Discard to Connect

A Mobile Bulky Waste Pick-up Service in The Hague

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↗ Acknowledgements

↗ Executive Summary

The overall graduation project aims to mitigate the misplacement of bulky waste around underground waste containers in The Hague. The project sees bulky waste disposal as a practice and investigates the entangled elements around it. Through field research methods, including interviews with photo elicitation, observations, and thematic analysis, the project uncovers how diverse factors shape bulky waste disposal habits. It reveals that the frequent movers with migration backgrounds need more support in disposal because of their transportation constraints, language barriers, and weak responsibility in the community.

Based on the research findings, the project defines its design goal as making frequent movers with a migration background feel confident in managing bulky waste and developing a sense of responsibility in the community during housing transitions in The Hague. Given that the end client is the municipality of The Hague, the project focuses on the design challenge of how the public sector provides public infrastructure/services to citizens. In response, the project proposes the "Oh Oh Pick-Up", a mobile bulky waste pick-up service provided by the municipality. The Hague citizens can dispose of bulky objects/ waste without an appointment, taking items to the designated collection spot and time. Community waste specialists will take items by cargo bike and notify residents their coming with music.

The concept was evaluated by The Hague citizens and stakeholders, including policymakers and local coordinators. The results indicate the opportunity to create more social awareness and support people with transportation constraints. The project further proposes a service development as a suggestion for future work. Collectively, this project contributes to advancing inclusive waste disposal service design in public contexts by integrating perspectives from social practice theory and culture-sensitive design.

Project Focus and Contributions

The graduation project integrates social design, service design, and the public sector (Figure 1). It explores how designers address complex social issues of bulky waste misplacement in The Hague, engaging both citizens and the municipality in the co-creation of solutions.

For designers, the project serves as a guide on how to address social issues, engage stakeholders, and consider sociological perspectives.

For the public sector, the project envisions a bulky waste system that places greater importance on inclusivity and sustainability.

Figure 1. Project focus.

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01. Introduction

This chapter provides an overview of the graduation project, starting with the "Achter afval" project as a starting point and the challenges of bulky waste misplacement in The Hague. It outlines the research focus, which aims to understand bulky waste practices and develop design interventions to address misplacement. The structure of the project follows the process of Explore, Define, Design, and Deliver.

1.1 Project Background: The Project "Achter afval" (Behind the Waste)

The project "Achter afval" (behind waste) is a study into the underlying causes of waste problems in The Hague, consisting of three phases. It is carried out by the Erasmus School of Social and Behavioral Sciences (ESSB) in the period from March 2024 to September 2025. It aims to investigate the underlying causes of waste nuisance and design interventions that contribute to mitigating the waste misplacement in The Hague. The graduation project is built upon Achter afval project and will be part of an ongoing initiative commissioned by the Municipality of The Hague.

Waste misplacement in public spaces is a persistent problem in the Hague (Figure 2). The issues commonly reported include the addition of bags, bulky waste, and mattresses. Some interventions only address the symptoms with a temporary effect and only work in neighborhoods with high social cohesion (Merkelbach, Dewies & Denktas, 2021). The results from Achter afval phase 1 show that waste problems are entangled with structural, social, cultural, and economic aspects in certain neighborhoods of the Hague. People's actions are not only influenced by individual motivations but also by knowledge, skills, and resources available to them and their connection with the living environment.

In order to work from a broader social perspective, the research seeks integrated solutions that focus more on the underlying causes of the waste problem, such as socio-economic circumstances and perceived bond with a neighborhood. Charter and Loewestein (2023) called this latter category an "s-frame" or systemic focus rather than an "i-frame" focus on behavior of people.

Figure 2. Waste misplacement on the Fugastraat in Loosduinen (Tielemans, 2023).

1.2 Project Context: The Hague City, Stakeholders, and Bulky Waste Disposal

1.2.1 Den Haag (The Hague)

The Hague is a fast-growing city with 560,000 inhabitants, according to statistics in 2023. As cities become denser with increasing populations, maintaining clean will become more challenging. Waste misplacement in public spaces is a persistent problem in the Hague. The municipality proposed fifty measures in 2023 to tackle the nuisance of waste and additional placements in the city. The Hague's official website indicates that more than half of the city's residents have an immigrant background (Western and non-Western). This number continues to rise steadily, showing the diversity of the residents in the Hague.

1.2.2 Bulky Waste

"Additional placements" in this project refer to waste that has not been placed in the right public spaces, which often happens next to the ORACs (underground residual waste containers). Sometimes, residents throw mattresses or irons into the bins here, and then ORAC gets stuck (Tielemans, 2023). The findings from the Achter afval project phase 1 depict that misplacement often happens in densely inhabited neighborhoods.

Bulky waste in this project is treated as a separate category in the misplacement issue, highlighting its distinct features, such as often being unpacked, larger in size than the underground container slot, and sometimes being left on the street (Figure 3). The bulky waste in this research is the category that cannot be thrown into underground containers or garbage bags. Examples include furniture, electronic products, plastic toys, mattresses, and bicycles (metal objects), following the definition on The Hague's official website. In Dutch, bulky waste is referred to as "grofvuil" or "grof afval."

In this project, the notion of bulky waste contains not only the physical size of items but also their material characteristics, which require separate recycling processes. Due to a lack of precise translation, even smaller or medium-sized objects that share these characteristics, such as, carpets, luggage cases, screens, and microwaves, are categorized under bulky waste.

Figure 3. Bulky waste, such as a mat and luggage box, was randomly thrown on the street on the Laak. The photo was taken during the observation in Laak.

1.2.3 The Municipality of The Hague

The end clients in this project are the policymakers in the Department of Clean City for The Hague. They are responsible for creating policy / managing the budget for projects to keep the city clean. Topics include littering on the street/ in water/ in parks, and bulky waste, placed next to containers. Their policy field stops, for example, when trash is collected, then other colleagues are the responsible policy officers. Policy makers work for and advise our councillor (wethouder in Dutch), who has "waste" as one of his responsibilities. The councillor is the official who is (indirectly) chosen through municipal elections.

Because of their position as policymakers, they are able to start pilots/projects/interventions for policy topics, such as using visual cues on the street or on the containers to see if this helps prevent waste/littering.

1.2.4 Addressing Bulky Waste in The Hague

Residents of The Hague can dispose of bulky waste using infrastructures and services provided by the municipality. This project primarily focuses on public services supported by the municipality. The private disposal services, in which residents directly hire cleaning companies without involvement from the municipality, were not discussed in this project. The methods related to bulky waste disposal are introduced below, based on the information from the website of the municipality of The Hague (https://www.denhaag.nl/en/waste-and-recycling/) and MyCleanCity App (https://www.mycleancity.nl/).

1. Collection Service

The municipality collects bulky waste and large garden waste for free. Residents in The Hague can schedule an appointment through phone calls or through the municipality's website. Bulky waste should be placed outside by 7:45 a.m. on the day of the appointment, or after the evening (10:00 p.m.) before. The service accepts items such as furniture, carpets, and large appliances. Importantly, residents have to follow the correct procedures, as improper disposal of waste, such as placing it on the street without an appointment or outside designated hours, may result in a fine.

However, construction and demolition waste are not included and require a paid appointment. Residents can arrange home collection using special rubble sacks or a puinkub (a large sack) or bring it to a waste depot. The municipality of The Hague does not provide "Grofvuil containers (Bulky waste containers)" as a renting service (See Figure 4 for example). This is only offered by a private company.

Figure 4. The Bulky waste container on the street in the Laak district of The Hague. The picture was taken by the researcher.

2. Waste Depot

Citizens can bring bulky waste to a waste depot in The Hague, where most types of waste are accepted free of charge. The staff at the waste depots will assist in placing bulky waste in the correct container and sorting the waste by material type, such as wood, stone, or metal. This sorting process enables the reuse or recycling of valuable materials and ensures the proper handling of harmful materials. There are three waste depots in The Hague (Figure 5).
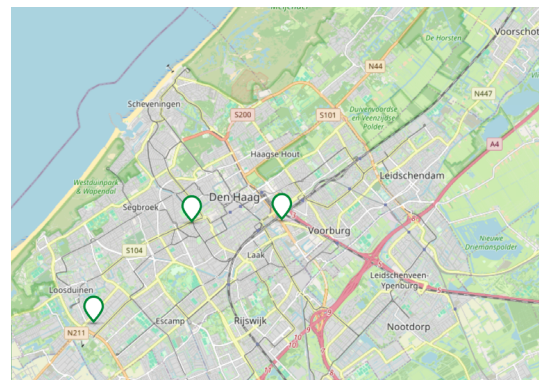
Figure 5. Three waste depots in The Hague. The picture was from the municipality's website.

3. MyCleanCity App

MyCleanCity is a mobile app developed to support cleaner neighborhoods in The Hague (Figure 6). Residents can use the app to quickly report waste-related problems, such as illegal dumping or stuck ORACs. With the help of image recognition, the app automatically detects the issue category and location from a photo, allowing users to submit a report in a short time.

Figure 6. My CleanCity App (Source: https://www.mycleancity.nl/).

1.3 Problem Definition

The waste misplacement in the Hague presents a challenge that extends beyond individual behaviors to a broader social perspective. Seeing waste as a social practice brings a challenge that designers combine the lens from different disciplines, such as sociology, to address the issue. These require designers to take a more holistic view of the issue and have the ability to bridge research and practice by tailoring the needs to more inclusive solutions.

The project takes bulky waste (furniture, electronics, mattresses) as a key focus and aims to mitigate bulky waste misplacement through design intervention that supports local stakeholders in waste management.

The research questions are:

- What are the practices of bulky waste disposal for people living in The Hague?

- What are the factors impacting bulky waste disposal for people living in The Hague?

- How can design intervention mitigate bulky waste misplacement in The Hague?

The expected outcomes:

- Research outcome: Analysis of the practices of bulky waste disposal and Identification of multiple factors influencing bulky waste disposal habits.

- Design outcome: Development and evaluation of design concepts to mitigate bulky waste misplacement.

1.4 Project Structure based on Double Diamond

The project structure was based on the Double Diamond model proposed by the Design Council (2004), with adjustments made to fit the project context. The four main phases are (1) Explore, (2)Define, (3)Design, and (4)Deliver, combining multiple iterative activities (Figure 7).

(1) Explore: This phase is to understand the bulky waste practice. The target is people who have lived/ live in the Hague. In addition, field research, such as interviews with photo elicitation, observation, and participant-led tours, was conducted to understand the current context of bulky waste in the Hague.

(2) Define: The research identified the factors impacting the bulky waste disposal and captured some bulky waste misplacement stories. The design brief was refined according to the insights from the Explore phase and further forming the design direction.

(3) Design: A co-design workshop was employed to adopt the opinions of The Hague citizens and stakeholders into solutions. Together with residents, policymakers from the municipality of The Hague, and designers, two ideas were selected as the base of the final concept.

(4) Deliver: The final concept was proposed through converging and iterating ideas. It was evaluated by the Hague citizens, stakeholders. The project summarized the recommendations and limitations of the final concept.
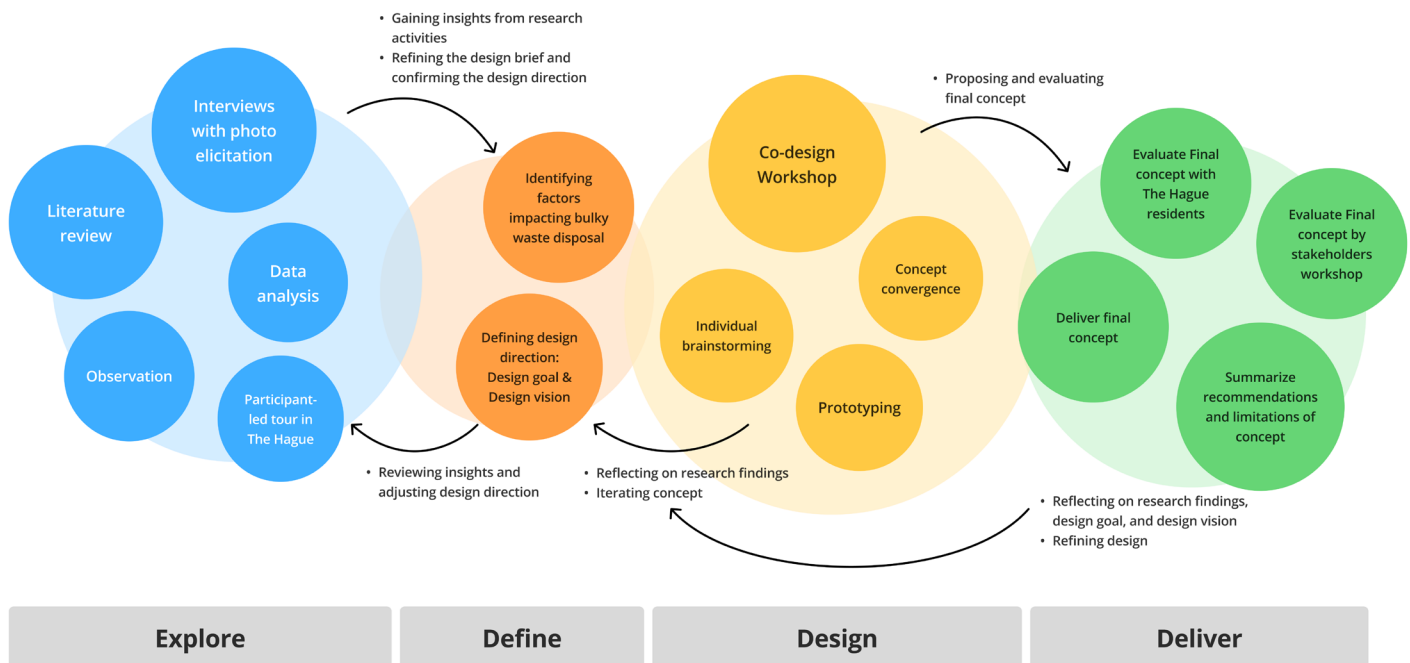
Figure 7. Project stucture, based on the Double Diamond (Design Council, 2005).

02.
Literature Review

This chapter reviews literature relevant to waste disposal, with the aim of understanding how everyday waste behaviors are shaped by broader social and cultural contexts. It introduces social practice theory and investigates how its core elements interact within practices. It also explores how cultural values and different cultural scales influence perceptions of waste, and discusses how culture sensitive design can lead to more inclusive waste management solutions.

2.1 Social Practice Theory

Social practice theory focuses on practice in social life rather than individual behavior. These practices are described in combinations of elements: material, meaning, and competence (Shove, Pantzar & Watson, 2012) (Figure 8). For instance, in cooking, materials include pots, knives, cutting boards, the food itself, a cooking book, the kitchen space, and the human body. The know-how, such as cutting vegetables and baking techniques, applied when cooking are skills. Meanings such as a healthy diet are the motivations for participating in the practice in its particular form (Kuijer, 2017).

Kuijer (2017) proposed using practice theory as a conceptual framework for research. Design researchers can apply methods of user research and take practices as a unit of analysis instead of products, users, or interactions. Designers can study situated practices to identify design opportunities for interventions by analyzing the relations of elements (Kuijer & de Jong, 2012). Kuijer & de Jong (2012) also suggested that possible alternative configurations can be found by studying the variety of practices between different cultural groups.
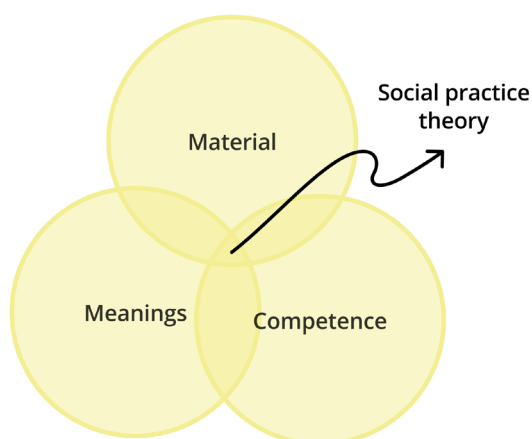
Figure 8. Social practice theory.

2.2 Waste Disposal as Social Practice

Public trashing is like all socially visible activities, which occur within a broader social setting and do not merely involve the actions of the trasher. It is shaped by the actions, interactions, and shared understandings of multiple individuals (Perry, Juhlin & Normark, 2010). Taking waste sorting as an example, a positive idea of waste sorting (meaning), knowledge of how to sort waste (competence), and accessible waste bins (material) may be essential elements that establish social practice in public space (Hartl and Hofmann, 2024).

In addition, different social institutions shape the value of "things." As Douglas (1966) argued, "dirt" is a "matter out of place," highlighting that waste is not inherently dirty but is defined by its context and the boundaries of social systems. The way we manage waste is subject to different, sometimes influenced by conflicting regulations and valuation systems (Dung, 2021). Apart from the meaning of objects, the meaning of the place connects to waste disposal practices. Previous studies suggest that social bonding can help to build attachments and motivate people in environmental management (Mohapatra & Mohamed, 2013). Uzell et al. (2002) highlight that socially cohesive communities have a stronger place identity that encourages environmentally sustainable attitudes. These findings suggest that place attachment could be a relevant factor in shaping residents' waste disposal practices—stronger attachment to a place may lead to more responsible behaviors.

2.3 The Cultural Lens of Waste

Previous studies have already indicated that culture influences how people perceive services, environments, and so on (Yoo, 2012; Wan et al, 2023; Cai et al, 2024). In certain contexts, the moral dimension associated with the term "waste" could be used to emphasize the worthiness of materials that are typically discarded or even their sacredness (Foellmer et al, 2022). The term 'culture' encompasses all aspects of human creation that shape interactions and responses to the world (van Boeijen & Schifferstein, 2023). Hofstede, Hofstede & Minkov (2010) defined "culture as the collective programming of the mind that distinguishes the members of one group or category of people from others." They emphasize the differences between cultural groups in value orientation.

Foellmer et al (2022) defined culture as the ways of knowing, being, and doing shared among different groups of people. They suggest that cultural factors interact in complex ways that impact waste behaviors, including micro-scale (individuals, families, local organizations), meso-scale (ethnic subcultures, larger organizations, and institutions), and macro-scale (national cultures, multinational organizations). In addition, the factors influence the success or failure of related interventions. Waste advocacy often misaligns scales, addressing problems at one level while proposing solutions at another (Liboiron, 2014). For example, reducing household waste through personal ethics (micro-scale) is encouraged, while structural factors like single-use plastics and excess packaging (meso- and macro-scale) may have a greater impact on waste outcomes. Carefully considering scale match is a crucial issue in waste interventions.

2.4 Culture Sensitive Design

Culture sensitivity is the competence to be aware of and to experience differences and similarities between people - their values and practices - that are based on what they have learned as members of groups (Van Boeijen & Zijlstra, 2020, p20). The culture sensitive designer aims to understand the values, needs, and desires of the intended users based on their cultural group. Culturally insensitive designs might deeply affect diverse communities, causing emotional distress, perpetuating stereotypes, and reinforcing exclusion, especially from marginalized groups (Saunders, 2023).

There is growing recognition of the importance of including cultural factors to better understand the influence of culture on waste-related behaviors. Notably, WHO Regional Office for Europe's European Programme of Work 2020-2025 includes "Behavioural and cultural insights for health" as one of its four flagship initiatives. By adopting a cultural lens, policymakers can better understand the variations in how different groups perceive and engage with waste, integrating these perspectives into broader commitments and frameworks (Foellmer et al., 2022).

03. Understanding Bulky Waste Disposal in The Hague

This chapter discusses how residents in The Hague dispose of bulky waste and the factors that shape this practice. A combination of qualitative methods was employed, including observations, interviews with photo elicitation, and participant-led tours in their communities. These approaches enable the researcher to investigate how people perceive, navigate, and act upon bulky waste disposal.

To understand the bulky waste disposal experience in The Hague, the research was guided by the following questions:

Main research question
How is the practice of disposing of bulky waste shaped by meanings, competencies, materials, and their interaction with public infrastructure and service in The Hague?

Sub-questions (SQs):
- How do residents in the targeted neighborhood define bulky waste and reflect on its value?
- How do residents engage with public infrastructure and services related to bulky waste disposal?

3.1 Field Research Methods in The Hague Context

3.2 Results of Feld Research

3.3 Key Findings

3.4 Conclusion

3.1 Field Research Methods in The Hague Context

3.1.1 Observation

Field observations were conducted in the Laak, Centrum, and Escamp districts to understand existing infrastructures and waste (mis)placement in these areas (Figures 9-11). The observation aims to familiarize with the local waste management environment.

Figure 9. Observation in the Laak district. Some bulky waste, such as fridge and chairs, were randomly placed on the street.

Figure 10. Observation in the Laak district. Some trash bags were randomly placed on the street.

Figure 11. Left: Observation in the Centrum district, where the ORACs were stuck, which might lead people to put trash bags outside the ORACs. Observation in the Escamp district, where objects were placed in a more orderly manner, suggests that residents might have applied for a collection service.

3.1.2 Semi-structured Interviews with Photo Elicitation

The semi-structured interviews aim to understand the experience of bulky waste disposal, taking around 40 minutes to one hour in Mandarin or English due to the researcher's language limitation. The approach incorporated photo-elicitation techniques to create a more interactive story-telling environment. Participants were asked to provide pictures of bulky waste near their homes and items they had discarded or planned to address recently. These pictures were printed out and used during interviews to evoke their experiences with bulky waste (Figure 12). In addition, during the interview, some bulky waste photos taken from observation and three stories about the misplacement of waste were utilized to encourage participants to share their own (misplacement) stories (Figure 13-14).

