PA	PA	PA	PA	SD	SD	CS	SD	CSCC	HM	SD CiS	P	D	
58	14:01:11	14:05:07	0:03	anonymous		Nederlands	Dutch	1016	50 - 59	SD	SD	SD	SD	SD	SD	SD	SD	SD	SD	CS	SD	CSCC	HM	SD CiS	O		
59	14:55:56	14:58:35	0:02	anonymous		Nederlands	Dutch	1013	40 - 49	SD	SD	SD	SD	PA	PA	PA	PA	SD	SD	NP	SD	CSCC	HM	SD CiS	L	P	
60	17:00:38	17:03:04	0:02	anonymous		Nederlands	Dutch	1015	60 - 69	SD	SD	SD	SD	SD	SD	SD	PA	SD	SD	CS	SD	CSCC	SM	PA	L	P	
61	18:18:36	18:23:00	0:04	anonymous		Nederlands	Dutch	1015	70 - 79	PA	PA	PA	PA	PA	PA	PA	PA	PA	CS	CS	PA	CSCC	HM	PA	L	P	
62	13:23:16	13:33:08	0:09	anonymous		Nederlands	Dutch	1012	30 - 39	SD	SD	SD	SD	PA	PA	PA	PA	SD	SD	PA	SD	CSCC	HM	SD CiS			
63	21:42:17	21:45:36	0:03	anonymous		Nederlands	Dutch	1011	50 - 59	SD	SD	SD	SD	SD	SD	SD	SD	SD	SD	CS	SD	CSCC	HM	SD CiS	L		
64	21:43:51	21:50:24	0:06	anonymous		Nederlands	Dutch	1011	60 - 69	SD	SD	SD	SD	SD	SD	SD	SD	SD	NP	CS	SD	CSCC	SM	PA	N	L	
65	17:00:40	17:13:24	0:12	anonymous		Nederlands	Dutch	1015	70 - 79	SD	SD	SD	SD	0	0	0	0	SD	SD	NP	PA		SM	PA	L	P	
66	17:34:27	17:39:41	0:05	anonymous		Nederlands	Dutch	1018	60 - 69	SD	SD	SD	SD	PA	PA	PA	PA	SD	SD	PA	SD	CSCC	HM	SD CiS	L	D	
67	12:34:46	12:41:08	0:06	anonymous		Nederlands	Dutch	1015	50 - 59	SD	0	0	0	0	0	0	0	SD	SD		SD	CSCC	HM	SD CiS	L	B	
68	16:13:59	16:19:21	0:05	anonymous		Nederlands	Dutch	1018	70 - 79	SD	SD	SD	0	0	0	0	0	SD	SD	CS	SD				D	P	

69	21:05:20	21:07:40	0:02	anonymous		Nederlands	Dutch	1011	50 - 59	SD	SD	SD	SD	SD	SD	PA	PA	PA	SD	SD	CS	SD	CSCC	HM	SD CiS	L	N
70	12:31:08	12:36:03	0:04	anonymous		Nederlands	Dutch	1012	70 - 79	SD	0	0	0	0	0	0	0	0	SD	SD		SD	CSCC	HM	SD CiS	N	L
71	14:18:17	14:22:16	0:03	anonymous		Nederlands	Dutch	1016	70 - 79	SD	0	SD	0	0	0	0	0	0	SD	NP	CS	SD	CSCC	HM	SD CiS	L	
72	19:24:54	19:40:15	0:15	anonymous		English (UK)	English	1018	20 - 29	SD	SD	SD	SD	SD	SD	SD	SD	SD	SD	SD	CS	SD	CSCC	HM	SD CiS	L	
73	13:38:53	13:45:10	0:06	anonymous		Nederlands	Dutch	1012	80+	SD	0	0	0	0	0	0	0	0	SD	CS	CS	SD	CSCC	HM	SD CiS	L	P
74	09:43:35	09:46:11	0:02	anonymous		Nederlands	Dutch	1018	50 - 59	SD	SD	SD	SD	PA	PA	PA	PA	SD	SD	CS	SD	CSCC	HM	SD CiS	L	P	
75	19:11:25	19:21:26	0:10	anonymous		Nederlands	Dutch	1011	40 - 49	SD	SD	SD	SD	SD	SD	PA	PA	SD	CS	CS	SD	CSCC	HM	SD CiS	L	P	
76	14:12:10	14:22:19	0:10	anonymous		English (UK)	Dutch	1017	40 - 49	PA	PA	SD	SD	SD	SD	PA	PA	NP	CS	PA	COCC	SM	PA	L	D		
77	21:19:21	21:27:23	0:08	anonymous		Nederlands	Dutch	1013	60 - 69	SD	SD	SD	SD	PA	0	PA	PA	SD	SD	CS	SD	CSCC	SM	PA	L	D	
78	21:35:18	21:52:49	0:17	anonymous		Nederlands	Dutch	1015	50 - 59	SD	SD	SD	SD	SD	SD	SD	SD	SD	SD	SD	CS	PA	COCC	SM	PA	L	D
79	16:56:33	17:01:16	0:04	anonymous		Nederlands	Dutch	1012	50 - 59	SD	SD	0	0	0	0	0	0	0	SD	SD	CS	SD	CSCC	HM	SD CiS	L	B
80	15:28:02	15:40:35	0:12	anonymous		Nederlands	Dutch	1015	50 - 59	SD	PA	PA	PA	PA	PA	PA	PA	PA	SD	PA	PA	CSCC	HM	PA	L	B	
81	18:40:01	18:43:40	0:03	anonymous		Nederlands	Dutch	1011	60 - 69	SD	SD	SD	PA	PA	PA	PA	PA	SD	SD	CS	SD	CSCC	HM	SD CiS	L		
82	15:57:19	16:02:07	0:04	anonymous		Nederlands	Dutch	1013	70 - 79	SD	SD	SD	0	0	0	0	0	0	SD	SD	CS	SD	CSCC	SM	SD CiS	L	P
83	12:26:49	12:29:10	0:02	anonymous		Nederlands	Dutch	1013	60 - 69	SD	SD	SD	PA	PA	PA	PA	PA	SD	SD	PA	SD	CSCC	HM	SD CiS	L		
84	21:45:26	21:51:49	0:06	anonymous		Nederlands	Dutch	1016	50 - 59	SD	SD	SD	SD	SD	SD	SD	SD	SD	SD	CS	SD	CSCC	HM	SD CiS	L	P	
85	19:07:34	19:10:06	0:02	anonymous		Nederlands	Dutch	1017	70 - 79	0	0	0	SD	0	0	0	0	0	SD	SD		SD	CSCC	SM	SD CiS	L	
86	10:04:12	10:06:14	0:02	anonymous		Nederlands	Dutch	1015	20 - 29	SD	SD	SD	SD	SD	SD	PA	PA	SD	SD	CS	SD	CSCC	HM	SD CiS	L	B	
87	11:07:14	11:20:29	0:13	anonymous		Nederlands	Dutch	1017	70 - 79	0	SD	0	0	0	0	0	0	0	SD	CS	CS	SD	CSCC	SM	SD CiS	L	B
88	18:35:04	18:37:39	0:02	anonymous		Nederlands	Dutch		50 - 59	SD	SD	0	0	0	0	0	0	0	SD	SD	NP	SD	CSCC	HM	SD CiS	L	P
1	10:24:54	10:37:59	0:13	anonymous		Nederlands	Dutch	1018	70 - 79	SD	SD	SD	SD	SD	PA	PA	PA	SD	SD	PA	SD	CSCC	HM	PA	L	P	
2	15:07:39	15:11:25	0:03	anonymous		Nederlands	Dutch	1012	40 - 49	PA	PA	PA	PA	PA	PA	PA	PA	PA	SD	PA	PA	COCC	SM	PA	L	D	
3	10:52:31	11:01:25	0:08	anonymous		Nederlands	Dutch	1013	70 - 79	SD	SD	SD	SD	SD	SD	SD	PA	SD	SD	CS	SD	CSCC	HM	SD CiS	L	N	
4	09:04:36	09:20:03	0:15	anonymous		Nederlands	Dutch	1017	50 - 59	SD	SD	SD	PA	PA	PA	PA	PA	PA	CS	CS	PA	CSCC	SM	PA	L	P	
5	14:14:40	14:26:47	0:12	anonymous		Nederlands	Dutch	1011	60 - 69	PA	PA	PA	PA	PA	PA	PA	PA	PA	CS	PA	PA	COCC		PA	L	D	
6	09:26:11	09:31:37	0:05	anonymous		Nederlands	Dutch	1015	60 - 69	SD	SD	SD	SD	0	0	0	0	0	SD	SD	PA	PA	CSCC	SM	SD CiS	L	N
7	16:05:12	16:10:13	0:05	anonymous		Nederlands	Dutch	1016	40 - 49	SD	SD	SD	SD	SD	SD	PA	PA	SD	CS	CS	SD	COCC	SM	PA	L	P	