Figure 12. Pictures from the researcher and participants were printed out and utilized during the interview.

The recruitment of participants focused on their experience with bulky waste, either through disposal or noticing it in their neighborhood in The Hague. The term misplacement was avoided in recruitment as some people might have a negative association with it. Citizens living in the districts of Centrum, Escamp, and Laak were specifically chosen due to their structural waste issues in public spaces, which was identified in the Achter Afval project's previous research. There are more specific hotspots within those neighborhoods.

The interviews were arranged at locations that were convenient for the participants. Four interviews were conducted online, two were in the building of the Industrial Design Engineering faculty, and Five were in the participant's home or cafe in The Hague.

Figure 13. Stories about bulky waste (1): A cup rack was abandoned on the grass but still new.

Figure 14. Stories about bulky waste (2)&(3): A man picked up a free air fryer in his building. After testing, he confirmed that it worked. A week later, he discovered a humidifier in the same spot, but this time, it was broken. He placed it back in the public space. He explained that he wasn't the one who had originally left it there, even though he still contributed to the misplacement.

3.1.3 Participant-led Tour

The researcher followed H05, C06, and S10 to their neighborhood after interviews, which assisted in directly observing the actual living environment and bulky waste on the street (Figure 15-17). The research visited the Centrum district twice and once in the Laak district.

Figure 15. The researcher followed H05 walking on the street in her neighborhood and found that residents pasted papers on a stick, which satirizes people who misplaced washing machines on the street.

Figure 16. C06 shared that residents usually put their bulky waste near the automatic parking gate, which will be picked up by the collection service. The left picture was provided by C06. The researcher took the right one in wide angles with more environmental information.

Figure 17. S10 showed around where he saw bulky waste on the street in the Laak district. Four fridges are on the street, but they still look fine. Compared to it, the mattress was placed randomly on the street.

3.1.4 Participants

Overall, eleven people were involved in the interview, consisting of eight female participants and three male participants. Table 1 provides an overview of demographic information. The participants, aged 23 to 36, range from students to working professionals, reflecting diverse housing experiences of student housing, rental apartments, and owned housing. Nine participants are living in The Hague, while Y03 and S07 no longer reside in the city. The majority (nine) had lived or currently reside in the Centrum. E02, F08, and S11 moved out Laak district, while S10 still lived there. Only S04 lives in Escamp. All participants had lived in rental accommodations in The Hague, and Nine of them had experienced relocation in The Hague. The past and current housing in Table 1 only focus on their living experience in The Hague.

Regarding cultural background, nine out of eleven participants had an Asian migration background. Five participants are from Taiwan, with two becoming naturalized citizens of the Netherlands. Two participants are from China. Three participants are Dutch nationals, including one with Chinese background and another with roots in Suriname. Only E2 is from France.

Table 1. Participants' demographic information.

Code	Age	Gender	Cultural Background	Occupation	Past Housing	Current Housing	Location & Duration
A01	23	Female	Chinese	Student	N/A	Student housing studio	Centrum (1 year)
E02	25	Female	French	Student	Rent housing	Rent house	Laak (3-4 months), Centrum (1 year)
Y03	23	Female	Chinese	Student	Student housing studio	Not live in The Hague	Centrum (6 months)
S04	34	Female	Taiwanese (with Dutch passport)	Working	Rent apartment	Private apartment (owner)	Near the beach side of The Hague (1 year), Escamp (1 year)
H05	29	Female	Taiwanese	Working	N/A	Private apartment (owned by partner)	Centrum (3 months)
C06	28	Female	Taiwanese	Working	Student housing	Rental apartment	Centrum (almost 3 years)
S07	29	Female	Taiwanese (with Dutch passport)	Working	Student housing studio and rental apartment	Not live in The Hague	Centrum (7 years)
F08	30±	Female	Taiwanese	Prepared to work	Rental apartment	Student housing studio	Laak (1 year), Centrum (3 years)
J09	36	Male	Dutch (Parents from China)	Working	Rent house	Owns an apartment	Lived The Hague for most of life, Centrum (6 years)
S10	32	Male	Dutch (from Suriname)	Working	Student dorms, Rental apartment	Rental apartment	The Hague (13 years), Laak (1 year)
S11	26	Male	Dutch	Working	Rent housing	Rents a house.	Laak (3-4 months), Centrum (1 year)

3.1.5 Thematic Analysis

Thematic analysis was conducted to identify patterns and insights from the interview data. The analysis used Atlas.ti as the primary coding tool. The goal is to find patterns that are relevant to the research questions. Seven interviews were conducted in Mandarin and four in English. The researcher is native to Mandarin and translated Mandarin quotations into English as accurately as possible.

The process followed the general steps outlined by Braun and Clarke (2006): (1) Familiarization with the data, (2) Generating initial codes, (3) Searching for themes, (4) Reviewing themes, (5) Defining and naming themes, (6) Producing the report, and with adaptations to fit the specific context of this study.

The analysis process in this research consists of the following steps:

1. Open coding
During this phase, conceptual labels were assigned to quotations to capture initial meanings without predefined categories. This stage is to familiarize yourself with your data and explore the factors of recurring ideas, behaviors, and perceptions related to bulky waste.

2. Grouping codes
After generating a broad set of codes, related codes were grouped. This process helped to identify emerging patterns and relationships between different codes.

3. Reviewing and iterating themes
The grouped codes were further analyzed and organized into thematic tables, which included the main themes, sub-themes, and supporting quotations. These themes were reviewed and discussed with the responsible researchers and other researchers involved in the Achter Afval project from Erasmus University and TU Delft. Through continuous refinement, the interpretations were strengthened to ensure coherence and accuracy.

3.2 Results of Field Research

3.2.1 Misplacement Experience

All participants had seen bulky waste on the street in The Hague, near their neighborhood. Eight out of eleven participants addressed bulky waste before. Four of them misplaced bulky waste before. These misplacement stories from participants were organized into three themes, demonstrating the underlying causes of the misplaced bulky waste.

Y03 & S10: The Dilemma of discarding the object when moving out

When preparing to move out, Y03 placed a cat transport box in the common area of her student housing, hoping someone would take it (Figure 18). When no one did, she discarded it beside a trash truck outside the building, following how other residents disposed of their bulky waste. Reflecting on her decision, she stated, *"But this thing [cat transport box] is not very valuable [with higher prices], so I don't think it's necessary [to sell it], and it also needs to be transported, which is also difficult."*

Regarding S10, he acknowledged his own misplacement behavior, admitting, *"I wasn't always the nicest person either."* When moving out of his student dorm, the next tenant did not want the carpet he had left behind. He wrapped out the carpet and threw it in the trash bin inside the building despite knowing it should have been handled through bulky waste service. He explained that renting a car or asking a friend to help dispose of it felt like too much hassle. Leaving the carpet beside the ORACs also didn't feel like a proper solution, and considering that option would have made him feel even worse.

S07: The unintentional misplacement following others' behaviors

S07, during her time as a student in The Hague, discarded a juicer beside the general garbage bin in her building. She explained, *"No one said anything special, and I really saw what was there there very often. Air fryers, microwaves,* lots of stuff… And no one would particularly notify us and tell us that we couldn't do this." At the time, she didn't give much attention to the consequences, assuming that someone would take and recycle it. Reflecting on this experience later, she acknowledged, *"To me, it just be a small juicer, but if I think about it now… there might be batteries in it, which would definitely need to be specially recycled."* This statement reveals her changing awareness of waste disposal.

J09: Anonymous participation in the bulky waste journey

J09 knows the collection service and waste depot. However, he has misplaced the bulky waste twice and without feeling guilty. He explained, *"I think if people saw me, I think [they might think] this misplacement, but in my mind. I don't see it as misplaced."* Once, he put a supporting rack for a mirror in a neighbor's rental container. On another, he saw some objects next to the container and assumed they would be collected by public service. He added his waste to it, and the next day they were gone. He believes, *"Even though I did not rent pay money for the container, I did not call the government to pick it up. I think it's part of the journey already, the way it's going out."* J09 considers this behavior smart and convenient, adding, *"It's not as sustainable if it has to make two trips, but it's more efficient if there's just one."*

Figure 18. The cat transport box is placed in the public space in the building. The picture was provided by Y03.

3.2.2 Factors Impacting Bulky Waste Disposal Habits

A total of 88 codes were noted during the thematic analysis, resulting in five main themes and 21 subthemes impacting bulky waste disposal habits. Some codes were not included in the final analysis as they were found to be unrelated to the study focus. These themes are clarified in the following sections with supporting quotes from the interviews. Table 2 provides an overview of the factors and the sub-factors. The five main themes identified in the data are:

A. Personal and Cultural Perceptions
B. Social Influence
C. Governance and Norms
D. Public Infrastructures and Services
E. Mobility

Table 2. Factors impacting bulky waste disposal habits.

Main factors	Sub-factors
A. Personal and Cultural Perceptions	A.1 Meaning of objects
	A.2 Value for money
	A.3 Time investment
	A.4 Anonymousness in discarding waste
	A.5 Identity as foreigners in the Netherlands
	A.6 Awareness of individual impact on the ecosystem
B. Social Influence	B.1 Family
	B.2 Partner
	B.3 Neighbors and neighborhood
	B.4 House manager/ Landlord
C. Governance and Norms	C.1 Education
	C.2 Regulation
D. Public Infrastructures and Services	D.1 Official website
	D.2 Sticker on the ORACs
	D.3 MyCleanCity app
	D.4 Registration letter: Paper guidelines and trash card
	D.5 Waste depot
	D.6 Collection service
E. Mobility	E.1 Moving out to a new place
	E.2 Residential mobility
	E.3 Transporting bulky objects

A. Personal and Cultural Perceptions

A.1 Meaning of objects

The meaning of objects plays a crucial role in determining whether they are considered waste. Participants evaluated several factors when deciding whether to discard an item, including its value in use, monetary worth, appearance, and personal need. For example, F08 described her considerations of picking discarded objects on the street: *"Do I need it? Does it look clean? Does it look safe? For electrical appliances, can they be used again? Are there any damages?"* This depicts that practicality is often over sentimental value when assessing whether an object is a waste. Also, the location of an object influences meaning and value. Objects outside were found to be more likely "'unclean'" than inside the building.

However, emotional attachment can influence disposal decisions, sometimes creating feelings of guilt. Meaningful objects are often kept rather than thrown away. They are not considered for discarding. For instance, S07, *"If [it] has memorial ('sentimental') value, basically, I will keep it."* Similarly, E02 shared, *"If someone had given it to me, it would hold value to me. Because, you know, I would feel bad to give it away".* The emotional connection can make discarding certain items a difficult decision. Strong attachments to objects can even influence long-term decisions, such as moving them across countries. For A01, a desk lamp she had used since her bachelor's program, which was taken from China to the Netherlands. It held both functional and sentimental matters. Despite the challenges of transporting a bulky item, she expressed her willingness to take it back to China if necessary. Her experience highlights how objects create connections that serve both a practical and emotional role in their lives.

A.2 Value for money

Bulky waste is a category that contains furniture and electronics. These bulky objects serve specific functions and have a higher monetary value. A01 emphasized this

perspective, *"This kind of thing [arifryer] is not considered garbage to me because there will definitely be someone who wants it."* Similarly, Y03 noted, *"If it was something more expensive, I would probably sell it."* When an object is still valuable in the market, participants are less likely to view it as waste. On the other hand, items with lower monetary value might be more readily discarded without much consideration. Y03 reflected on her experience, *"Especially in China, the manufacturing industry is very developed, and things are not very expensive to buy, and you don't feel bad about throwing them away."*

A.3 Time investment

"It's also dependent on how much time you are willing to invest to reuse something or to make it into something different." This quote of E02 indicates that the effort involved in reusing or repurposing an item is not purely financial. The potential time involved in dealing with items sometimes exceeds their value, leading some participants to discard the object for their convenience. For example, H05 shared her perspective that selling or donating second-hand items takes a lot of time. She believes it might be easier to apply for a collection service, even if the items are still usable.

A.4 Anonymousness in discarding waste

When people know how to avoid punishment through anonymousness, they may choose to misplace (or improperly handle), even if they understand that it's wrong. C06 shared that her friends had discussed how to throw bulky waste in Rotterdam, and one of them suggested placing it beside the public container. She described, *"He/ She (her friend) said that you can actually put it directly next to the trash container. It's actually not okay, but they said it's okay because there's no name on it."* Similarly, F08 had lived in a neighborhood in The Hague, where residents intentionally used black trash bags to prevent cleaning companies from checking their waste. She was reminded to follow this hidden rule.

Apartment living further reinforces waste-related anonymousness. Although the apartment usually provides an independent waste management system for residents, the system's intention to make disposal easier and more manageable does not encourage proper disposal behaviors. When S07 heard about Y03 misplacing the cat transport box, she considered doing the same if she were Y03, placing it beside the building's trash truck. She felt it was understandable, as the building lacks supervision. No one knows who threw it.

A.5 Identity as foreigners in the Netherlands

The quotations of F08 and S07 reflect that non-locals often feel indifferent to waste management systems and passively engage with the system. As F08 explained, *"But as a foreigner, I don't feel that much about the environment. When garbage piles up, I don't feel dislike or want to react or deal with it."* She noted that accessing information is much easier for locals, which makes her more proactive in addressing waste issues in Taiwan, saying, *"I think it will make you more proactive because at least you know the management system or the mechanism of government operation, which you are more familiar with."* S07 also highlighted the challenge: *"I think as an international student or people on an expat package, I really need to see how my Dutch friends, colleagues, and classmates learn from them. Because I think it is difficult to access this kind of information normally."*

A.6 Awareness of individual impact on the ecosystem

The awareness of the impact of discarding waste on the ecosystem provoked participants to reflect on their behaviors. For instance, Y03 shared that her awareness was strengthened by watching documentaries in a course where she learned how improper waste disposal negatively impacts the ecosystem, which made her feel morally compelled to do such actions. When looking at the photos of waste abandoned on the street, J09 reflected, *"I think that we waste a lot… we're just throwing away a lot, and it's a bit harming nature."* Additionally,

the recognition can lead to more conscious behaviors. As S04 stated, *"No matter how small this thing is, no matter how much you throw it into the environment, it will actually have an impact on other people or specific creatures in the environment, which makes me pay more attention to this matter."* This awareness inspired her to occasionally clean up some plastic bags on the street to prevent birds from eating them.

B. Social Influences

B.1 Family

Six participants' disposal habits are largely influenced by their significant others, such as family, partners, and friends. H05 and F08 developed their recycling behaviors by following their parents' practices. However, for E02 and J09, parental influence had the opposite effect on her. E02 shared that she adopted a more sustainable mindset than her parents, saying, *"I wouldn't be throwing away a lot of things because I wouldn't need to get new ones...My parents were a bit more wasteful in that sense. When they thought something was like broken or unusable just because it didn't look good".* J09 also chooses to live in minimalism, which is the reverse value of his parents.

B.2 Partner

The romantic relationship also plays an impactful role in shaping disposal habits. Three (E02, H05, and S07) participants with Dutch partners often rely on their partners' knowledge of local waste management systems and their language ability. For example, H05 learned about the collection day for the paper board from her boyfriend, and S07 mentioned that she became familiar with recycling in the Netherlands through her long-term relationship with her Dutch partner. Even though these participants hold recycling knowledge and are able to search for information by themself, some of them tend to follow how their partners' approach instead. H05's description of planning to throw a broken cabinet door reveals this tendency. She mentioned, *"I was thinking I am going to read*

the instructions of bulky waste in The Hague (the paper guidelines provided by the municipality), but if my boyfriend knew how to do it, then I might not read it."

B.3 Neighbors and Neighborhood

Four out of eleven participants mentioned the impact of their neighbors or neighborhood on their behaviors and views of waste. As F08 noted, *"I think the way I care about waste disposal is probably based on my community [usually do]."* For some, this influence came through observations. S07, for example, after moving to a new apartment, discussions in the neighborhood group chat about misplaced waste made her more conscious of proper disposal practices. She also observed that neighbors coordinated bulky waste disposal by asking in the chat if others wanted to place bulky waste together. H05 and F08 shared their observation regarding the communication of bulky waste in Taiwan (Figure 19). People usually paste a paper note on the bulky waste and write that had been scheduled for collection, which provides a sense of reassurance to them as residents. These examples depict how collective attitudes can shape individual waste disposal behaviors.

B.4 House manager/ Landlord

Apart from the official sources, participants living in rented housing understood waste disposal information provided their building managers or landlords. However, this guidance might not always be clear or incomplete and influence their behaviors and views. For example, S07 was told by the building manager, *"When you throw away your garbage, they [the municipality of The Hague] will sort it for you themselves, so the tax will be higher."* It impacts her to believe that many people do not recycle their waste because of the higher garbage tax. Y03 shared that she was told to place the cardboard beside their building's trash container, but she later doubted this because a government link shared in a group chat suggested particular disposal spots and improper disposal could lead to fines. When she moved out of the housing, she shredded

cardboard and threw it into the ORACs due to the uncertainty of cardboard disposal.

Figure 19. F08 observed Taiwanese people pasted paper on their bulky waste and wrote that it had been scheduled for collection (See red circle). The picture was provided by F08.

C. Governance and Norms

C.1 Education

Five participants believe that what they learned through the education system strongly shaped their disposal habits. Four of them believe that courses in elementary, middle, or high school built their base of recycling knowledge. For example, C06 stated, *"I think it is related to, we were taught to recycle when we were in elementary school in Taiwan. So, I seriously do recycling here".* However, Y03 had a different experience. While she was also taught about recycling, she frequently saw people littering on the street. *"Well, it's not that strict, and it doesn't seem like anything will happen?",* she said. This contradiction between the educational environment and real-world behavior made her question the necessity of recycling.

C.2 Regulation

Participants noted that the mandatory nature of regulations often compels people to comply with waste disposal rules. For example, when discussing the bulky waste on the street, S04 said, *"I think if fines can be implemented, people will be more proactive in protecting the environment."* However, regulation can sometimes be blurred, leading to gaps in compliance. As F08 mentioned, if the regulations did not specify how detailed the classification of waste should be when delivering it to public cleaners, she would not do it.

On the other hand, regulations can effectively encourage proper waste disposal, especially if there is a financial incentive. Recycling bottles and getting money back increases their willingness to follow regulations. F08 underlined this motivation, stating, *"Being able to exchange money is attractive for me, and it makes me more motivated to do that thing [recycling]."* However, for H05, who had only been in the Netherlands for 3 months, this system was unfamiliar to her and led to a culture shock. She did not know the bottles could be exchanged for money and initially pressed them flat out of habit before recycling them. Her boyfriend interrupted her behavior and reshaped the bottle, making her aware that she needed to adapt to a different recycling system.

D. Public Infrastructures and Services

D.1 Official website

Six out of eleven participants mentioned that they searched for information or used the service on the municipality's website. The quotation from J09 indicates the convenience of searching waste information on the official website rather than paper guidelines. He stated, *"I don't like to keep paper around. Read it once, and you can just find [information] online."*

D.2 Sticker on the ORACs

Many ORACs were pasted with a sticker about throwing the proper-sized trash bags into containers (Figure 20). It illustrates that the bulky waste could not be thrown into them. People can apply for bulky waste collection services by phone or on the website.

Three participants (A01, Y03, S07) (had) lived in the apartment and student housing, which has an independent waste management system. Therefore, they never noticed the stickers on the ORACs in the public area. The other seven participants used the ORACs, but they did not read the information in detail. It depicts that the sticker presenting information failed to match the needs of disposal. For example, F08 explained, "When I go to throw away the garbage, I just throw away the thing in my hand as soon as possible." Similarly, for E02, she said, *"I don't need to read more. I know it's a trash can. I know how to use it."*

Figure 20. Sticker on the ORACs in The Hague. The picture was taken by the researcher.

D.3 MyCleanCity app

None of the participants used My Clean City App before. Interestingly, their unfamiliarity with the app does not appear to be related to language barriers or living time. J09, a Dutch resident who has lived in the Centrum district for six years, had never seen or heard of it. He explained, *"It's usually letters. That's the way I expect them to communicate with me... e-mail as well, but I think I don't get emails when it comes to waste."* Also, he thinks the government is slow in digitalization and was surprised that there is an App about waste service. Also, S10, as a Dutch, despite having lived in The Hague for thirteen years, was unaware of the app. Upon discovering its features during the interview, he appreciated the function of finding nearby waste containers handy. However, for S11, figuring out how to throw the trash seems no need to have a whole app for it.

D.4 Registration letter: Paper guidelines and trash card

When registering an address in The Hague, residents receive a letter including an Afvalpas (trash card) for access to waste depots and paper guidelines with information on waste disposal (Figure 21). However, different participants encountered issues:

1. Participants did not receive the registration letter. (A01, E02, Y03, H05, S10, S11)
2. Participants received it but did not read the information. They do not fully understand how the bulky waste should be addressed. (S04, C06-J09, S11)
3. Participants lost the trash card. (S04, J09)
4. Participants threw away the paper guidelines. (C06, S08, J09-S11)

Figure 21. The trash card and paper guidelines. Pictures were provided by S04.

D.5 Waste depot

Three (E02, S04, S11) of them took bulky waste to the waste depot. To enter the waste depot, residents have to take a trash card. S11 expected that the infrastructure would not be car-based, as he believes not everyone in the city owns a car, unlike in his parents' village, where car ownership is more common for transporting bulky waste. However, the waste depot is still designed with a car gate. For S04, she did not have the trash card but was still able to access the waste depot, indicating that using the trash card may not always be mandatory. These experiences suggest inconsistencies in the access to and requirements when using the waste depot facilities.

D.6 Collection service

In The Hague, bulky waste can be collected by the municipality through scheduled appointments or taken to the waste depot. Three (C06, S07, S10) participants used a collection service. Even though S04 and S07 appreciate that it is convenient to pick up bulky waste near your home without any fee, S07 is concerned about the safety of placing bulky waste on the street. She disassembled tables with wood and steel pipes (Figure 22) and was afraid the waste would be blown away by wind or taken by someone for fighting. No confirmation has been sent by cleaning companies regarding picking up the waste. She hopes this one-sided communication can be improved.

Figure 22. The table was disassembled and discarded as bulky waste by S07. The picture was provided by S07.

E. Mobility

E.1 Moving out to a new place

Six out of eleven participants mentioned their bulky waste experience because of moving, which indicates moving is a moment that prompts people to determine whether to keep, sell, or discard objects. S10 described how furniture has always been an issue for him, as he prefers to live in unfurnished housing and decorate in his own style. A01 mentioned that if she could not take a spice rack when moving out, it would become a bulky waste for her. C07 faced a similar issue when deciding what to do with a mattress. The mattress did not fit into the bed size in her new housing. It was still usable but large and occupied some living space, prompting her to sell it on the online platform. However, when no one showed interest, she ultimately decided to dispose of it through the municipality's collection service. She explained, *"I think because I bought that thing [the mattress] for only 30 euros, and I could only sell it for 10 euros, and I thought it was a bit of hassle [to put more effort], so I decided to throw it away".*

E.2 Residential mobility

High residential mobility fosters informal exchange activities for objects in the building (Figure 23). For example, S04 shared that when she lived in an apartment, there was an unspoken consensus among residents to leave unwanted items in a common space for others to take. Similarly, in the student housing where A01 and Y03 live, residents place objects in shared areas, allowing others to take them freely. This hidden rule in the community blurs the boundary between misplacement and secondhand donation.

In addition, the features of high residential mobility in apartments make interacting with other residents more challenging. "Apartment living doesn't really provide an environment that fosters interpersonal connections or the kind of relationships you might have with neighbors in a community. The atmosphere tends to be more individualistic.", F08 remarked. She thinks this lack of social connection contributes to the severity of the waste misplacement issue in her building. When residents do not know their neighbors, the sense of anonymity further reduces their willingness to take responsibility for proper waste disposal.
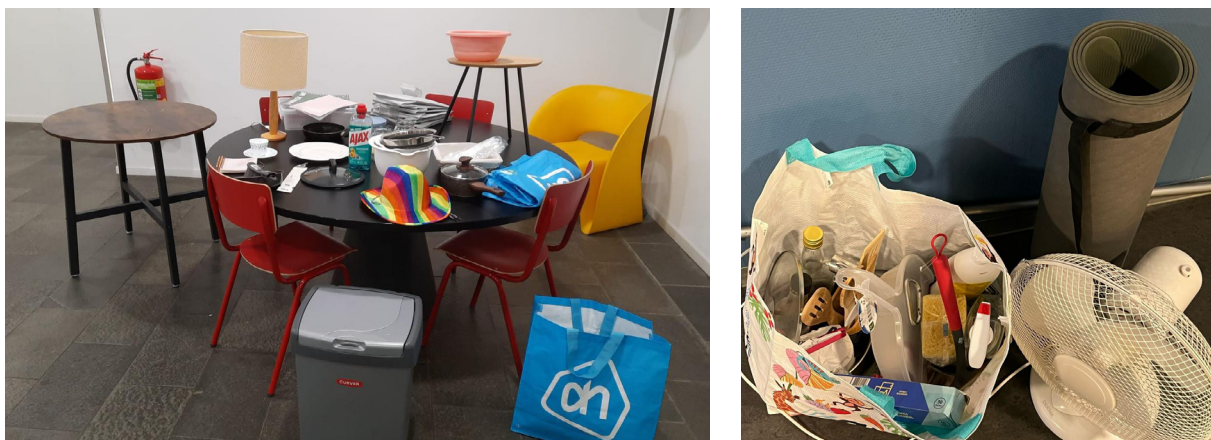
Figure 23. Informal exchange activities for objects in the building. The picture was provided by A01.

E.3 Transporting bulky objects

Seven out of eleven participants considered selling items or taking them to a waste depot when deciding how to deal with bulky objects (waste). However, transporting bulky objects is difficult, as most participants rely on walking or bicycles. E02 and S11 recently took waste to the depot with their partners. Since the electronics could fit in tote bags, they took the tram and walked there. In contrast, S04 shared that she had taken a fire extinguisher by bike to the waste depot. She rode for over half an hour because the first depot did not accept it. It was dangerous to transport such a heavy item (Figure 24).

Figure 24. Taking the fire extinguisher to the waste depot. The picture was provided by S04.

3.3 Key Findings

Overall, the findings align with social practice theory, which states that waste disposal is a practice that interacts with meaning, competencies, and materials. For example, Y03 chose to put a cat transport box in the building, blending the value of money, time investment, limitation in transporting, and knowledge of disposal ways in addressing the bulky waste.

The entangled factors also depict how object value and definition of the misplacement are fluid. Some participants evaluate objects based on usability (e.g., F08), while others retain them due to sentimental meaning (e.g., A01). These shifting value definitions echo Douglas's (1966) notion of 'dirt' as 'matter out of place,' where what counts as waste depends on context and social norms. Next, the following paragraph will discuss the blurred concepts of misplacement.

3.3.1 Difficulties in Defining Misplacement

The misplacement initially mentioned that bulky waste was not properly placed in public spaces following the regulated disposal method in The Hague. However, the interviews found some contradictions:

How do we identify the misplacement of bulky waste?

Observations reveal that bulky waste left on the streets often lacks visual markers, such as papers or stickers. This lack of informational indicators makes it challenging to determine whether the items have been abandoned or are awaiting collection services and classify waste as "misplaced." The identification of misplacement can only be inferred by observing the manner in which the waste is placed: whether it is arranged in an orderly or sloppy manner, placed in front of a house, scattered randomly along streets, or left next to the ORACs (Figure 25).

Figure 25. A microwave and a pan were abandoned beside the ORACs.

If abandoned items are taken by others, is it still misplacement?

Participants shared the unofficial exchange activities in their buildings. Placing items in the public space can be identified as "misplacement" since it is not allowed. However, when objects are removed for reuse or repurposing, what was once viewed as waste may be redefined as a valuable item. This highlights a dynamic tension between an object's perceived value and its classification as waste, depending on whether it is seen as abandoned or repurposed.

If bulky waste is collected properly, is it still misplacement?

The case of participants like J09 further complicates the concept of misplacement. They put their bulky waste in containers rented by others, raising questions about how misplacement is defined. Although he ensured that waste would be collected by using rented municipal containers, he did not contribute to the rental payment and was not permitted to dispose of their waste in these containers. It challenges that if the waste was properly collected, it still constitutes misplacement without following official procedures.

3.3.2 Social Connection Over Place Attachment

While many of the findings align with the literature, the expected influence of place attachment did not emerge. According to the literature, place attachment can shape how individuals care for their living environment. The interview explored whether a sense of place attachment could lead to more environmentally sustainable attitudes.

However, participants often described feeling connected to people they care about and a sense of "home" in The Hague or the Netherlands rather than physical places. As F08 explained, *"I realized that my connection to home was linked to people, which means whether I build better relationships with the people I met there."* This suggests that the participants' sense of home was closely tied to social relationships rather than long-term residence. Even C07, a Taiwanese who had lived in The Hague for four years, still feels disconnected from Dutch society, saying, *"I realize that I don't have a strong sense of belonging here. I don't feel that I belong to this society."* This suggests that participants' sense of home was closely tied to social relationships rather than long-term residence.

Only one participant, S11, mentioned a sense of responsibility that resembled place attachment. He explained that he would take action if a waste issue occurred in the shared garden of his community. However, he has a more passive attitude toward the waste on the street, saying, *"I want it to be clean, but I'm not gonna make it my problem."* This indicates that while people may care for semi-private shared spaces, this concern does not extend to public streets.

An insight emerging from these findings is that the social connections have a greater impact on people than place attachment, especially close relationships with family, partners, or friends (B. Social Influences). Few participants mentioned direct interactions with neighbors, highlighting a gap in the sense of community for people with migration backgrounds living in The Hague. Participants shared that anonymity surrounding bulky waste disposal in public spaces diminishes personal responsibility (A.4 Anonymousness in discarding waste). The key gap is that without neighbor-level connections, people feel less responsible for public spaces, which affects their bulky waste disposal behaviors. Future design interventions could therefore focus on making bulky waste practices, on encouraging neighborhood-level interactions to strengthen a sense of community and shared responsibility.

3.3.3 Role of culture in the bulky waste disposal practice

Insights shared by participants point to the cultural challenges faced by people with migration backgrounds as they adapt to life in The Hague. Participants revealed experiences of cultural shock, unfamiliarity with local waste systems, and a sense of detachment. For example, A.2 Value for money, A.5 Identity as foreigners in the Netherlands, 3.3.2 Social Connection Over Place Attachment.

Alough most cultural impacts were captured under A. Personal and Cultural Perceptions, other findings also reflect cultural influences. For example, H05's story about pressing the plastic bottle flat rather than recycling it for cash back (C.2 Regulation). Another example is the observation from H05 and F08, bulky waste is usually stated with paper that it has been scheduled for collection, reflecting practices more common in collectivist cultures (B.3 Neighbor and neighborhood).

Overall, most findings regarding culture emerged at the micro-scale, such as individuals, family, partner, neighbors, and so on. They also intersect with broader meso- and macro-level factors of regulations or education, highlighting the multi-scalar nature of the practices of bulky waste disposal. Since this project is commissioned by the municipality of The Hague, it further explores how meso-level public services and infrastructure impact micro-scale behaviors, aiming to avoid the misalignment between the scale of the problem and that of proposed solutions.

3.3.4 Limitation

While the findings offer valuable insights into waste practices, it is important to acknowledge the limitations to contextualize the scope and generalizability of this study. This section will further elaborate on the limitations of this research.

Language
The interviews were conducted in English and Mandarin due to language limitations. Six participants were interviewed in Mandarin, and their transcriptions were translated into English by the researcher, who is a native Mandarin speaker. This process may have translation biases, potentially affecting the interpretation of participants' responses.

Gender
The study includes eight females and three males, resulting in a gender imbalance. However, the focus is more on the bulky waste experience rather than gender comparison. The current sample provides sufficient insights to support the research findings. Additionally, due to networking limitations and time constraints, expanding the sample to include more male participants was not feasible.

Cultural background
Because of the researcher's Taiwanese background, half of the participants are Taiwanese (five out of eleven). This may introduce cultural bias in understanding how different groups perceive and handle bulky waste in The Hague.

3.4 Conclusion

The findings reveal that waste practices are shaped by a complex interplay of personal values, social influences, institutional factors, and so on. The blurred boundaries of misplacement and shifting object values highlight that waste is not a binary category but fluid and formed by social context. The misplacement of waste can occur either during the process or in the outcome of disposal. For example, J09 putting his waste in his neighbor's rental container is a case of misplacement in terms of the disposal process, even though the waste would eventually be collected.

Besides, the limited influence of place attachment suggests the project should take more account of the connection with people rather than physical place. More emphasis would be placed on raising a sense of community, shared responsibility, and neighborhood-level interaction. Cultural factors emerged primarily at the micro-scale, but entangle with meso- and macro-level factors. This multi-scale nature of bulky waste disposal practices underscores the importance of adopting a culture-sensitive mindset in design and avoiding a mismatched solution to the problem.

To conclude, efforts to mitigate bulky waste misplacement should consider not only enhancing infrastructures and services but also addressing how people perceive value, develop knowledge, and navigate social norms in specific contexts. These insights assist in defining the problem in the next phase.

04. Defining Design Direction

This chapter explores design opportunities and limitations derived from the research findings. The first section outlines the design possibilities and restrictions based on the earlier research activities. These insights aid in identifying five problem scenarios and supporting further discussion with the policymakers from the municipality of The Hague.

4.1 Emerging Design Opportunities and Limitations

Based on the analysis, this section outlines the potential boundaries and starting points for design. The goal is to preliminarily frame where the design could intervene effectively and where limitations should be acknowledged.

E. Mobility emerged as a critical moment for the need to dispose of bulky items. Participants often face transportation constraints and a lack of knowledge when moving. How to support people with transporting bulky waste and how related services can be improved are design opportunities. In connection with this, living in rental housing reveals important stakeholders, such as the house manager or landlord. They often serve as the first point of understanding waste disposal for renters. Partners and neighbors/ neighborhood are also considered greatly influencing how internationals adapt to local disposal practices. Although family strongly shapes early waste habits, most participants' families are not in the Netherlands, reducing its relevance as a design opportunity in this context.

This research highlights the factor of **A. Personal and Cultural Perceptions**, which the municipality might overlook in its waste management strategies. Two sub-factors stand out: **A.4 The anonymity in discarding waste** and **A.5 The identity of foreigners in the Netherlands**. Anonymity in waste disposal affects the sense of responsibility, and apartment living seriously weakens it. Additionally, the identity of foreigners influences how they perceive and engage with local waste management systems.

In terms of **D. Public Infrastructures and Services**, opportunities arise in making disposal information more accessible and improving how people learn and follow waste procedures. However, **D.2 Sticker on the ORACs** and **D.3 MyCleanCity App** are not in the design scope. The information provided on the sticker attached to the ORACs does not align with the moment of waste disposal, indicating that stickers are unnecessary for improving information delivery. For the MyCleanCity App, the municipality plans to replace it with a web-based app.

4.2 Problem Scenario of Bulky Waste Disposal in The Hague

Building upon the design opportunities and limitations identified in Section 4.1, some patterns were identified from this study. The majority of participants in this study have migration backgrounds (ten), have moving experience (eight) within The Hague, and all of them have lived in rental housing. These experiences shape how they interact with the local waste system and influence their attitudes and disposal habits.

To better represent the patterns identified, five different scenarios were presented below, and their challenges will be listed in this section. This study uses a four-frame comic to demonstrate key moments in each scenario (Figure 26-30). This also assists in discussing the contextual background and design direction with the officials from the municipality of The Hague.

A. Misalignment Between Information Delivery and Moment of Need

In Miss A's first few months after moving into the apartment in The Hague,

she received a letter. The letter was entirely in Dutch. She roughly translated parts of it and realized it contained information about waste disposal, but she didn't read it thoroughly and ended up recycling the paper.
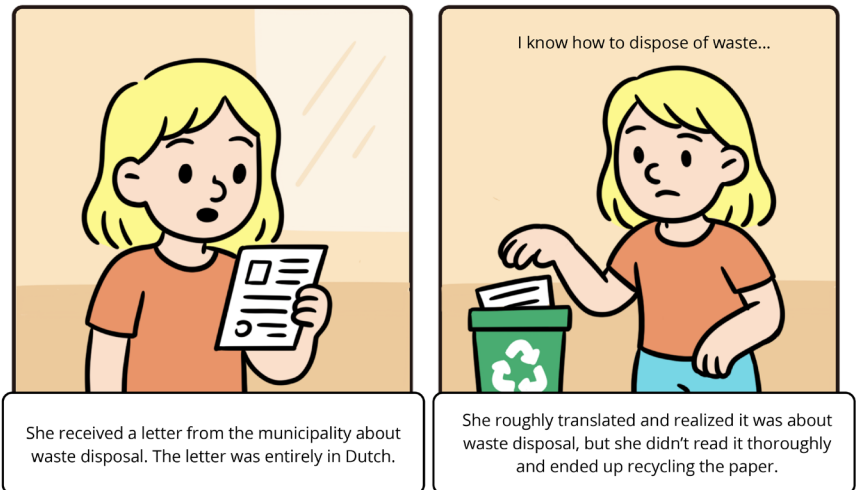
A few months later, she wanted to throw away a computer battery along with some broken electronic devices. She went online to look for information. She found out that bringing electronics to a waste depot requires an Afvalpas (trash card). However, she never received this card, and her landlord hadn't mentioned it either.

She received a letter from the municipality about waste disposal. The letter was entirely in Dutch.

She roughly translated and realized it was about waste disposal, but she didn't read it thoroughly and ended up recycling the paper.

A few months later, she wanted to throw a computer battery away.

She found that she needed an "Afvalpas" to access the local waste depot but never received one.

Figure 26. The scenario of A. Misalignment Between Information Delivery and Moment of Need.

Challenges

- The timing of receiving information does not align with the actual need. Most people do not need bulky waste disposal instructions right after moving in.

- The language barrier reduces the motivation to understand the information.

- Printed materials are easily thrown away or lost. People primarily rely on online resources to look up information.

- Miss A moved into the apartment without receiving the trash card, and her landlord did not provide related information.

B. Weak Sense of Shared Responsibility and Knowledge

Mr. B was never introduced to how bulky waste is handled,

neither through university nor during the immigration process. When he moved in, his landlord only explained how to sort waste inside the building, without mentioning anything specific about bulky waste.

The building has its own waste disposal system. He noticed that most people leave broken items next to the building's regular waste bins. Recently, he considered placing a broken blender next to the bins as well, thinking, "I don't really know my neighbors. They and the building manager probably won't say anything. No one knows me anyway."
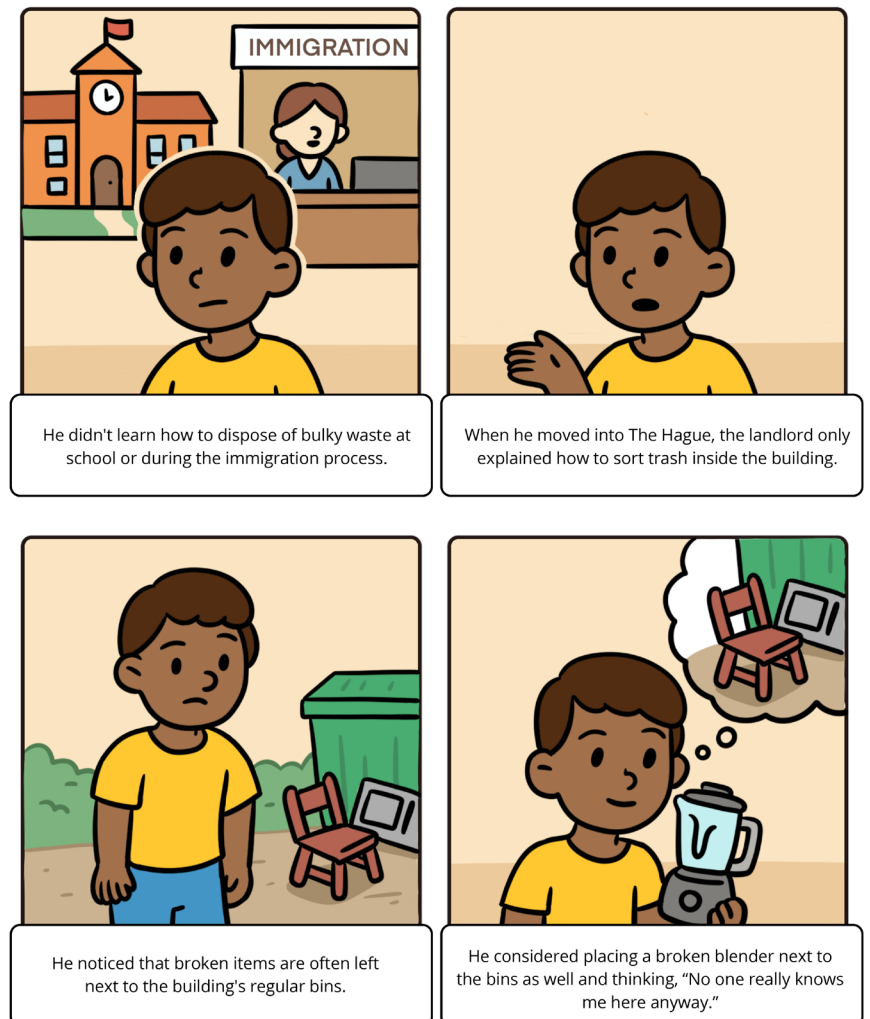
Figure 27. The scenario of B. Weak Sense of Shared Responsibility and Knowledge.

Challenges

- Mr. B was not introduced to how to deal with bulky waste, leading him to be unaware of proper disposal methods.

- The landlord only provided guidelines for sorting waste inside the apartment but did not explain how bulky waste should be disposed of.

- Lack of shared responsibility for waste disposal leads to improper disposal behaviors.

C. Ambiguity in Public Responsibility

Mr. C often sees bulky waste,

such as microwaves, chairs, and mattresses, left on street corners, and he feels it makes the environment look messy. At the same time, he thinks, "Maybe the local residents here have their own way of dealing with it." No one has ever told him that these abandoned items can be reported to the municipality, and he never considered how or where to do it.

He often sees bulky objects on the street and feels it makes the area messy.

He thinks, "Maybe the local residents here have their own way of dealing with it."

No one ever told him he could report the abandoned items on the street to the municipality.