# I Potential user interview guide

## Bewoners interviews

Voorstellen, wie ben ik. Achtergrond studie

Wie bent u? Wat doet u in het dagelijks leven etc.

HREC form

## Opnemen???

Introductie van mijn onderzoek, kijken naar alternatieve manieren om afval in te zamelen die minder belasting opleveren van de stad.

<https://forms.office.com/e/BAyiK6fgwS>

- Ik heb begrepen dat u momenteel uw afval aan de straat kan zetten, klopt dat?
- U heeft aangegeven dat u liever *uw afval zelf wegbrengt/uw afval laat ophalen*, waarom geeft u de voorkeur aan deze manier van inzamelen?
- Zou u meer betrokken willen zijn bij het afvalinzamelingsproces, bijvoorbeeld door zelf gescheiden afval in te leveren?
- Momenteel is er weinig mogelijkheid tot het scheiden van afval, staat u er voor open om er aan mee te werken dit mogelijk te maken, ook als dit extra inzet betekent vanuit uw kant?
- Wat vindt u het meest belangrijk aan een nieuwe manier van inzamelen? (Gemak, het straatbeeld, minimaliseren van zwerfvuil, duurzaamheid, efficiëntie)
- Welke zorgen of bezwaren zou u hebben bij het overschakelen naar een nieuw systeem voor afvalinzameling?
- Wanneer er voorzieningen komen om uw afval dicht bij huis zelf kwijt te kunnen zullen deze op sommige plekken zichtbaar zijn in het straatbeeld, wat vindt u daarvan?
- Bent u bereid dit te accepteren wanneer u hier andere voordelen voor terug krijgt zoals een schonere straat, minder auto's door de straat en de mogelijkheid 24/7 uw afval kwijt te kunnen?

Om de stad, de straten en bruggen te ontlasten kijken we naar alternatieve inzamelmethoden, deze methoden maken gebruik van het water.

- Heeft u er problemen mee wanneer u in plaats van een vuilniswagen ziet rijden een boot ziet varen?

## J Coding scheme

Theme	Sub theme	Label
Preference for waste on appointment	Prefers WoA	Pref WoA
	Prefers WoA Less litter	Pref WoA, Less litter
		Pref WoA, Less teared bags from totting
		Pref WoA, Less teared bags for cans/bottles with deposit
		Pref WoA, Less teared bags by rats and seagulls
Aversion to self disposal	Prefers WoA ability to easily separate	Pref WoA, wants to separate waste
		Pref WoA, wants to separate plastic
		Pref WoA, limited storage
		Pref WoA, Likes to plan pickup at moment of choice
	Averse SD worried about additional waste placements/litter	Aver SD, containers often full
		Aver SD, additional placement of waste at container
	Averse SD container does not prevent waste on streets	Aver SD, container does not prevent waste on streets
		Aver SD, Anti social residents of Amsterdam still place garbage outside
		Aver SD, tourists and visitors still place garbage outside
		Pref SD
Preference for self disposal	Prefers SD Less litter	Pref SD, Less litter
		Pref SD, Less teared bags from totting
		Pref SD, Less teared bags for cans/bottles with deposit
		Pref SD, Less teared bags by rats and seagulls
		Pref SD, Flexibility
		Pref SD, Be able to dispose when bin is full
		Pref SD, Limited storage
		Pref SD, wants to separate waste
		Pref SD, wants to separate plastic
		Pref SD, if containers are emptied on time
Aversion to waste on appointment	Prefers SD, if maintained well	Pref SD, Has problems with the current state of (underground) containers
		Aver WoA, No flexibility
		Aver WoA, Does not want to stay at home
		Aver WoA, Employee should not have to wait at door
		Aver WoA, No carrying bags through house when bell rings
		Worried about extra traffic
		Container should not be visible from house
		A container gives a disturbed view
		Boat should not be visible from house
		A boat gives a disturbed view
Not in my backyard	Boat not in (my) sight	Doubts on location of the boat
		Boat not too long at same place
		No fixed places around beautiful canals
		A container in my view is fine
		A container in my view could be acceptable if it blends in
		A boat in my view could be acceptable if it blends in
		The waterways should be used to transport waste
		A boat would be a good option to collect waste
		Seeing the boat pass is fine
		Too little law enforcement
Willing to accept a boat/container in view		Having to call for law enforcement
Sees potential in using waterways		
Too little law enforcement		