He never considered how or where to report it.
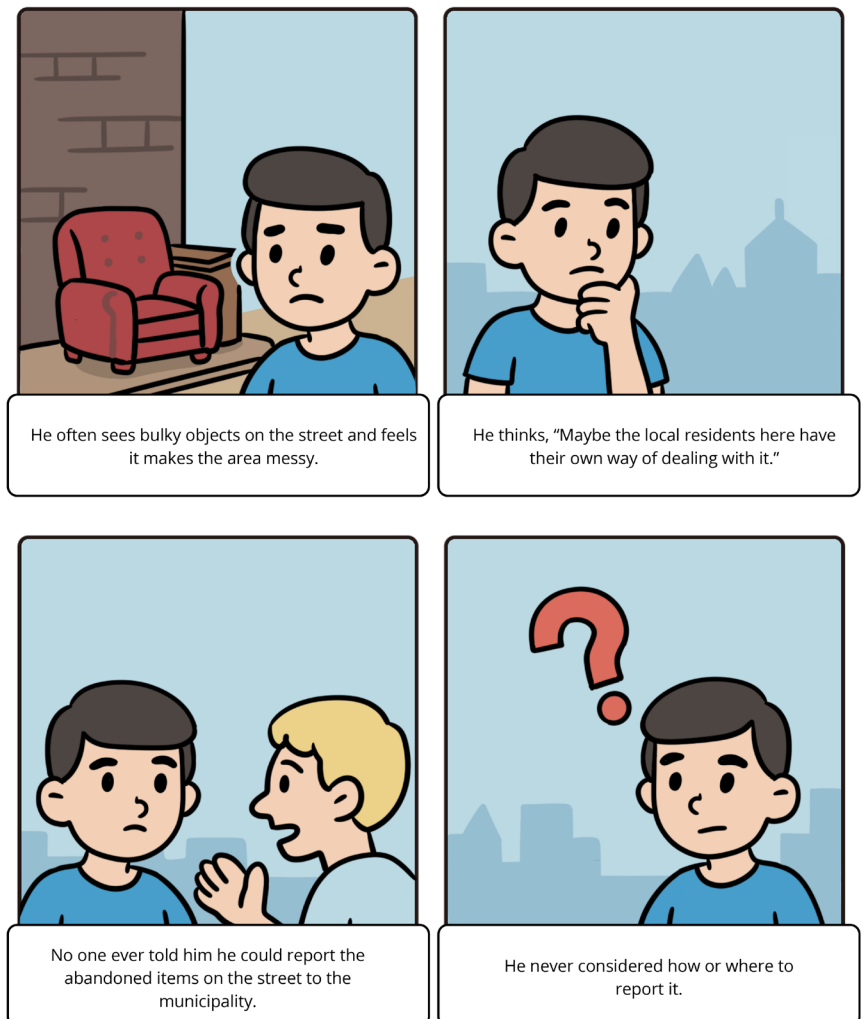
Figure 28. The scenario of C. Ambiguity in Public Responsibility.

Challenges

- Mr. C is unaware that he can report abandoned items to the municipality, leaving him without the necessary knowledge to take action.

- Mr. C does not want to react or deal with it, with a passive attitude engaging in the system.

D. Mobility Constraints in Bulky Waste Disposal

Miss D usually gets around by bike or on foot.

She's planning to move next month and wants to get rid of an old folding table and a carpet. However, these items are difficult to transport by bike or on foot to the waste spot.

She found out that she could book a collection service, but calling a public cleaner to pick up just two items felt like a waste of resources. Her family doesn't live in the Netherlands to help with the move. Although she could ask a friend with a car, she doesn't want to bother them for such small things.

She usually travels by bike or on foot.

She's moving next month and wants to get rid of an old items, but they're hard to carry.

She found out could book waste collection, but it might be a waste of resources.

Her family doesn't live in the Netherlands, and she doesn't want to ask a friend with a car for such small things
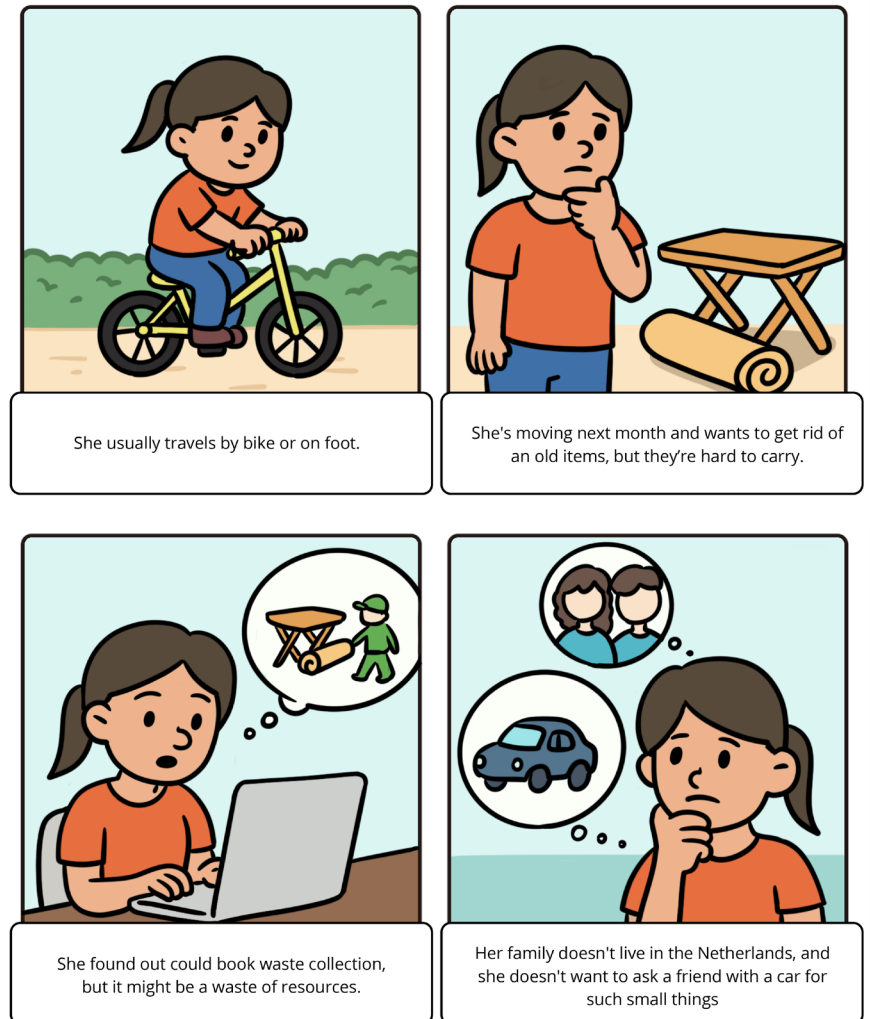
Figure 29. The scenario of D. D. Mobility Constraints in Bulky Waste Disposal.

Challenges

- Miss D struggles with transporting bulky items like a table and carpet by bike or on foot, limiting her options for disposal.

- Using a public collection service for just two items seems like an excessive use of resources.

E. Lack of Transparency in Bulky Waste Collection Services

Finally, she chose to book a collection service through the municipality's website.

Following the guidelines, she placed the bulky waste on the street. She was afraid that the items might also be blown by the wind, but She had to work that day and couldn't know if they were picked up or taken by someone else. This made her feel unsure if she could really trust the service and use it again.

Finally, she booked a collection service on the municipality's website.

She followed the regulations and placed the old table and rug on the street.

She was afraid that the items might also blown by the wind, but She had to work that day and couldn't know if they were picked up or taken by someone else. This made her feel unsure if she could really trust the service and use it again.
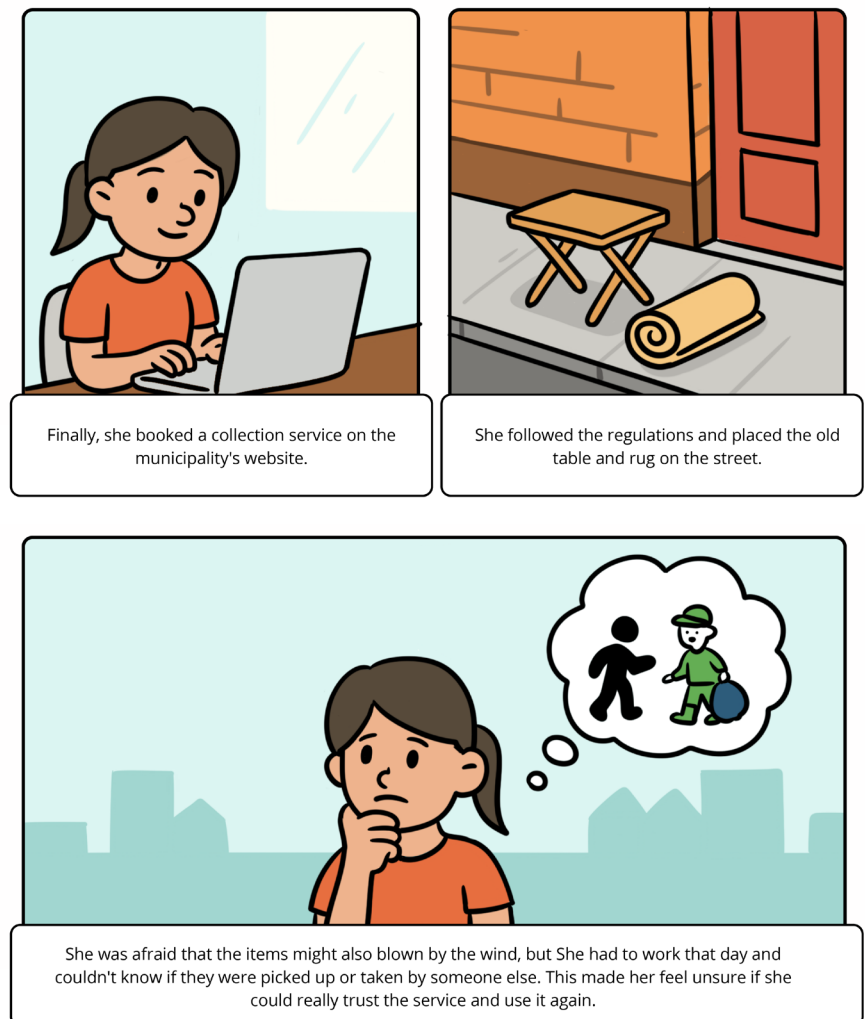
Figure 30. The scenario of E. Lack of Transparency in Bulky Waste Collection Services.

Challenges

- The collection service did not provide information about picking up bulky waste, causing Miss D to doubt the system's effectiveness.

- Miss D was concerned that her items would be blown away by, but she could not check whether it might cause safety issues.

4.3 The Meeting with the Municipality of The Hague

A meeting was scheduled with policymakers from the Municipality of The Hague to validate the relevance of the design directions (Figure 31). The discussion focused on presenting the five problem scenarios (shown in the Section 4.2) and gathering feedback on which initial ideas resonate most with the current context.

4.3.1 Key Priorities were Formed Based on the Discussion on Problem Scenarios

The municipality expressed interest in three scenarios: **B. Weak Sense of Shared Responsibility** and Knowledge, **D. Mobility Constraints in Bulky Waste Disposal**, and **C. Ambiguity in Public Responsibility**. **B.** and **D.** were identified as the most urgent challenges. People who lack local knowledge tend to follow others' misplacement behaviors. With weak shared responsibility in place, they might be indifferent to the waste system. In response, the policymakers revealed that they encourage people to use the collection service even for medium-sized objects. Improper disposal without following official procedures may bring additional challenges for recycling and require more manpower to handle. For **D. Mobility Constraints in Bulky Waste Disposal**, they also identified transportation constraints of residents and tried to support them. Regarding the theme of **C. Ambiguity in Public Responsibility**, policymakers recognized it as valuable and suitable for long-term strategies.

While for problem scenario **A. Misalignment Between Information Delivery and Moment of Need**, about the issue that residents usually lose their trash card, the municipality has already worked on digitizing the trash card to allow residents to access the waste depot. **E. Transparency in Collection Service** about improving the feedback on the collection services not urgent.

Figure 31. The meeting with policymakers in the municipality of The Hague using problem scenarios.

4.3.2 Feedback from the Municipality of The Hague for Initial Ideas

Based on the five problem scenarios, the project proposed two How Might We (HMW) questions and some initial design ideas during the meeting. Two questions and the following ideas were introduced below:

How might we improve information about bulky waste disposal for non-native Dutch speakers?

- Visualize how bulky waste is reused in materials and new products.

- Visualize the waste disposal process, such as the time investment.

- Encourage them to understand information.

How might we support residents with limited transportation to dispose of bulky waste?

- Shared transportation for bulky waste.

- Grouped Pickup Service.

- Neighborhood Drop-off spot in collaboration with local stores.

In response to ideas under question 1, the municipality showed interest in visual elements, as they allow for easier implementation and testing. Regarding question 2, they had already started some collaborations with some local second-hand stores to encourage people to exchange objects. Additionally, they had been studying the Rotterdam municipality's shared "bakfiets" (electric cargo bikes). However, the Rotterdam municipality shared that the services tend to attract only those who are already compliant with waste regulations. This led them to reflect on how interventions might better reach residents who contribute to waste misplacement, not just those who are already motivated.

4.4 Reflection on Design Direction

How to define "proper" bulky waste disposal for different stakeholders?

The definition of "proper" bulky waste disposal is not the same, but varies depending on the stakeholders involved. This disparity reflects differing priorities embedded within the waste management system.

This project compares the perspectives of the municipality and residents, deriving insights from prior research activities (see Chapter 3) and meeting with the municipality (see Section 4.3). From the municipality's perspective, proper disposal may emphasize cost-effectiveness and compliance. The solution can minimize unplanned clean-up efforts, helping avoid excessive use of manpower and municipal budget. They expect that residents will follow established procedures, such as scheduling pick-up appointments and adhering to sorting and disposal guidelines (See Section 4.3.1). This ensures that public spaces remain uncluttered and functional efficiency of the urban environment.

In contrast, bulky waste disposal for residents may be impacted more by convenience. Especially during periods of moving, people seek to minimize stress, rather than adding burdens for managing the bulky waste/objects. They would prioritize time-saving disposal options, as an interviewed participant H05 mentioned that selling or donating second-hand items takes a lot of time, and throwing away all items is easier (See Section 3.2.2, A.3 Time investment). They also tend to choose the way that helps them avoid the risk of fines or shame. For example, when an interviewed participant, Y03, moved out of the housing, she

shredded cardboard and threw it into the ORACs due to the uncertainty of cardboard disposal (See Section 3.2.2, E.4 House manager/ Landlord).

Despite differences in other values, both the municipality and residents place significant importance on cleanliness. However, the focus differs. For the municipality, cleanliness relates to maintaining tidy public spaces, while for residents, cleanliness is more tied to private living spaces. Only one interviewed participant, S11, shared his care for the public space of the shared garden (See Section 3.3.2 Place Attachment). Most participants' waste disposal habits reflect a strong priority on maintaining a tidy personal environment. For instance, participants F08 and J09 dislike having waste in their homes. When J09 had a broken cabinet door, he moved it to the storage room to avoid occupying his living space. Similarly, F08 does not have a trash bin at home and chooses to discard small-bag trash every day. Their disposal habits reflect a strong priority on maintaining a tidy personal environment.

The value divergence can lead to tension between the municipality and residents. Understanding these different perspectives provides insights for defining the design direction and suggests that design intervention should therefore balance residents' needs and the municipality's goals.

What effect can design interventions create?

Even though the municipality has expressed interest in implementing visual design interventions, the impact of such solutions may be limited if residents still passively receive information. Thus, this project reflects on the role of intervention. The solution is not to make a "band-aid" or "repair" design in making improvements, but to bring innovation to the municipality. The proposed concept could inspire the municipality to think about interventions with a future vision. The project aims not just to improve existing conditions but to foster more innovative spaces.

What existing solutions can inform future design directions?

The discussion of initial ideas revealed the potential to explore broader design opportunities. Some proposed interventions have already been piloted or implemented. Designers should be cautious not to reinvent the wheel, but instead build upon lessons learned by standing on the shoulders. Understanding current solutions will be an important foundation as the project moves into the next phases of ideation.

05. Developing Concept: How Frequent Movers Manage Bulky Waste

This chapter incorporates research insights into concrete design directions aiming for supporting bulky waste disposal for frequent movers with migration backgrounds in The Hague. It defines the design vision, goals, and target group personas. Following the phase of individual brainstorming, five ideas were discussed in the co-design workshop, from which two were selected as the foundation for the final design proposal. In the end, the chapter reflects on the idea selection and iteration.

5.1 Defining Design Direction

This section defines the overall design direction by reframing the design goal and identifying the target user. While earlier findings revealed tension between the municipality and residents. The graduation project frames The Hague citizens as the main users in this context. The design focuses on supporting residents in managing the bulky waste.

5.1.1 Design Vision

This project reflected on the distinctive goals of the municipality and residents (See Section 4.4). A design vision is envisioned where bulky waste disposal is not seen as a stressful and isolated task. Figure 32 provides an overview. For residents, especially those with a migration background and a short-term connection to the city. Bulky waste disposal can be done in ways that feel warm, social, and an empowering experience. It provides an opportunity to interact with the neighborhood and feel part of a community, even temporarily. For the municipality, the goal is not just outcome-based efficiency, but creating stronger connections with residents' lived experiences. The interventions can act as a bridge, providing accessible solutions and supporting responsible disposal behaviors, where both institutional goals and resident needs are addressed.

Current condition   **Design vision**

Municipality
- Cost-effectiveness
- Compliance
- Cleanliness: Public space

Tension in different priorities of bulky waste disposal

Residents
- Feel at ease
- Convenience
- Cleanliness: Mainly in private space

Municipality

The goal is not just outcome-based efficiency, but creating stronger connections with residents' lived experiences.

Residents

Bulky waste disposal can be embedded in daily routines in ways that feel warm, social, and empowering.

Figure 32. Current condition to design vision.

5.1.2 Design Goal

After reflecting on stakeholders' different values, the effects of previous design choices, and insights from the co-design workshop (Section 5.4), a new design goal and related design criteria were developed to adjust the design direction. The updated goal takes into account both short-term and long-term considerations.

To avoid confusion for readers, the design goal and critera in this section is the final version. Earlier goal versions and details of the reflections are included in Appendix A.

> The design goal is to make <u>frequent movers with a migration background</u> **feel confident** in managing bulky waste and **develop a sense of responsibility in the community** during housing transitions in The Hague.

Based on the design goal, **five key design criteria** were derived: Knowledge empowerment, Transportation support, Clarity of information, Service accessibility, and Social awareness. These criteria serve as guiding principles for the next phases of ideation and concept development. Further explanation of the design criteria can be found below:

To make residents **feel confident** in managing bulky waste:

1. **Knowledge empowerment**: Residents understand how to dispose of bulky waste and how to use existing infrastructures and services.

2. **Transportation support**: Residents can overcome transportation barriers in transporting bulky waste with an alternative option.

3. **Clarity of information**: Information about bulky waste disposal is easy to understand.

4. **Service accessibility**: The service provides language support and communication channels that are more accessible to non-Dutch-speaking residents.

Develop residents' **sense of responsibility** in the community:
5. **Social awareness**: Residents feel connected with the community and feel encouraged to act in ways that benefit others in the community.

5.1.3 Persona

To better represent the patterns identified, a persona was synthesized based on shared traits. A persona is a fictional character (that represents the target group), expressing specific needs, habits, motivations, or cultural backgrounds of specific groups of users. By keeping the persona's perspective in focus, the design process can remain empathetic, helping to avoid overly diffuse ideas and ensure that solutions respond to user needs.

This persona, Lynn, reflects recurring themes from interviews and observations. She embodies the transitional, multilingual, and socially detached experience that many people with migration backgrounds face in The Hague, which shapes how she approaches bulky waste during frequent moves.

Lynn
- Age: 30
- Languages: English (daily use), Dutch (basic)
- She has lived in a rental apartment in the Centrum district for the past five years.
- She has relocated twice within The Hague.

Attitude

"If I cannot move with this rack, it might become a bulky waste for me. Even though it is still usable."

"I've moved so many times that I don't feel attached to any one place."

"I know I shouldn't add to someone's bulky waste pile, I do it sometimes because… no one really knows me anyway."

"As an international person, it's hard to find clear information about waste disposal normally. I usually observe what others do."

Background

Lynn came to the Netherlands to pursue a master's degree. After graduation, she started working. She has lived in the Centrum district for the past five years, renting different apartments as her housing situation changed. She does not know about her neighbors. While she has settled into life here, she still relies on English for daily communication, as her Dutch remains limited. Since moving to the Netherlands, she has relocated twice within The Hague due to lease changes.

Challenges

- Lacks a sense of long-term stability, with rental contracts often short and changes frequent.
- Experiences stress and confusion during each move due to uncertainty about local rules and bulky waste disposal.
- Has limited interaction with neighbors, making them feel less responsible for the local community.

Needs

- Seeks reliable support for transporting items and managing bulky waste during housing transitions
- Needs easy-to-understand and English-friendly information about clear procedures for local bulky waste procedures.
- Needs guidance on what to keep, donate, or discard when moving.
- Needs to feel that her small actions still matter, even if she is a temporary resident.

5.2 Individual Brainstorming

To further explore design opportunities based on the revised design goal and persona, an individual brainstorming session was conducted. This ideation phase involved an iterative diverge-converge process to explore possible solutions.

During the ideation process, existing solutions and ongoing initiatives were also reviewed to ensure the proposed ideas would either build upon or extend current systems, rather than reinvent the wheel. For example, both Amsterdam and The Hague municipalities have planted mini-gardens around underground waste containers to reduce littering (Figure 33). Residents in Rotterdam and The Hague can search for nearby thrift stores that support exchange, repair, or recycling via municipal websites. Rotterdam also offers free electric cargo bikes to help residents transport bulky or reusable items to recycling centers (Figure 34).

Ultimately, five ideas were selected to be brought into the co-design workshop and discussed with policymakers, designers, and The Hague citizens as the next step. These ideas were introduced below (See Figure 35-39).

Figure 33. The municipality of Amsterdam built mini-gardens around ORACs to reduce littering (Menezes, 2022).