Figure 23: Coding scheme



## K Code book potential user interviews

Theme	Sub-theme	Nr. of times theme came up	Nr. of times sub-theme came up	1011	1012	1013	1015	1016	1017	1018
Preference for waste on appointment	Prefers WoA	19	4	1	1	0	0	0	2	0
	Prefers WoA Less litter		8	3	4	0	0	1	0	0
	Prefers WoA ability to easily separate		5	2	3	0	0	0	0	0
	Pref WoA, Limited storage		1	0	1	0	0	0	0	0
	Pref WoA, Likes to plan pickup at moment of choice		1	0	1	0	0	0	0	0
Aversion to self disposal	Averse SD worried about additional waste placements/litter	13	7	3	4	0	0	0	0	0
	Averse SD container does not prevent waste on streets		6	4	2	0	0	0	0	0
Preference for self disposal	Prefers SD	47	6	0	0	1	1	1	2	1
	Prefers SD Less litter		15	0	0	1	5	1	4	4
	Prefers SD Flexibility		9	0	0	3	1	2	2	1
	Prefers SD ability to easily separate		7	0	0	4	1	0	0	2
	Prefers SD, if maintained well		10	0	0	4	0	2	2	2
Aversion to waste on appointment	Averse WoA, No flexibility	4	1	0	0	1	0	0	0	0
	Averse WoA, Efficiency		3	0	0	0	0	0	3	0
Not in my backyard	Worried about extra traffic	17	2	1	0	0	0	1	0	0
	Container not in (my) sight		7	2	0	0	1	1	3	0
	Boat not in (my) sight		8	2	1	0	3	1	1	0
Willing to accept a boat/container in view	Willing to accept a container in view	6	5	0	1	2	0	0	1	1
	Willing to accept a boat in view		1	0	0	0	0	1	0	0
Sees potential in using waterways	Prefers solution using the waterways	12	6	1	1	2	0	0	1	1
	Willing to accept use of waterways		6	1	1	0	1	1	1	1
Too little law enforcement	Too little law enforcement	4	3	1	0	1	0	0	0	1
	Having to call for law enforcement		1	1	0	0	0	0	0	0

Table 11: Code frequencies  
no. of times themes are mentioned per interview

## L Quotes potential user interviews

Interview	ID	Quotation	Labels
1011	Q11.01	Bewoner: Oké als één minuut is dan kies ik afval laten ophalen. Drie minuten ook, vijf minuten ook, zes minuten zeker, ja ook allemaal. Ik ben gewoon niet voor de containers. Onderzoeker: Dat is heel duidelijk. Bewoner: Heeft u liever de mogelijkheid om een afval op elk moment zelf weg te kunnen gooien of maakt u een afspraak met de ... om dat op te halen. Laat ze ophalen.	Pref WoA
1011	Q11.02	Bewoner: Ooh in het zicht, ik dacht dat het vanuit mijn raam in het zicht was. Dus dat was voor mij die vraag gaf onduidelijkheid. Onderzoeker: Nou ja, er zijn inderdaad vragen zoals de vorige, dan wordt het inderdaad specifiek benoemd dat u hem zelf zou kunnen zien staan. Bewoner: Ja Onderzoeker: En deze vraag is het inderdaad de vraag van in het algemeen. Bewoner: Moeilijk he, om die vragen dan echt, als ik dan... Ja, aan de rand van het centrum. En dat betekent dan dat ik, ja, maar dat betekent dat ik bijvoorbeeld 16 minuten moet lopen om daar naar een container te doen? Als ik het aan het rand van het centrum, want wat is het... Onderzoeker: Nou, dat gedeelte mag u nu buiten beschouwing laten. Het is gewoon puur en alleen de vraag, als u mag kiezen tussen wilt u liever containers dichterbij en hier en daar in het zicht of liever verder weg en niet in het zicht? Bewoner: Ja aan de rand buiten het zicht. Ja. De eerste ja.	Container should not be visible from house
1011	Q11.03	Bewoner: Ik zal de eerste vraag even beantwoorden, omdat ik heel veel last heb van zwerfvuil, met name door dat mensen hun zakken of te vroeg of te laat buiten zetten en er daardoor een ophoping van vuilniszakken komt.	Pref WoA Less litter
1011	Q11.04	En het andere is dat er heel veel ratten en meeuwen de vuilniszakken openmaken, waardoor er van alles in de straten en in de buurt rondslingert	Pref WoA Less teared bags by rats and seagulls
1011	Q11.05	ochtends, hoe heet het, de morgensterren die de vuilzakken open snijden om blikjes en flesjes en andere waardevolle spullen proberen te traceren waardoor elke keer met het vuil ophalen, alle opengesneden vuilniszakken en alles wat daarin zit door de straat en de buurt zwerft en in de gracht komt, ook van plastic en alles.	Pref WoA Less teared bags from totting, Pref WoA Less teared bags for cans/bottles with deposit
1011	Q11.06	En ik weet van vrienden ook dat er mensen gewoon vaak te lui zijn of dat de container, nou ik weet niet of die container vol zit, om het ook daadwerkelijk erin te doen. Ja, het zit ook wel vol. Ja, ja.	Aver SD containers often full
1011	Q11.07	En dan alsnog vuile zakken op straat belanden en met hetzelfde probleem als wat ik hiervoor zei, dat al het vuil op de straat komt.	Aver SD additional placement of waste at container
1011	Q11.08	Dat is gewoon een soort gedrag van mensen. Dus vandaar dat ik niet voor containers ben. Onderzoeker: Ja, dat is heel logisch. Bewoner: Het gedrag van Amsterdammers, dat moet ik er wel bij zeggen. Onderzoeker: Dus eigenlijk is het, het probleem zou niet zozeer de container zijn, maar inderdaad het geheel daaromheen. Wat ervoor zorg dat het eigenlijk niet werkt? Bewoner: Ja ik denk echt het asociale gedrag van de Amsterdammer en ja.	Aver SD, Anti-social residents of Amsterdam
1011	Q11.09	Bewoner: Ja, ik weet niet zeker of ik het goed begrijp, maar ik zou wel zou ik ook fijn vinden om alles te scheiden. Ja dat vind ik heel belangrijk. Oké, Bewoner: Dat is het goede antwoord? Nouja niet het goede antwoord, maar dat is een antwoord.	Pref WoA wants to separate waste
1011	Q11.10	Bewoner: Ja, ik vind het eigenlijk ook jammer dat we geen plastic scheiden.	Pref WoA wants to separate plastic
1011	Q11.11	Bewoner: Ja, nou voor die container heb ik eigenlijk net gezegd, dan kun je terugverwijzen naar die ene vraag wat ik net heb gezegd	Aver SD containers often full, Aver SD additional placement of waste at container, Aver SD container does not prevent waste on streets
1011	Q11.12	Bewoner: En bezwaar voor het ophalen of zorgen dat, Ja, nou ja, dat mensen niet weten dat ze moeten bellen, dus de communicatie van de gemeente naar de bewoner. Dat dat duidelijk is en dat met name hier in het centrum waar veel expats wonen en mensen voor short stay die dat dan niet begrijpen en dat alsnog buiten zetten.	Aver SD, tourists and visitors still placing litter
1011	Q11.13	Dat er niet genoeg handhaving is en er niet genoeg op gehandhaafd wordt dat is een hele grote zorg, die staat eigenlijk op nummer één wat dat betreft dus, dat er geen handhaving is ja. Geen capaciteit, dat krijg ik eigenlijk altijd heel vaak te horen door de telefoon als er weer iets ligt. We hebben geen capaciteit voor handhaven.	Too little law enforcement
1011	Q11.14	Dus als u puur en alleen de container of de stortzuil die daar staat, ziet staan. Bewoner: En waar? Aan die rand of wat? Want dat had ik ingevuld. Aan de rand of verschillende plekken in het centrum? Onderzoeker: Nee, verschillende plekken in het centrum. Echt wel gewoon op loopafstand van uw huis. Bewoner: Nou niet voor mijn deur, dat sowieso, uit mijn zicht.	Container should not be visible from house