Figure 34. People can borrow free electric cargo bikes in Rotterdam to transport their bulky waste/ objects (Gementee Rotterdam, 2022).

Idea 1: Shared transportation

People can borrow a trolley for free as a public service. They can use it for moves and put their bulky waste in it for collections. The trolley can be taken to the parking area and locked in the designated collection spot. So the waste can be picked up by cleaners.
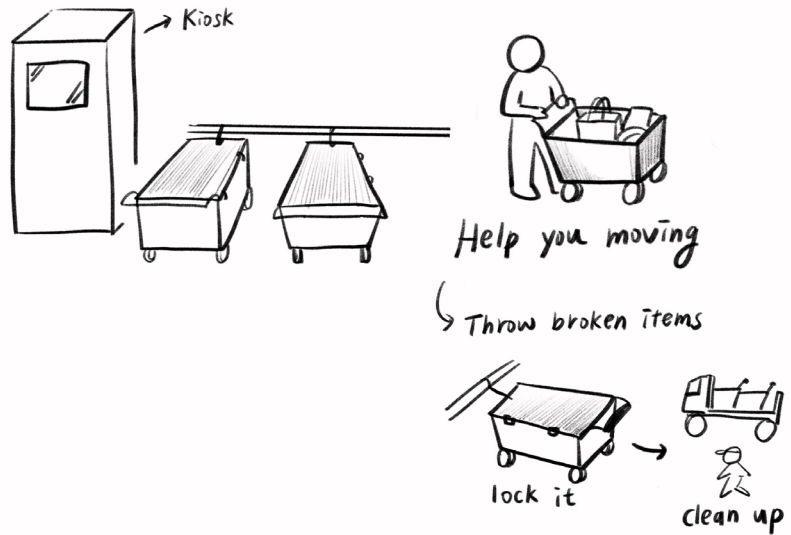
Figure 35. Idea 1: Shared transportation.

Idea 2: Joining collection

When applying for the collection and writing what they want to throw away on the website, people can see the spots assigned for the collection service or where someone has already put their waste. So they can navigate to the collection spot and do not have to worry about selecting a location and checking regulations. People can apply to put the bulky waste in the assigned area by scanning the QR code on the kiosk. The machine will print out paper that people applying for throw out, and they can paste it on their waste.
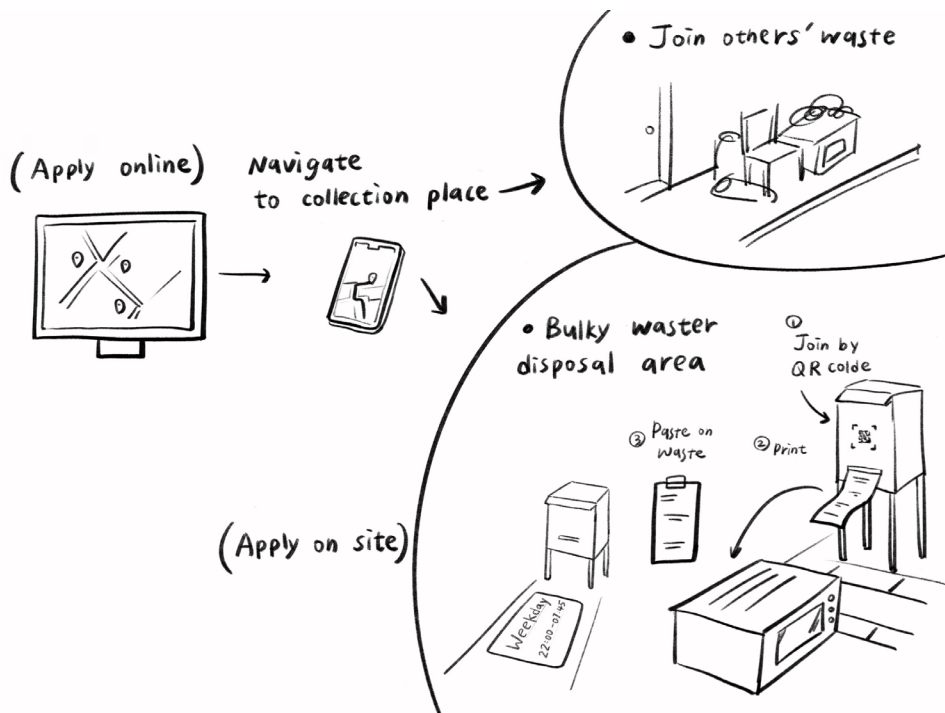
Figure 36. Idea 2: Joining collection.

Idea 3: Fixed group pick-up service

Once a month, people see a group pick-up trolley that travels along a fixed route around the neighborhood. The trolley will play music to make people notice it coming. People can walk out and throw their bulky waste in a car, or take something still usable.
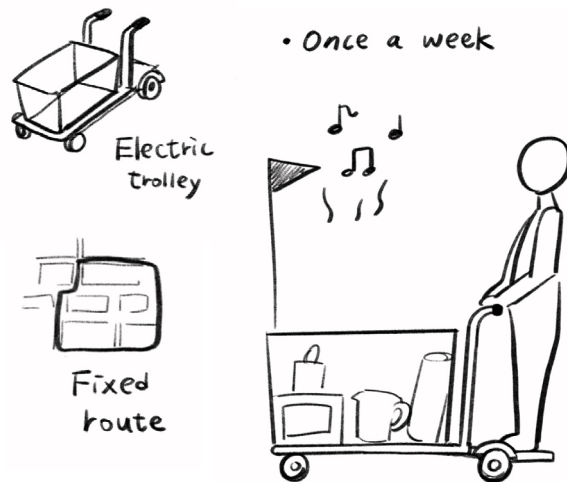
Figure 37. Idea 3: Fixed group pick-up service.

Idea 4: Public showroom

If people have some reusable items, they can take them to a showroom in the neighborhood. People can see through the windows, put usable items in them, and write stories about their objects. It's like decorating the room together.
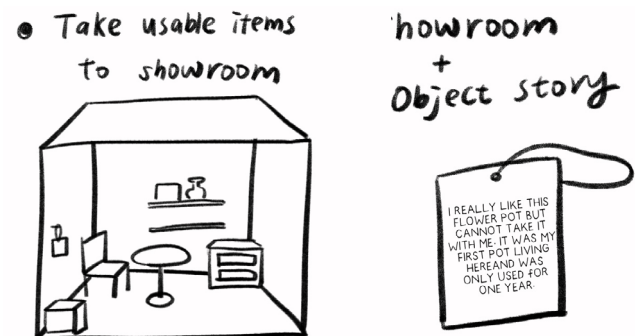
Figure 38. Idea 4: Public showroom.

Idea 5: Visual markers

When residents move in, they receive a package with instructions on how to dispose of their garbage. Some stickers and tapes are for bulky waste. They can paste on the bulky waste when putting it on the street for collection. There are different sentences on the tapes. For example, "Let's keep our street nice for everyone." "I'm waiting for my ride."
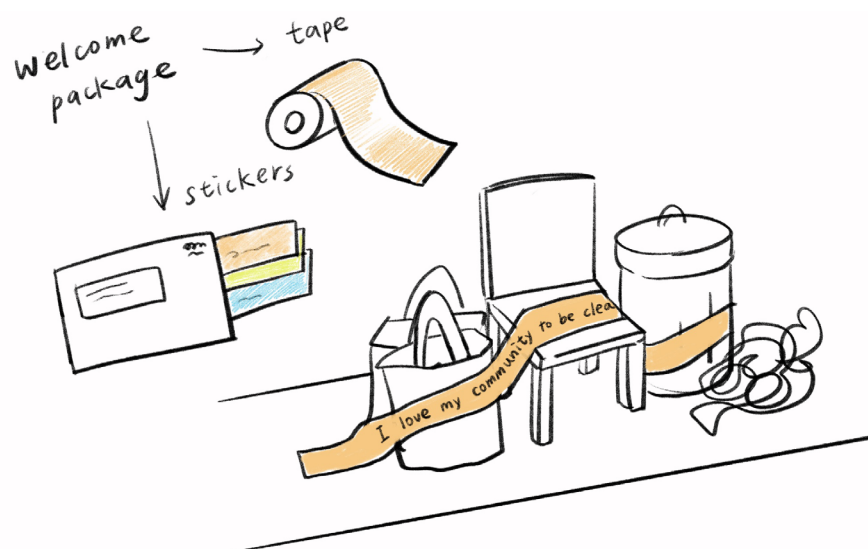
Figure 39. Idea 5: Visual markers.

5.3 Co-design Workshop

To iterate on design ideas that support frequent movers with a migration background in The Hague, a co-design workshop was conducted to evaluate and iterate on five ideas from individual brainstorming (Figure 40). Five ideas from brainstorming can be found in Section 5.2. This workshop aimed to not only assess ideas but also to integrate the diverse perspectives of different stakeholders, including residents, policymakers, and designers. The workshop employed personas to foster participants' empathy for the design scenario and bodystorming as a role-play activity to facilitate their collaboration. Eventually, two ideas were selected and built the foundation for the final concept.

Figure 40. Co-design workshop.

5.3.1 Why Co-design? Adopting a Participatory Mindset

The complexity of problems frequently results in conflicting individual perspectives, especially in the context of group decision-making. This indicates that addressing a complex problem is fundamentally a social process involving project teams, controllers, influencers, stakeholders, and organizations, with careful consideration for effective resolution (Kpamma et al., 2017). How to manage bulky waste reflects these complexities. The finding in Chapter 3. Understanding Bulky Waste Disposal Experiences in The Hague already indicated that it was influenced by multiple stakeholders and shaped by infrastructural or cultural factors.

To address this complexity, adopting a participatory mindset becomes essential, overcoming disciplinary and cultural barriers to cultivate a shared language and collaborative exploration (Sanders & Stappers, 2012). Co-design workshop was therefore chosen as the primary method in the idea convergence phase. The researcher invited three types of participants: residents with a migration background, policymakers from the municipality of The Hague, and designers. This composition was intentionally curated to foster integration of multiple perspectives. Residents can provide living experiences, municipal representatives brought in practical and policy-related considerations, and designers contributed creative thinking.

5.3.2 Workshop Design

Seven participants were invited for the co-design workshop, consisting of two policymakers from the municipality of The Hague, two designers, and three The Hague citizens (Table 3). Designers, policymakers, and P7 were recruited through researchers' networks. F6 were recruited from the last interviewed participants. A7 was F6's friend and was invited through F6. In addition, two people were invited as observers and attended without influencing or participating in the design activities.

The co-design workshop was structured into four phases: (1) Warm-up, (2) Group discussion, (3) Show time, and (4) Wrap-up. It took 1.5 hours in total. The duration of each phase and activities can be found in Table 4. The session began with a warm-up activity, reviewing the project background, existing bulky waste practices, and implemented solutions. The persona Lynn (See Section 5.1.3) was introduced to participants and helped them to build the foundation for empathy.

During the group discussion, seven participants were divided into two groups, with each group focusing on one design direction. Group A focused on the short-term goal of building confidence in bulky waste management. They discussed Idea 1: Shared transportation, Idea 2: Joining collection, and Idea 3: Fixed group pick-up service. Group B explored the long-term goal of developing shared responsibility within neighborhoods and discussed Idea 4: Public showroom and Idea 5: Visual markers. Details of these idea proposals are elaborated in Section 5.2. During the show time, the idea selected by the group was presented through bodystorming, which helped participants visualize and collaboratively refine the scenarios (Figure 40).

Finally, in the wrap-up session, participants were asked to write down what they care about and what they worry about in relation to the selected idea and discuss all together (Figure 40). This closing activity helped capture individual concerns and values that may not have surfaced during the group work.

Code	Background	Group in the workshop
E1	Policymaker from the Clean City Department in The Hague municipality.	Group A: Short-term goal.
J2	Policymaker from the Clean City Department in The Hague municipality.	Group B: Long-term goal.
B3	Design researcher, engaging in the Achter Aval project.	Group A: Short-term goal.
N4	Design student, studying Design for Interaction at TU Delft.	Group B: Long-term goal.
A5	Citizen, living in Centrum (half a year)	Group B: Long-term goal.
F6	Citizen, living in Laak (1 year), Centrum (3 years)	Group B: Long-term goal.
P7	Citizen, living in Bezuidenhout (9 months)	Group A: Short-term goal.

Table 3. Participants' background information in the co-design workshop.

Duration	Phase	Activities
20 minutes	Warm-up	- Introduce the Project background - Introduce current bulky waste practices and solutions for reducing waste misplacement.
40 minutes	Let's Explore the Concepts!	- Introduce persona and bodystorming - Seven participants were divided into two groups, with each group focusing on one design direction.
10 minutes	Show time	- Share the selected and iterated concept by bodystorming
20 minutes	Wrap-up	- Write down what you care about and worry about on paper - Share your opinions

Table 4. The workshop brief agenda.

5.3.3 Bodystorming for Facilitating Collaboration

Bodystorming, combining role-play and simulation, is a way to physically experience a situation in order to generate ideas. By physically acting out their ideas, participants were able to externalize ideas and collaboratively refine them. Vega-Cebrián et.al (2023) reviewed how bodystorming methods are being applied. It can be a generative strategy to develop ideas from scratch, combining with sensory materials, or performative prototyping. In this co-design workshop, the bodystorming aims to promote conversation and collaboration with stakeholders through interaction and expand design possibilities. The generative and enacted form of participant observation creates conditions for the collective sense-making by allowing participants to perform and negotiate actions in simulated settings in real time (Schleicher et. al, 2010).

5.3.4 Results of the Co-design Workshop

Originally, Group A and Group B explored different goals in their ideas. However, as the discussion progressed, participants began to integrate both perspectives. The final idea selections reflected this convergence, incorporating elements of immediate practicality with broader community engagement. The persona Lynn proved to be a useful tool for guiding the discussion, helping participants to consider both short-term needs and long-term effects. Group A, in particular, reflected on the contextual factors that might contribute to Lynn's passive behavior and questioned how she would interact with the waste system.

Group A chose Idea 3: Fixed group pick-up service. Participants explained that they quickly decided to move forward with the idea because they believed people like persona Lynn, with a more passive attitude engaging in the system, would be unlikely to use Idea 1: Shared transportation and Idea 2: Joining

collection that required active participation.

Group B chose Idea 5: Visual markers, preferring its practicality over the more complex Idea 4: Public showroom. The showroom idea still left some concerns about not working in a crowded street and maintenance. While the idea of a showroom stimulated discussion around visibility as an art project, concerns were raised about its feasibility in dense urban streets and the difficulty of maintenance. Visual markers like stickers and tapes were seen as simpler, scalable interventions that could still effectively stimulate awareness in the neighborhood.

In the next section, the selected ideas will be examined in detail, highlighting both their potential benefits and limitations as identified through workshop discussion.

5.3.5 Selected Ideas

Overall, avoiding the need for prior appointments for the **Idea 3: Fixed group pick-up service** was appreciated during the workshop discussion, which enhances the convenience and flexibility in disposing of bulky waste. The stickers/tape design can serve as low-cost, effective visual markers that indicate bulky waste has been properly reported and is scheduled for collection. **Idea 5: Visual markers** could contribute to establishing disposal norms.

This section presents participants' opinions on two selected ideas, Idea 3: Fixed group pick-up service (music trolley) and Idea 5: Visual markers (stickers/tapes). It highlights their perceived advantages, drawbacks, and suggestions for refinement.

(1) Group pick-up service: The music trolley in the community.

Convenience without making an appointment.

Four participants mentioned that the music trolley idea is convenient and does not require appointments. A5 and F6 emphasized the importance of reducing the effort required for disposal. For example, F6 expressed what she cares about is "how convenient (less effort and quicker) I can throw my bulky waste away".

Sound and visual appearance provide noticeable cues.

Participants mentioned that sound can make people aware of the waste pick-up coming and trigger disposal behavior. As P7 wrote, "the music (melody) sinks into people's brains, and they know when to dump their trash". However, A5 considered that the sound could also interfere with some residents.

Collection time is a key concern.

Four participants are concerned about whether the collection times align with residents' daily routines, including after work, at night, or on weekends. N4 noted that it might take efforts in planning to fit the collection time. She also worried about how the municipality can maintain the system to regularly pick up waste.

Design suggestions

- To accommodate different routines, flexible scheduling, such as evening or weekend rounds, should be further considered.

- The sound design should strike a balance between being a helpful auditory cue and avoiding noise disturbance, especially in dense neighborhoods.

- Notice in advance for bulky waste disposal in The Hague should be accessible to citizens, allowing them to prepare accordingly.

- The design of the music trolley should further consider the needs of other stakeholders, such as municipal workers and public cleaners, ensuring operational feasibility across the system.

(2) Visual Markers: Stickers/ tapes pasted on the bulky waste.

Stickers can help identify the "legal" bulky waste, as a medium for social communication.

F6 and P7 see the stickers as a way to contribute to the community's cleanliness, which could bring a positive impact on neighbors. The sticker can offer a visual that indicates bulky waste is awaiting collection. As B3 noted, they allow people on the street to easily recognize that the waste is being handled through the regulated process. Over time, such visibility can increase public awareness and help foster new social norms around proper disposal.

The concern of forgetting or discarding the stickers.

Five out of seven participants highlighted the risk of residents losing or discarding the stickers or tapes. They might often be overlooked in the welcome package or accidentally thrown away, reducing their intended impact. J2, as a policymaker, pointed out that how people get stickers/tapes should be further clarified.

Design suggestions

- Since the concern about forgetting or discarding the stickers, distribution should not solely rely on welcome packages. Alternative touchpoints, such as second-hand stores, waste depots, could be considered.

- To increase their adoption, stickers should be designed to be visually clear. This can be achieved by using icons or images and minimizing lengthy text, making it more accessible to diverse residents. What information is delivered can be further iterated.

5.4 Inspiration from the Co-design Workshop

5.4.1 Can the Service be More Proactively Approach Citizens?

The selected idea of the Group pick-up service: The music trolley in the community, prompted a reflection on the relationship between citizens and public services. Normally, residents play an active role in learning and using services, such as scheduling bulky waste collection, bringing waste to the depot, or renting electric cargo bikes to throw the bulky waste. These practices require a certain level of proactive engagement. In contrast, the idea of the group pick-up service introduces a more proactive approach. This idea has the potential to better reach residents, especially those with migration backgrounds who may be less familiar with local waste management systems. It creates more on-site touchpoints and social interaction for residents when using public services.

5.4.2 Visual Communication and Social Norms

The idea of Visual Markers: Stickers/ tapes pasted on the bulky waste presented the potential as a medium for information and social communication. Echoing the findings in Chapter 3, the bulky waste usually lacks visual marks, making it difficult to distinguish between legal and illegal placements. By introducing this idea, the project identified an opportunity not only to demonstrate legitimacy but also to empower individuals in labeling and communicating about their objects. This form of subtle communication can help establish social norms around waste placement.

Following this perspective, the terms and messages on the stickers should be carefully designed. For example, participants wrote down "Don't hate me" on the stickers. This example framed the waste as something with a negative or burdensome sense. It made this

project reflect on how sticker design might reshape the perception of waste itself, whether it could challenge or flip the impression of waste by introducing more positive messages.

5.4.3 Limitations of the Co-design Workshop

Due to the time constraints of the whole graduation project, the co-design focused on idea convergence rather than divergence. As a result, this limited the space for residents and policymakers to brainstorm new ideas together. Nevertheless, bringing developed ideas to the workshop effectively framed the discussion topics and allowed participants to focus on selecting the most promising ideas within the available time.

5.5 Next Step: Toward the Final Concept

This chapter presented the development of design ideas, beginning with individual brainstorming and refined through the co-design workshop. During the workshop, ideas were evaluated by participants, leading to the selections of two ideas: (1) A music trolley that enables fixed group pick-up without requiring appointments and encourages social interaction, and (2) Visual markers, such as stickers or tapes, that make legal disposal recognizable and promote social norms.

The next step will focus on consolidating the group pick-up service as the core of the final concept. This idea stood out because it transforms the interaction between residents and public services by proactively engaging with users. The stickers will be considered as complementary tools in this service. Building on insights from the interviews, co-design workshop, and other research activities, the final concept will be further developed and iterated. Finally, this concept will be evaluated to identify its opportunities and challenges.

5.6 Concept Iteraction and Refleciton

The project reflected on social practice theory's view, as bulky waste disposal is seen as a practice and combined with meaning, skills, and materials (See Section 2.1). Dealing with bulky waste requires a certain level of knowledge in sorting objects. A key question emerged: how might the service enable residents to learn from the disposal process rather than merely seeking to discard waste as quickly as possible? Echoing the design vision, the service should focus on empowering residents in bulky waste disposal, rather than prioritizing outcome-based efficiency.

Therefore, the project developed tools, such as tapes and stickers integrated in a toolbox, that can help note the status of objects. These tools aim to strengthen residents' awareness not only around discarding items but also about repair and reuse. This also responds to the key findings in Section 3.3, which highlights the fluid nature of the definition of waste. What one person considers waste may hold value for another. Tools can further create a moment in the object's meaning transition.

When refining more details in tools, the project reflected on the Section 5.4.3 Visual communication and social norms. For example, the messages "Don't hate me" on the collection tapes proposed by the participants during the co-design workshop could shift the impression of waste by incorporating more positive or neutral terms (Figure 41). The stickers paired the garbage bin icon with "broken". This might also lead to the idea that "Broken" things should inevitably be thrown away (Figure 42).Consequently, the project adjusted the term and iconography to be more like a conversation with objects. This iteration was inspired by Marie Kondo's KonMari method, which emphasizes thanking the item for its service and letting it go, rather than simply tossing it away (For more information, see KonMari's website https://konmari.com/).