1011	Q11.15	Bewoner: Midden in het centrum, al die containers. Ja, ik vind het gewoon geen mooi gezicht. Als het wel allemaal heel goed zou lopen toch... Denk ik ook dat Stichting Oude Stad of van Amsterdam dit beeld ook niet fijn vindt. En ik eigenlijk ook niet. Die argumenten tegen mijn ding, dat ik die geen container zou willen, ook al is er geen zwerfvuil of iets. Uhm... Nee, ik zou het... een container, dat soort ijzeren ding, vind ik gewoon niet passen. Er moet gewoon... ja, of er moet, weet ik veel, een boom voor elke container, tien bomen, moet ik zeggen.	A container gives a disturbed view
1011	Q11.16	Bewoner: Oké, nee vind ik niet erg. Laat ik maar een boot varen. Vind ik een subliem idee.	Seeing the boat pass is fine
1011	Q11.17	Bewoner: En waar die boot ligt, ja, ik heb daar heel veel vragen van, oké, kijk als die boot er de hele dag ligt bij mij voor de deur, dan vind ik dat ook niet zo heel erg gezellig.	Doubts on location of the boat, Boat not too long at same place
1011	Q11.18	Waar mensen misschien met auto's hun vuil brengen, waardoor het verkeer ook weer meer wordt met afvalbrengers als het niet heel erg verspreid is. Of ja, als het juist ver uit elkaar ligt. Ik denk dat mensen dan met een auto komen.	Worried about extra traffic
1011	Q11.19	Onderzoeker: Oké, dus eigenlijk is de conclusie die boot die mag er zijn maar het liefst niet te dicht bij u in de buurt? Bewoner: Nee, niet bij mijn op de gracht, het is de mooiste gracht van Amsterdam. Nee, dat is niet.	Boat should not be visible from house
1011	Q11.20	Bewoner: Maar ik ben wel voorstander van die boot hoor, ik vind het echt wel heel goed iets dat er geen auto's rijden. En ook met dat ophalen ben ik alles over het water met de elektrische boot weliswaar, niet zo'n vieze uitlaatboot. Ik denk nou perfect. Ja.	The waterways should be used to transport waste, A Boat would be a good option to collect waste
1011	Q11.21	Ik weet dat hier, dat weet jij misschien ook wel, dat er echt soms op zondagochtend twee mannetjes komen en die snijden de vuilniszak open en die gaan kijken of ze welke adresgegevens van degene die de vuilniszak heeft gedaan. En dan krijg je een boete van 100 euro. Maar die komen niet vanzelf, daar moet je voor bellen.	Having to call for law enforcement
1011	Q11.22	Nou ja, het grootste ding wat ik ook nog denk is dat mensen, dat er echt een gedragsverandering moet, worden van de asociale Amsterdammers. Die denkt dat alles kan. Dat is echt... Ik denk dat je daar nog veel meer op moet inzetten. Met gedragskundigen en... Hoe beïnvloed je het gedrag, hoe worden mensen minder asociaal?	Aver SD, Anti-social residents of Amsterdam
1012	Q12.01	Onderzoeker: Superfijn, dankjewel. Dus jij zegt heel duidelijk, het ophalen vind ik fijner. Bewoner: Ja, zoals in de 9 straatjes en de Passeerdersgracht.	Pref WoA
1012	Q12.02	Bewoner: De reden is omdat je dan helemaal geen afval meer op straat hebt.	Pref WoA Less litter
1012	Q12.03	Bewoner: En ik blijf nu ook twee uur thuis voor Albert Heijn. Dus dan kan ik het tegelijkertijd plannen als ik toch thuis ben en blijf voor Albert Heijn. Onderzoeker: Oké. Ja. Bewoner: En je zit minder met troep, nu doordat je soms... Maandag is checkout dag, maar dan zijn we te laat voor het afval aanbieden. Dus dan zou ik tot en met donderdag drie zakken hier in mijn huis moeten opslaan ergens, voordat ik ze kan wegbrengen.	Pref WoA plannable pick-up moment
1012	Q12.04	Bewoner: Ja. Ze komen het dan wel gescheiden ophalen he? Bewoner: Want nu is het glascontainer weer verwenen hier. Dus ik moet nu naar de [straatnaam] of naar de [straatnaam] volgens mij voor mijn glas. Soms laat ik die in een fles dan maar met het gewone afval meegaan, want dan hoeft ik niet dat in mijn huis op te slaan. En dat was, ja, je moest echt plannen om dat weg te brengen. Voorheen was het hier aan de straat.	Pref WoA wants to separate waste
1012	Q12.05	Bewoner: Ja, ik denk dat het heel veel afval aantrekt en ook heel veel stank. En je merkt nu al bijvoorbeeld, wij mogen ons afval maandag ochtend tussen 6 en 8 uur aanbieden. Veel mensen doen het zondagavond al. Dat trekt dus ook heel veel troep aan. En dan eigenlijk moet je daarna, als de wagen geweest is, dus helemaal de straat gewoon vegen.	Aver SD container does not prevent waste on streets
1012	Q12.06	Onderzoeker: Omdat iedereen zakken opgetrokken heeft voor blikjes? Bewoner: Ja, of de meeuwen of de ratten.	Pref WoA Less teared bags for cans/bottles with deposit, Pref WoA Less teared bags by rats and seagulls
1012	Q12.07	Onderzoeker: En je zegt inderdaad, je noemt zelf al het stukje gescheiden inzamelen. Vind je dat er weinig mogelijkheid is tot gescheiden inzamelen? Zeker, het is heel lastig. Papier lukt nog, maar het is heel lastig. Onderzoeker: En je bent wel bereid om daar aan mee te werken, dat zou je graag doen? Bewoner: Ja. Ja? Ja, natuurlijk!	Pref WoA wants to separate waste
1012	Q12.08	Bewoner: plastic wordt hier sowieso niet opgehaald. Ik heb hiervoor in het Westerpark gewoond. Daar werd plastic apart opgehaald in een oranje container, dat is hier natuurlijk in het centrum helemaal niet. Onderzoeker: Nee. Zou je het wel fijn vinden om plastic in ergens ter vallen ook te scheiden? Bewoner: Nou zeker, omdat je nu ook statiegeld of extra geld betaalt in de supermarkt voor plasticverpakkingen. Dan zou ik van dat geld eigenlijk verwachten dat een overheid of een fonds daar ook oplossingen voor zoekt	Pref WoA wants to separate plastic

1012	Q12.09	Bewoner: Het straatbeeld vind ik het allerbelangrijkste. Onderzoeker: Het straatbeeld? Bewoner: Het is echt zo'n teringbende hier. Het wordt alleen maar erger. En ze zijn nu al een maand niet meer wezen wegen.	Pref WoA Less litter
1012	Q12.10	Onderzoeker: En het straatbeeld gaat dan met name over het aanzicht qua zwerfvuil wat er ligt? Bewoner: Ja,	Pref WoA Less litter
1012	Q12.11	Bewoner: Ik denk met containers is het bezwaar nog steeds dat mensen ernaast plaatsen. Dat ze te weinig geleegd worden.	Aver SD container does not prevent waste on streets, Aver SD additional placement of waste at container
1012	Q12.12	Dat zie je nu op de [straatnaam] ook, dat daar veel naast geplaatst wordt, of dingen die niet passen, tot ze vol zitten. Dan loop je met die zakken en dan kan je er nergens mee naartoe. Onderzoeker: Dan heb je geen uitwegmogelijkheid meer? Bewoner: Nee, want alles zit dan vol. Dus dan moet ik mijn fiets pakken en naar de [straatnaam] fietsen, en dan kan ik het daar kwijt. Dan lig je echt te leuren met je huisvuil.	Aver SD containers often full
1012	Q12.13	Bewoner: Nou, voorheen was de glascontainer en papiercontainer waren container op straatniveau, dus die beletten het uitzicht. Als ze wegvallen, en je hebt in sommige plekken dat ze helemaal met gras bedekt zijn. Dan zie ik niet zo'n probleem. Ik denk dat de bijplaatsing het grootste probleem is. Maar containers boven de grond is... Ook niet helemaal wat je wil.	A container in my view could be acceptable if it blends in
1012	Q12.14	Bewoner: Ja. Ik denk dat als je in containers denkt dat het nog steeds bijplaatsen en ehh... Als er eenmaal bijgeplaatst is trekt het nog meer afval aan. Dan denken toeristen ook, ik kiek er nog een beetje afval bij.	Aver SD additional placement of waste at container
1012	Q12.15	Bewoner: Ja. Dan gaan nog steeds mensen zelf met hun afval over straat. Of bijplaatsen.	Aver SD additional placement of waste at container
1012	Q12.16	Bewoner: Nee, want dan weet je in ieder geval dat de stad het op een normale manier oplost	Seeing the boat pass is fine
1012	Q12.17	Ja. Ik denk een ophaalboot, waar je al je vuil, dan ook je gofvuil kwijt kan. Want dan is dat de plek waar je alles neerzet. Dus dan hoef je niet het op de hoek van je straat te zetten of voor je deur.	The waterways should be used to transport waste, A Boat would be a good option to collect waste
1012	Q12.18	Dus dan zou ik tot en met donderdag drie zakken hier in mijn huis moeten opslaan ergens, voordat ik ze kan wegbrengen.	Pref WoA Limited storage
1012	Q12.19	Maar misschien niet op zaterdagmiddag. Met die boot gaan varen. Als alle toeristen er zijn, dan zou ik het wel op een dal uur doen. Onderzoeker: O ja, dus het liefst wel op een moment dat het eigenlijk niet zichtbaar is. Bewoner: Ja, maar dat vind ik met alles. De straat schoon wegen doe je ook voordat de stad open gaat.	No fixed places around beautiful canals
1013	Q13.01	Bewoner: Zelf wegbrengen dan	Pref SD
1013	Q13.02	Onderzoeker: Oké, dat is heel duidelijk. En heeft u liever dat u de ophaaldienst uw afval op afspraak dus ophaalt of dat u het afval zelf kunt wegbrengen maar dat u de ondergrondse container wel vanaf uw raam hier ziet staan op de straat? Bewoner: Nee, absoluut niet. Onderzoeker: Wilt u dan liever zelf wegbrengen nog steeds? Bewoner: Waarom zou ik dan ondergrondse container willen hebben staan? Onderzoeker: Dat weet ik niet. Bewoner: Oké. Onderzoeker: Uiteindelijk, als die ergens komt te staan, dan moet die ergens staan. Bewoner: Oh, dan moet die ergens staan. Onderzoeker: Dat is het idee. Bewoner: Ah, oké. Basically is dat het idee. Onderzoeker: Dat is waar ik eigenlijk naar aan het zoeken ben, is de afweging die mensen maken. Bewoner: Not in your backyard. Onderzoeker: Exact. Bewoner: Ehm... Het maakt... Ja, kan me niet zo verschelen.	A container in my view is fine
1013	Q13.03	Bewoner: Maar er is geen handhaving, dus ja. Enzovoorts.	Too little law enforcement
1013	Q13.04	Bewoner: Nou ja, wat ik al zei, ik wil graag allemaal kunnen scheiden, zo goed mogelijk kunnen scheiden en op eigen initiatief weg kunnen brengen. Dat zijn de belangrijkste dingen. Kijk toen we plastic onderscheiden hadden we een vuilniszak per maand. En ik vind het ook leuk om tussen kunnen scheiden. En nu kunnen we plastic niet scheiden en dan hebben we een vuilniszak per week.	Pref SD Be able to dispose when bin is full, Pref SD wants to separate waste, Pref SD wants to separate plastic
1013	Q13.05	Maar er zijn ook mensen, ik denk van de Airbnb, die vuilniszakken buiten zetten op andere tijden, die worden dan opengemaakt en dat verspreidt zich over de straat. En daarover klaag ik al... Ik heb 40 klachten ingediend, van hier daar wat er neergezet wordt.	Pref SD Less litter
1013	Q13.06	Nou ja, omdat ik het een belemmering vind, want dan ben ik natuurlijk verplicht om daar rekening mee te houden. En daar heb ik een hekel aan om met anderen rekening te houden. [gelac	Pref SD Flexibility
1013	Q13.07	Bewoner: Het laten ophalen, dat had ik al gezegd, dat perkt mij in mijn vrijheid. Dus dat vind ik ook vervelend. Ik wil op momenten dat ik zelf denk oké die vuilniszak is vol of het plastic is vol of de lege flessen staan in de weg, dan wil ik het zelf weg kunnen brengen. Dus die vrijheid vind ik belangrijk.	Aver WoA No flexibility
1013	Q13.08	En ten tweede vind ik het gewoon een fijn gevoel als ik bijvoorbeeld plastic... dan heb ik het idee dat er nog wat mee gebeurt. Begrijp je?	Pref SD wants to separate plastic, Pref SD wants to separate waste
1013	Q13.09	En nou die bakken die vol zitten. In het weekend is het op zaterdag, de palmkracht zit alles vol. Ik weet niet of je er net van geweest bent, maar gisteren was het één geld op de bende.	Pref SD Has problems with the current state of (underground) containers