In addition to refining the visual language of the tools, the project also explored ways to create explored opportunities to create moments of social interaction within the service, aligning with the vision of offering residents a warm and communal experience. The project came up with the idea of giving snacks to residents, aiming to facilitate moments where neighbors could engage in informal conversations.

Together, design elements such as the logo, tape patterns, stickers, and toolbox were continuously iterated based on input from other designers/ design students. The various versions developed throughout these iterative cycles were documented in Appendix B. The prototyping process can be found in Appendix C.

Figure 41. The initial idea of collection tape.

Figure 42. Initial idea of stickers noting the objects' status of broken.

06. Delivering Concept: "Oh Oh Pick-Up" Service

This chapter introduces the concept of the "Oh Oh Pick-Up" service, developed in the final stage of the project. The concept was evaluated by citizens of The Hague and stakeholders, including policymakers and local waste management specialists. Drawing on the insights gained from these evaluations, the chapter offers recommendations for future service development and reflection on the limitations and opportunities in the proposed concept and the whole project.

6.1 From Ideas to Concept Delivery: An Overview

6.2 Concept: "Oh Oh Pick-Up", A Mobile Bulky Waste Pick-up Service in The Hague.

6.3 Concept Evaluation with The Hague Citizens

6.4 Concept Evaluation through Stakeholders Workshop

6.5 Discussion

6.6 Recommendations on "Oh Oh Pick-Up" Service

6.7 Conclusion and Reflection

6.1 From Ideas to Concept Delivery: An Overview

After confirming Group Pick-up Service as the foundation of the final concept, the project proceeded with further iterations and reflected on findings from prior research activities. This led to the development of OhOh Pick-Up, a mobile bulky waste pick-up service, as the final delivered concept in this project. Its branding is inspired by the image of The Hague.

The concept was evaluated through live demonstrations with The Hague residents and the stakeholders workshop, focusing on the understanding of the service concept and tool design. Based on the evaluation results, additional design details were refined to strengthen the service design aspects. The following Section 6.2 presents an integrated and comprehensive version of the concept. This aims to provide readers with a clearer understanding of the envisioned concept in its fully developed form. The overview from ideas to concept delivery can be found in Figure 43.

Since it is impossible to evaluate all parts of the concept in detail, the evaluation mainly focused on simulating the service scene and introducing the concept verbally. This simulation involved recruiting a person to act as the community waste specialists, equipped with a cap and a logo T-shirt, renting a cargo bike, presenting the toolbox, and demonstrating the collection of bulky waste on the cargo bike.
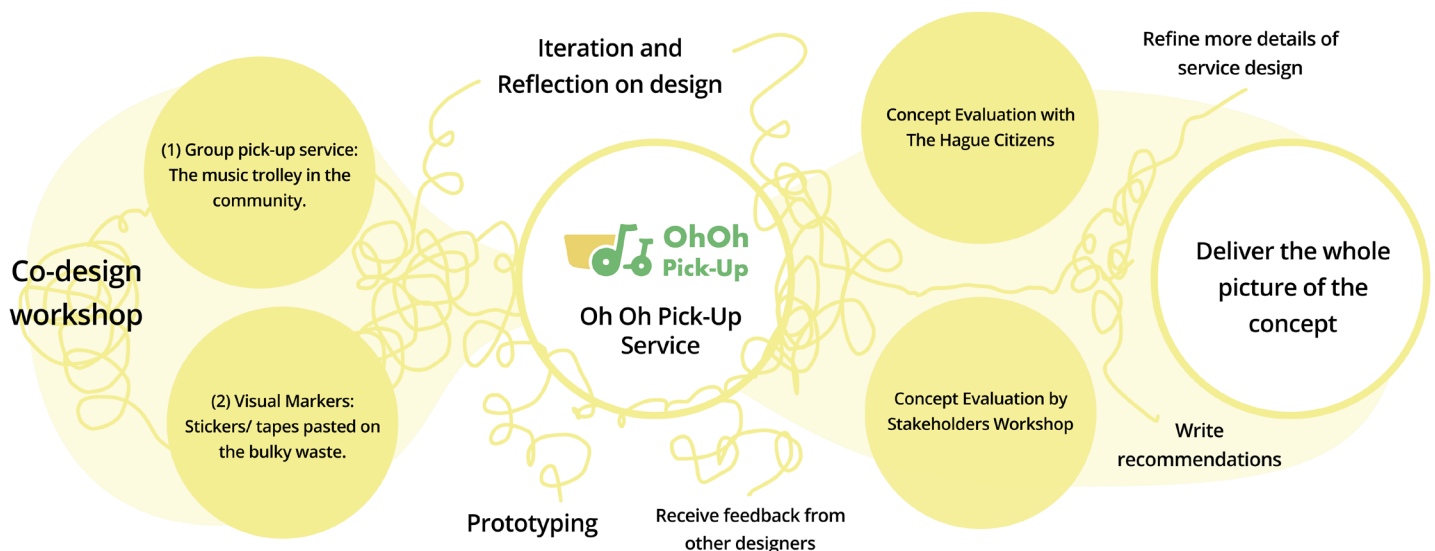
Figure 43. From ideas to concept delivery: An overview.

6.2 Concept: "Oh Oh Pick-Up", A Mobile Bulky Waste Pick-up Service in The Hague.

6.2.1 Concept Introduction of "Oh Oh Pick-Up" Service

"Oh Oh Pick-Up is not only about collecting waste in a convenient way."

The service aims to encourage residents to

Reflect on their relationship with their belongings *and further*

Fosters a sense of community*.*

"Oh Oh Pick-Up" is a bulky waste collection service, which allows The Hague citizens to bring their bulky waste directly to the car without making an appointment. On weekends, a community waste specialists (see definition in Section 6.1.3), rides around the neighborhood on a bakfiets (cargo bike), playing the famous music "Oh-Oh Den Haag" to notify residents of its arrival. The community waste specialists will stop by and help residents sort their waste by card and stickers to mark the status of objects. Residents can choose different tools to help them sort the objects/ waste (See 6.2.6 for details).

Occasionally, the service offers snacks, as the service sometimes partners with local businesses for seasonal promotions. There is a lottery mechanism in place where some snack packagings are with coupons for

second-hand stores (Figure 44). This incentive encourages participation and promotes the system of a circular economy.

At the end of the pick-up time each weekend, the community waste specialist brings the reusable and repairable items to the waste depot. The local second-hand stores and repair cafes take reusable and repairable items once a month. Items that can no longer be used will be left in the waste depot for disposal. See the object's journey overview in Figure 46.

The service strives to shift residents' behavior and mindset, from having no clear idea of disposing of bulky waste, discovering the service, gaining awareness of ways of dealing with objects, and eventually forming more conscious disposal habits (Figure 45).

Figure 44. Snack design example: chocolate bar.

Having no clear idea of how to deal with discarded bulky waste

Discovering Oh Oh Pick-Up and use it

Being Aware of more options more than discarding objects as waste

Being more conscious about dealing with bulky objects or waste in daily life

Forming reflective disposal habits

Figure 45. The impact of "Oh Oh Pick-Up" Service on The Hague citizens.

Bulky objects are
delivered to waste depot.

Items that cannot be used
anymore are recycled by
the waste depot.

Bulky objects are collected by "Oh
Oh Pick-Up" service.

Afvalbrengstation

"Oh Oh Pick-Up" service collects bulky
objects/ waste once a week.

Waste depot

Repairable items are taken
by repair cafe.

Reusable items are taken by
second-hand stores.

Kingloop

Repair cafe

Second-hand store

Staff from second-hand stores and repair cafes come to the waste depot and take objects once a month.

Figure 46. The journey of collected objects in the "Oh Oh Pick-Up" service.

6.2.2 Mapping Stakeholders in the "Oh Oh Pick-Up" Service

The stakeholders map presents an overview of the primary stakeholders, secondary stakeholders, and tertiary stakeholders in the concept, indicating the need for closer collaboration (Figure 47). Mapping these relationships provides the municipality with an overview to identify potential conflicts of interest and opportunities for collaboration.
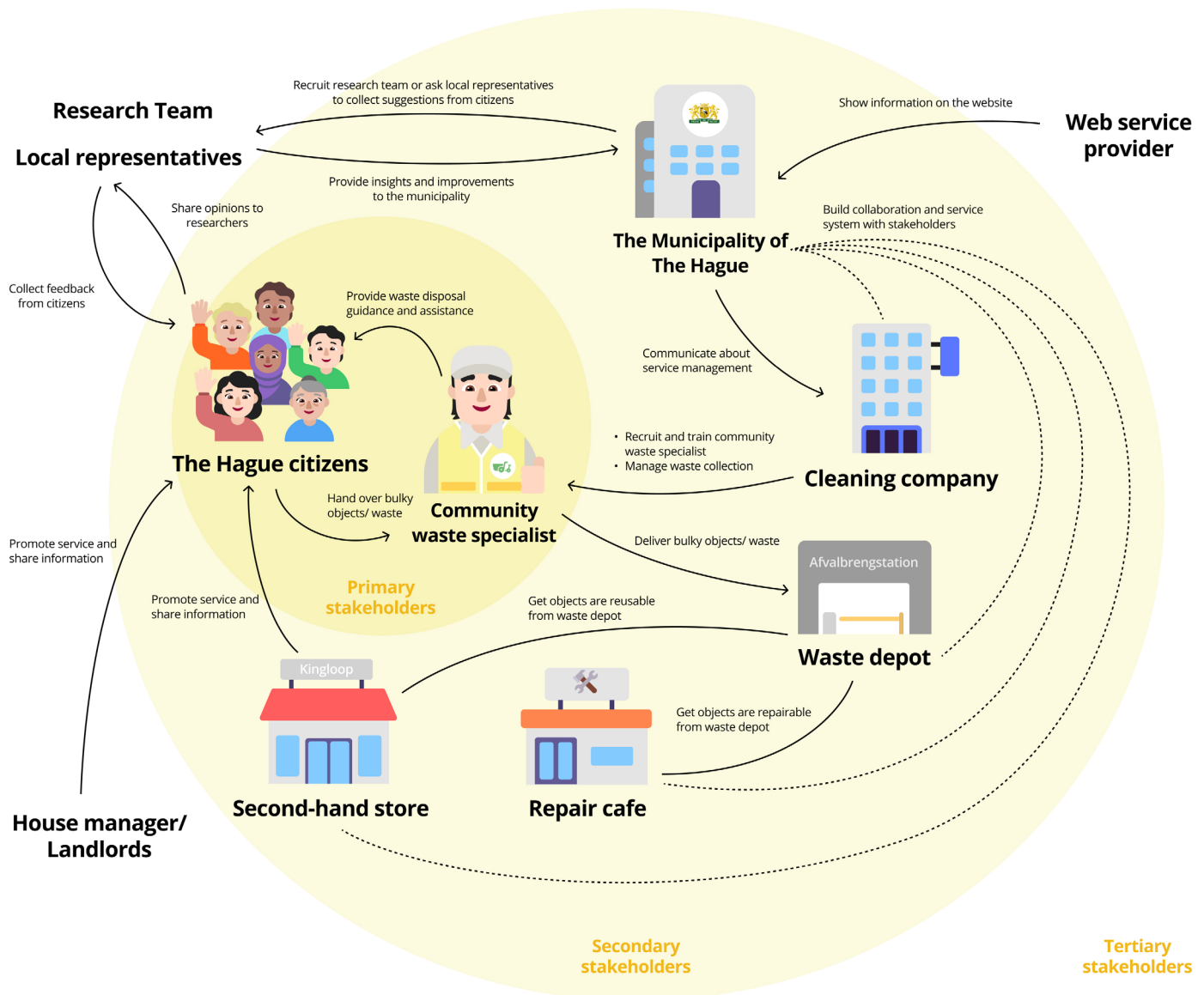
Figure 47. Stakeholders map of "Oh Oh Pick-Up" service.

6.2.3 Vital Role of Community Waste Specialist

Besides the residents as main users, the community waste specialist also plays a crucial role. While this role is often referred to as "cleaner," the project adopts the term "community waste specialist" to more accurately reflect the expertise, knowledge, and social status associated with their work.

Their responsibilities extend beyond physical labor. It also demands knowledge of waste disposal and strong interpersonal skills. To make them more recognizable to residents, community waste specialists will wear a cap or vest while providing the service. Additional background information about the community waste specialists role can be found in Figure 48.

Cap

Vest

They are good at riding a cargo bike.

Community waste specialist

They understand and follow waste disposal regulations, especially for bulky waste.

They are familiar with environmental and traffic safety guidelines, including safe handling of potentially unsafe materials.

They can handle bulky waste with physical strength and care.

They are friendly and approachable, enjoying conversations with people from the neighborhood.

Figure 48. Community waste specilaist.

6.2.4 User Journey of the "Oh Oh Pick-Up" Service

Citizens can know about the service through flyers in the neighborhood, on-site interaction when a community waste specialist arrives, and the municipality's website, where they can check when and where a community waste specialist will be available.

To better align with daily routines, the service is proposed to operate on weekend evenings. At each collection point, the community waste specialist will stop for 15 minutes. Figure 49 shows the simplified journey of how residents can use the service. The steps and how users react to the service, from noticing broken items, being aware of the Oh Oh Pick-Up service, and ultimately using it, can be found in the journey of using the service in Figure 50.

Although the placement of the collection spots is not illustrated in the project, it is a vital part of the service design. This project emphasizes the consideration of their location to support a smooth user experience. The collection spots are suggested to be located within a 5 to 10-minute walk, roughly 300–500 meters apart. They should be positioned away from crowded areas to ensure safe access for both residents and cleaning staff, minimizing disruption to traffic. Ideally, the clear signage should be placed to help residents easily identify the spot.

01 Checking your time and where is collection spot

02 Taking bulky waste to the collection spot before the cleaner comes

03 Tracking cleaner's coming time on the website

04 Sorting and objects when delivering them

05 Ending with some snacks with your neighbors

*Cleaner will stop each spot for 15 minutes.

Figure 49. Simplified journey from the user perspective.

Journey Map: Using "Oh Oh Pick-Up" service in The Hague

Steps	With the need of addressing broken objects	Being aware of Oh Oh Pick-Up service	Planning and checking details before using the service		
User actions	I want to throw some broken items, but I'm still not sure how to handle this.	I hear the music on the street and see some people throw objects on a cargo bike. I see flyers on the street, and there is a cargo bike that will collect bulky waste on the street from 6-8 pm. I find there is a bulky waste pick up service without making appointment on the municipality website.	I check my schedule and I am available next Saturday.	I check that there is a collection spot near my house. The cleaner will stop at the spot around 6:30.	I check that I only have small-medium items, such as pans and wood, and can walk to the spot.

Timeline	One week before

User goals	I want to throw bulky waste and know how to do it.	I want to confirm when and where the service is available, so I can be prepared and get rid of my bulky waste.

User Experience	It's a bit annoying that this waste has occupied space for half a year.	Let me check whether I am able use this service.

Touch points	Service it self	Flyers	The website of The Hague municipality	Community waste specialist	Flyers	The website of The Hague municipality

User gains	☑ Knowing the way to deal with bulky waste through Oh Oh Pick-Up	☑ Service information about time, route, location

Figure 50. The journey of using the "Oh Oh Pick-Up" service in The Hague.

Waiting for the bike coming	Discarding the bulky waste	Interacting with the cleaner

| I am prepared and go to the collection spot around 6:30. | I check the cleaner on the website to see when they will be at the collection spot. | I hear "Oh-Oh Den Haag" music and discovered the bike is coming. | With the help of the cleaner, I quickly put my bulky waste on the bike. | I am asked by the cleaner if there is anything that could be labeled as repairable or reusable in my bulky waste. | I do not label any of my items, but I notice that others had. | I ask the cleaner about what kind of bulky waste he usually collects. He answers my question in a friendly manner. | I get a chocolate bar from the cleaner. It is with a second-hand store coupon from it! |

Saturday

I want to make sure I'm at the right spot and time, so I don't miss the bike and can drop off my bulky waste smoothly.	I want to hand over my bulky waste to cleaner smoothly and and find out if there's anything I need to do for disposal.	I want to ask the cleaner about the service with clear answers.

The cleaner is coming! He will stop at the collection spot for 15 minutes.

Cleaner helps me put the waste in the bike.

Some people leave messages to objects.

There is a second-hand store coupon!

Music	Community waste specialist	Cargo Bike	Cargo Bike	Community waste specialist	Tools for sorting the objects	Community waste specialist	Snacks

☑ Real-time tracking of the cleaner's location	☑ Assistance from the cleaner	☑ Clear and friendly communication with cleaner
☑ The notification of coming	☑ Options for reuse or repair	☑ Various snack reflects the season or themes of event

6.2.5 The Load Capacity of the Cargo Bike

The current concept has been simulated with a smaller-sized cargo bike, originally designed for carrying childrena larger electric cargo bike, designed for house moving, would be better suited for the collection service. For example, the one shown in Figure 51, provided by the "Stadswerkplaats" in Groningen. It can carry up to 250 kg for most items.

Figure 51. The cargo bikes rental service provided by the "Stadswerkplaats" in Groningen has been supporting people in moving large items (Parr, 2019, 19 April).

6.2.6 Tools Design

There are three main tools for residents to sort their objects, which are organized in a toolbox hanging beside the cargo bike (Figure 52-55).

Figure 52. Tools for sorting objects in the "Oh Oh Pick-Up" service.

"Bye Bye" cards

Residents can write messages, such as for exchange purposes or a final farewell, to objects.
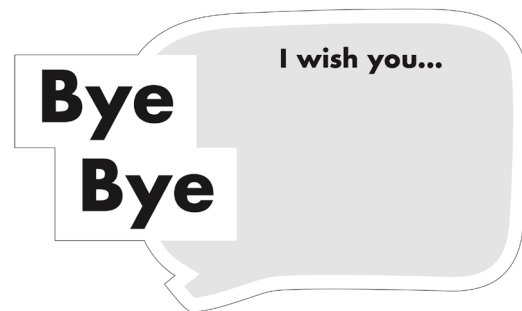

Figure 53. "Bye Bye" cards that help residents mark their objects' status.

Sentence washi tapes & Round stickers

Residents use sentence tapes and stickers to label the objects. The tapes and stickers are in red, yellow, and green, respectively, indicating whether they are discarded, repairable, or can be reused.

Figure 54. Sentence washi tapes and round stickers.

Collection tapes

The tape contains the information of phone calls and the online application QR code. People can take it home and paste it on the waste applied for collection service. This not only delivers information about the collection service, but also promotes it that mark legal dumping.

Figure 55. Collection tapes.

6.3 Concept Evaluation with The Hague Citizens

This concept evaluation aims to understand how residents perceive the "Oh Oh Pick-Up" service, and how residents envision it if it is implemented in The Hague.

To assess the "Oh Oh Pick-Up" concept, participants were asked two key questions:

- Is the concept clear to you?

- Do you think your neighbors would use it?

6.3.1 Method: Live Demonstration

Live demonstration using a rented cargo bike, which was equipped with prototypes simulating how the "Oh Oh Pick-Up" service would function. The goal was to create a high-fidelity implementation of how the service would operate in everyday life, allowing residents to interact with the concept in a situated context. More evaluation setting details of the setting can be found in Appendix E.

Overall, the concept was received by nine participants (Table 5). P1 and 2 were pre-recruited residents. They engaged in semi-structured interviews for around 30 minutes at their homes. This session provided richer insights compared to other participants who participated in briefer, on-street interactions, due to the focused setting.

The remainder of the evaluation was conducted through a guerrilla study lasting approximately 1.5 hours, including time spent relocating and setting up the demonstration materials. P3 and 4 were approached in the neighborhood in the Escamp district (Figure 56). However, spontaneous engagement proved challenging due to the small number of people observed in the residential area. As a result, the strategy was adjusted to approach participants in front of a local supermarket (Figure 57). P5 to 9 were briefly interviewed in this location for 10 minutes each.

Figure 56. Evaluation in the neighborhood of the Escamp district in The Hague.

Figure 57. Evaluation in the neighborhood of the Escamp district in The Hague.

Code	Recruitment Method	Gender	Cultural background
P1	Pre-scheduled	Female	Taiwanese with a Dutch passport
P2	Pre-scheduled	Female	Russian
P3	Guerrilla study	Female	Dutch
P4	Guerrilla study	Male	Dutch
P5&P6	Guerrilla study	Female & Male (Couple)	Armenia & Dutch
P7	Guerrilla study	Female	N/A
P8	Guerrilla study	Male	N/A
P9	Guerrilla study	Female	Dutch

Table 5. Participants' information.

6.3.2 Results of Evaluation with Live Demonstration

While nine participants took part in the live demonstration, the richness of the data differed among individuals. Most of the evaluative input was derived from P1, 2, 5–7, and 9.

Participants 1 and 2 contributed the most detailed insights, as they were pre-recruited and interviewed for approximately 30 minutes each. Participants 5, 6, 7, and 9 also provided more feedback, as they stayed on site longer and were more open to conversation during the guerrilla sessions.

In contrast, Participant 3 is 88 years old and not skilled in English, making verbal feedback more limited. Participant 4 expressed general satisfaction with his current lifestyle and had no prior experience with bulky waste disposal, and thus offered no specific input on the service concept. Participant 8 had positive attitudes toward the concept, noting it seemed convenient, but did not express a strong need or intention to use it.

Music as a situated signal.