1013	Q13.10	Dus ik vind, voor mezelf is het gewoon een fijn gevoel, waar ik weet van heel veel mensen dat het ze geen zak kan schelen, maar voor mezelf vind ik het belangrijk.	Pref SD wants to separate waste
1013	Q13.11	En wat zou ik zeggen, ja, en welke bezwaren er zouden zijn? Ja, nou ja, wat ik nu heel vervelend vind is dat er nu zoveel rotzooi rond die bakken ligt.	Pref SD Has problems with the current state of (underground) containers
1013	Q13.12	Dus eigenlijk zou je het heel fijn vinden op het moment dat er een alternatieve manier komt, maar het moet wel goed ingeregeld zijn. Bewoner: Ja	Pref SD If containers are emptied on time
1013	Q13.13	Bewoner: Dus niet, op het Haarlemmerplein heb je gewoon een paar, stalen bakken en het ziet er niet uit. Dus daar mag wel enige aandacht aan besteed worden. Ja. Dat het een beetje in het straatbeeld past.	A container in my view could be acceptable if it blends in
1013	Q13.14	een van de alternatieve manieren is door het gebruik van boten. En dat zou er dan voor zorgen dat de straten minder belast worden en het water des te meer. Of des te meer dat er daar meer voorbij vaart. Denkt u dat het als positief ervaren wordt? Bewoner: Nou waarschijnlijk niet door de woonbouwbewoners. Want die zullen daar misschien wel problemen mee hebben. Maar in het algemeen denk ik dat dat een vrij simpele goede manier is. Omdat, je hebt een hoop volume. Dat is één ding. En twee, je kan het makkelijk vervoeren. Dus dat betekent dat je die vrachtwagens, die hier door de straat rossen, dat je daar voor een belangrijk deel van af bent. Het lijkt mij een heel efficiënt systeem, maar goed, het is niet iets wat nieuw is natuurlijk.	The waterways should be used to transport waste
1013	Q13.15	Bewoner: Nee, maar het is papier natuurlijk. Mijn papierbakken zijn heel vaak vol. Glas brengen we altijd weg. Groente en fruit gaan naar het Wormhotel. Plastic deden we ook altijd weg, maar dat hebben ze opgeheven.	Pref SD wants to separate plastic, Pref SD wants to separate waste, Pref SD Has problems with the current state of (underground) containers
1013	Q13.16	Het komt ook omdat heel veel huizen hier hebben gewoon weinig opslag. Dus op het moment dat wij van onze spullen af willen, dan brengen we het weg. Anders staat het hier in de weg.	Pref SD Limited storage
1013	Q13.17	Ja. Maar goed, ik denk dus dat het probleem van die boten, ik denk dat dat verreweg de beste oplossing is	A Boat would be a good option to collect waste
1015	Q15.01	Bewoner: Nou, dat je het zelf in de hand hebt. Dat vind ik het belangrijkste eigenlijk. Flexibiliteit. Flexibiliteit, ja. Dat je zelf de regie hebt over je eigen afvalafvoer. En het voorkomt ook...	Pref SD Flexibility
1015	Q15.02	Kijk, nu zetten heel veel mensen de zakken ook niet op de verkeerde momenten buiten. En als het niet meer wordt opgehaald dan heeft dat ook geen zin meer, ook niet op de verkeerde momenten. Dus ik hoop dat het dat ook zou tegen gaan.	Pref SD Less litter
1015	Q15.03	Scheidt u momenteel afval? Bewoner: Ja, wij scheiden afval. We doen flessen, papier en de rest. Onderzoeker: Oké. En zou u er voor openstaan om dat nog verder uit te breiden? Bewoner: Jawel, zeker. Onderzoeker: Door die plastic of GFTE ook te scheiden? Bewoner: Ja, ja.	Pref SD wants to separate waste, Pref SD wants to separate plastic
1015	Q15.04	Bewoner: We hebben in het voorjaar meeuwen die alles openpikken, want dan hebben ze hun jongen en dan zijn ze rabiaat om overal het voer uit te halen. We hebben steeds meer ratten,	Pref SD Less teared bags by rats and seagulls
1015	Q15.05	en we hebben nu die blikjes natuurlijk die uit die zakken worden gehaald.	Pref SD Less teared bags for cans/bottles with deposit
1015	Q15.06	Dat zijn ook gewoon mensen die daar weer hun eigen economie aan ontlenuen.	Pref SD Less teared bags from totting
1015	Q15.07	En u heeft in de vragenlijst aangegeven dat u eigenlijk liever het afval zelf wegbrengt dan dat u het laat ophalen door een dienst van de gemeente? Wat is de reden dat u daar de voorkeur aan geeft? Bewoner: Nou, dat je het zelf in de hand hebt	Pref SD
1015	Q15.08	Bewoner: Nou, ik vind bijvoorbeeld dat je het op zo'n stuk gracht niet kan doen. Dat kan niet. Dat zou natuurlijk ook bizar zijn in het werelderfgoed. Dat kan niet.	A boat gives a disturbed view, No fixed places around beautiful canals
1015	Q15.09	Onderzoeker: Ja. En terug naar het stukje van dicht bij huis, dus hier aan de gracht, dat is gewoon een no-go, daar hoort eigenlijk niks? Bewoner: Dat is idioot, dat kan niet. Nee, dat kan niet. Nee.	Container should not be visible from house
1015	Q15.10	Het zou dus ook kunnen dat die boot hier in de gracht voorbij komt met het afval erop. Bewoner: Ja, dat is zo.	Seeing the boat pass is fine
1015	Q15.11	Bewoner: Nee, dat snap ik, maar dan is het bij de burens net zo slecht. Nee, dat kan niet. Dat kan niet. Dat kan niet. Nee. Nee, dat kan niet. Nee. Nee, ze moeten het ophalen en doorvaren. Dat wel. Dat kan wel. Ja. Net als de auto's. Ja.	Boat should not be visible from house
1015	Q15.12	En dat dat langzamer gaat en dat hij misschien even twee uur ergens moet liggen, dat snap ik. Maar niet een boot permanent met vuilniszakken in de gracht. Dan krijg je het zelfde met meeuwen, et cetera.	Boat not too long at same place
1015	Q15.13	Bewoner: Kijk, op dit moment is denk ik het grootste probleem het zwerfvuil.	Pref SD Less litter
1016	Q16.01	Onderzoeker: Oké. En je geeft aan dat je eigenlijk in veel gevallen liever zelf het afval zou wegbrengen als je het vergelijkt met het oplaten halen. Bewoner: Ja.	Pref SD

1016	Q16.02	Bewoner: Ja, dus als die container anders in het zicht is van mijn huis, dan heb ik liever dat ze het ophalen. Ja.	Container should not be visible from house
1016	Q16.03	Bewoner: Nou, kijk, uiteindelijk wil ik naar een situatie toe dat we geen zwerfafval meer hebben. En dat gebeurt eigenlijk alleen maar door op te laten halen	Pref WoA Less litter
1016	Q16.04	Bewoner: Omdat je toch op een gegeven moment, kijk weetje misschien heb ik vanavond wel zes eters, ik noem maar even wat. En stel dan heb je een ophaal afspraak maandagochtend en dan heb je dus die stinkende zakken in huis.	Pref SD Flexibility, Pref SD Be able to dispose when bin is full
1016	Q16.05	Bewoner: Dat zelf wegbrengen blijft een probleem met zwerfafval. Omdat... Nou ja, ook qua aanzien zeg maar. Het maakt niet uit waar je het doet, maar er zijn altijd mensen die dingen naast hun container blijven zetten.	Pref SD Has problems with the current state of (underground) containers
1016	Q16.06	eb je dan nog een mening over dat bij jou thuis dan er een boot voorbij zou komen varen? Bewoner: Nee, dat lijkt me helemaal prima.	Seeing the boat pass is fine
1016	Q16.07	Bewoner: Alleen, waar gaat die boot liggen? Onderzoeker: Ja. Bewoner: Not in my backyard.	Boat should not be visible from house
1016	Q16.08	Dus als die echt overkapt is en groen is en je ziet niet dat het een afvalboot is, dan vind ik het dan weer een heel ander verhaal	A boat in my view could be acceptable if it blends in
1016	Q16.09	Dat kan met de boot ook gaan gebeuren, want ja, als je een woonboot, een woonark hebt en dat komt naast je, heb je natuurlijk veel meer logistiek naast je boot, van mensen die die zakken weg komen brengen, et cetera.	Worried about extra traffic
1016	Q16.10	En wij hebben dus één afvalcontainer voor ons stukje straat, maar dat is veel te weinig. Dus er ligt altijd rotzooi	Pref SD Has problems with the current state of (underground) containers
1016	Q16.11	Bewoner: En dat is natuurlijk toch anders als je in Amsterdam woont, en niet een tuin hebt met een container waar je het in kan. Onderzoeker: Ja, ja. Bewoner: Ik heb gewoon een klein appartement waar je, ja, je kan er nergens mee naartoe.	Pref SD Limited storage
1016	Q16.12	Dat komt omdat we dat rattengift niet meer mogen hebben sinds januari dit jaar. En dat is natuurlijk ook een whalhall, al dat afval wat er ligt en al dat vreten. Ze zijn er natuurlijk sowieso, maar er schijnen nu meer ratten te zijn dan inwoners van Amsterdam.	Pref SD Less teared bags by rats and seagulls
1017	Q17.01	Eerst was het al voor het staal, maar dan heb je het op een gegeven moment onder controle. En dan weet die gast ook, hier moeten we niet komen want dan komt die heks naar buiten. Ik vind het ook een inbuik op je privacy. Ja, flikker op, het is echt een inbreuk. Maar dan hebben ze het onder controle. Maar nu zijn die blikjesjagers er weer. En dan gaan we blikjes graaien en ook in de algemene prullenbakken.	Pref SD Less teared bags for cans/bottles with deposit
1017	Q17.02	Er ligt altijd, ze zijn bijna altijd vol en dan ligt het helemaal vol met vuilniszakken.	Pref SD Has problems with the current state of (underground) containers
1017	Q17.03	Bewoner: Dat is zeer tijdrovend, want wij moeten van achter komen. Dus dan moet die vuilnisman wachten tot ik één voor één al die zakken door het huis heen heb gelopen. Dus dat is per zak minimaal twee minuten lopen. En als ik er tien heb, is die twintig minuten aan het wachten.	Aver WoA Employee should not have to wait at the door
1017	Q17.04	Dus als ik acht vuilniszakken heb, die staan hier achter het huis in een container, die moet ik dan allemaal door het huis, beneden, doorheen schouwen en dan voor je neerzetten. Dus dan ben ik daar een hele tijd mee bezig. Dus als er een man aan de deur staat die wacht tot ik het vuilnis daar heb staan, dan is er twintig minuten weg.	Aver WoA No carrying bags through house when bell rings
1017	Q17.05	Want iedereen wil, er zijn heel veel mensen die wonen in appartementen, die hebben geen ruimte om die vuilnis neer te zetten.	Pref SD Limited storage
1017	Q17.06	maar je kan de ondergrondse container zien staan vanaf het huis. Bewoner: Oehh, ik wil hem niet zien! Nee, dat wil ik niet! Doe dan maar de eerste.	Container should not be visible from house
1017	Q17.07	Onderzoeker: En heeft u liever containers aan de rand van het centrum zoveel mogelijk buiten het zicht of liever containers op meer plaatsen in het centrum maar dan meer in het zicht? Bewoner: Dan meer in het zicht. Niet mijn zicht.	Container should not be visible from house
1017	Q17.08	Bewoner: Ja, daar gaat er al eentje langs de ehh, maar dat is een bekakte man. Die gaat alleen treasure hunten. Die uitdrukking moet je weten. Een morgenster, morgenster is het volgens mij. Zo'n mooie uitdrukking, morgenster, betekenis. Een morgenster is iemand die 's morgens vroeg de vuilniszakken open maakt op zoek naar handel. Dat is een morgenster	Pref SD Less teared bags from totting
1017	Q17.09	En dat het veel te arbeidsintensief is voor mensen die van hoog moeten komen of van achter moeten komen.	Aver WoA No carrying bags through house when bell rings
1017	Q17.10	het liefst zou je op sommige momenten het afval liever zelf wegbrengen en op andere momenten zou je liever hebben dat het opgehaald wordt. Bewoner: Ja, er is geen peil op te trekken eigenlijk.	Pref SD, Pref WoA
1017	Q17.11	Bewoner: Dan moeten ze er maar iets moois maken, kunstobjecten van maken of wat dan ook.	A container in my view could be acceptable if it blends in
1017	Q17.12	Bewoner: En bijgehouden wordt, dat die vaak genoeg leeggehaald wordt.	Pref SD If containers are emptied on time, Pref SD Has problems with the current state of (underground) containers