P1, P2, P9 appreciate the music of the "Oh Oh Pick-up", similar to the experience of an ice cream car. P1 mentioned that the music could help to establish a touch point so that people will know what to do. However, P7 pointed out that the use of music may not be culturally accessible for people with migration backgrounds. She questioned the assumption that people unfamiliar with Dutch norms would recognize the meaning of the music and act upon it, noting, *"That this new thing means that you're saying this is a niche for somebody who doesn't know the Dutch culture, who's not able to use the website? Why would they know that this music means that they can bring it?".*

Time arrangement and accessibility of the service.

P1 and P2 emphasized the importance of having fixed and clearly communicated time slots for the community waste specialist's visits to the neighborhood. As P1 explained, *"Sometimes, when I am at work, I will never meet them. So if his time cannot be divided into morning, afternoon, or even after 6 pm, the time will be the weekend."* This concern was also addressed in Section 5.3.5 Selected Ideas: Design suggestions for Group Pick-up Service: The music trolley in the community, where aligning the service with citizens' daily routines was highlighted as a key consideration for implementation.

Apart from the scheduling, P1 and P9 addressed the need to know the service. The awareness would be the key, as P1 believed that if her neighbors were aware of the service, they would be likely to use it. Similarly, P9 mentioned that flyers could encourage her to use it. To increase visibility in the early stages, P1 suggested launching the service in a more central area in the early stage.

The opportunity bringing people together through waste practices.

The potential to foster social interaction around waste practices was appreciated by P1 and P2. As P2 put it, *"I like it's bringing [people] together, like in a social way, that we will take care of our trash."* The idea also opens up opportunities for direct interaction with community waste specialists. P1 emphasized the value of this interaction, stating, *"I think this is very important because it is common to see people cleaning the streets, but many people will pass by without knowing that they are doing a very important thing."*

Those who need the service most are the least likely to access it.

P2, 4, 5, and 7 considered that only people who already use the existing service and can be communicated with would use the service. Participant 4 described the challenge, saying, *"Sometimes the people here do not collaborate, we try to tell them don't throw the trash, and some of them will listen to you and some of them will just look at you with dead eyes."* P2 also believed that people who do not care about the waste misplacement would not find the service. P5 suggested that engaging a community member would effectively help others understand the service.

General feedback on service and tool design.

For service implementation:

- P1 appreciated that the concept creates a circular economy of objects.

- A concern is about the potential additional workload for community waste specialists. Since community waste specialists would need to visit multiple locations rather than a single designated spot after finishing waste pick-up.

- In the initial stage of the service, priority could be given to neighborhoods with lower rates of car ownership, as residents in these areas may have more difficulty transporting bulky waste to the waste depot on their own.

For tool design:

- The goodbye care creates a sense of ritual for throwing away objects, making disposal a positive experience.

- The package design of the chocolate bar should include the ingredients.

- The sentence on the tape, "Say goodbye to me," could be replaced with alternative wording. Since the concept is already centered on saying goodbye to objects, repeating the phrase becomes redundant. The tape is meant to express that the item is broken or no longer usable, which could be expressed more directly.

6.4 Concept Evaluation through Stakeholders Workshop

6.4.1 Method: Stakeholders Workshop

This evaluation activity was conducted as part of a larger workshop organized in collaboration with the "Achter aval" project team members from Erasmus University (Figure 58). The workshop invited seven participants, consisting of policymakers from the municipality of The Hague, people from public waste management, and local coordinators. It lasted for approximately two hours and was structured into two sessions.

In the first hour, researchers presented the concepts to all participants. In the second hour, participants were divided into two groups to evaluate the proposed concepts. The graduation project was seen as an embedment within the "Achter aval" project. It was treated as one small concept under review during the discussion, and with a limited time for a 15-minute discussion.

6.4.2 Results of the Stakeholders Workshop

Understanding current waste services in The Hague

The policymaker highlighted the fragmented nature of waste services in The Hague, describing how different organizations operate bulky waste and litter collection separately. As he explained, one cleaning company primarily collected bulky waste on an appointment basis, with staff picking up items and moving to the next location, a route only known to the service itself. Another company focuses on litter collection, with smaller crews walking through neighborhoods, gathering litter, and transporting it to drop-off points.

Suggestions for concept operation and opportunities combining the pick-up concept with waste collection day

Considering the fragmented nature of waste

services in The Hague, the question arose of how the logistics for "Oh Oh Pick-Up" could be organized, especially considering its undefined details for when, where, and how waste would be collected. To address this, he proposed introducing central points within neighborhoods where residents could drop off broken or unwanted items, allowing for more regular collections every few days. A environmental management specialist further suggested the vehicles stop for a set period, then move to other spots and announce residents during the process.

Participants responded positively to integrating the "Oh Oh Pick-Up" service with the existing waste collection day. As one policymaker explained, the waste collection days generally take place after work hours, around 16:00 to 20:00, at the central point of the area. The exact times vary by area. He noted, *"I think it's nice to maybe combine this idea [with waste collection day]...drive through the different streets and collect little bulky waste and then immediately create or raise awareness for the collection waste that's going on a few blocks away."* In addition, a local collaboration coordinator emphasized the potential of combining this service with existing events, saying, *"Maybe organise some planning or routine...it maybe there are opportunities to create other moments to pick it up, but the combination of this one[waste collection day] it's a really good because we all already inform the neighbors with a letter"*.
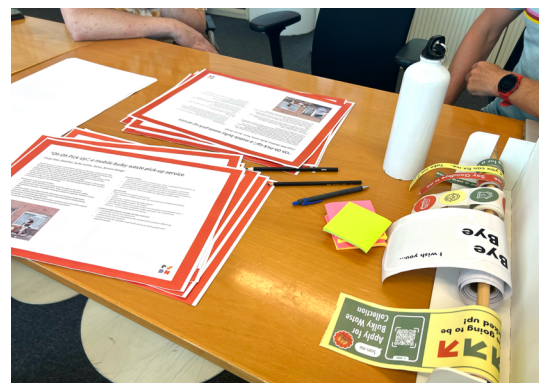

Figure 58. The stakeholders workshop.

Positive feedback on using collection tapes to visualize the bulky waste status

The policymaker expressed strong interest in using collection tapes as a communication tool, describing it as "an addition to our communication instruments." Participants emphasized that such tapes could help clarify the status of bulky waste placed in public spaces. As the chain director of Clean City explained, "you can inform your neighbor… the neighbors know it's not illegal dumping," highlighting the tape's potential to build a social norm in trust and transparency in bulky waste disposal in the community.

Building on the residents' elephant paths of reuse activities in the neighborhoods

The chain director of Clean City appreciated the concept of promoting reuse activities. He pointed out that such practices already occur in neighborhoods via platforms like Hoplr, an app that connects neighbors. The "Oh Oh Pick-Up" service can build on this existing behavior and further encourage people to participate in these reuse activities.

The need for stronger collaboration with local actors

There is a clear need for closer collaboration between waste services and other stakeholders to support the "Oh Oh Pick-Up" concept. As the policymaker stated, *"collaboration needs to be much stronger than it is now,"* pointing out that while options like repair cafés already exist, their role and visibility could be improved.

The chain director of Clean City added that many repair cafés are looking for better ways to communicate with the community beyond simply announcing, "We do exist, please come to us." This highlights the further development of a more supportive network between waste services, second-hand stores, and repair cafés to better integrate these resources. Importantly, he also mentioned the approach needs to recognize that waste practices vary across neighborhoods, especially in areas with more waste misplacement challenges.

6.5 Discussion

6.5.1 Discussion Based on Design Criteria

This project explored how a bulky waste pick-up service that supports The Hague citizens with migration backgrounds in confidently manage bulky waste. To assess how the concept meets its design goals, five key design criteria were discussed below: Knowledge empowerment, Transportation support, Clarity of information, Service accessibility, and Social awareness, deriving from the design vision (Section 5.1.1). The following sections discuss how the concept performed based on the evaluation with the Hague citizens and the stakeholder workshop.

1. Knowledge empowerment
Residents understand how to dispose of bulky waste and how to use existing infrastructures and services.

Participants can understand the concept of the bulky waste pick-up service. However, concerns were raised regarding the timing and location of the service process, which may affect its accessibility (Section 6.3.2, Time arrangement and accessibility of the service).

Furthermore, a critical part of how residents might understand proper waste disposal within this concept depends on direct interaction with the community waste specialists. This interactive element was not tested during the evaluation, leaving a gap in assessing its impact on knowledge empowerment.

2. Transportation support
Residents can overcome barriers in transporting bulky waste.
Participants appreciate the mobile pick-up service as it solves transportation issues for those without cars. For example, P9 likes the concept because it can support her in disposing items without a car.

3. Clarity of information
Information about bulky waste disposal is easy to understand.

Since the concept was primarily introduced verbally, the clarity of information was not evaluated. The evaluation did not include touchpoints such as the poster or website for understanding the disposal process. These elements could be tested in future steps to assess how effectively the information is communicated and how easy it is for residents to understand.

4. Service Sccessibility
The service provides language support and communication channels that are more accessible to non-Dutch-speaking residents.

The concept uses English as the language of communication. While the service is accessible for residents who speak English, it may pose challenges for non-English-speaking migrants. This implies that the service is more approachable for "expats," who usually have fluent English skills and are often highly skilled workers residing in the Netherlands. The other concern is that residents who are less collaborative may not use the service (Section 6.3.2, Those who need the service most are the least likely to access it.). This indicates that the service may be effective for certain residents with a migration background, but it cannot meet the needs of the most vulnerable groups.

> **5. Social awareness**
> *Residents feel connected with the community and feel encouraged to act in ways that benefit others in the community.*

Participants, as The Hague citizens, valued the concept that could gather residents together when disposing of the objects/ waste (Section 6.3.2, The opportunity bringing people together through waste practices). In addition, the collection tapes could note the legal dumping on the street, which was highlighted by the policymaker and chain director of Clean City as a way to foster social norms of trust within the community (Section 6.4.2, Positive feedback on using collection tapes to visualize the bulky waste status). These findings suggest that the concept encourages both direct and indirect interactions, emphasizing its potential to strengthen community connections.

Overall, evaluating the concept through the design criteria framework highlights its strengths in addressing **2. Transportation support** and **5. Social awareness**, while it reveals its limitation in **4. Service accessibility** for non-English speakers or the vulnerable groups. Due to the evaluation limitation, the **1. Knowledge empowerment** and **3. Clarity of information** was not effectively evaluated. Through generating the journey of service development, the project provides a brief direction for refining the service in future work.

6.5.2 Limitation

(1) Limitation of Evaluation with Live Demonstration
Some factors affected the data quality of the evaluation. The research can only reach out to people speaking English or Mandarin. Language barriers posed a challenge when interacting with participants, especially when conducting a guerrilla study. Many passersby were in a hurry, which resulted in brief interactions and limited opportunities for in-depth feedback. The available timeframe for conducting the live demonstration was also constrained because the project adjusted the location of the evaluation site. The unstable weather conditions further reduced participants' time spent on the evaluation.

In addition, the evaluation did not cover the full user journey from understanding the service to completing disposal. Future work should test the different stages of the service, thereby informing further service refinement and development.

(2) Limitations in Stakeholder Involvement of second-hand stores and repair cafes
A notable limitation of the concept evaluation is the absence of input from key stakeholders such as people from second-hand shops, repair cafes, waste depots, which play vital roles in building service systems (Can refer to Section 6.2.2). The project was unable to engage these groups, identifying a gap for future research to reach out to more stakeholders and understand their operational conditions.

(3) Limitation of Stakeholders Workshop

The workshop faced some limitations regarding participant selection, time allocation, and language barriers. People from second-hand stores and repair cafés were not invited, which limited the opinions on how to integrate their services into the concept. Although the project attempted to interview staff from second-hand stores in The Hague, these invitations were declined.

Furthermore, the graduation project was part of the larger project of "Achter Aval" in the workshop, resulting in limited time and language barriers. Since the first session was mainly conducted in Dutch, which limited the project researchers' participation. Also, only 15 minutes were allocated to discussing one concept, which constrained the depth of discussion and the thorough exploration of relevant topics.

(4) Limitation in engaging certain citizen groups in The Hague

While the "Oh Oh Pick-Up" service shows potential in fostering social interaction and encouraging more accessible bulky waste disposal, it is important to acknowledge its limitations in reaching certain resident groups. Based on evaluation feedback, the concept tends to appeal to those who are already familiar with the waste system, open to collaboration, and comfortable navigating services in English. In contrast, residents who are socially isolated or unwilling to engage are less likely to respond to such services, regardless of how well-designed they are.

This highlights an important limitation: the concept may not reach those whose behaviors most urgently need to change. However, the project does not aim to provide a solution that can perfectly solve the waste misplacement issue in The Hague. There is no single solution that can fully resolve such a complex social challenge. Instead, the goal is to propose a concept that better supports citizens of The Hague with a migration background. The intention is to design a service supporting their needs regarding transportation, language, and social interaction. By generating insights into the migrant group's needs, the project contributes to the municipality's efforts in developing a more inclusive waste management system.

6.5.3 Future Service Development

This project explores the development of the "Oh Oh Pick-Up" service. From the preliminary research phase to long-term operation, Figure 59 outlines how the service is introduced, promoted, and improved, consisting of activities.

As the load capacity of the cargo bike is a key limitation, the next step in service development is to focus on certain neighborhoods and assess feasibility and operational efficiency. Based on this constraint, the service is more suitable for collecting "small to medium-sized" bulky waste. The items can be carried by hand and brought to the collection spot within about a 5 to 10 minute walk. Example includes, laundry basket, suitcase, bookshelf, knife, pan, Microwave, drying rack, carpet, vacuum cleaner. However, the bike might be filled after two to three spots, which could potentially force community waste specialist to stop collection. It would be critical to run pilot trials that test the load limitations of the cargo bike in a real-world context. The trials can help identify and refine supporting strategies, such as supplemental drop-off points.

Additionally, employing cargo bikes in the waste collection process will also require dedicated spaces for their storage. In dense urban environments, allocating such spaces is challenging, making it vital to consider utilizing areas more efficiently. One possibility is to integrate these spaces with existing infrastructure, such as combining cargo bike storage with waste depots, or even with repair cafés, or second-hand stores. It not only makes more efficient use of space but can also create a multi-functional hub that supports waste collection, promotes reuse and repair behaviors, and improves route planning for community waste specialists.

Importantly, the long-term operation of waste services relies on the stability of second-hand stores. This project emphasizes the importance of key stakeholders of second-hand stores in supporting a circular system. These shops are crucial not only for giving discarded items a second life but also for conveying the value of reuse in creating a circular system. However, Den Haag FM, local news, noted that a recent bankruptcy of "Kringloop Schroeder" second-hand shops in The Hague, without enough support from the municipality. "For the residents of The Hague, this loss means much more than just the closing of shops."These shops also serve as important community spaces for vulnerable residents. Even though Kringloop Schroeder was saved from demise after a few weeks, it indicates the unstable operation of the second-hand store in The Hague. It is crucial for the municipality to recognize and actively support second-hand shops as essential partners in sustainable waste management. It is not only for their sustainable contributions, but also for their social value in strengthening the community.Therefore, future

service development should prioritize the financial and operational viability of second-hand stores as a foundational element of the system. Without this stability, diverting reusable items from the waste system may become ineffective.

After a regular implementation, the service can expand to events in collaboration with the local community. For example, residents could borrow cargo bikes from the municipality to organize neighborhood clean-ups, making bulky waste management a shared activity. Partnerships with local schools can also be explored, allowing students to participate as volunteers and combining educational opportunities with community service.
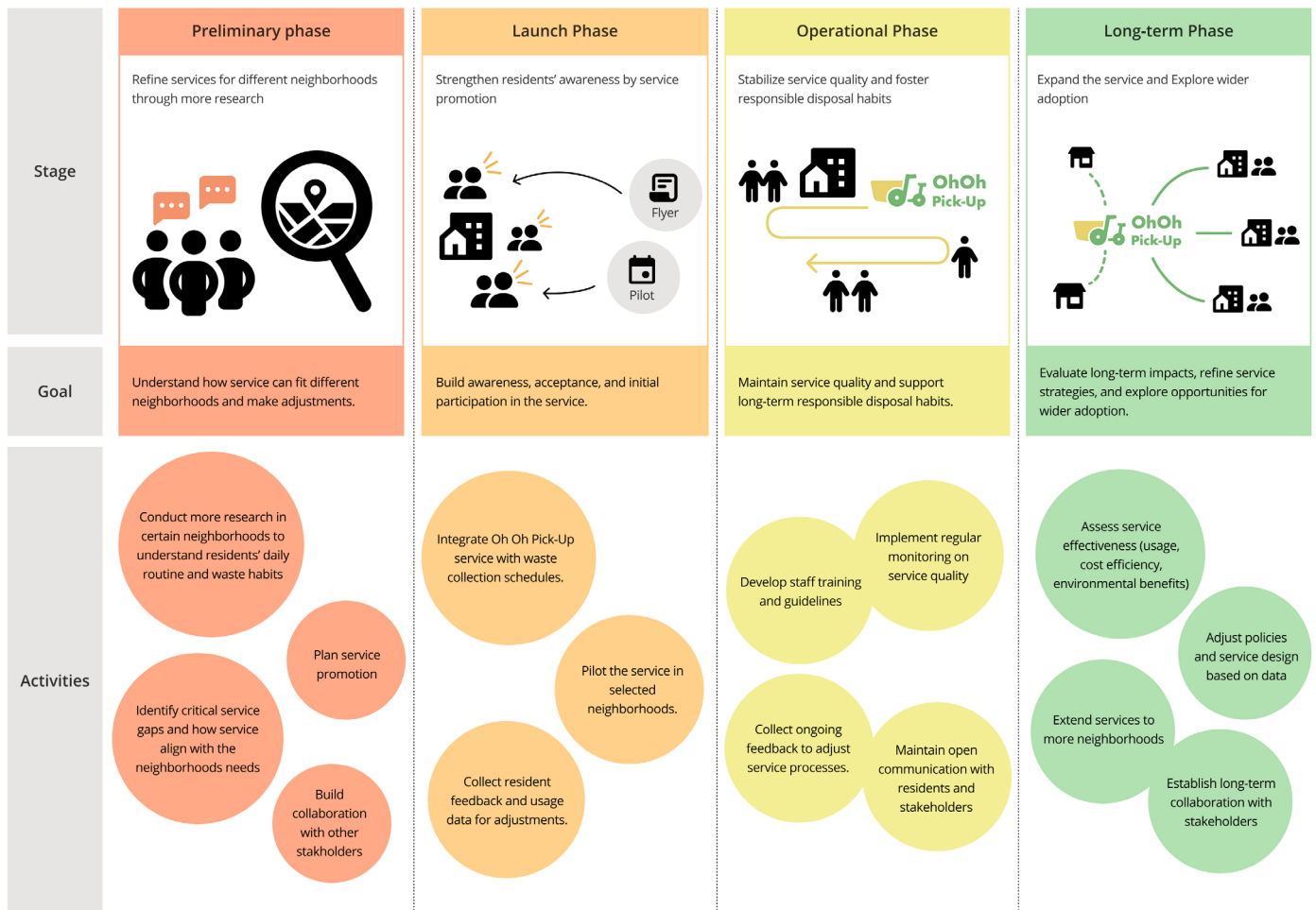
"Oh Oh Pick-Up" Service Development journey

	Preliminary phase	Launch Phase	Operational Phase	Long-term Phase
Stage	Refine services for different neighborhoods through more research	Strengthen residents' awareness by service promotion	Stabilize service quality and foster responsible disposal habits	Expand the service and Explore wider adoption
Goal	Understand how service can fit different neighborhoods and make adjustments.	Build awareness, acceptance, and initial participation in the service.	Maintain service quality and support long-term responsible disposal habits.	Evaluate long-term impacts, refine service strategies, and explore opportunities for wider adoption.
Activities	Conduct more research in certain neighborhoods to understand residents' daily routine and waste habits; Plan service promotion; Identify critical service gaps and how service align with the neighborhoods needs; Build collaboration with other stakeholders	Integrate Oh Oh Pick-Up service with waste collection schedules.; Pilot the service in selected neighborhoods.; Collect resident feedback and usage data for adjustments.	Implement regular monitoring on service quality; Develop staff training and guidelines; Collect ongoing feedback to adjust service processes.; Maintain open communication with residents and stakeholders	Assess service effectiveness (usage, cost efficiency, environmental benefits); Adjust policies and service design based on data; Extend services to more neighborhoods; Establish long-term collaboration with stakeholders

Figure 59. "Oh Oh Pick-Up" Service development journey

6.6 Recommendations on "Oh Oh Pick-Up" Service

Cultural sensitivity in communication

- The service could consider the cultural interpretation of cues in the service, such as music. People may not understand the intended meaning.

- The next step can explore how touchpoints, such as flyers or the municipality's website, communicate with broader groups.

Service timing alignment with daily routines

- The service should consider offering time slots that accommodate citizens, such as on weekends or in the evenings, and clearly communicate fixed time slots to increase the predictability of the service.

Service promotion strategies

- To encourage more citizens indifferent to the waste system, community members or local influencers to raise awareness and explain the service.

- The concept can start with neighborhoods where residents are less likely to own cars and may have more difficulty disposing of bulky waste.

Community waste specialists workload and role

- The service should consider the additional workload for community waste specialists, as multiple stops may increase the time spent and operational complexity.

- Community waste specialists may need to complete further professional training to effectively communicate with residents.

- The concept should be further evaluated with people who work similarly to community waste specialists to assess the operational feasibility from their perspective.