1017	Q17.13	Dus dan zou je in plaats van de vuilniswagen de vuilnisboot voorbij zien varen. Bewoner: Dat vind ik niet erg. Nee, nou ja, je hoeft niet al die zakken open en bloot neer te leggen. Maar ik neem aan dat die gewoon onder zo'n ding naar binnen gaan. Ja, gewoon dicht.	Seeing the boat pass is fine
1017	Q17.14	Bewoner: Afvalboot Amsterdam, even kijken. (zoekt plaatje op) Kijk, dit wil ik niet.	A boat gives a disturbed view, Boat should not be visible from house
1017	Q17.15	Die blikjes, dat statiegeld. Dat is gewoon, daar heb ik helemaal geen fluit aan. Die blikjes. Kijk, dat statiegeld op die blikjes creëert ongelofelijk veel afval. Ze breken de vuilnisemmers open, de algemene vuilnisbakken, ze maken de vuilniszakken open, en ze weten natuurlijk in no-time daar bij het studentenhuus, daar zullen veel blikjes liggen.	Pref SD Less teared bags for cans/bottles with deposit
1017	Q17.16	Ik ben groot voorstander van de boot.	A Boat would be a good option to collect waste, The waterways should be used to transport waste
1017	Q17.17	Maar als ik op een bovenwoning woon en ik heb geen balkon, wat doe ik dan? Als het warm is, of als ik op vakantie ga of als ik een weekend weg ben of als ik moet werken.	Pref SD Limited storage
1017	Q17.18	Ja dan afspraak maak maar, dan spaar ik het op voor een week.	Pref WoA
1017	Q17.19	Bewoner: Dan ga ik, dan ben ik heel blij.	Pref SD
1017	Q17.20	Is ik dan zeg dat de container op één minuut lopen is, Bewoner: Dan ga ik, dan ben ik heel blij. Maar ik wil niet in de straat hebben.	Container should not be visible from house
1017	Q17.21	Het is soms te zwaar, dat kan ook. En wat doe je als je bij de container komt en hij is wel vol? Wat doe je als de container wel vol is, is het duivels dilemma. Ga je dan terug met je zakje in de regen, in de sneeuw en spekglad? Nee, dan moet die wel binnen het zicht zijn.	
1017	Q17.22	Dat vind ik ook van mijn zak. Die worden opengescheurd, alle spullen worden op straat geflikkerd. En of ik moet het opruimen of die vuilnisman moet het opruimen	Pref SD Less litter
1018	Q18.01	Want wat u zelf al aangaf is dat er heel veel afval uit die zakken valt als ze open gemaakt worden of als er meeuwen opkomen of ratten. Dus dat dat heel veel zwerfvuil creëert. Bewoner: En mensen hebben ook vaak rommel. Geen zakken, kartonnen dozen en noem maar allemaal op.	Pref SD Less teared bags by rats and seagulls, Pref SD Less litter
1018	Q18.02	Dus als u de keuze heeft, onafhankelijk van de afstand, als de afstand even niet meer meespeelt, dan zou u liever zelf het afval wegbrengen dan dat u...Bewoner: Ja	Pref SD
1018	Q18.03	Of dat u het afval zelf kunt wegbrengen, maar dat de container waar u het heen moet brengen daar aan de overkant van de gracht zichtbaar is, of aan die kant bij het raam, dat u hem kan zien vanaf uw huis in het straatbeeld? Bewoner: Nou, ik vind dat niet zo erg.	A container in my view is fine
1018	Q18.04	Ik zou dat niet erg vinden. Want kijk nu, al die auto's en noem het allemaal op. Maar, er is hier in de stad wel een groot verschil. Ik heb een kennis, zij zit in een rolstoel en ze woont in Oost. En daar ruimen ze veel netter op. Dus daar is bij de bakken, daar staan zes bakken op een rij. En daar is het eigenlijk bijna nooit rommel. Onderzoeker: Dus dan moet de bakker wel netjes blijven	Pref SD Has problems with the current state of (underground) containers
1018	Q18.05	Nou het is bij mij vooral, als ik naar mezelf kijk eerst, dat er dus geen rommel in de buurt blijft liggen.	Pref SD Less litter
1018	Q18.06	dat er dus geen rommel in de buurt blijft liggen. Ja, wel bij die bakker waarschijnlijk, daar maak ik me strak wel wat zorgen om. Zie ik ook vaak.	Pref SD Has problems with the current state of (underground) containers
1018	Q18.07	En ja dat eigenlijk, en ik vind het ook goed om, als ik er naartoe wil lopen, dan doe ik dat op dat moment.	Pref SD Flexibility
1018	Q18.08	Zou u het fijn vinden om meer betrokken te zijn bij het afval, inzamelingsproces door bijvoorbeeld uw afval gescheiden aan te bieden? Niet alleen restafval, maar ook plastic en karton. Bewoner: Ja heel graag.	Pref SD wants to separate waste
1018	Q18.09	Ik was helemaal niet tevreden over de gemeente toen de plastic bakken weggingen. Ik ben fanatiek he, en dat is het.	Pref SD wants to separate plastic
1018	Q18.10	Wat zou u ervan vinden op het moment dat u hier een afvalboot voorbij ziet vagen in plaats van de afvalwagen voorbij ziet rijden. Onderzoeker: Dat is toch niet erg? Moet je zien wat hier allemaal voorbij vaart.	Seeing the boat pass is fine
1018	Q18.11	Ja, dus u zou het liever zelf weggooien dan dat iedereen het zelf...Bewoner: Ja goed, dan heb ik het over mezelf, maar ik heb het nu ook over alle andere mensen, wat ik hier dus elke week meemaak, wat voor zootje het dan is.	Pref SD Less litter
1018	Q18.12	Het straatbeeld of het zwerfvuil? Bewoner: Ja. Onderzoeker: En dan het straatbeeld met name hoeveel zwerfvuil er ligt in de stad? Bewoner: ja.	Pref SD Less litter
1018	Q18.13	Oké, want u vroeg inderdaad naar de alternatieve manieren van inzamelen en als we dan met die bakken, hoe werkt dat dan als die containers daar staan, want die moeten ook geleegd worden. En een van de dingen waar ik zelf naar aan het kijken ben nu, Bewoner: Misschien kan dat op een boot op sommige plekken?	A Boat would be a good option to collect waste
1018	Q18.14	En dan moet je hier zien wat daar gebeurt op dat pleintje. Ohh! En dat ligt ook aan de gemeente die niet streng genoeg is, vind ik hoor.	Too little law enforcement