Collaboration with local actors

- It is recommended to establish a closer cooperation network, including repair cafes, second-hand shops, and so on, to enhance the resource integration of the service

Tool design improvements

- The "Say goodbye to me" sentence tapes could be removed, as labeling items that are no longer in use may not be necessary. Additionally, the round stickers could also be eliminated since the sentence tapes are already user-friendly and serve the same purpose. Including just one of the two labeling tools would simplify the design without losing its purpose.

6.7 Conclusion and Reflection

This project explored how residents with migration backgrounds in The Hague experience bulky waste disposal and how design could support more inclusive waste practices. Based on insights from research activities, the "Oh Oh Pick-Up" service concept was developed. While the concept demonstrates potential in fostering social interaction and reducing barriers for residents with migration backgrounds, it remains limited in reaching certain migrants. Instead of perfectly meeting all the needs of residents, this project focuses on understanding the specific group of frequent movers with migration backgrounds and offers a vision for bulky waste disposal.

In response to the title of "Discard to Connect", the design aims to strengthen the sense of responsibility in the community, focusing on more connections to people. The intended impact is progressive, starting with individual awareness around reuse and repair, extending to interactions with community waste specialists and other residents, and eventually leading to item exchanges or donations when using the service, and forming social norms around bulky waste disposal. It is important to acknowledge that the long-term effects of this service cannot be evaluated within the scope of this project. The evaluation only shows its potential in the community. Moreover, implementing the complete service will require further collaboration, resources, and pilot testing. It is unrealistic to develop all service touchpoints and details at once. Therefore, this project tried to establish a foundation by outlining the concept and proposing directions for future development, offering a starting point for a more inclusive and sustainable bulky waste system in The Hague.

Referring back to the whole project, it has been challenging to address complex social issues and stakeholder management. Especially when proposing solutions, a designer has to balance the tensions among the municipality, residents, and other relevant stakeholders. Through this process, I realized that a designer is already "beyond only a designer." In this project, I found myself designing not just a workshop, a service, a tool, or an interaction, but also mediating between diverse interests and crafting narratives. Stepping into a wicked problem requires more knowledge and cross-disciplinary collaboration. This experience has strengthened my ability to zoom in and out of the topic, and to communicate with people who have different needs and perspectives.

Overall, this project supports me in exploring my interest in social design, design for the public, and participatory design. Social theory has expanded my perspective, allowing me to think beyond "users" and to consider people's real-life experiences. It prompted me to consider intersecting factors, rather than trying to solve problems from a single perspective. For higher complexity issues, the solution needs to be more integrated.

References

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Den Haag FM. (2025, May). *Kringloopwinkels na 102 jaar definitief failliet, 300 mensen 'zijn hun plek kwijt'.* Omroep West.https://www.omroepwest.nl/economie/4971218/kringloopwinkels-na-102-jaar-definitief-failliet-300-mensen-zijn-hun-plek-kwijt

Design Council. (2004). *The Double Diamond: A universally accepted depiction of the design process.* https://www.designcouncil.org.uk/our-resources/the-double-diamond/

Douglas, M. (1966). *Purity and danger: An analysis of concepts of pollution and taboo.* Routledge.

Dung, Y. A. (2021). *'Recycling the past': Tzu-chi waste recycling and the cultural politics of nostalgia in Taiwan* (Doctoral dissertation). Leiden University.

Foellmer, J., Liboiron, M., Rechenburg, A., & Kistemann, T. (2022). *How do the cultural contexts of waste practices affect health and well-being?.* World Health Organization. Regional Office for Europe.

Gemeente Rotterdam. (2022, June 1). *Leen een elektrische bakfiets om uw afval weg te brengen.* Gemeente Rotterdam. https://duurzaam010.nl/nieuws/elektrische-bakfiets/

Hartl, B., & Hofmann, E. (2024). To sort or not to sort?–Consumers' waste behavior in public. *Journal of Cleaner Production, 475*, 143677. https://doi.org/10.1016/j.jclepro.2024.143677

Hofstede, G., Hofstede, G. J., & Minkov, M. (2010). *Cultures and organizations, software of the mind— Intercultural cooperation and its importance for survival.* McGraw-Hill.

Shove, E., Pantzar, M., & Watson, M. (2012). *The dynamics of social practice: Everyday life and how it changes.* SAGE Publications Ltd. https://doi.org/10.4135/9781446250655

Kuijer, L. (2017). Practices-oriented design. In K. Niedderer, S. Clune, & G. Ludden (Eds.), *Design for behaviour change: Theories and practices of designing for change (pp. 116-127).* (Design for social responsibility). Taylor & Francis Ltd. https://doi.org/10.4324/9781315576602-10

Kuijer, L., & de Jong, A. M. (2012). Identifying design opportunities for reduced household resource consumption: exploring practices of thermal comfort. *Journal of Design Research, 10*(1-2), 67-85. https://doi.org/10.1504/JDR.2012.046140

Menezes, F. (2022, October 21). Amsterdam is planting mini-gardens around trash cans with hopes to cut littering. BrightVibes. https://www.brightvibes.com/amsterdam-is-planting-mini-gardens-around-trash-cans-with-hopes-to-cut-littering/

Merkelbach, I., Dewies, M., & Denktas, S. (2021). Committing to keep clean: nudging complements standard policy measures to reduce illegal urban garbage disposal in a neighborhood with high levels of social cohesion. *Frontiers in Psychology, 12,* 660410. https://doi.org/10.3389/fpsyg.2021.660410

Mohapatra, B., & Mohamed, A. R. (2013). Place attachment and participation in management of neighbourhood green space: A place-based community management. *International Journal of Sustainable Society, 5*(3), 266–283. https://doi.org/10.1504/IJSSOC.2013.054715

Perry, M., Juhlin, O., & Normark, D. (2010). Laying Waste Together: The Shared Creation and Disposal of Refuse in a Social Context. *Space and Culture, 13*(1), 75-94. https://doi.org/10.1177/1206331209353685

Sanders, E. B. N., & Stappers, P. J. (2012). *Convivial toolbox: Generative research for the front end of design.* Bis.

Schleicher, D., Jones, P., & Kachur, O. (2010). Bodystorming as embodied designing. *Interactions, 17*(6), 47-51. https://doi.org/10.1145/1865245.1865256

Tielemans, J. (2023, May 11). *Bewoners uit Loosduinen kunnen afval niet kwijt: 'Soms vier keer op en neer lopen'.* Omroep West. https://www.denhaagfm.nl/dhfm/4716027/bewoners-uit-loosduinen-kunnen-afval-niet-kwijt-soms-vier-keer-op-en-neer-lopen

Uzell, D., Pol, E., & Badenas, D. (2002). Place identification, social cohesion, and environmental sustainability. *Environment and Behavior, 34*(1), 26–53.

Van Boeijen, A. G., & Schifferstein, H. N. (2024). How to include the sociocultural context in food design: Insights, tools and strategies. *International Journal of Food Design, 9*(1), 73-99. https://doi.org/10.1386/ijfd_00061_1

Van Boeijen, A. G. C., & Zijlstra, I. S. J. (2020). *Culture sensitive design: A guide to culture in practice.* bis Publishers.

Vega-Cebrián, J. M., Márquez Segura, E., Turmo Vidal, L., Valdiviezo-Hernández, O., Waern, A., Van Delden, R., ... & Tajadura-Jiménez, A. (2023, July). Design resources in movement-based design methods: a practice-based characterization. In Proceedings of the 2023 ACM Designing Interactive Systems Conference (pp. 871-888). https://doi.org/10.1145/3563657.3596036

APPENDIX

APPENDIX A. Iteration of Design Goal

Ideas of design goal

About Information delivery
 Support non-native Dutch speakers in accessing and understanding bulky waste disposal information, especially when they move into The Hague.

About Transportation constraints
Support residents with limited transportation when disposing of bulky waste in The Hague.

Information & Transportation
Support non-Dutch speakers with limited transportation in understanding and acting on how to properly use bulky waste services.

A design goal formed during the Midterm Evaluation meeting

A design goal was formed during the Midterm Evaluation meeting of the graduation project. It aims to support non-Dutch speakers with limited local knowledge and transportation in understanding and acting on properly disposing of bulky waste. This goal combined two HMW questions mentioned in Section 4.3.2.

Design Direction

Overall goal is to mitigate the bulky waste misplacement in The Hague.

Design goal:
Support non-Dutch speakers with limited local knowledge and transportation in understanding and acting on properly disposing of bulky waste.

Move into The Hague
Improving the information delivery of registration letter.

Move to new places
Navigating users to choose the proper disposal way.

Figure A1. Initial design goal was formed during Midterm Evaluation meeting.

A new design goal and related design critera emerged after making iteration.

The design goal is to make frequent movers with a migration background feel confident in managing bulky waste and develop a sense of responsibility in the community during housing transitions in The Hague.
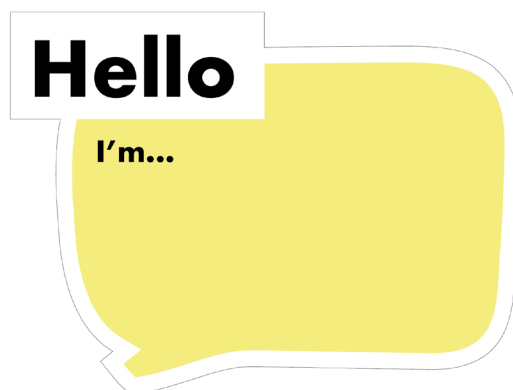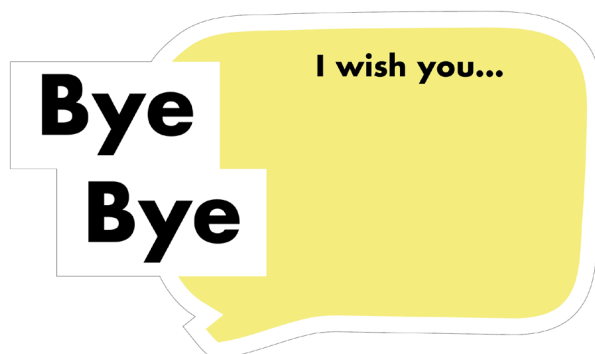
To make residents feel confident in managing bulky waste:
- Feasibility: Residents have the ability and resources (e.g., their own physical, knowledge, supporting public infrastructures or services) to manage bulky waste disposal.
- Clarity of information: Residents needcan receive clear information to understand how to dispose of bulky waste.
- Service Accessibility: Residents can access services that match residents' living contexts.

Develop residents' sense of responsibility in the community:
- Social awareness: Residents feel connected with the community and feel encouraged to act in ways that benefit others in the community.

OH OH
PICK-UP

OHOH
PICK-UP

OhOh
Pick-Up

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OhOh
Pick-Up

Join the OhOh Pick-UP
Pick-Up Beats 🕐 Saturday Afternoon
With Cleaner Streets
Call City Office to Take Bulky Waste 📞 14070
Together We Care, Together We Share
Apply for Bulky Watse Collection Online

10% off

OhOh Second Hand Store
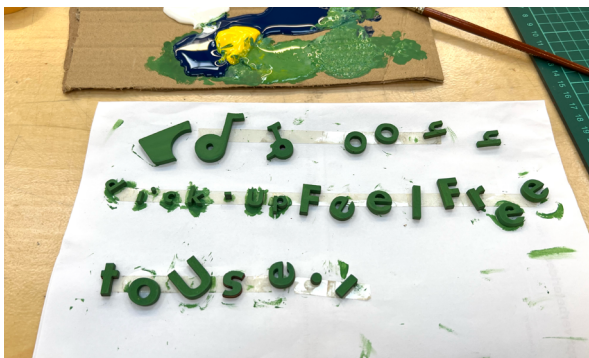In-Store ONLY | Valid until 11/07/25.

Call Gemeente to Take Your Waste
06-XXXXXXXX

NOT DUMPED!
Collection coming soon

Call Gemeente to Take Your Waste
06-XXXXXXXX

Ready for My New Life.

I'm going to be picked up!

APPENDIX C. Prototyping Process

APPENDIX D.
Color Scheme of the "Oh Oh Pick-Up" Service

The logo of "Oh Oh Pick-Up" service features light yellow and green, creating an energetic image (Figure D1). The color scheme of the "Oh Oh Pick-Up" service is based on the primary colors of the municipality of The Hague, yellow and green (Figure D2). In addition to the logo colors yellow and green, the "Oh Oh Pick-Up" service also refers to other available color series and a grayscale series (Figure D3).

Figure D1. The Logo of "Oh Oh Pick-Up" service.

Figure D2. Primary colors of the of The Hague are yellow and green. The picture was from the municipality's website.
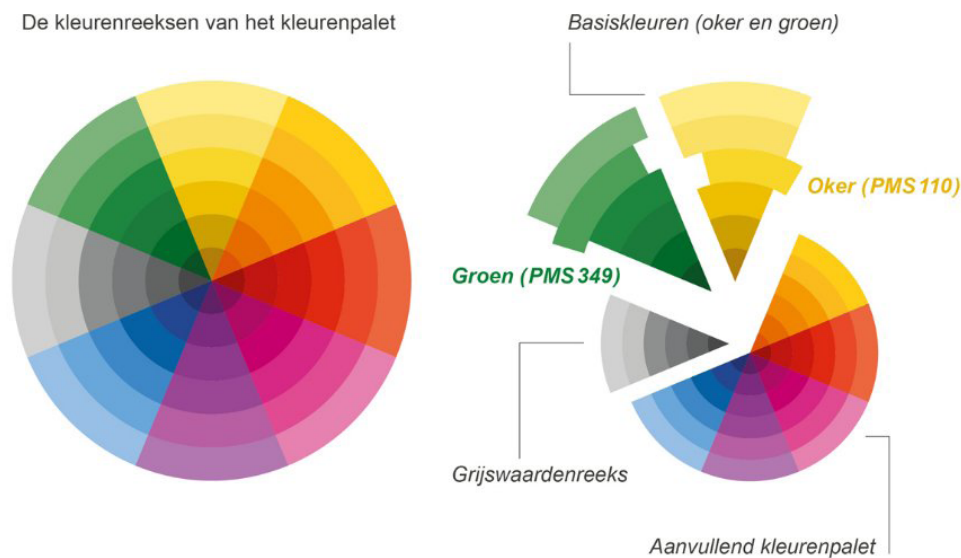

Figure D3. Different color series (series) of the municipality logo. The picture was from the municipality's website.

APPENDIX E. Concept Evaluation Set Up

Notice Board
The board displays a large "Pilot test" to inform people that this is a concept evaluation. It also includes the sentences "Tell us what you think" and "Grab some snacks" to welcome participation.

Question Board
The board contains two questions: "Is the concept clear to you?" and "Do you think your neighbors would use it?" There is space provided for sticky notes where people can write their feedback.

Sticky Notes & Pen (Not visible in the picture)
These are provided for participants to write down their feedback.

Bluetooth Speaker (Not visible in the picture)
It plays a redesigned version of "Oh Oh Den Haag" to simulate real setting.

APPENDIX F. The Orignial Project Brief

DESIGN FOR our future

*TU*Delft

Personal Project Brief – IDE Master Graduation Project

Name student   Jade Lo   **Student number**   6,007,465

PROJECT TITLE, INTRODUCTION, PROBLEM DEFINITION and ASSIGNMENT
Complete all fields, keep information clear, specific and concise

Project title   The Social Practice of Waste: Mitigating the Misplacement of Bulky Waste in the Hague

Please state the title of your graduation project (above). Keep the title compact and simple. Do not use abbreviations. The remainder of this document allows you to define and clarify your graduation project.

Introduction

Describe the context of your project here; What is the domain in which your project takes place? Who are the main stakeholders and what interests are at stake? Describe the opportunities (and limitations) in this domain to better serve the stakeholder interests. (max 250 words)

The graduation project is built on the "Achter Afval (behind waste)" project through Erasmus University, commissioned by the Municipality of The Hague. The Achter Afval project aims to explore the underlying causes of waste misplacement in the Hague.

Waste misplacement in public spaces is a persistent problem in the Hague. The issues commonly reported include the addition of bags, bulky waste, and mattresses (See Figures 1 and 2). Some interventions only address the symptoms with a temporary effect and only work in neighborhoods with high social cohesion (Merkelbach, Dewies & Denktas, 2021). The results from Achter afval phase 1 show that waste problems are entangled with structural, social, cultural, and economic aspects in certain neighborhoods of the Hague. People's actions are not only influenced by individual motivations but also by knowledge, skills, and resources available to them and their connection with the living environment.

Therefore, the project seeks integrated solutions that extend beyond the behaviors of individuals. To develop more socially inclusive solutions, Achter Afval suggested focusing on the placement of garbage bags or bulky waste in a specific district or neighborhood in order to build ties and work together toward solutions. The co-creation methods will be applied to engage local stakeholders in identifying their needs and designing interventions that promote greater acceptance of waste management solutions.

➔ *space available for images / figures on next page*

image / figure 1 **Waste misplacement on the Fugastraat in Loosduinen (Tielemans, 2023).**

image / figure 2 **The bulky waste, such as a mat and luggage box, was randomly thrown on the street on the Laak**

Personal Project Brief – IDE Master Graduation Project

Problem Definition

What problem do you want to solve in the context described in the introduction, and within the available time frame of 100 working days? (= Master Graduation Project of 30 EC). What opportunities do you see to create added value for the described stakeholders? Substantiate your choice.
(max 200 words)

The waste misplacement in the Hague presents a challenge that extends beyond individual behaviors to a broader social perspective. Public trashing is like all socially visible activities, which occur within a broader social setting and do not merely involve the actions of the trasher. It is shaped by the actions, interactions, and shared understandings of multiple individuals (Perry, Juhlin & Normark, 2010). Seeing waste as a social practice brings a challenge that designers combine, different disciplines, such as sociology, to address the issue. These require designers to take a more holistic view of the issue with the ability to bridge research and practice by tailoring the needs to more inclusive solutions.

The project takes bulky waste (furniture, electronics, mattresses) as a key focus and is treated as a separate category in the misplacement issue, highlighting its distinct features, such as often being unpacked, larger than the underground container slot, and sometimes occasionally left on the street. The aim is to mitigate bulky waste misplacement through design intervention that supports local stakeholders in waste management.

The research questions are:
What are the practices of bulky waste for people living in the Hague?
How can design intervention mitigate bulky waste misplacement?

Assignment

This is the most important part of the project brief because it will give a clear direction of what you are heading for. Formulate an assignment to yourself regarding what you expect to deliver as result at the end of your project. (1 sentence) As you graduate as an industrial design engineer, your assignment will start with a verb (Design/Investigate/Validate/Create), and you may use the green text format:

- *Understand the social practices of bulky waste in the Hague.*
- *Design interventions to mitigate the misplacement of bulky waste in The Hague.*

Then explain your project approach to carrying out your graduation project and what research and design methods you plan to use to generate your design solution (max 150 words)

The project follows the double diamond model as a design process with four phases: (1) Discover, (2) Define, (3) Develop, and (4) Deliver, which was proposed by Design Council (2004).

(1) Discover: Snowballing sampling will be used to begin the interview with a few study participants and continue on the basis of referrals from those participants. The field research will be conducted through observations and walking interviews to understand the current context. The main focus will be on people as tenants and landlords in The Hague.
(2) Define: Analyze research findings to generate insights, which helps to refine the design brief and confirm the design direction.
(3) Develop: A co-design method will be utilized to adopt users/stakeholders' opinions into solutions. Through ideating, prototyping, and iterating ideas, the final concept will be proposed.
(4) Deliver: Evaluate the final intervention with users/ stakeholders, and summarize recommendations and limitations for future implementation.

Project planning and key moments

*To make visible how you plan to spend your time, you must make a planning for the full project. You are advised to use a Gantt chart format to show the different phases of your project, deliverables you have in mind, meetings and in-between deadlines. Keep in mind that all activities should fit within the given run time of 100 working days. Your planning should include a **kick-off meeting**, **mid-term evaluation meeting**, **green light meeting** and **graduation ceremony**. Please indicate periods of part-time activities and/or periods of not spending time on your graduation project, if any (for instance because of holidays or parallel course activities).*

Make sure to attach the full plan to this project brief.
The four key moment dates must be filled in below

Kick off meeting	14 Feb 2025
Mid-term evaluation	11 Apr 2025
Green light meeting	27 Jun 2025
Graduation ceremony	25 Jul 2025

In exceptional cases (part of) the Graduation Project may need to be scheduled part-time. Indicate here if such applies to your project

Part of project scheduled part-time	
For how many project weeks	
Number of project days per week	

Comments:

Motivation and personal ambitions

Explain why you wish to start this project, what competencies you want to prove or develop (e.g. competencies acquired in your MSc programme, electives, extra-curricular activities or other).

Optionally, describe whether you have some personal learning ambitions which you explicitly want to address in this project, on top of the learning objectives of the Graduation Project itself. You might think of e.g. acquiring in depth knowledge on a specific subject, broadening your competencies or experimenting with a specific tool or methodology. Personal learning ambitions are limited to a maximum number of five.
(200 words max)

Reading participatory and co-design/ co-creation papers usually inspires me. However, many questions arise about how to employ these methods in the real setting raised in my mind. I believe that the most effective way to gain a deeper understanding is through practical application in real-world scenarios rather than remaining solely within the theoretical framework. I am looking forward to exploring what can be achieved in a practical setting of the project and bridging the gap between academia and practice.

In addition, I am interested in the diversity among people, which has always broadened my understanding of the world. Some design lectures sparked me to embrace the complexity of humanity and society with a deeper understanding of micro, micro, and macro perspectives. This project supports me in continually exploring my interest in social design, design for the public, and participatory design. I am excited about this opportunity to further develop the ability to interact with multiple stakeholders, collaborate with the municipality, and propose more inclusive designs when addressing social issues.